

ANALYSIS OF DATASET WITH HEART DISEASES USING NEURAL NETWORK APPROACH

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Abstract - The major techniques of Data mining is Classification. Many real world problems in fields such as business, science, industry and medicine can be resolved by using classification method. Neural Networks have become evident as an important tool for classification. The advantages of Neural Network helps for effective classification of given data. Study of a Heart disease dataset is analyzed using Neural Network method. To expand the effectiveness of classification process, parallel approach is adopted in the initial stage.

Key Words: Data mining, Classification, Neural Networks, Parallelism, Heart Disease

1. INTRODUCTION

Data mining is the research and analysis of big data to discover significant patterns. It is considered under the data science field of study and varies from predictive analytics issues because it describes past data, as data mining aims to predict future results. Eventually data mining techniques are used to implement machine learning (ML) models that enhance modern artificial intelligence (AI) applications such as search engine algorithms and recommendation systems.

Data mining helps to extract patterns in the steps of knowledge discovery in databases in which intelligent methods are used. The upcoming field of data mining provides new techniques and intelligent tools which help the human being to analyze and understand large data remains on difficulties and unsolved issues. The functions in current data mining includes Classification, Regression, Clustering, Rule generation, Discovering association rules, summarization, dependency modelling and sequence analysis.

Data mining methods have been used in diagnostic and health care applications because of their predictive nature. Data mining algorithms can study from past illustrations in clinical data and model the often times non-linear relationships between the independent, dependent variables. The final model presents a formalized knowledge which can provide a good diagnostic decision.

The structure of the paper follows the introduction, where fundamental problems of neural networks for classification

are represented in Section 2. Section 3 represents the implementation of neural networks in the medical field. In Section 4 a neural network proceed towards generating effective classification, and the performance of the network is analyzed. Section 5 concludes the study.

1.1 Problem Statement :

The study of neural network proceeds to generate effective classification algorithms. To implement classification of medical data, the neural network is studied using Back propagation rules. The structure of neural network is appropriate for parallelly processing the outcome at each neuron in various layers which is calculated parallelly. The implementation of the network is analyzed with different types of test.

2. Understanding neural networks:

The neural network is a sequence of algorithms that recognizes an underlying relationships in a set of data for a process that imitates the way the human brain does. Here Neural networks follows to systems of neurons, organic or artificial in nature. Neural networks can be modified for changing an input, so the network causes the best possible result, where without the need to redesign the output criteria. The study of neural networks, which has its source in artificial intelligence, is rapidly obtained popularity in the enhancement of trading systems. The Artificial Neural Network (ANN) is a method that is frequently used to solve data mining applications. Neural Network is a set of processing units when gathered in a closely interconnected network, provides a liberal structure displaying some characteristics of the biological neural network. The design of neural network offers a chance to the user to implement parallel concept at each layer level. other significant features of ANN is fault tolerance .ANNs are well opted in scenarios where information is uncertain. ANN is information processing methodology that varies tremendously from conventional methodologies in that, it employees study by illustrations to solve issues rather being than a fixed algorithm. It can be separated into two categories which depends on the training methods, Supervised training and Unsupervised study. Networks that are supervised need the actual expected outcome for each input where as

unsupervised networks does not need the desired outcome for each input.

Artificial neural networks are the way for life-changing applications to be progressed for use in all departments of the economy. Artificial intelligence that are built on ANNs are disturbing the traditional ways of doing things. Like translating web pages into other languages to, having a virtual assistant order groceries online to have a conversation with chatbots to solve issues. The popular neural network rule is back-propagation algorithm. Many types of neural networks can be used for classification purposes, the goal is on the feed forward multilayer networks or multilayer perceptrons which are the widely learned and applied neural network classifiers. The feed-forward, back-propagation architecture is developed in the 1970's. This back-propagation architecture is the most popular, efficient, and quick-to-learn model for complex, multi-layered networks. Training inputs are used to the input layer of the network and desired outputs are differentiated at the output layer. While the learning process, a forward sweep is made by the network and the output of every element is computed layer by layer. The disagreement between the output of the final layer and the desired output is back-propagated to the previous layers usually modified through the derivative of the transfer function, and the connecting weights are normally modified. This proceeds for the previous layers until the input layer is extended. A key attribute of neural networks is an iterative learning in which data cases are represented to the network one at a time and the weights associated with the input values are adjusted each time. All scenarios are represented the process often starts over again. Throughout this learning period the network studied by allocating the weights so as to be able to predict the appropriate class label of inputs. Once a network has been designed for a particular purpose that network is ready to be trained.

3. Neural Network Benefits:

- Neural Networks have the efficiency to study by themselves and create the output that is unlimited to the input described to them.
- The input is processed in its own networks rather than of a database therefore the loss in data does not affect its study.
- These networks can study from illustrations and use them when alike event arises making them able to process with real-time events.
- If a neuron is not giving response, a piece of data is lost, the network can determine the criticism and still produce the outcomes.
- They can perform various tasks parallelly without affecting the system execution.

4. Neural Network Uses:

The Artificial Neural Network has been from 1943 when it was initially structured but has recently come into light under Artificial Intelligence because the applications that makes it more preferable. These include:

- Image Processing system.
- Language processing and translation system.
- Route detection system.
- Speech recognition system.
- Forecasting system.

Artificial Neural Networks are being applied to solve complex issues and the demand is enlarged with time. The large Number of applications from face recognition systems to making precise decisions are being managed by Neural Networks. The more it is revealed to real-time illustrations, the more it adjusted. Neural Networks are efficient of studying from mistakes.

