

STUDY ON ARTIFICIAL NEURAL NETWORK*

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ABSTRACT

This paper discusses the emergence of an Artificial Neural Network (ANN) as a method for analyzing various system parameters. The data -processing model target on the way biological nervous systems, such as the process data, brain is artificial neural network. Multiple layers of basic processing elements known as neurons make up an ANN. The neuron has two functions.it collects information and generates an output. The use of ANN offers a broad overview of the theory, learning laws, and implementations of the most important neural network models, as well as descriptions and computation styles. The network mathematical model clarifies the principles of inputs, weights, summing function, activation function, and outputs. The ANN then assists in deciding the type of learning that should be used to modify weights as parameters change. Finally, ANN deployment, ANN preparation, and prediction efficiency complete the device review.

KEYWORDS

Ann, Neural Network.

1. INTRODUCTION

The idea of an artificial neural network (ANN) was first developed in the field of neuroscience/biology, where neural networks play a crucial role in the human body. The neural network is used to conduct work in the human body. A neural network is nothing more than a web of interconnected neurons. There are millions and millions of neurons that are related.in terms of quantity with the assistance of these integrated systems, in humans, all parallel processing takes place in neurons. The perfect example of this is human body. Processing in Several Threads.

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A neuron is a type of biological cell that uses electrical and chemical changes to transfer information from one neuron to another. It is made up of a cell nucleus, or soma, and two separate types of tree-like branches: the dendrites and the axon. The nucleus of the cell body includes information about inherited characteristics and other genetic information. Plasma is a liquid that contains molecular machinery. Producing the material that the neurons need. The entire method of receiving and transmitting signals is automated. Dendrites receive signals from other neurons in the same way as a neuron does. The neuron sends signals through a long thin strand known as an axon during electrical activity bursts, and the axon separates these signals through synapse and sends them to the other neurons.

2. ARTIFICIAL NEURAL NETWORKS

Artificial neural networks are mathematical models or cognitive systems in electronics engineering and related fields, inspired by a human central nervous system (particularly the brain), able to both train machines and recognize patterns. The mechanism in this way will resolve more complicated situations, because the animal's nervous system is more complex than the human system. In general, artificial neural networks are viewed as massively integrated 'neuron' structures that calculate input values.

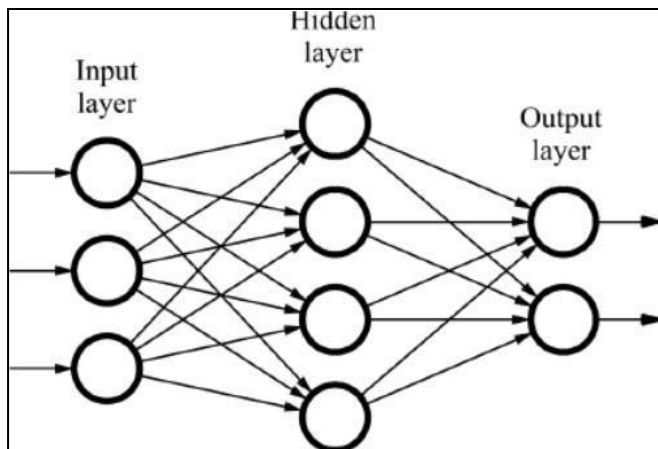


Fig.2.1 Diagrammatic flow of Simple ANN

Fig. 2.1 A neural network is a computer model that resembles a networked neuronal system in the brain. It contains interconnected neurons called processing elements which work together to create an output function. Neural networks consist of layers/dimensions for input which output, and in the majority of cases have a hidden layer composed of units that transform the input into what the output layer can use.

Neural networks are much like a website with millions of interacting neurons. All parallel processing is performed in the body using these interconnected neurons, and the perfect

example of parallel processing is the body of man or woman. The clustering of basic artificial neurons is now in the artificial neural networks. This clustering takes place when layers are formed, which are then linked. The other aspect of "art" innovation networks is how these layers interact to address the dynamic issues of the modern world. Neural networks can therefore be used to extract patterns and to detect developments that are too difficult to be detected by either humans or other computer techniques, with their greater capacity to infer significance from complicated or improper information.

