Volume 5, Issue 1, January 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Study of Theoratical Propertioes of Artificial Neural Network, a Kind of Application Used In Computer Science and Electronics Engineering

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Abstract:-With the help of this paper we come to know that artificial neural network has a capability of learning machine and and we are able to recognize pattern. This systems consists of interconnected "neurons" that are used compute values from inputs by feeding information within the network. In this research paper we have studies theoretical and dynamic properties of artificial neural network with the help of it is possible to know and determine storage capacity of any network

Keywords-Artificial neural network, Theoreticalproperties, dynamic properties, Generalization and statistics

I. ARTIFICIAL NEURAL NETWORKS

To better understand artificial neural computing it is important to know first how a conventional 'serial' computer and its software process information. A serial computer has a central processor that can address an array of memory locations where data and instructions are stored [1]. Computations are made by the processor reading an instruction as well as any data the instruction requires from memory addresses, the instruction is then executed and the results are saved in a specified memory location as required. In a serial system (and a standard parallel one as well) the computational steps are deterministic, sequential and logical, and the state of a given variable can be tracked from one operation to another [2].

(a)APPLICATIONS OF NEURAL NETWORKS

Various possible applications of artificial neural network is shown below

(a) Sales Forecasting
(b) Industrial Process control
(c) Customer Research
(d) Data Validation
(e) Risk Management
(f) Target Marketing

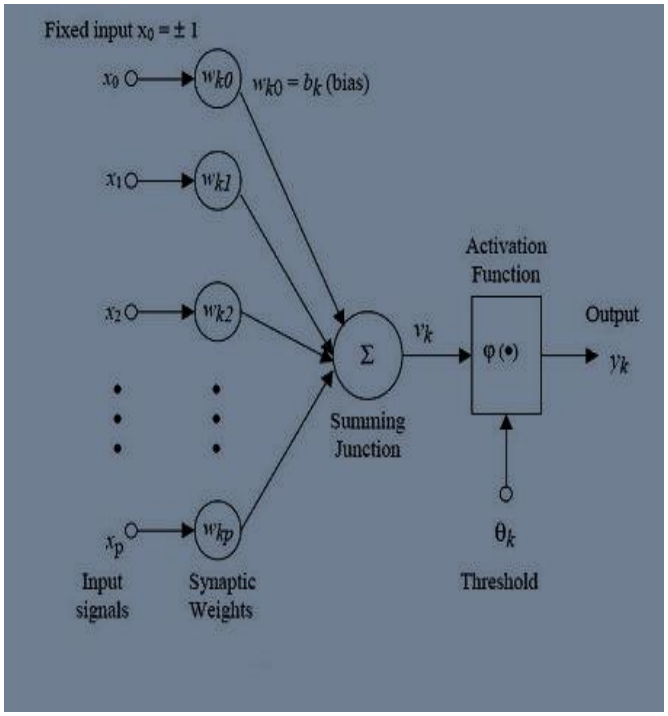

Figure1 Neural Network with activation function

Many important advances have been boosted by the use of inexpensive computer emulations. Following an initial period of enthusiasm, the field survived a period of frustration and disrepute [4]. During this period when funding and professional support was minimal, important advances were made by relatively few researchers. These pioneers were able to develop convincing technology which surpassed the limitations identified by Minsky and Papert. Minsky and Papert, published a book (in 1969) in which they summed up a general feeling of frustration (against neural networks) among researchers, and was thus accepted by most without further analysis. Currently, the neural network field enjoys a resurgence of interest and a corresponding increase in funding [5]. Neural networks are also similar to biological neural networks in performing functions collectively and in parallel by the units, rather than there being a clear delineation of subtasks to which various units are assigned. The term "neural network" usually refers to models employed in statistics, cognitive psychology and artificial intelligence. Neural network models which emulate the central nervous system are part of theoretical neuroscience and computational neuroscience [6].

II. THEORETICAL PROPERTIES

(a) Computational power
(b) Capacity
(c) Convergence
(d) Generalization and statistics
(e) Confidence analysis of a neural network

(a) Computational power

It is Universal Turing Machine using a finite number of neurons and standard linear connections. It is used for irrational values for weights results in a machine with super-Turing power [7].

(b) Capacity

It is called as abilityto define modelfor any given function. It may be called as the amount of information that can be stored in the network and to the notion of complexity.

(c) Convergence

It is used for a very large amount of data or parameters, some methods become impractical. Sometimes it is declared that theoretical guarantees regarding convergence are an unreliable guide to practical application.

(d) Generalization and statistics

(i) It is used for cross-validation and similar techniques in order to check for the presence of overtraining and optimally select hyper parameters such as to minimize the generalization error. The second is to use some form of regularization.

(ii) This is a concept that emerges naturally in a probabilistic (Bayesian) framework, where the regularization can be performed by selecting a larger prior probability over simpler models; but also in statistical learning theory.

