Analyzed Neural Network based Prediction Model for Infosys and TCS

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***Abstract* - Neural Network is a part of Artificial Intelligence. It is very emerging and promising technology to predict data in terms of numeric data, text data, image data, audio data and video data and found that neural network is very use full in all fields as compare to others. In this, we studied and applied two more important algorithms of Artificial Neural Network called Feed Forward and Back Propagation on stock price prediction of TCS and Infosys from National Stock Exchange (NSE) of India after that compared between Feed Forward Algorithm's and Back Propagation Algorithm's results with different size of dataset. After that we compared and found Back Propagation has a better prediction accuracy than Feed Forward.**

***keywords* - Artificial Intelligence, Neural Network, Stock Market, Feed-Forward Neural Network, Back-Propagation Neural Network**

I. INTRODUCTION

Stock Market is considered as one of the fundamental column of economy of any country and it also provides a way where anyone can invest his money in stock. Market for Intraday, Short term and Long term purpose the time has gone when people use to consider stock market as a gambling. If some knowledge could be gathered before investing money in stock market so it is a very good field for investing money. This knowledge is provided by many researchers and Brokerage houses by using fundamental, technical, sentimental, statistical analysis. There are also so many techniques under these analyses. But some people can still face some loss and don't gain profit even after consulting with many researchers and/or brokerage houses due to some reasons. Therefore lot of work has been done by the researchers and the scientists of computer fertility but still lot of possibilities exists to improve it further. To reduce these types of problems there is still much scope for research in Stock Market for researchers.

Technical analysis is also done by many techniques and we wish to go forward with our research work in Hybrid soft computing. The principal constituents of Soft Computing are Fuzzy Logic, Evolutionary Computation, Probabilistic Reasoning, and Machine Learning, Neural Network, Deep Learning, Neuro Fuzzy.

In this we studied and applied two more important algorithms of Artificial Intelligence called Feed Forward and Back Propagation on stock price prediction of TCS and Infosys from National Stock Exchange (NSE) of India after that compared between Feed Forward Algorithm's and Back Propagation Algorithm's results with different size of dataset. After that we compared and found Back Propagation has a better prediction accuracy than Feed Forward. In Feed Forward, each layer move their data in one direction only, while in Back Propagation, each layer move their data in both direction. We can also say Back propagation is based on Feed forward but it is fully based on it and produced more accurate results. That's why we can say Back Propagation is better than Feed Forward.

By using these techniques we are making learning schemes for predicting the script values for Intraday, Short term and Long term of any stock market. Here we has used many technical parameters with traditional parameters but also we adopt some smart solutions for investing in market. We would pick common stocks of expert suggestion, brokerage houses, daily business news etc. Analysis will also be done by observing the election effects. It will also be observed that how Indian markets varies on the bases of International Market using Neural Network. And also we compared both Feed forward and Back propagation techniques. We found Back propagation algorithm is more affective for stock price prediction.

II. REVIEW OF LITERATURE

In **[1]**, we found many researchers applied various different techniques for the stock market price prediction using artificial neural network (ANN). We found two conventional approaches for stock market prediction called Random Walk Theory (RWT) and Efficient Market Hypothesis (EMH).

In **[2],** proposed a deep learning method for event-driven stock market prediction. 'Novel neural tensor network model' for events are extracted from news text, and represented as dense vectors, trained and 'a deep convolutional neural network model' for both short-term and long-term influences of events on stock price movements.

In **[3],** presented a novel outlier mining algorithm to predict long term behavior of stock trend and detected anomalies on the basis of volume sequence of high frequency tick-by tick data of stock market, as anomalies can affect the prediction. The proposed, makes experimental results are profitable on the Chinese stock market, especially in a long-term usage.

In **[4],** proposed an algorithm for combining the theory of BP Neural Networks and Pattern Matching to establish a stock market forecasting system. This algorithm has analyzed and forecasted the Titan Oil's price and found the hybrid system achieves for

better forecasting accuracy than either of the two models used separately. Furthermore this paper compared combining Neural Network with Genetic Algorithms.

In **[5],** proposed a surveyed of more than 100 related previously published articles that focused on neural networks and neuro-fuzzy techniques which is derived and applied to forecast stock market values. Classifications are made in terms of input data, output data, forecasting methodology, performance evaluation, and performance measures used.