2.1 Background

Inspired by neural networks was the study of the central nervous system of the human brain. In an Artificial New Network, a network called a biological neural network consists of basic artificial nodes, called "neuron," "memory components" or groups."

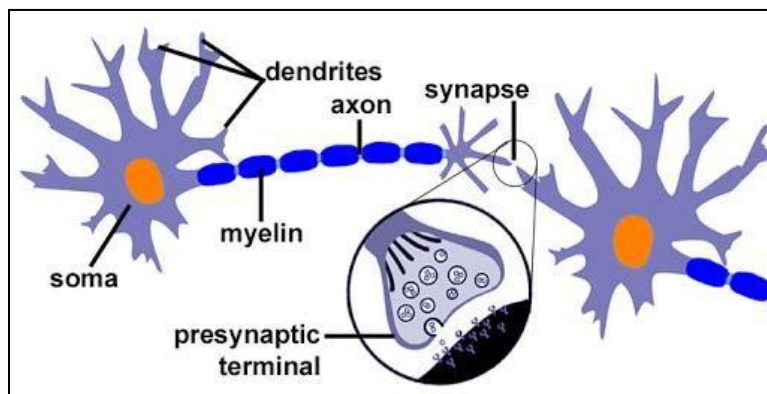


Fig.2 Genetic Neuron

The artificial neural network is not described in one way. However, whether they have the following properties, a subset of Statistical or Mathematical or Computing Models will usually be considered "neural networks":

1. Consisting of adaptive weight sets, i.e. numeric parameters tuned by the learning algorithms.
2. Able to approximate non-linear inputs.

Conceptually, the adaptive weights are link strengths between neurons that are stimulated during the training and prediction.

Neural networks in functions performed together and in tandem, rather than by clearly defining subtasks, on which different units are allocated, are analogous to biological neural neural networks. Typically the term "neural network" refers to structures used in statistics, psychology of cognitive and artificial intelligence. The theoretical neuroscience and computer science have neural network architectures that mimic the central nervous system.

2.2 Working of Neural Networks

The work of neural networks focuses on the various ways in which these individual neurons can be combined. This clustering happens in the human mind in order to store knowledge dynamically, interactively and in a self-organized manner. Neural networks are biologically built from microscopic components in a three-dimensional universe. These neurons appear to be able to interconnect almost uncontrolled. This is not the case with any man-made network that is planned or existing. Integrated circuits are two-dimensional structures with a small number of interconnection layers using modern technologies. This physical fact limits the forms and extent of the silicon-implementing artificial neural networks. The primitive artificial neurons currently form a basic clustering. This clustering takes place when layers are formed, which are then linked. The other aspect of the engineering system's art of solving real world challenges is the way these layers link.

3. ANN MODELS

Artificial intelligence Neural network models are basically basic mathematical models that define a function $f: X \rightarrow Y$ or an X or both X and Y distribution, but often often intimately linked to a specific learning algorithm and/or learning law.

The general use of ANN implies that a class of such functions should be described (where members of the class are obtained by varying parameters, connection weights, or specifics of the architecture such as the number of neurons or their connectivity).

3.1 Network function

The word network refers to the interconnections between neurons of the various layers of each structure in the term 'artificial neural network.' There are three layers in an example structure. The first layer has input neurons that transmit data to the second neuron layer through synapses, then to the third neuron output layer via further synapses. More dynamic structures would have more neuron layers, with some increasing neuronal input and output layers. The synapses record "weights" parameters which manipulate the measurement data. ANN typically has three parameter types:

1. The pattern of interconnection between neuron layers
2. The method of learning about updating interconnection weights
3. The activation function which converts the weighted input of a neuron to its output

