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Artificial Neural Network Applicability in Business Forecasting

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Abstract:

The application of computer is involved in almost every field in the modern age. It is used from making bus fare ticket to control the critical process involved in nuclear reactor. The ultimate goal of using computer is to increase speed and accuracy. The computer science now gradually moves to design the computer based entities that think and behave like human beings. Some examples of these entities are expert system and robot. This new branch of computer science is called artificial intelligence. The modern definition of artificial intelligence is "The study and design of intelligent agents where an intelligent agent is a system that perceives its environment and takes actions which maximizes its chances of success. As we are dealing with designing computer based entities that behaves like human being so, it is necessary to know how human being think and act. The nervous system helps the human being to think, to learn and to act. In the same analogy, Artificial Neural Network in Artificial Intelligence helps computer based entities to think, learn and act like human beings. In this research paper after discussing the basic model of an artificial neural network, its role in business forecasting is discussed.

Keywords: Artificial Neural Network, Business Forecasting, Applications.

I. Introduction

In the human brain, a typical neuron collects signal from others through a host of fine structures called dendrites. The neuron sends out spikes of electrical activity through a long thin strand known as an axon, which splits into thousand of branches. At the end of each branch, a structure called a synapse converts the activity from the axon into electrical effects that inhibit or excite activity in the connected neurons. When a neuron receives excitatory input that is sufficiently large compared with its inhibitory input, it sends a spike of electrical activity down its axiom. Learning occurs by changing the effectiveness of the synapses so that the influence of one neuron on another changes.

An artificial neural network is a simulation of biological brain. The purpose of a neural network is to learn to recognize pattern in our data. Once the neural network has been trained on sample of our data it can make predictions by detecting similar patterns in future data. Thus a neural network is a computational system inspired by the structure, processing method, learning ability of a biological brain [1].

II. COMPONENTS OF NEURON [2]

Artificial neural networks are typically composed of interconnected 'units', which serve as model neurons. Following discussion throw the light on the components of the neural network.

(a) Inputs (X_i)

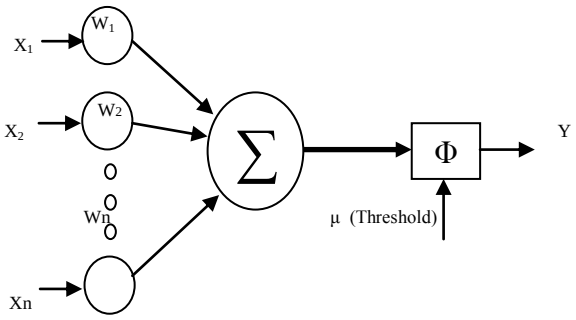
Typically, the input values are external stimuli from the environment or comes from the outputs of other artificial neurons. They can be discrete value from set such as {0,1} or real valued numbers.

(b) Weight (W_i)

The first thing an artificial neuron does is to compute the weighted sum of its inputs. The weights are real-valued numbers that determine the contribution of each input. The goal of neural network training algorithm is to determine the best possible set of weight values for the problem under consideration.

(c) Threshold (μ)

The threshold is a real number that is subtracted from the weighted sum of the input values. Sometimes the threshold is called bias value. In the later case the real number is added to the weighted sum.



(d) Activation Function

The activation function for the original McCullochpitts neuron was the unit step function. The various other activation functions include sigmoid, piecewise linear, Gaussian, Identity. The behavior of an artificial neural network depends on both the weights and the activation function (input-output function) that is specified for the neuron.

(e) Output (Y)

The artificial neuron computes its output according to the equation shown below

$$Y = f\left(\sum_{i=0}^{n} w_i x_i - \mu\right) = f\left(\sum_{i=0}^{n} w_i x_i\right)$$

This is the result of applying the activation function to the weighted sum of the inputs, less the threshold. This value can be discrete or real depending on the activation function used. Once the output has been calculated, it can be passed to another neuron (or group of neurons) or sampled by the external environment.

III. Business Forecasting With Artificial Neural Network [3][4]

Artificial neural networks (ANNs) have emerged as an important quantitative modeling tool for business forecasting. ANNs has powerful pattern classification and prediction capabilities. One of the major application areas of ANNs is forecasting. One of the major application areas of ANNs is forecasting. The ability to accurately predict the future is fundamental to many decision processes in planning, scheduling, purchasing, strategy formulation, policy making, and supply chain operations. As such, forecasting is an area where a lot of efforts have been invested in the past. Yet, it is still an important and active field of human activity at the present time and will continue to be in the future. Forecasting has been dominated by linear methods for many decades. Linear methods are easy to develop and implement and they are also relatively simple to understand and interpret. However, linear models have serious limitation in that they are not able to capture any nonlinear relationships in the data. The approximation of linear models to complicated nonlinear relationships is not always satisfactory. ANNs provide a promising alternative tool for forecasters. The inherently nonlinear structure of neural networks is particularly useful for capturing the complex underlying relationship in many real world problems. Neural networks are perhaps more versatile methods for forecasting applications in that not only can they find nonlinear structures in a problem, they can also model linear processes. In addition to the nonlinear modeling capability, ANNs also have several other features that make them valuable for forecasting tasks. First, ANNs are data-driven nonparametric methods that do not require many restrictive assumptions on the underlying process from which data are generated. This "learning from data or experience" feature of ANNs is highly desirable in various forecasting situations where data are usually easy to collect, but the underlying data-generating mechanism is not known or pre-specifiable. neural networks have been mathematically shown to have the universal functional approximating capability in that they can accurately approximate many types of complex functional relationships. The combination of the above-mentioned characteristics makes ANNs a very general and flexible modeling tool for forecasting.