III. DATA COLLECTION AND PRE-PROCESSING

To apply both proposed algorithms we collect data from http://www.nseindia.com for two stock companies TCS and Infosys. We collected two years data with some important parameters Date, Open, Close, Low, High, Volume. We pre-processed all data for better results. We also normalized data for better training and testing.

IV. Methods and proposed work

An artificial neural network (ANN) is a system or circuit of man-made neurons, or in an advanced sense, a neural nework, made out of counterfeit neurons or hubs. There two principle calculations of neural systems:

Feed Forward Neural Network

Back Propagation Neural Network

1. Feed Forward Neural Network

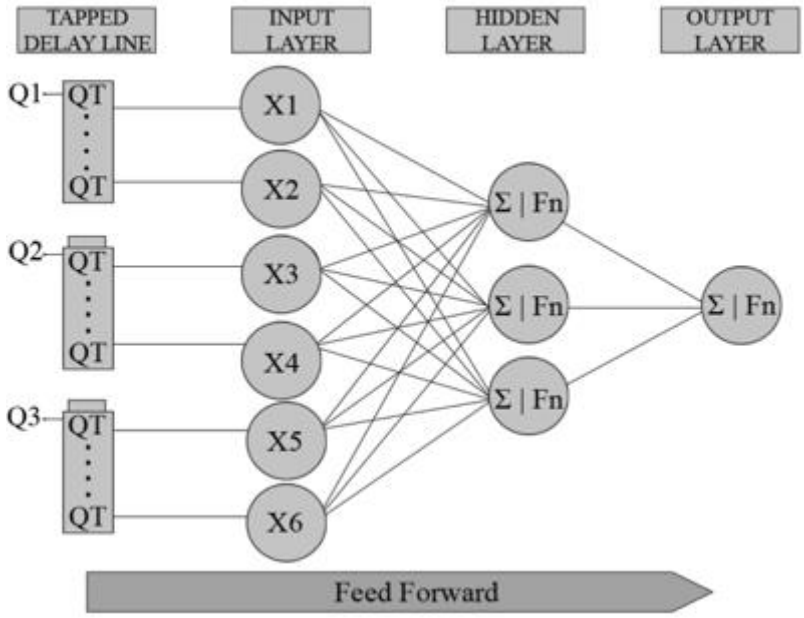
In, Feed Forward Neural Network (FFNN) system is a part of ANN wherein associations between the multiple layers called input layer, output layer and hidden layers; each layer has many neurons which has own values and we applied weights on that values. It is move in one direction only input layer to hidden layer and hidden layer to hidden layer (if network has more than one hidden layers) at last hidden layer to output layer. It never support reverse direction.

1. **Input** x**:** Set the corresponding activation a^1 for the input layer.

2. **Feedforward:** For each $l = 2, 3, \ldots, L$ compute $z^l = w^l a^{l-1} + b^l$ and $a^l = \sigma(z^l)$.

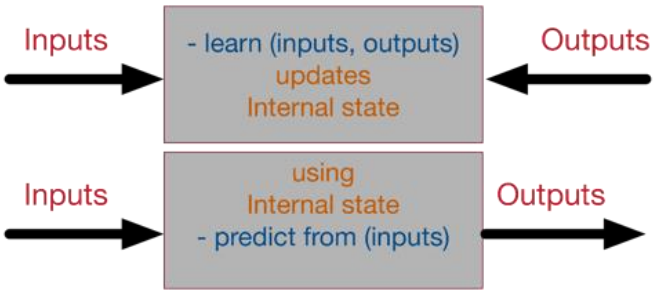
3. **Output error** δ^L**:** Compute the vector $\delta^L = \nabla_a C \odot \sigma'(z^L)$.

4. **Output:** The gradient of the cost function is given by $\frac{\partial C}{\partial w^l_{jk}} = a^{l-1}_k \delta^l_j$ and $\frac{\partial C}{\partial b^l_j} = \delta^l_j$.



2. Backpropation Neural Network

A regulated counterfeit neural system, at the most noteworthy and least difficult portrayal, can be exhibited as a black box with 2 strategies learn and anticipate or conjecture as following:



Neural network as a black box

The learning procedure takes the given sources of info and the ideal given yields and updates its inward loads in like manner, so the determined yield get as close as conceivable to the ideal given yield. The foresee procedure takes an information and create, utilizing the inside level, the in all probability yield as per its past "preparing/learning experience". That is the reason AI is called once in a while model fitting like scientific demonstrating.

