Artificial Neural Network based Diagnosis System

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Abstract *- An Artificial Neural Network (ANN) is sequence processing concept that is stimulated by the way genetic nervous systems, i.e., brain, progression information. The key element of this concept is the novel formation of the information processing system. It consists of a huge amount of highly interrelated processing elements (neurons) working in unity to resolve particular problems. ANNs, like individuals, learn by example. An ANN is configured for a particular purpose, such as data classification or pattern recognition, via learning process. Learning in genetic systems engrosses modification to the synaptic connections that exist in between the neurons. This is factual of ANNs as well. ANN is a branch of Artificial intelligence in computer science. Neural Networks are presently a popular research field in medical, specifically in the areas of cardiology, urology, radiology, oncology and etc. In this paper, an effort has been made to construct use of neural networks in the medical field.*

Keywords: - *ANN (Artificial Neural Network), Neurons, Diagnosis system.*

I. INTRODUCTION

Nowadays, neural networks (NNs) are broadly used in various fields. Simultaneously, back-propagation (BP) has been extensively accepted as a successful knowledgeable system to figure out the proper ethics of the weights for NNs.

Neural networks acquire a special approach to problem solving than that of conventional computers. Conventional computers use an algorithmic and logical approach such that computer follows a set of information with the purpose of solve a problem.

Neural networks process the information similarly the human brain does. The network is a collection of a huge amount of extremely interrelated processing elements working in equivalent to solve a particular problem. Neural Network cannot be planned to execute a particular task. There are tasks that are most appropriate to an algorithmic and logicalapproach such that arithmetic operations and tasks that are most appropriate to neural networks. Especially, a huge amount of tasks, require structures that utilize a mixture of the two approaches with the purpose of execute at utmost efficiency.

Computer architectures generally initiate simply computing centre called Arithmetic and Logic Unit which is supported by a Control Unit and a Memory Unit. Even with the Silicon technology approaching its limit, these computer systems are not at all any match to the capacity of the human being brain. Can we have a computer architecture imitating the brain? This line of analysis led researchers to neural networks, which contains an extremely interrelated network of huge amount of small, autonomous computing elements known as neurons. In early times of ANN and fuzzy systems, a number of researchers aimed to utilize some essential characteristics of such systems (i.e., adaptivity, fault tolerance, and regularity) to propose competent hardware executions, which were consideration to perform further accessible computing tools in execute in neuro-fuzzy systems (NFSs). This, in combination by means of the influential abilities of neural and fuzzy systems as worldwide task approximators, system models and system controllers gave a powerful inclination to the hypothetical and convenient studies on *soft computing* and their hardware executions.

Execution of neural networks (NNs) can be consummate using either analog or digital hardware [5]. The digital execution is more accepted as it is having the benefits of privileged accuracy, improved repeatability, lesser sound compassion, enhanced testability, and privileged flexibility and compatibility with an another kinds of preprocessors. Alternatively, analog systems are much more complex to be considered and can barely be sufficient for big level inventions, or for very explicit applications [5]. The digital NN hardware executions are classified as: 1) field-programmable gate array (FPGA)-based implementations, 2) digital signal processor (DSP)-based implementations, and 3) application specific integrated chip (ASIC)-based implementations [5], [6]. DSP-based implementations are in order and hence do not preserve the analogous architecture of the neurons in a layer. ASIC implementations do not propose re-configurability from the client. FPGA is the mainly appropriate hardware for NN implementation because it preserves the analogous architecture of the neurons and can be re-configured by the client.

ANNs have an exceptional capacity of erudition the connection among the input-output mapping from a given dataset not including at all previous information or suppositions in relation to the statistical distribution of the data [3]. This capacity of erudition from a certain dataset not including at all

previous information makes the neural networks appropriate for categorization and prophecy tasks in realistic conditions. Additionally, neural networks are essentially nonlinear which constructs them more possible for precise representation of complex data prototypes, in compare to many conventional techniques based on linear techniques. Due to their performance, they can be pertained in a broad range of medical fields such as cardiology, gastroenterology, neurology, oncology, and pediatrics [1].Asthma is a continual provocative disorder of the airways described by an impediment of airflow, which may possibly be entirely or incompletely inverted with or without precise treatment [7]. Airway redness is the outcome of communications among different cells, cellular essentials, and cytokines. In predisposed individuals, airway redness might be reason intermittent or determined broncho paroxysm, with warning signs like panting, breathlessness, chest stiffness, and cough, mostly at night or after work out.

For this proposed Research work VHSIC Hardware Description Language (VHDL) is accepted in the circuit design for FPGA. The design result by VHDL is configuring on FPGA through Leonardo and Quartus.

II. METHODOLOGY

A. *Artificial Neural Network*

Artificial Neural Networks are comparatively basic electronic reproductions based on the neural structure of the brain. The brain essentially trained from practice. It is ordinary evidence that several problems that are ahead of the range of existing computers are certainly solvable by petite power competent packages. This brain reproduction also assures a fewer procedural way to expand machine resolutions.

These organically enthused techniques of computing are considered to be the next foremost expansion in the computing industry. Even simple animal brains are proficient of functions that are presently impracticable for computers. Computers do rote things well, like maintaining ledgers or executing composite mathematical problem. But computers have trouble identifying even though easy samples much less simplifying those samples of the past into proceedings of the futures.

B. *A simple neuron*

An artificial neuron is a machine with various inputs and single output. The neuron consist two methods of functions; the training method and the using method. In the training method, the neurons can be taught to fire (or not), for fastidious input sample. In the using method when a taught input sample is identified at the input, their related outputs become the existing output. If the input sample does not belong in the taught record of input sample, the firing rule is used to determine whether to fire or not.

