Economic Approach for Stochastic Artificial insemination by Neural Network

Tashakori, Zeynolabedin and Mirzaei, Farzad

Electrical and Computer Engineering Department, Shiraz University of Technology, Shiraz, Iran, Electrical and Computer Engineering Department, Azad University of Marvdasht, Fars, Iran

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Zeynolabedin Tashakori[1], Farzad Mirzaei[2],

[1]Electrical and Computer Engineering Department, Shiraz University of Technology, Shiraz, Iran
[2]Electrical and Computer Engineering Department, Azad University of Marvdasht, Fars, Iran

1. Abstract

The most common neural network model is the multi-layer perceptron (MLP). This type of neural network is known as a supervised network because it requires a desired output in order to learn. The goal of this type of network is to create a model that correctly maps the input to the output using historical data so that the model can then be used to produce the output when the desired output is unknown. In this paper, a new MLP is proposed for insemination problem. The result of the proposed method, is shown the high performance beside a very fast respond for the problem. Moreover, the conversion of the error is analyzed by the proposed method. All the simulation and result is done in MATLAB environments.

Keywords: **A Multilayer Perceptron (MLP), Neural Network, Targets Train, Neuron, Targets Train.**

1. Introduction

In the recent years, the applications of Neural Network (NN) are rapidly increased. This is mainly because such a systems can use in many kinds of problems such as power system [1], stability analysis [2], decentralize control [3], clustering data analysis [4], etc. For instance, in [5] fuzzy logic is used in high power voltage control for the first time but it is not perfect to low level frequency problems or low level electrical energies. In optimization problem neural network is used and modeled as the wind uncertainty in the main structure in [6]. The Mathematical modeling of neural network for stochastic and probabilistic problems is explained in [7], [8] which are perfect for renewable energy as well. In [9] for the first time neural network is used to model the random delay in control systems for the first time. Neural network has a lot of application in other science for nonlinear and non-convex problems [10-15].

Artificial insemination is a fertility treatment for humans, and is a common practice in the breeding of dairy cattle and pigs. Artificial insemination may employ assisted reproductive technology, donated sperm, and/or animal husbandry techniques. In this paper, I want to predict the probability of Artificial insemination by multi-layer perceptron (MLP) in neural network.

In this paper, try to examine different numbers of neuron such as 10, 20, 30 in order to have a correct analysis of the problem. The results is proved that by increasing the neurons, the accuracy of the problem is better and the conversion error is very fast. It should be noted that Mydir is a way which program is run and addpath is a function which can add more way into the program by MATLAB neural network software. Also, by training more data or by increasing more test data, the neural network solution guarantee to coverage the error with a high performance results. After defined the neuron and layer of the neural network, the main insemination problem is applied to prove the high performance by MATLAB NN toolbox. Finally, incremental updating and batch updating are applied. The accuracy of the algorithm with different number of neurons and also True/false positive rate is analyzed and shown in the result section. In the second section, Multi-Layer Perceptron is defined. In the section three, artificial neuron and data are analyzed and explained. In the section four represented the results and discussion. Finally, the conclusion is represented in section 5.

2. Multi-layer Perceptron (MLP)

A multilayer perceptron (MLP) is a feedforward artificial neural network model that maps sets of input data onto a set of appropriate outputs. An MLP consists of multiple layers of nodes in a directed graph, with each layer fully connected to the next one. Except for the input nodes, each node is a neuron (or processing element) with a nonlinear activation function. MLP utilizes as a supervised learning technique called back propagation for training the network. However, there are exists many other methods, MLP is a modification of the standard linear perceptron and can distinguish data that are not linearly separable. Moreover, MLP can guarantee the stability of the system and find the global solution for the problem. In this paper MLP is used for the neural network

model and the system based training of the neural network is MLP. Fig.1 shows MLP in neural network.

