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# DECISION SUPPORT SYSTEM BASED ON SIGNS AND SYMPTOMS USING NEURAL NETWORKSFOR CONGENITAL HEART DISEASE DIAGNOSIS

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**ABSTRACT:**

**One of the important methods of data analysis is classification. Many real-world problems in various fields, such as business, science, industry, and medicine can be solved using a classification approach. Neural networks have emerged as an important tool for classification. The advantages of neural networks help to efficiently classify these data. In this study, a set of heart disease data is analyzed using a neural network approach. To improve the efficiency of the classification process, a parallel approach was also adopted in preparation.**

**This project is aimed at the design and implementation of automatic diagnosis of cardiovascular diseases using MATLAB. Cleveland data set for heart disease was used as the main database for training and testing system developed. To prepare and test the Cleveland data set, two systems were developed. The first system is based on the structure of a multilayer perceptron (MLP) of a neural network in the artificial domain (ANN), while the second system is based on the approach of aadaptive network-based fuzzy inference system (ANFIS).**

**KEYWORDS: Congenital Heart Disease, Disease Diagnosis, Decision Support System, Back propagation Neural Network.**

## I. INTRODUCTION:

Recently, heart disease has become one of the most common diseases that people suffer from. According to statistics, this is one of the leading causes of death worldwide (CDC report). Many factors, such as clinical symptoms and the relationship between functional and pathological manifestations of heart disease and another human heart, complicate the diagnosis and cause a delay in diagnosing the right solution. Thus, the diagnosis of heart disease is a major problem in the healthcare industry and many researchers are trying to develop systems to support a medical solution (MDSS) to help doctors. These systems are designed to moderate the time of diagnosis and improve the accuracy of diagnosis and to support the decision-making process more complex diagnosis.

Currently, hospital information systems using decision support systems have various tools available for data but are still limited. These tools can only answer a few simple questions such as "identify male patients under the age of 20 and married who was being treated for a heart attack." However, they are not able to respond to complex queries "data Patient histories, predicting the likelihood of patients suffering from cardiovascular disease ", as an example

According to, clinical decisions are often made on the basis of ideas from doctors and heuristic experiences, rather than in the rich knowledge data hidden in the database. They lead to undesirable prejudices, mistakes and unnecessary medical expenses that affect the quality of the treatment provided to patients. Driven by the need for a system of this type, in this work the method effectively diagnoses heart diseases, which leads to a reduction in medical errors and changes in access practice suggests that reduces the time of diagnosis and improves the safety and satisfaction of patients.

These shortcomings can be solved using the methods of neural networks. In this study, the neural back propagation network model is most often used to classify the diagnosis of congenital heart defects based on signs, symptoms and physical examination of the patient, as shown in the table below. Since the solutions of the neural network do not depend on the algorithmic solution depends on the above examples of cases, which gives more accurate results than the individual results.

## II. LITERATURE SURVEY:

Jayshril S. Sonawane et al.[1] is explained prediction of the diagnosis of heart disease, the neuron single-layer perceptron multiple neural networks is required to be explained. After 13 clinical signs, the neural network is formed using an inverse propagation algorithm to predict the presence or absence of heart disease. The system provides an accuracy of 98% compared to another traditional system.

Nilakshi P. Waghulde [8] developed a system for the diagnosis of cardiovascular diseases. The author made a hybridization of the genetic algorithm and the neural network. In this system, the genetic algorithm for

initializing the neural network and the neural network trained to calculate the hidden nodes is optimized. This neural genetic approach gives an accuracy of 98% with 12 parameters.

Nabeel al-milli is a system developed compared to predicting heart disease, based on the neural back propagation network. The author uses the verse in MatLab for the execution and prediction of 13 physicians, such as age, gender attributes, chest pain, etc. The predictions are divided into 4 classified as a normal person, the first shot, the second shot, and the end of life[11].

