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Stock Prediction using Artificial Neural Networks Approach

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ABSTRACT

We present an Artificial Neural Network approach to forecast stock market indices. We design of the Neural Network model. Also having its salient features and customizable parameters. A number of activation functions are implemented along with options for cross validation sets. We finally test our prediction on the Nifty stock index dataset where we predict the values on the basis of values from the past n days. We achieve a best case accuracy of 96% on the dataset. We analysis of technical , fundamental , time series and statistical .That are all used to attempt to predict the price in the share market but none of these analysis techniques are proved as a consistently acceptable prediction tool. Artificial Neural Network (ANN) is part of Artificial Intelligence (AI) which is a popular way to identify unknown and hidden patterns in data which is suitable for share market prediction. For predicting of share price using ANN, there are two modules, one is training session and other is predicting price based on previously trained data. We used Back propagation algorithm for training session and Multilayer Feed forward network as a network model for predicting price. We introduce a method which can predict share market price using Back propagation algorithm and Multilayer Feed forward network.

***Keywords*— Artificial neural networks, Multi-layer neural network, Prediction methods and Stock markets..**

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I. INTRODUCTION

Share markets became popular in recent year. Many factors have become additional essential for the analysis of market. The analysis technics in recent few years' shows that the nonlinear domain with computing technologies may be sculptured additional exactly compared to single market and linear applied math strategies that are the mainstay for technical analysis for fast decade. Prediction of stock price level 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 and 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. Neural networks among varied computing tools are more and more accustomed the monetary prognostication as neural nets are found to be technologically versatile and powerful, ideally suited to perform monetary market research. Lot of research have shown that ANN have the capability to be told the underlying mechanics of stock industries. ANN are wide used for prognostication monetary markets. Artificial neural network is a mathematical model. It has capability to learning from machine and pattern matching. Neuron is basic unit of nervous system such as brain. Artificial neural network is borrowed from central nervous system. It is inspired by biological nervous.

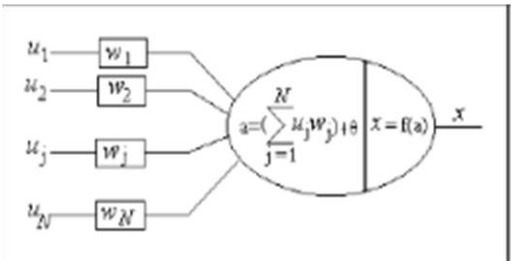

Fig 1.1 Artificial Neural Network

II. LITERATURE SURVEY

A stock market big opportunity for the investor's .Share market presents them with a chance to learn financially status by using financially resources on shares and derivatives of varied industries. It's a chaos system; that means the activity happen share markets are unpredictable and unsure. Also cost unit are unpredicted and unsure. To build some style of sense of this chaotic behavior, researchers are search out a way which may estimate the result of this uncertainty to the flow of share market. From the analyses of varied applied mathematical models, ANN area analogous to non-parametric, nonlinear, regression technics. So, Artificial Neural Networks (ANN) actually has tell unknown and hidden part of information which may be effective for share market prediction. If successful, will this could this may be useful for investors and finances which can completely contribute to the economy. There are unittotally different strategies that are applied so as to predict Share Market returns. The securities market reflects the fluctuation of the economy, and receives 10 million investors' attention since its initial development. The securities market is characterized by bad, high-yield, thus investors are involved concerning the analysis of the securities market and making an attempt to forecast the trend of the securities market. However, securities market is wedged by the politics, economy and plenty of different factors, let alone the quality of its internal law, like value (stock index) changes within the non-linear, and shares knowledge with high noise characteristics, so the normal mathematical applied mathematics techniques to forecast the securities market has not yielded satisfactory results. Neural networks will approximate any advanced nonlinear relations and has hardiness and fault-tolerant options. Therefore, it's terribly appropriate for the analysis of stock knowledge. In dozens of neural network models that were suggests, researchers usually use the hop garden network. hop garden network is that the commonest feedback network model, it's one among the models that almost typically studied currently. The hop garden network is that the mono layer recognized by an equivalent vegetative cell, and is additionally a symmetrically connected associative network while not learning operates

III. IMPLEMENTATION DETAILS

3.1. Neurons Network

Neurons are same structure like biological neuronal structure. They are transferring a signal from one neuron to another through synapses is a complex chemical process in which specific transmitter substances are released from the sending side of the junction. The effect is to raise or lower the electrical potential inside the body of the receiving cell. If this graded potential reaches a threshold, the neuron fires. It is this characteristic that the artificial neuron model attempt to reproduce. The neuron model is the one that widely used in artificial neural networks with some minor modifications on it.