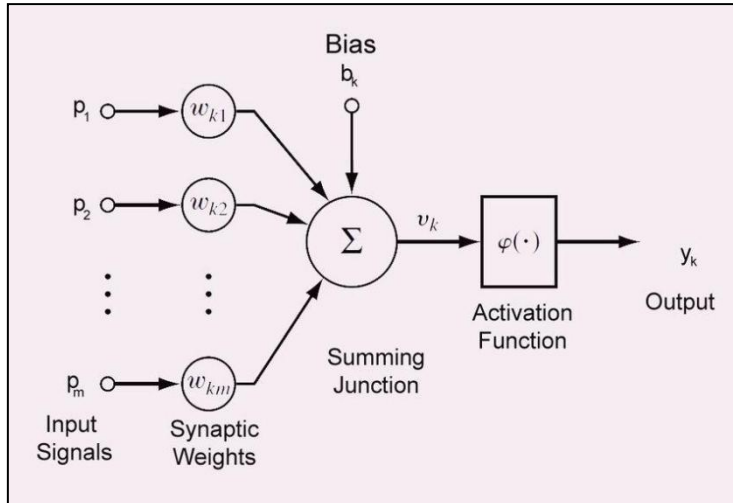


Fig.3.1 Nonlinear Model of Neuron

4. CHARACTERISTICS OF NEURAL NETWORK

Computers are basically good in calculations that then take the input method and send the results according to calculations made by a specific algorithm, the more decisions they make, but ANN uses their own guidelines, the better the decisions they make. The features are essentially those which should be present in smart systems, such as robotics and others. There are six basic and essential features of the Artificial Neural Network, which are shown in the diagram:

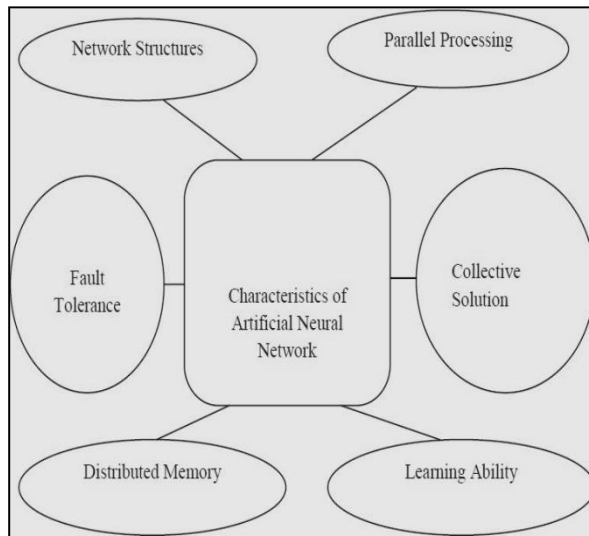


Fig.4 Characteristics of ANN

4.1 The Network Structure

ANN's network structure should be straightforward and easy. Two kinds of processes are essentially recurring and non-recurring. The recurrent structure is often referred to as the Auto Associative or Feedback Network, whereas the Non Recurrent Network is also known as the Feedback or Association Network. The signal travels in a single direction only in Feed Forward

Network but in Feedback Network, the signal moves in both directions by inserting network loops. As can be seen in the following figures:

Using a Feed-forward ANN to predict NBA Games

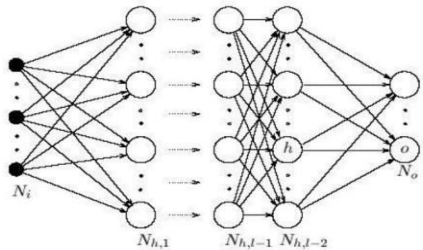


Fig. 4.1(a). Feed Forward Network

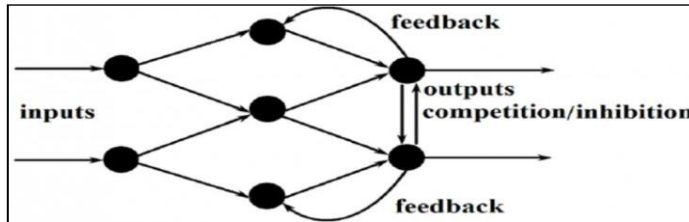


Fig. 4.1(b) Feedback Network

4.2 Ability of Parallel Processing

ANN is just the computing sector definition of parallel processing. Parallel processing is performed in human neurons by the human body. However we incorporate these in ANN, such as matrix and other matrix calculations by using pure and easy parallel processing technology.