S.Florenceprepared a data mining tool to analyze a heart attack. In their study, the authors investigated several methods of data mining for accuracy comparison. He used the neural network algorithm using the decision tree algorithm (ID3) with 6 selected attributes from the heart attack training data set provided by the UCI under the siege machine[12].

Milan kumari et al. reduce complexity of detection of cardiovascular diseases using vector support vectors, artificial neural networks (ANN), and the wood tree array classifier copy algorithm. we investigated the efficacy of these algorithms for the detection of heart disease as a function f of the sensitivity, specificity, accuracy, error rate, positive of the mass of real false positives of AAS and. the author noted the accuracy ripper-81.08%, a decision tree - 0.79.05%, ANN -80.06% to SVM - 84.12%. While the ripper error range-2.756, a tree tap 0.2248, 0.2248 and ANN-SVM-0.1588. The analysis shows that the four SVM classification models are the best outcome for forecasts.

Vanisree K et al. [4] has prepared a system for the diagnosis of congenital heart disease. Author advance its operation with the sign of symptoms and the patient's assessment of physical properties. Entire system is based on the feedback of the neural network (neural network) and provides 90% accuracy of the result.

Hongmei [7] is the development of a system for diagnosing five major cardiovascular diseases using a three-layer multilayer perceptron neural network (MLP). IT Product 38 of the input attributes the case of several patients. The number of neurons in the secret will of the level - determined by training in the cascade process. For the five types that were predicted by Cardiac, the Author of Disease 5 output sofas are used. In addition, the author considers them as missing data with averaged substitution. The accuracy of this system is derived from 63.2 to 82.9%.

Rajkumar and Sophia[21]projected the diagnosis of heart disease using a data mining algorithm. They combined chemical properties and electrocardiograms (ECGs) in diagnosing cardiovascular diseases. This study has an accuracy of 53.33%.

For cardiac disease, Gudadhe et al. Proposed, a system based on support vector machines and Multilayer perceptron neural network architecture. Support vector machines show only the presence or absence of hereditary diseases up to 80.41%, while the artificial neural network will prepare five different classes for hereditary diagnosis with an accuracy of 97.5% [9].

Usha Rani [10] used a combination of the distribution and propagation algorithm to reverse the development of HDPS. The experiment is carried out taking into account models of neural networks with one or several layers. In each hidden layer and the output of each neuron, parallelism is established to speed up the learning process.

## III CONCEPT OVERVIEW:

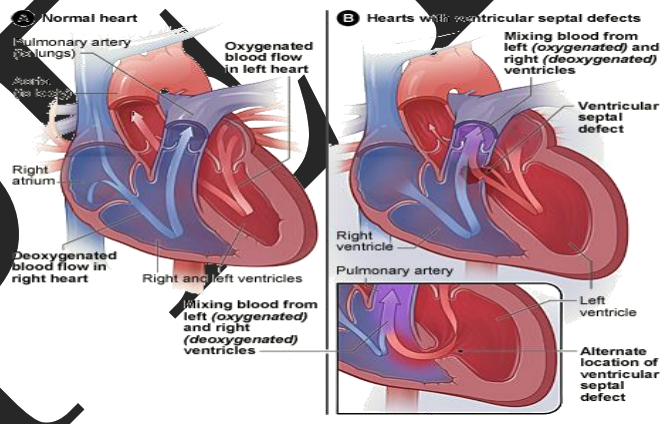



Figure 1: Heart Defect

"Neural network" redirects here. For live neuron networks, see a neural network. For the newspaper, see Neural Networks (paper). To develop the concept of neural networks see (Evolution). We are redirected to "neural calculus."