(e) Confidence analysis of a neural network

We know that MSE on a validation set can be used for measuring variance. Sometimes used for measure confidence interval of the output of the network, assuming a normal distribution. It is validfor long output probability distribution that stays the same and the network is not modified [8].

Once these conditions are met, neural networks offer the opportunity of solving problems in an arena where traditional processors lack both the processing power and a step-by-step methodology. A number of very complicated problems cannot be solved in the traditional computing environments. For example, speech is something that all people can easily parse and understand. A person can understand a southern drawl, a Bronx accent, and the slurred words of a baby. Without the massively paralleled processing power of a neural network, this process is virtually impossible for a computer. Image recognition is another task that a human can easily do but which stymies even the biggest of computers. A person can recognize a plane as it turns, flies overhead, and disappears into a dot. A traditional computer might try to compare the changing images to a number of very different stored patterns.

III. ANN MODELS

Now we are going to describe various models used for artificial neural network ANNs are processing devices (algorithms or actual hardware) that are loosely modeled after the neuronal structure of the mamalian cerebral cortex but on much smaller scales. Although ANN researchers are generally not concerned with whether their networks accurately resemble biological systems, some have. For example, researchers have accurately simulated the function of the retina and modeled the eye rather well.

(a) Feed-Forward Networks
(b) Radial Basis Function Networks
(c) Recurrent Networks
(d) Echo State Networks
(e) Hopfield Networks
(f) Self-Organizing Maps

(g) Competitive Models
(h) ART Models
(i) Boltzmann Machines
(j) Committee of Machines

Other networks work on problems where the resolutions are not just one of several known values. These networks need to be capable of an infinite number of responses. Applications of this type include the "intelligence" behind robotic movements. This "intelligence" processes inputs and then creates outputs which actually cause some device to move. That movement can span an infinite number of very precise motions. These networks do indeed want to smooth their inputs which, due to limitations of sensors, come in non-continuous bursts, say thirty times a second. To do that, they might accept these inputs, sum that data, and then produce an output by, for example, applying a hyperbolic tangent as a transfer functions. In this manner, output values from the network are continuous and satisfy more real world interfaces.

IV. LIMITATIONS OF NEURAL NETWORKS

There are many limitations to neural network analysisResearchers also soon realized that cyclic networks, with feedbacks through neurons, could define dynamical systems with memory, but most of the research concentrated (and still does) on strictly feed-forward networks because of the smaller difficulty they present.
One important and pioneering artificial neural network that used the linear threshold function was the perceptron, developed by Frank Rosenblatt. This model already considered more flexible weight values in the neurons, and was used in machines with adaptive capabilities. The representation of the threshold values as a bias term was introduced by Bernard Widrow in
(a) Backpropagational neural networks are in a sense the ultimate 'black boxes'. Apart from defining the general architecture of a network and perhaps initially seeding it with a random numbers.
(b) Backpropagational networks also tend to be slower to train than other types of networks and sometimes require thousands of epochs. If run on a truly parallel computer system this issue is not really a problem, but if the BPNN is being simulated on a standard serial machine

V. CONCLUSION

In present paper we have discussed various kinds of theoretical properties used in artificial neural network all these properties are helpful in knowing storage capacity of network for performing various functions. In future we are planning to study dynamic properties also .Dynamic neural networks not only deal with nonlinear multivariate behaviour, but also include time-dependent behaviour such as various transient phenomena and delay effects. All these Techniques are used to measure a system process from observed data fall under the general category of system identification.

REFERENCES

[1] Da, Y., Xiurun, G. (July 2005). T. Villmann, ed. "An improved PSO-based ANN with simulated annealing technique". New Aspects in Neurocomputing: 11th European Symposium on Artificial Neural Networks. Elsevier. doi:10.1016/j.neucom.2004.07.002. Retrieved 30 December 2011.
[2] Minsky, M.; S. Papert (1969). An Introduction to Computational Geometry. MIT Press. ISBN 0-262-63022-[3] D. C. Ciresan, U. Meier, J. Masci, J. Schmidhuber. Multi-Column Deep Neural Network for Traffic Sign Classification. Neural Networks, 2012.
[4] Sergios Theodoridis, Konstantinos Koutroumbas (2009) "Pattern Recognition", 4th Edition, Academic Press, ISBN 978-1-59749-272-0.
[5] B. A. Pearlmutter. Learning state space trajectories in recurrent neural networks. Neural Computation, 1(2):263–269, 1989.
[6] A. Graves and J. Schmidhuber. Framewise phoneme classification with bidirectional LSTM and other neural network architectures. Neural Networks, 18:602–610, 2005.
[7] Learning internal representations by error propagation by Rumelhart, Hinton and Williams (1986).
[8] Industrial Applications of Neural Networks (research reports Esprit, I.F.Croall, J.P.Mason)

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