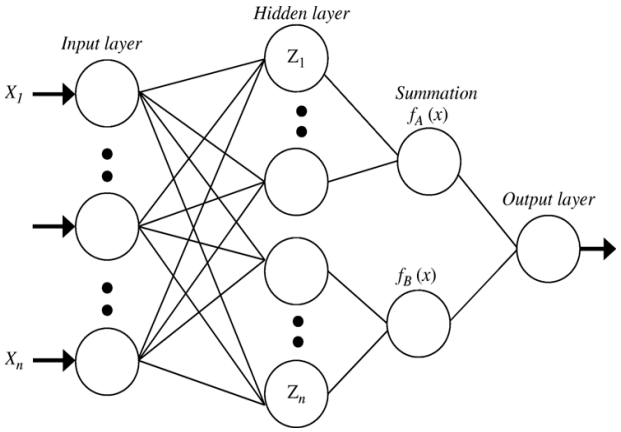

Fig 1. Multi-layer Perceptron (MLP).

Based on the fig. 2 by increasing the number of layer in MLP, the accuracy of the system increased. However, the mathematical modeling of the system is become complicated. For this paper which has a lot of data, by increasing the number of the data, the performance of neural network is increased exponentially and the coverage of error was very fast.

3. Artificial Neuron and Data

An artificial neuron is a mathematical function conceived as a crude model, or abstraction of biological neurons. Artificial neurons are the constitutive units in an artificial neural network. The artificial neuron receives one or more inputs (representing the one or more dendrites) and sums them to produce an output (representing a biological neuron's axon). Usually the sums of each node are weighted, and the sum is passed through a non-linear function known as an activation function or transfer function. In the artificial neuron and data, the number of neurons, training data and target data paly a very significant role in the behavior of the program and minimizing the time and coverage speed.

3.1. Neurons Data

In this paper, a part is defined as Neuron's which you can determine the number of neurons that you need for your estimation. So, it is possible to change the number of neurons according to the demand (which is estimated or predicted before the programming) and your valid data.
In such kind of program, the best program is a program that no changes happen in your final result for any different number of neurons. It means the program saturated very fast and coverage the error in the worst case scenario. As a result, the number of neurons could change according to the demand and possible data. In the result section, the above statement is analyzed and proved for different number of neurons and defined it as an accuracy of algorithm with different number of neurons.

3.2. Targets Train

For writing a program it is need some correct sample data which are test and experienced before. So by referring to them as a pattern for other data in order to figure out that the available data (current data) are belong to what kinds of groups. In this paper, two different groups is defined and analyzed: 1) True 2) False. In fact, by selecting some correct data as a pattern for future data. This method help to compare to both kinds of data for take a decision as a result. In this program a set of data is used as a pattern which you can see in the program as targets train. In fact, targets trains are a goal for the result.

4. Case study and Results

In this paper, it is possible to change parameters according to the interest. Also, it is possible to add any new experience into the basic data for further information's. For example, this case study used 283 data for get true result. Considering that new data update to 1000 information. Therefore, easily can add them to the current results for better production especially when the goal is mixed up two different phylum's of animals (for example cattle of Asian and cattle of USA) for low risk and high economic efficiency. Also easily can update the program for produce better phylum's and organic productions.
The accuracy of the neural network program is shown in fig 2 and fig 3 for different number of neurons. The result prove the high performance of the proposed technique.

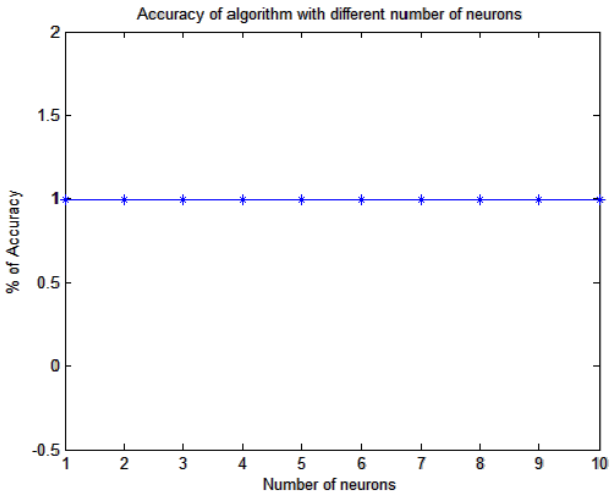

Fig. 2 Accuracy of Algorithm for 10 Number of Neurons.