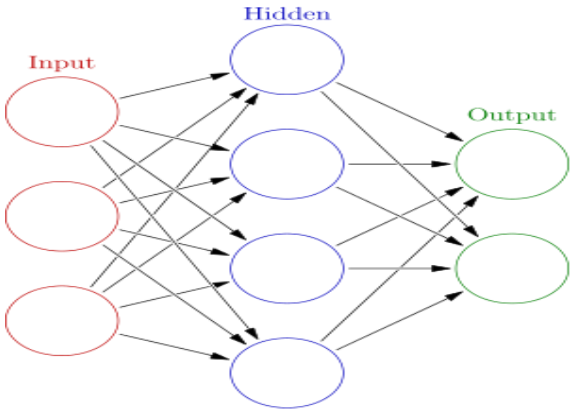



Figure 2: Neural Network

An artificial neural network is an interconnected group of nodes, in a vast network of neurons in the brain. Here, each node is a circular artificial neuron and the arrow is a connection between the output of the neuron and another input.

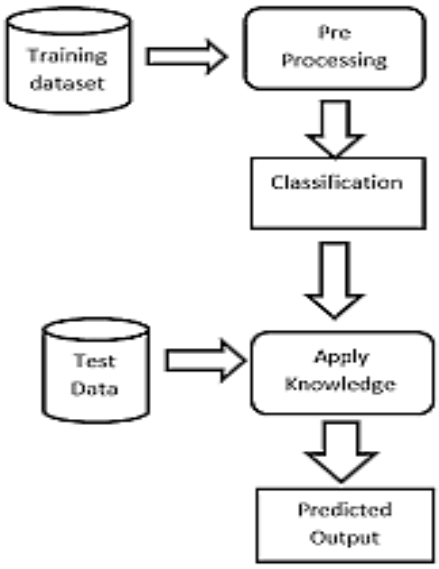



Figure 3: Proposed System Overview

Intelligent data analysis is the process of automating the detection of information (knowledge). Discovery of knowledge in databases (KDD) is a process of obtaining high-level knowledge from low-level data. Data extraction plays an important role in KDD. Data extraction is an interdisciplinary field. Its main goal is to discover the relationships in the data and the prediction of the results. Researchers are trying to find satisfactory solutions within a reasonable time by means of research methods since many problems are difficult to solve at a feasible analytical time. As a result, mining plays a role. Intelligent data analysis helps to extract models in the knowledge discovery process in databases in which they apply intelligent methods. Extracting data from the emerging field promises to provide new technologies and intelligent tools that help a person to analyze and understand large data bodies remain on a complex and unresolved problem. Common features in the current data mining practice include classification, regression, clustering, rule generation, the discovery of association rules, summaries, dependence modeling and sequence analysis. Classification is one of the most important methods of data mining. The input in the classification problem is a set of data, called the training set has a number of attributes. Attributes are continuous or categorical. One of the categorical attributes is the label of the class or attribute of the classification. The goal is to use a training kit to create a class label model based on attributes, so the model can be used to classify new data, rather than from a set of training data. Various data extraction problems can be effectively managed using soft computing. These methods are fuzzy logic, neural networks, genetic algorithms and a set of oil that will lead to smart, interpretable and cheap compared to traditional methods.

Artificial Neural Network (ANN) is one of the most frequently used methods of mining models for extracting a reasonable and reliable method and is used to find significant models that describe a data report. With the essential features of ANN network neural network above, it will be adopted in this study for the classification of data. Parallel processing is performed at each node at different levels of the network.

Data extraction methods are widely used in medical and diagnostic applications because of their predictive power. Data mining algorithms can learn from past examples of clinical data and often simulate nonlinear relationships between independent and dependent variables. The resulting model is a formalized knowledge, which can often provide a good diagnostic evaluation.

In this study, we propose a neural network approach to the definition of effective classification standards. To calibrate medical data, a neural network is trained using the back propagation algorithm. Since the neural network structure is suitable for parallel processing, the output of each neuron at different levels is calculated in parallel. Network performance analysis of different types of test data.

## III. DECISION SUPPORT SYSTEM FOR CONGENITAL HEART DEFECT DIAGNOSIS

In order to increase the accuracy of diagnosis and reduce the time of diagnosis, it has become a challenge to create an effective and reliable decision support system for decision support and an even more complex diagnosis. Therefore, soft computing methods, such as neural networks, have shown great potential for application in the development of a system for supporting medical solutions for cardiovascular diseases.