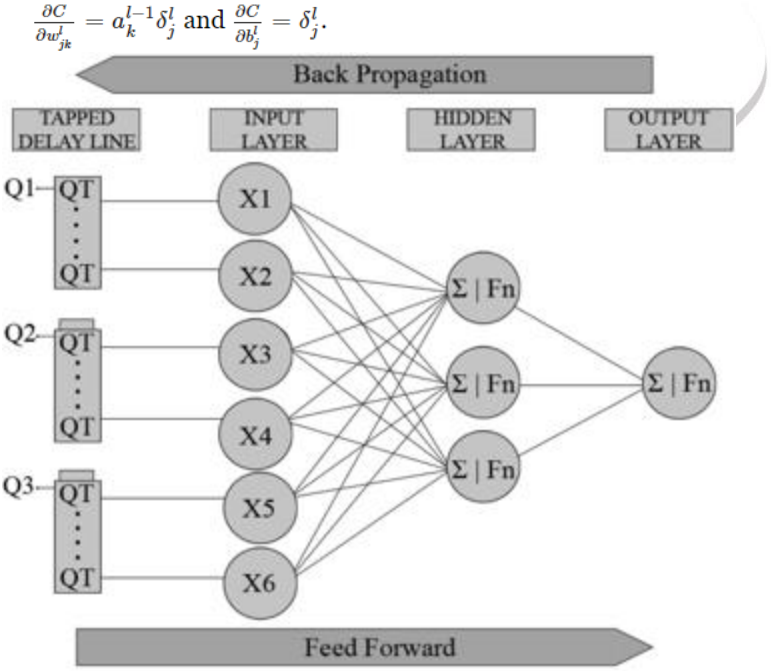
1. **Input x:** Set the corresponding activation a^1 for the input layer.

2. **Feedforward:** For each $l = 2, 3, \ldots, L$ compute $z^l = w^l a^{l-1} + b^l$ and $a^l = \sigma(z^l)$.

3. **Output error δ^L:** Compute the vector $\delta^L = \nabla_a C \odot \sigma'(z^L)$.

4. **Backpropagate the error:** For each $l = L-1, L-2, \ldots, 2$ compute $\delta^l = ((w^{l+1})^T \delta^{l+1}) \odot \sigma'(z^l)$.

5. **Output:** The gradient of the cost function is given by $\frac{\partial C}{\partial w^l_{jk}} = a^{l-1}_k \delta^l_j$ and $\frac{\partial C}{\partial b^l_j} = \delta^l_j$.



V. Result

Stock Market is a wide area for researchers. It has N dimensions to find something new and better. We worked on two most popular companies of Indian stock market which is listed on NSE National Stock Exchange that's is called Infosys and TCS. Stock Market work for three types of persons like Intraday, Short term and Long term investors. In this we worked on two most popular algorithms of Artificial Neural Network (ANN) called FeedForward and Back Propagation algorithms. In these algorithms we required Input layer, hidden layers, output layer. We collected 5 parameters Open, Close, High, Low and Volume for input layer's neurons.

We created two different neural networks first one is Feedforward and second one is Back propagation neural network. In Feedforward neural network we use 5 collected parameters as input parameters after that we connected input layers neurons with hidden layers neurons and at last we connected hidden layers neurons to output layers neurons. In Back propagation, it same as Feedforaward neural network but in this when we complete first round from input layer to output layer via hidden layer after that we calculated errors in between actual output and predicted output after this neural network move to back propagate (reverse)

direction and modify the weights on the basis of gradient-decent than move to again forward direction this process work many times that is called epochs.

Inputs parameters

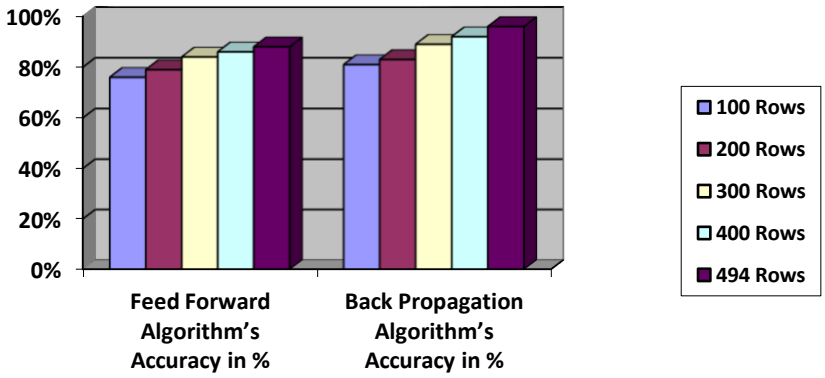
We has applied feed advance and back engendering calculations on 2 organizations loads of NSE India called Infosys and TCS. We took 2 years regular routine authentic information which has 494 lines or exchanging sessions from 01-01-2017 to 31-12-2018 with open value, close value, significant expense, low value, volume as information parameters and following day open cost as yield parameters.