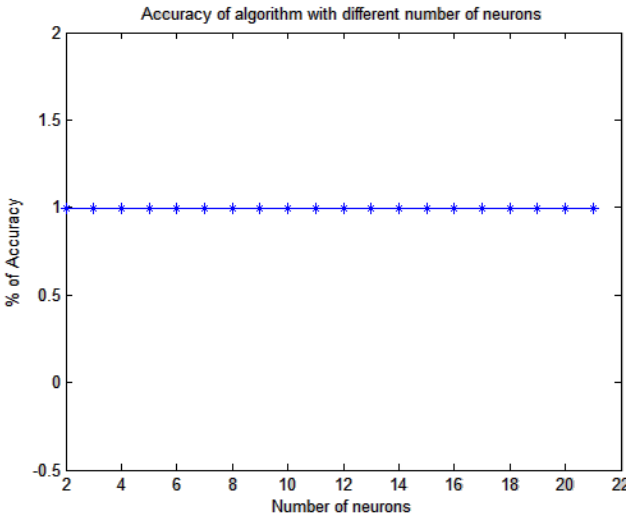

Fig 3 Accuracy of Algorithm for 20 Number of Neurons.

Three kinds of group's are defined as three different colors. The first groups are dark green and light green (to some extant light yellow) which are represent that those kind of phylum's are ready for reproduce in a safe condition Fig 4. However, dark green are much better than light green. Therefore, investing on them is very logical and far from any stress and strain.

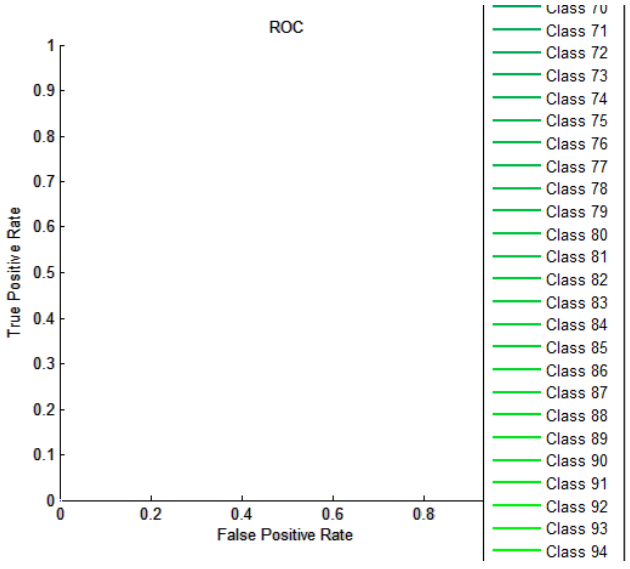

Fig 4 First Groups (No risk).

The second groups are belongs to the light read which means that insemination is in the risk Fig 5. So, for investment should get sample again or analyze the condition for reproduce due to they are in border line. The third groups are dark red and dark blue (other colors) which represent that insemination are in the high risk and they are not ready for insemination and also not proper for investment. As a result, we should reject them and invest in the other groups Fig 6.