Disadvantages of the existing system can be overcome with the help of neural networks. In this study, the neural model of the back-propagation network most commonly used to perform the classification of congenital heart defects based on signs, symptoms and physical examination of the patient is shown in the table below. Since the neural network, the solution does not depend on the algorithmic solution, and this depends on the examples of the previous cases, which provides more accurate results of the human diagnosis.

## IV. PERFORMANCE ANALYSIS:

The analysis of the system consists of mathematical calculations, simulation, and its results, the comparison with several systems and the final result of the system.

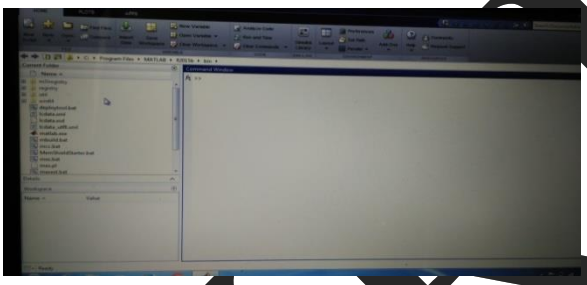
**A. ANALYSIS OF PROPOSED SYSTEM:**

Matlab neural network toolbox provides tools for designing, deploying, viewing, and simulating neural networks. It supports advanced power grids, basic radial networks, dynamic networks, self-organizing maps and other proven network paradigms.

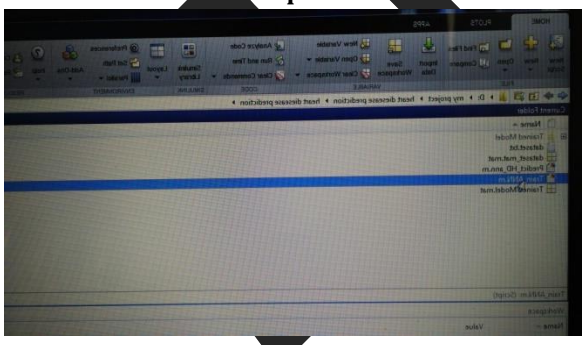
Follow the Matlab examples to learn how to use the four graphical tools to form the neural networks to solve the problem of regulatory functions, pattern recognition (clustering and historical time series on their own). To start the master GUI type is nnstart. This allows you to access GUIs for tasks such as function fitting, pattern recognition, data cluster, and time series analysis. The second way to use the toolbox is through the command line operation, which we will not cover.

**B. NEURAL NETWORK DESIGN STEPS:**

- Acquire data
- Form the network
- Configure the network
- Initialize the weights and biases
- Train the network
- Authenticate the network
- Use the network



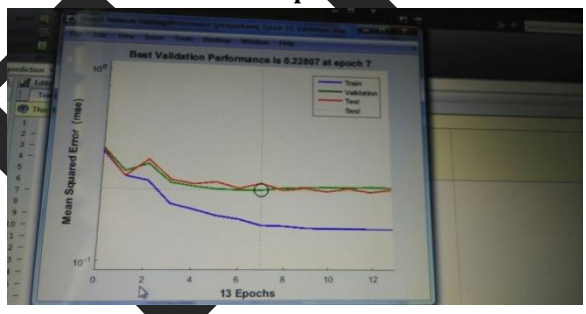
**Steps 1**



**Step 2**

**Step 3**


**Step 4**

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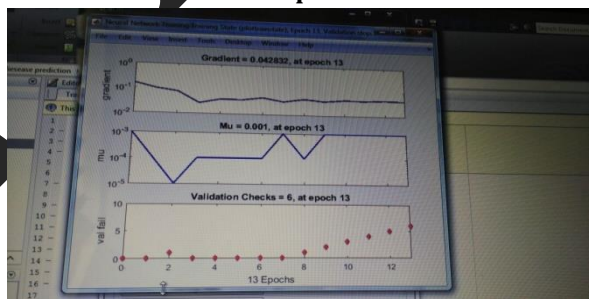