5. Examples of Neural Networks in the Medical Science:

Though they may seem like a futuristic concept, ANNs have been applied in healthcare for most of decades. In fact the book "Neural Networks of Healthcare study" has the various uses of this system before till 2006. Before 2006 the main achievements of ANNs were known in surroundings like speech processing systems and image processing systems. Today as there are new technologies emerging they are capable of changing behaviour that we found neural networks in the first place. It is worth noting down that there may be tremendous latest options for changing the trade.

The possibilities for Neural Networks in Healthcare include:

- Diagnostic systems – ANNs can be applied to detect heart and cancer issues as well as different other diseases known by large data.
- Biochemical analysis – ANNs are applied to analyze urine, blood samples as well as tracking glucose levels in diabetic patients, determining ion levels in fluids and detecting different pathological issues.
- Image analysis – ANNs are mostly applied to analyze medical images through different areas of healthcare including tumor detection, x-ray classifications and MRIs.
- Drug development – ANNs are applied in the progress of drugs for different issues. Works by applying enlarge amounts of data to come to a result about treatment suggestions.

6. Prediction of Future Health care:

The most important issue with ANNs is that the studied attributes involved, when it comes about assessing huge loads of data can sometimes be tough to interpret. This is why ANNs are regularly used throughout situations wherein we have a lot of information to make sure that the observed data doesn't have too many flukes. If you toss a coin two times and get a tail every time this doesn't mean that a coin only has a tails side. It means that you require evaluation and more testing to get a correct measurement of probability. ANNs will require tweaking if they're going to change that the healthcare field requires. However, new AI development seems that neural networks have a very significant role to play in the future predictions of healthcare.

7. Learning of an Artificial Neural Network:

A network has been designed for a specific application that network begins to be trained. To begin this stage the initial weights are chosen randomly. There are approaches for learning, supervised and unsupervised learning. Supervised learning requires a procedure for supplying the network with the desired outcome by casually grading the network execution, by supplying the desired outcomes with the inputs. Unsupervised learning is where the network has to make use of the inputs without outside help. The huge portion of networks use supervised learning. Unsupervised learning is applied to execute an initial characterization on inputs. However the blown sense of being truly self learning it is still a significant believe that is not fully understood and does not completely work and is put down to the lab.

In this illustration the neural network is studied with Heart Diseases database sets by applying feed forward neural network application and back propagation learning rules with variable learning rate. The input of the network possess of 13 neurons to show each feature as the database set contributes 13 features. The sequence of classes are four: 0 : normal person, 1: first stroke, 2: second stroke and 3: end of life. The output contains two neurons to show these classes. The details of the back propagation algorithm is verified in the above context used to study the neural network while the learning process. Many neural networks are designed with or without hidden layers. single and multi layer networks and studied with heart disease dataset. Association with the number of epochs and the sum of squares of bugs throughout the learning process for different networks can be seen in the Fig 1-2.

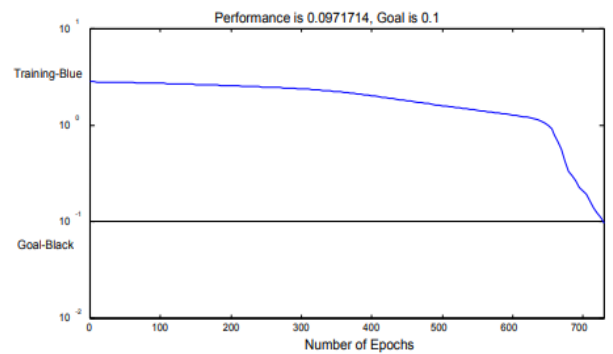


Fig.1 Learning the Single Layer Network with Dataset of Heart Diseases.

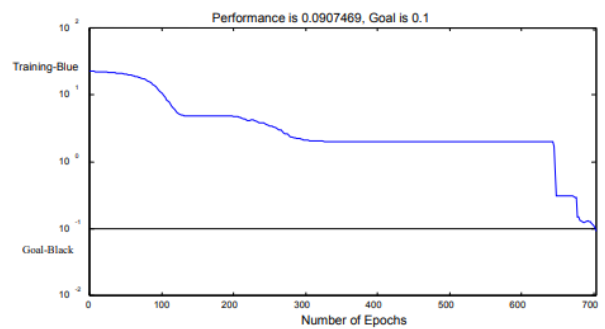


Fig.2 Learning the Multi Layer Network with Dataset of Heart Diseases.

8. Performance study of Neural networks:

For calculating the performance test of the various sample units are collected as test data. The test data is given as the input to the learning network and the output is calculated with the adjusted weights. The outcome of the net is differentiated with the target outcome to train the learning capability of the network sets for classifying the heart disease datasets.

Table -1: Illustration Tables of Heart disease datasets.

Learning illustrations	Test illustrations	Classification Effectiveness	
		Single dimensional	Multi dimensional
50	200	67%	89%
100	150	69.43%	90%
150	100	78.6%	56.3%
200	300	91.9%	82%

9. CONCLUSIONS

Classification plays a significant role in the issues of rapidly appeared in the field of data mining. Most issues in business, science, industry, and medicine can be treated as classification training issues. The wide range of ANN and their capability to study complex, nonlinear relationships including disturbed or less precise data. Neural networks are well known to solve issues in bio-medical engineering. In this training of Neural network technique is accepted for classification of medical research dataset. The illustration is being conducted while Heart Disease dataset and also considering the single and multilayer neural network types. Back - propagation rules with variable learning rate is applied to study the networks. To analyze execution of the network different types of test data are given as input to the network. Parallelism is developed at each neuron where all hidden, output layers to speed up the training phase. The illustration results proved that neural networks technique supplies satisfactory outcome for the classification module.

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