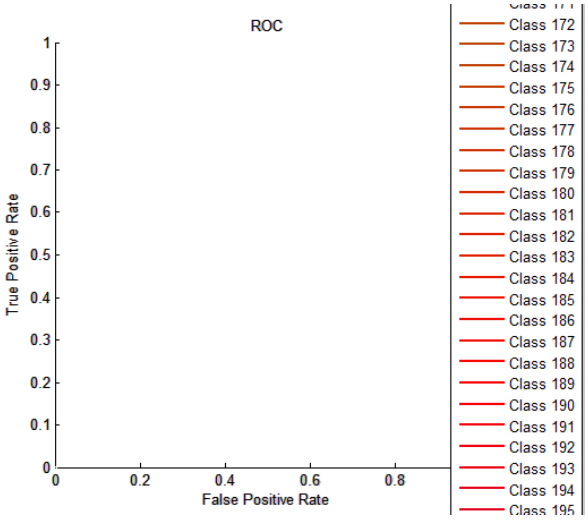

Fig. 5 Second Groups (Low risk).

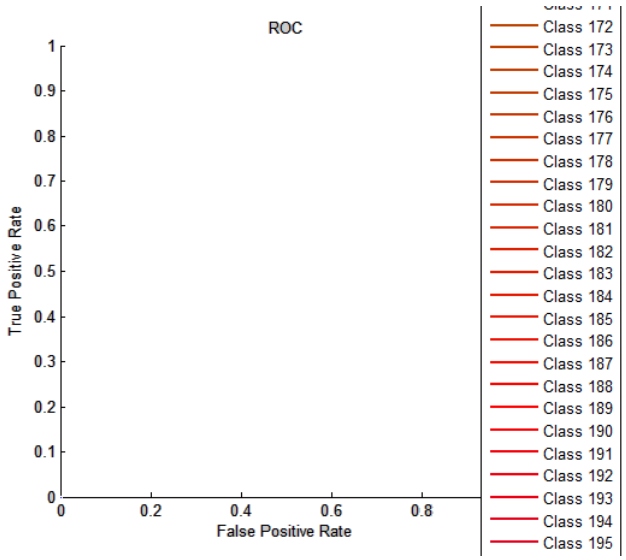

Fig 6 Third Groups (Full risk).

In the final result, the true or false rate is defined based on the program. For instance, if the selection is in the correct way the plot and result proved the accuracy of the selection otherwise the false result is presented. This part of the program, shown the intelligent behavior of the neural network compare to other methods. Figure 7 shown an example of that part.

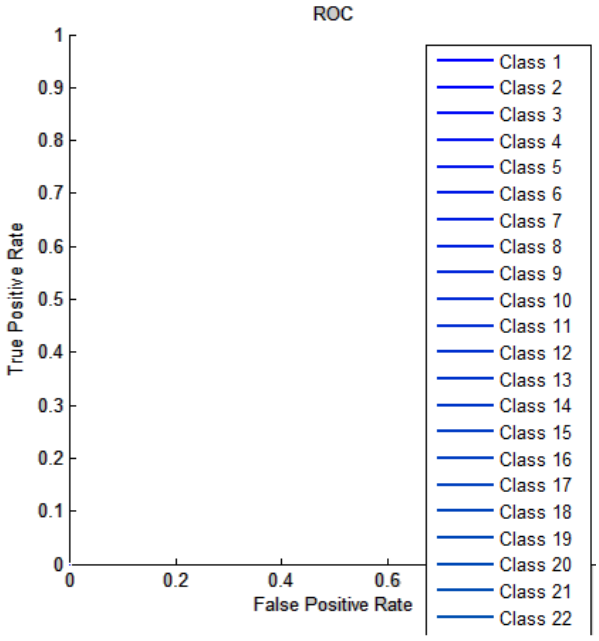

Fig 7. Result for True or False Rate.

5. Conclusions

It is not possible to guarantee that all of the artificial program is true in practical because many factors maybe change at the same time and always we have exceptional event in the environment. But, by prediction the problems and solve it by many simulation and analyzer software it is possible to compare all techniques. Among many science, neural network is a very powerful science that can show the approximate result in a very perfect possible way. In this paper, tried to show one aspect of neural network in practical side of this science. This kind of program is very useful for the future of the machine learning, smart grids and cyber-physical systems.

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