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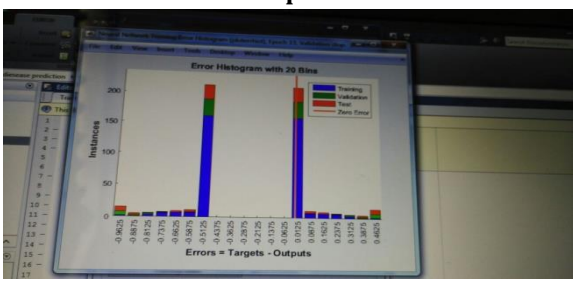


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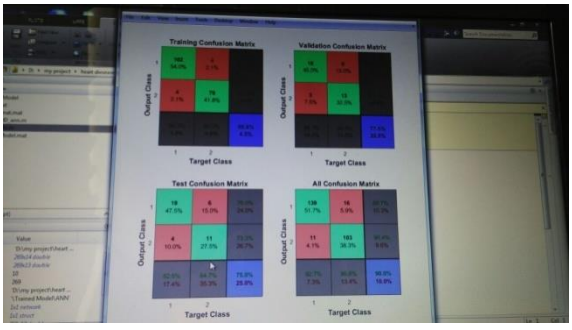


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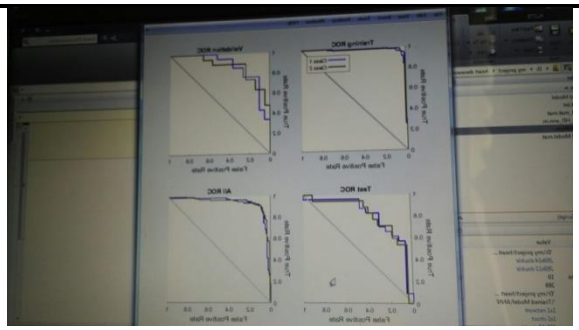

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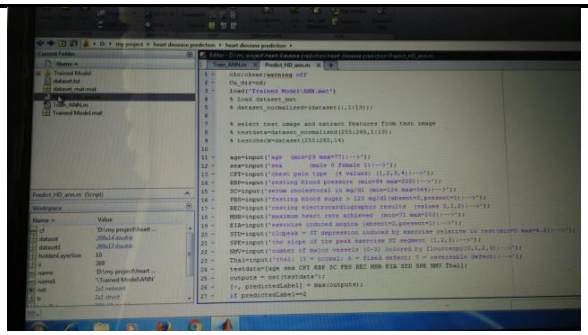
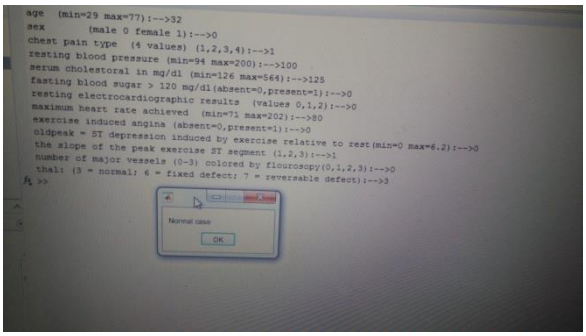


**Step 10**

**C. FINAL RESULT:**




**V. CONCLUSION**

This research effort has developed two systems based on ANN and the neuro-fuzzy approach to the development of an automated diagnostic system for cardiovascular disease. It is understood that the neuro-fuzzy system is superior to the INS system using a training data set where the accuracy of each system is 100% and 90.74% respectively. However, using a test data set, it is clear that the system exceeds INSA Neuro-fuzzy systems, with the highest accuracy for each system being 87.04% and 75.93% respectively. This system can be used in hospitals by doctors and doctors to classify patient's heart disease. Further work can be done through the use of a different architecture and forming INS algorithms for more accurate results.

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