The neuron has N input, denoted as u1, u2 ...,uN. Each line connecting these inputs to the neuron is assigned a **weight**, which are denoted as w1, w2... ..,wN respectively. Weights in the neurons model correspond to the synaptic connections in biological neurons. The **threshold** in artificial neuron is usually represented by **θ** and the **activation** corresponding to the graded potential is given by the formula:

$$a = \sum_{j=1}^{n} wjuj + \boldsymbol{\theta}$$

The inputs and the weights are real values. A negative value for a weight indicates an **inhibitory** connection while a positive value indicates an excitatory one. Although in biological neurons, has a negative value, it may be assigned a positive value in artificial neuron models. Sometimes, the threshold is combined for simplicity into the summation part by assuming an imaginary input u0 =+1 and a connection weight *w0* = **θ**. Hence the activation formula becomes:

$$a = \sum_{j=1}^{n} wjuj$$

The output value of the neuron is a function of its activation in an analogy to the firing frequency of the biological neurons: x = (a) There are a number of functions that are used. Some include binary threshold, linear threshold, sigmoid, hyperbolic tan and Gaussian.

3.2. Artificial Neural Networks

While a single artificial neuron is not able to implement some Boolean functions, the problem is overcome by connecting the outputs of some neurons as input to the others, so constituting a neural network. Suppose that we have connected many artificial neurons. In such a case, there are several neurons in the system, so we assign indices to the neurons to discriminate between them. Then to express the activation *ith* neuron, the formulas are modified as follows:

$$ai = \sum_{j=1}^{n} WijX + \Theta i$$

Where x! Maybe the output of another neuron or an external input. There are a number of architectures in use for ANNs. In **feed forward** neural networks, the neurons are organized in the form of layers. The neurons in a layer get input from the previous layer and feed their output to the next layer. In this kind of networks connections to the neurons in the same or previous layers are not permitted. The last layer of neurons is called the output layer and the layers between the input and output layers are called the hidden layers. The input layer is made up of special input neurons, transmitting only the applied external input to their outputs. In a network if there is only the layer of input nodes and a single layer of neurons constituting the output layer then they are called single layer network. If there are one or more hidden layers, such networks are called multilayer networks. The

structures, in which connections to the neurons of the same layer or to the previous layers are allowed, are called **recurrent** networks.

IV. BACK PROPOGATION ALOGORITHM

BP network means back-propagation network. It's a multi-layer forward network, learning by min mean sq. error (RMS). BP network is not fully supervised learning. Starting for all, artificial neural network (ANN) has to learn an exact learning criteria, so it will work. Importance for E-learning (Electronic Learning) may be listed as below. If the result calculate in network is wrong, then the network caught to scale back the chance of creating identical mistake next time through learning. This project uses data processing technique to check historical information concerning share market in order that it will predict the desired values a lot of accurately.

Algorithm:-

1. Accept input sample/share price
2. Perform its weighted summation.
3. Apply it to input layer neurons.
4. Process all inputs at each neuron by
5. Transfer function to get individual.
6. Hidden layer and repeat 1,2,3,4
7. Steps pass it as an input to all neurons of
8. For hidden layer neurons.
9. Pass output of hidden layer neurons to all output layers and repeat 1,2,3,4 Steps to get final output.
10. Display the final output.

There are a few disadvantages associated with back propagation learning as well:

- The convergence obtained from back propagation learning is very slow.
- The convergence in back propagation learning is not guaranteed.
- The result may generally converge to any local minimum on the error surface, since stochastic gradient descent exists on a surface which is not flat.
- Back propagation learning requires input scaling or normalization.

The main steps using the Back propagation algorithm as follows:

Step 1: Feed the normalized input data sample, compute the corresponding output;

Step 2: Compute the error between the output(s) and the actual target(s);

Step 3: The connection weights and membership functions are adjusted;

Step 4: IF Error > Tolerance THEN go to Step 1 ELSE stop.

V. MODEL ANALYSIS

We used artificial neural network which has a input layer with number of neurons, a hidden layer which has number of neurons and a output layer with one neuron. The back propagation algorithm has been used for training the network.

5.1 Training Phase

There are two part first is the training phase and second is the prediction phase. The training phase are having two parts, the propagation phase and the weight update phase. In the propagation phase first the input data is normalized for feeding the network into the input nodes using the formula.

Min A, Max A = Boundary values of the old data range. New min A, New max A = Boundary values of the new data range. In this case it is -1 and 1 because the back propagation can only handle data between -1to 1.

we are seen the normalized input data are accept into the input layer, then the weights are multiplied with the each input data and enter into the neurons of hidden layer, the function of a single neuron are described . In our model the hidden layer neurons has the same working as the input layers neurons .After that each and every neuron pass through the output to the next neuron of the output layer. The output layer solve problem same way as the hidden layer neuron and generate the final output which is the compared with the real output and calculate an error signal e.

$$e = \frac{Actual\ Output - ANN\ Output}{\text{Actual Output}}$$

The error e is generated from the Propagation Phase is used to update the weight using the following formula:

Updated Weight = weight (old) + learning rate * output error * output (neurons i) * output (neurons i+1) *(1 - Output (neurons i+1)).

VI. CONCLUSION

We developing the application of ANN (Artificial Neural Networks) to the task of stock prediction. We described the technics behind ANNs and our Neural Network model and its salient features. The obtaining result in both the cases were 80 percent accurate. Prediction is 80 percent accurate unless there is a big and sudden variation in the actual data like in the Dynamic System, where it becomes impossible to exactly predict the changes.

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