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An Improved Approach for Business & Market Intelligence using Artificial Neural Network

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Abstract: This paper describes the generation of data mining, data mining objects, tasks, and classification of data mining applications in marketing strategy. It discusses many common data mining methods and techniques, and offers the info mining in promoting strategy within the application. Companies have been collecting data for decades, building massive data warehouses in which to store it. Even though this data is available, very few companies have been able to realize the actual value stored in it. To extract these values Data mining process is used. Stock prediction with data mining techniques is one of the most important issues in finance being investigated by researchers across the globe. . This paper presents extensive process of building stock price predictive model using the ARIMA model and Back Propagation Algorithm also the comparison between them.

Key Words: Data mining, Stock Market, BPNN, ARIMA model.

Introduction

Stock price prediction is an important topic in finance and economics which has spurred the interest of researchers over the years to develop better predictive models. The autoregressive integrated moving average (ARIMA) models have been explored in literature for time series prediction. This paper presents extensive process of building stock price predictive model

using the ARIMA model and Back Propagation Algorithm. Published stock data obtained from New York Stock Exchange (NYSE) and Nigeria Stock Exchange (NSE) are used with stock price predictive model developed.

Prediction of stock price level movement is thought to be a difficult task of monetary statistic prediction. Associate degree correct prediction of stock worth movement might yield profits for investors. As a result of the quality of exchange information, development of Economical models for predicting is incredibly troublesome. Statistical strategies and neural networks are usually used for statistic prediction. Since stock markets are complicated, nonlinear, dynamic and chaotic. Many studies have shown that artificial neural networks have the capability to be told the underlying mechanics of stock markets. In fact, artificial neural networks are wide used for prognostication monetary markets. Artificial neural network is a mathematical model. It has capability to machine learning and pattern matching. Neuron is basic unit of nervous system such as brain. ANN is borrowed from central nervous system. It is inspired by biological technology. Biological neuron stores knowledge in memory bank, while in an artificial neuron the data or information is distributed through the network and stored in the form of weighted interconnection. Figure 1 show graphical representation of artificial neuron. Where "x_i" represents the input to the neuron and "w_i" represents the weight of the neuron.

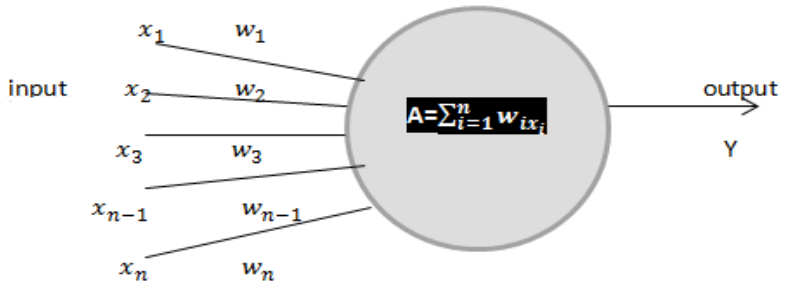

Figure 1: Graphical representation of artificial neurons

The overall input to the neuron is calculated by $a = \Sigma i=0\ w_i x_i$. To normalize this sum into a standard range, functions called threshold functions, (sigmoid functions being the most widely preferred one) are used. The output of this function is guaranteed to be in (0, 1).
In this paper the data mining based on neural is researched in detail, and the key technology and ways to achieve the data mining based on neural are also researched. [1].

Proposed Work

Back Propagation Learning

Back propagation is a form of supervised learning for multi-layer nets, also known as the generalized delta rule. Error data at the output layer is back propagated to earlier ones, allowing incoming weights to these layers to be updated. It is most often used as training algorithm in current neural network applications. Since its rediscovery, the back propagation algorithm has been widely used as a learning algorithm in feed forward multilayer neural network [9].