- Open Price-The ordinary exchanging session is work between 9:15 AM to 3:30 PM in both the significant stock trades of Indian securities exchange - BSE, and NSE. In any case, before the ordinary exchanging session, there are little pre-opening session from 9:00 AM to 9:15 AM each day and principle advertise from 09:15 AM to 3:30 AM. This is the period when the opening cost of the offers and stocks is chosen.
- Close Price-"Shutting cost" by and large alludes to the last cost of market at which a stock exchanges during a normal exchanging day session. For some U.S. markets, standard exchanging sessions running beginnings from 9:30 a.m. to 4:00 p.m. Eastern Time.
- High Price-This is the most elevated shutting cost of a stock in the course of recent weeks, balanced for any stock parts, or the most noteworthy intraday selling/purchasing cost of a stock in the latest (or current) exchanging session.
- Low Price-Today's low is a security's intraday exchanging most reduced cost. The present low is the most reduced cost at which a stock exchanges through the span of an exchanging day.
- Volume-Volume is the quantity of portions of stock, choices, bonds, or prospects can tracts exchanged over a given assigned period (e.g., every day, week after week, month to month). Propelling volume is the all out volume at all stocks cost expanding; declining volume is the aggregate at all stocks diminishing in cost.

We create 2 neural systems, initial one depends on feed forward neural system and second one depends on back spread neural system. In both neural systems has 5 neurons in input layer, 10 neurons in shrouded layer and 1 neuron in yield layer. The outcomes are given in Table1.

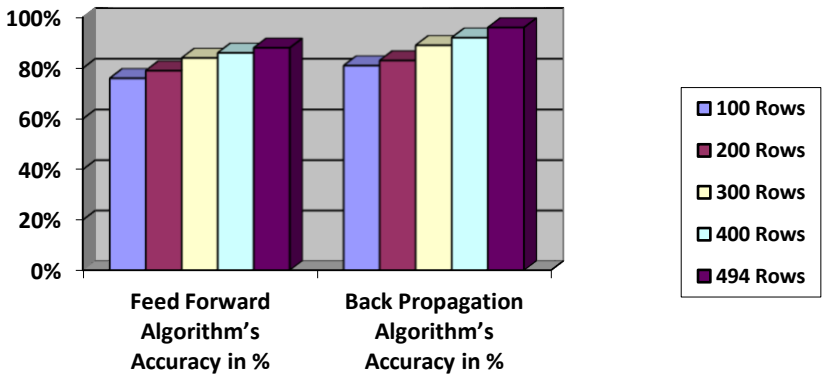
Infosys

Dataset/Algorithms Name	Feed Forward Algorithm's Accuracy in %	Back Propagation Algorithm's Accuracy in %
100 Rows	76.34%	81.44%
200 Rows	79.56%	83.23%
300 Rows	84.34%	89.87%
400 Rows	86.67%	92.23%
494 Rows	88.01%	96.67%



TCS

Dataset/Algorithms Name	Feed Forward Algorithm's Accuracy in %	Back Propagation Algorithm's Accuracy in %
100 Rows	75.67%	80.24%
200 Rows	80.76%	81.53%
300 Rows	82.89%	88.87%
400 Rows	85.02%	93.77%
494 Rows	89.30%	97.07%



VI. CONCLUTION WITH FUTURE WORK

In this, we studied and applied two more important algorithms of Artificial Intelligence called Feed Forward and Back Propagation on stock price prediction of TCS and Infosys from National Stock Exchange (NSE) of India after that compared between Feed Forward Algorithm's and Back Propagation Algorithm's results with different size of dataset. After that we compared and found Back Propagation has a better prediction accuracy than Feed Forward. In Feed Forward, each layer move their data in one direction only, while in Back Propagation, each layer move their data in both direction. We can also say Back propagation is based on Feed forward but it is fully based on it and produced more accurate results. That's why we can say Back Propagation is better than Feed Forward.

In future we can also apply these technique on different companies/sectors of NSE and also we can apply same as with foreign stock exchange. This is also can be applied on different in different fields like medical, finance, banking, entertainment, sports and many more.

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