4.3 Distributed Memory

ANN is a large infrastructure that cannot satisfy the need for the ANN system with a single unit memory and consolidated memory. Thus we need to store data in a weight matrix that is long lasting so information is processed as patterns across the whole network structure.

4.4 Fault Tolerance Ability

ANN is a very complex system and thus a fault tolerant should be required. Because if any element fails, it does not effect the system as much, but if all the components fail, it fails totally.

4.5 Collective Solution

ANN is a machine interconnected A machine output is a composite output of different inputs, such that all outputs are summarised after multiple inputs are processed. For any operator of the ANN system, the partial response is useless.

4.6 Learning Ability

Most of the learning rules in ANN are used to create process models and explore valuable information in developing environments across a network.

5. ADVANTAGES OF NEURAL NETWORKS

1. Adaptive learning: A neural network can understand how tasks can be done.
2. Self-organization: a neural network or ANN may generate its own imagery of input received during the learning process.
3. Actual time: Calculations can be performed in parallel in neural networks or ANNs.
4. The identification of patterns is a powerful data protection technology. Neural networks are able to detect the trends in the data collection.
5. Learning rather than scripting is developed for the framework. Neural networks show the trends in the data that the researcher is open for more exciting work.
6. In an evolving world, neural networks are adaptive. Although it may take some time to learn a rapid, dramatic transition, neural networks are outstanding at adjusting the continuous change.
7. Informational models can be created in neural networks if traditional methods fail. Since neural networks can handle complex dynamics, they can easily model data, which with conventional approaches, including inferential statistics or programming logic, is too difficult to model.

6. LIMITATIONS OF NEURAL NETWORK

Both things have certain merits and demerits in this universe, such that the system of the neural network has certain merits and demerits. ANN restrictions are:

1. Networks ANN or Neural is not a problem solver for everyday life.
2. No formal methodology has been established.
3. For the advancement of neural networks there is no single systematic paradigm.
4. Variable output quality may be the ANN.
5. Many ANN Systems do not explain how problems are resolved.
6. ANN's nature is like a black box.

7. APPLICATION

The Artificial Neural Networks' real-time implementations are:

1. Functional approximation, including prediction and modelling of time series.
2. Call control- Respond with a hand swipe while riding to the incoming call (speaker-ON).
3. Classification, including understanding of pattern and order, pattern and systematic decision making.
4. Use quick hand movements to skip tracks or monitor volume on your video player .
5. Processing of data, including filters, clusters, isolation of blind signal and compression.

6. This is ideal if the gadget touches a barrier, as wet hands are wet, socks, filthy, and so on, or in an electronic book with quick, left and right movements.

8. CONCLUSION

In this article, we explored the artificial neural network, the functioning of neural networks, ANN features, its benefits, ANN shortcomings and implementations. ANN's benefits over traditional tactics are different. You would usually expect a network to train very well depending on the type of the programme and the complexity of the internal data trends. This is the case with problems with complex or non-linear relationships. We had concluded that, as technology increases, the need for artificial intelligence often increases because of concurrent processing, because we can perform more than one job at a time with parallel processing. This makes concurrent treatment necessary at the moment, so we can save more and more resources and time in any job relating to electronics, computers and robotics by means of parallel processing. If we speak about the Future work we can conclude that more algorithms and programs needs to be developed so that we can remove the shortcomings of the Artificial Neural Network and use it for the different applications more and better.

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