Due to more resources of the human brain Neural Network, scientists seek to transmit the principal of synaptic advances to computer science and its functions. Hence, the principal of ANN is established.

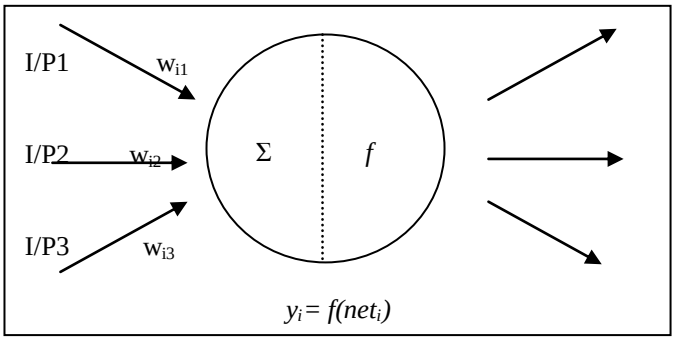

Figure 1. ANN basic building layout

The basic computational factor (neuron) is frequently known as a unit or node (Figure 1). It acknowledges input from other or from an outside basis. Each input has an associated weight w, which can be rehabilitated, so as to model synaptic edification. The node figure out some function f of the weighted sum of its inputs (Equation (1)):

$$Y_i = f(\Sigma_j \; w_{ij} \; y_j) \quad (1)$$

Where

- The weighted sum $\Sigma_j \; w_{ij} \; y_j$ is known as the net input to node i, frequently written net_i.
- Note that w_{ij} refers to the weight from node j to node i.
- The function *f* is the node's activation function. In the simplest case, *f* is the unique function, and the node's output is just its net input. This is known as linear node.

III. PRINCIPLES OF NEURAL NETWORK

Artificial neural networks (ANNs), as a promising discipline, studies or imitates the information dispensation potentials of neurons of the human brain. It exploits a disseminated illustration of the information stored in the network, and thus resultant in vigour against damage and consequent fault tolerance. Generally, a neural network model obtains an input vector ***X*** and generates output vector ***Y***. The relationship between ***X*** and ***Y*** is firmed by the network architecture. There are several forms of network architecture stimulated by the neural architecture of the human brain. The neural network usually consists of one input layer, one output layer, and one or more hidden layers, as shown in Fig. 2.

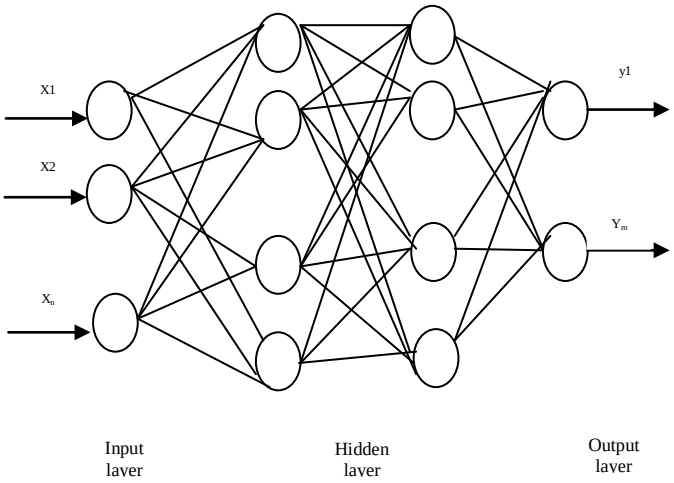

Figure 2. The basic architecture of neural network

In the neural network model, it is extensively accepted that a three-layer back propagation neural network (BPNN) with an individuality relocate function in the output unit and logistic functions in the middle-layer units can estimated any constant function randomly well specified an adequate quantity of middle-layer units . Moreover, in the practical applications, about 70 percent of all exertions are typically trained on a three-layer back-propagation network, as exposed by:

1. The back propagation learning algorithm, considered to train a feed-forward network, is an efficient erudition method used to develop the constancies and exclusions in the training sample.

The foremost advantage of neural networks is their capacity to afford bendable plotting or mapping between inputs and outputs. The arrangement of the straightforward components into a multilayer framework produces a map between inputs and outputs that is reliable with any fundamental functional relationship in spite of its "true" functional form. Having a general map between the input and output vectors eradicates the need for unfounded priori limitations that are needed in predictable statistical and econometric modelling. Therefore, a neural network is often viewed as a "universal approximator", i.e. a bendable functional form that can estimate any capricious function arbitrarily well, given sufficient middle-layer units and suitably adjusted weights. Both hypothetical evidence and experimental relevance have established that a three-layer BP neural network (BPNN) model with an identity transfer function in the output unit and logistic functions in the middle-layer units is satisfactory for foreign exchange rates forecasting.

IV. CONCLUSION

In this paper, first of all we described about methodology of artificial neural network and simple neuron, some preliminaries about back-propagation neural networks are presented. A basic architecture of three-layer BPNN model is described in the form of matrix. Based upon the basic structure and learning process, the weight update rules are derived in terms of steepest gradient descent algorithm. Using the weight update rules, some data analysis tasks are performed. However, in the neural network applications, an important process, data preparation process, is often neglected by researchers and business users. Although data preparation in neural network data analysis is important, some existing literature about the neural network data preparation are scattered, and there is no systematic study about data preparation for neural network data analysis.

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