IV. Applicability Of Artificial Neural Network In Business Forecasting

Artificial neural networks are increasingly popular in today's business fields. The main aim of this research paper to analytically reveals the applicability of artificial neural network in business forecasting. Some prominent areas in business where artificial neural networks are used are discuss below:

(i) Artificial neural Networks in sale forecasting [4]
Sales forecasting lets businesses make better purchasing decisions and manage inventory more efficiently. It can also identify new opportunities for increased sales. However, sales forecasting is extremely difficult, since a large number of factors influence sales that are often interrelated. Price, seasonality, advertising, and competitor behavior are all factors that influence sales. Artificial Neural Network analyzes historical data to learn the interrelation between these factors, and makes predictions of sales levels for various combinations.

(ii) Artificial Neural Network used in Tourism Demand Forecasting for the Tourism Industry [3]
In the tourism industry, planning is particularly important because of the rapid economic and political changes, increased operational complexity, and complicated tourism businesses. To a large extent, planning relies heavily on accurate forecasts. Practical tourism forecasters concentrate primarily on quantitative causal-relationship and time series methods. Although these traditional quantitative forecasting techniques have attained a certain level of success in tourism research, it is generally unknown whether they are able to simulate the relationship of demand for tourism as accurately as multiprocessing node-based artificial neural networks (ANNs). In spite of their promising industrial applicability, ANNs have not been of major interest to tourism researchers. At present, the number of published articles on ANNs is very limited in the tourism literature.

(iii) Artificial neural networks in Bankruptcy Prediction [5]
The forecast of bankruptcies belong to classification problems. With input variables, generally financial and accounting data on a firm, we try to find out in which category the firm enters, bankrupt or not bankrupt. The availability of a large amount of accounting and financial data on computerize databases, facilitates the use of artificial neural networks with quantitative data. They are tested as substitutes of traditional statistical tools such as multivariate discriminate analysis. Research studies on using NN's for bankruptcy prediction started in 1990, and are still active now. Currently, several of the major commercial loan default prediction products are based on NN's. For example, Moody's Public Firm Risk Model is based on NN's as the main technology. Many banks have also developed and are using proprietary NN default prediction models. From the many studies existing in the literature, it can be seen that NN's are generally more superior to other techniques such as ADM, Logistic Regression and Recursive Partitioning.

(iv) Using Artificial Intelligence For Real Estate Forecasting [6]
Forecasting is a major issue in most aspects of real estate practice. Valuation and appraisal are forecasting. Property development relies on forecasting of expected costs and returns. Property and facilities managers use forecasts of supply and demand as well as of costs and returns. Funds and investment managers rely on forecasts of value now and in the future through forecasts of growth and economic activity. With all this forecasting being relied upon it is somewhat surprising that the use of Artificial Neural Networks is better and effective than traditional way of working.

(v) ANN in Foreign Exchange Rate forecasting [7][9]
Exchange rate forecasts are drawn up through the computation of a currency's value vis-à-vis other currencies over a period of time. While there are various theories that can be used to predict exchange rates, all of them have limitations. No model has been able to establish a monopoly in the forecasting process. As it is possible to model both linear and nonlinear structures in time series by using Artificial Neural Network (ANN), it is suitable to apply this method to the chaotic series having nonlinear component. Literature review shows that the use of ANN provides accuracy and fast prediction in Foreign Exchange Rate forecasting.

(vi) Customer Relation Management through Artificial Neural Network[8]
As churn management is a major task for companies to retain valuable customers, the ability to predict customer churn is necessary. In literature, neural networks have shown their applicability to churn prediction. Most commonly artificial neural network with the back propagation learning algorithm is used in churning prediction. It is used to improve the performance of prediction of the two classes, namely churn and non-churn customers.

V. Conclusion

This research paper tells us that how technology improves. Whenever we use artificial neural network in any area the resultant algorithm or software is called self learning algorithm or software. In this research paper we are reviewing some hot areas in the field of business where forecasting plays a crucial role. From the analytical review we conclude that whenever we use artificial neural network in making forecasting both the speed and accuracy improved over the tradition and statistical methods used for this purpose. This research paper is also helpful for those who pursue or wish to do the research in the field of using machine learning techniques in business forecasting.

References

[1] Rajendra Akerkar, " Introduction to Artificial Intelligence", Prentice-Hall of India,2005

[2] "Neural Networks for Data Mining" , http://wps.p re nhall.com wps/media/objects/4242/ 4344809/ turba n_online_ch06.pdf

[3] G. Peter Zhang, *"Neural Networks in Business Forecasting",* Idea Group Publishing 4th edition ,2004

[4] "*Neural Network Forecasting "* , http:/ /www.o zgrid.com / Services/excel-neural-predict.htm

[5] Nikhil Bhargava , Manik Gupta IIT Delhi, " *Application of Artificial Neural Networks in Business Applications*"

[6] Peter Rossini , *" Using Expert Systems and Artificial Intelligence For Real Estate Forecasting"*, Sixth Annual Pacific-Rim Real Estate Society Conference Sydney, Australia, 24 - 27 January 2000

[7] Dr Clarence N W Tan, *"An Artificial Neural Networks Primer with Financial Applications Examples in Financial Distress Predictions and Foreign Exchange Hybrid Trading System",* School of Information Technology, Bond University, Gold Coast, QLD 4229,Australia

[8] Chih-Fong Tsaia, , and Yu-Hsin Lub, *" Customer churn prediction by hybrid neural networks",* Expert Systems with Applications Volume 36, Issue 10, December 2009, Pages 12547-12553

[9] Suresh Kumar Sharma, Vinod Sharma, "Proficient Prophecy of Foreign Exchange Rate Using Artificial Neural Network : A Case of USD to INR", International Journal of Computer Applications (IJCA) , April 2012.