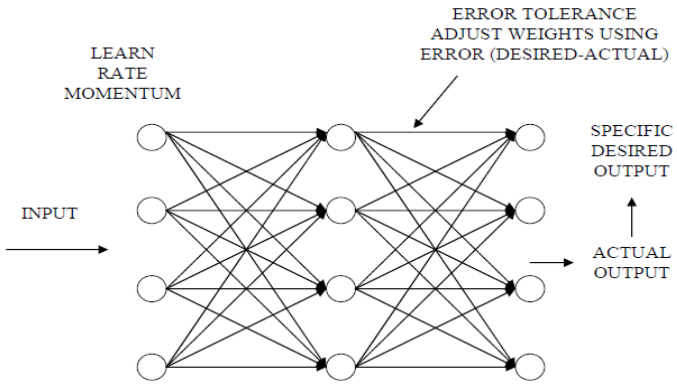

Figure 2: Back Propagation Network

There are literally hundreds of variations of back propagation in the neural network literature, and all claim to be superior to "basic" back propagation in one way or the other. Indeed, since back propagation is based on a relatively simple form of optimization known as gradient descent, mathematically astute observers soon proposed modifications using more powerful techniques such as conjugate gradient and Newton's methods. However, "basic" back propagation is still the most widely used variant. Its two primary virtues are that it is simple and easy to understand, and it works for a wide range of problems. The basic back propagation algorithm consists of three steps.

- The input pattern is presented to the input layer of the network. These inputs are propagated through the network until they reach the output units. This forward pass produces the actual or predicted output pattern.
- Because back propagation is a supervised learning algorithm, the desired outputs are given as part of the training vector. The actual network outputs are subtracted from the desired outputs and an error signal is produced.

- This error signal is then the basis for the back propagation step, whereby the errors are passed back through the neural network by computing the contribution of each hidden processing unit and deriving the corresponding adjustment needed to produce the correct output. The connection weights are then adjusted and the neural network has just "learned" from an experience.

RESULTS

Comparison of ARIMA Model & ANN Back Propagation Algorithm

Date	Actual	Predicted Value Using ARIMA Model	Accuracy	Predicted with Our Method	Accuracy Using ANN
03-03-10	13.86	13.8	99.57%	13.8587	99.9906%
04-03-10	13.78	13.91	99.07%	13.7790	99.9927%
05-03-10	14.13	14.02	99.22%	14.1283	99.9880%
08-03-10	14.17	14.13	99.72%	14.1688	99.9917%
09-03-10	14.12	14.24	99.16%	14.1190	99.9929%
10-03-10	14.56	14.35	98.56%	14.5580	99.9859%
11-03-10	14.49	14.45	99.72%	14.4891	99.9938%
12-03-10	14.84	14.56	98.11%	14.8378	99.9851%
15-03-10	14.81	14.67	99.05%	13.2810	89.6759%
16-03-10	15.14	14.77	97.56%	15.1422	99.9853%
17-03-10	15.42	14.88	96.50%	15.4237	99.9760%
18-03-10	15.28	14.98	98.04%	15.2800	99.9999%
19-03-10	15.07	15.09	99.87%	15.0699	99.9993%
22-03-10	15.11	15.19	99.47%	15.1118	99.9883%
23-03-10	15.26	15.3	99.74%	15.2622	99.9856%
24-03-10	15.07	15.4	97.86%	15.0700	99.9998%
25-03-10	15.2	15.5	98.06%	15.2021	99.9862%
26-03-10	15.46	15.6	99.10%	15.4572	99.9820%
29-03-10	15.42	15.71	98.15%	15.4244	99.9715%
30-03-10	15.41	15.81	97.47%	15.4141	99.9734%

Table 4.4: Table of Comparison of ARIMA Model & ANN Method

The above table 4.4 shows the comparison between ARIMA (autoregressive integrated moving average) & ANN method. Its shows the predicted values calculated for NYSE Nokia Stock Price for a given period using ARIMA model & ANN Back Propagation method. By observing the table we can say that the average accuracy by using ARIMA model

is around 98.7% whereas for ANN Back Propagation is 99.47% which is superior over previous method. So by general observation we can say that ANN Back Propagation method is better when it comes to prediction of values of stock price. The data is chosen in the back date as we have to show comparison between previous method & recent method. Also we have found predicted values of recent data whose results are quite accurate.

Conclusion

Hence it is capable to input a dataset of companies to predict the dataset which is available to check the further errors according to the given time and date. The empirical results obtained showed high level of accuracy of daily stock price with prediction. Therefore, this approach has the potential to enhance the quality of decision making of investors in the stock market by offering more accurate stock prediction compared to existing technical analysis based approach. In future work, we intend to determine the critical impact of specific fundamental analysis variables on quality of stock price prediction.

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