

## ***Forecasting Prediction for Stock Markets based on Machine Learning***

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## **Abstract:**

ANN is used in the prediction of the data thus Stock market and financial forecasting use ANN to predict the data. ANN analyses the vast financial data and recognizes the patterns and relationships to get the decisions. Various technologies are being used by banks, Hedge funds, trade markets, and other financial institutes to reduce risk and improve investment strategies. ANN are the algorithms that emulate the aspects of the human brain. This gives the self-training power to get the forecast based on heuristic information.

## **Keywords:**

Forecast, Heuristic, Hedge, Patterns, Artificial Neural Networks

## **1. Introduction:**

### **1.1. What is Machine Learning?**

Machine learning is the branch of Computer Science and Artificial Intelligence that deals with the uses of data and algorithms to show the way that humans learn and gradually increase accuracy through experiences. Artificial Neural Networks(ANN) help to get decisions. Neural Networks are used in many applications, including marketing research and forecasting. The major fields in which neural networks have found application are enterprise planning, financial operations, business analytics, trading, forecasting, and product maintenance.

### **1.2. Application of ANN in Trading:**

Prediction of the stock market means not only has monetary benefits but the stock market is an important factor in today's Indian Economy. Thus, understanding the stock market becomes more important. There are a number of methods for predictions of the stock market and one is to use the software which uses the graphical and statistical data to forecast the market. Now it's time to execute the trades. Algorithmic trading is one that does not need a trader to execute the trade but completes the said action automatically. Algorithmic trading method is becoming more and more popular in today's financial world. This can be done with the help of ANN (Artificial Neural Networks). ANN helps to forecast followed by trade based on the predicted values. Neural Networks are the universal approximators and map the non-linear functions. ANN can also be used for pattern recognition, classification, and forecasting, these functions make ANN more flexible. As per the research of the previous years, ANN are better than most statistical methods in financial forecasting.

All kind of traders can get the benefit of Neural Networks. Neural Networks don't actually tell about the forecast. Even they don't provide a tool for offering the solutions. However they analyze the price data and uncover the opportunities.

Stock price predication in trading with the help of machine learning can help you to discover the upcoming values of the different company stocks and the financial assets which are on exchange. The concept of predicting the stock price is to obtain the profits. Whereas the prediction of how market runs is quite difficult. Some other factors like psychological, physical, rational and irrational behaviours and many more are helpful to predict.

Because of the dynamic and volatile factors it becomes difficult to predict the stock price with high accuracy. With the help of ANN, one can make the decision about trade based on examined data. The Neural Networks are the tools for the next generations that can find the non-linear dependencies and the patterns that some methods are not able to uncover.

### **1.3. Neuroevolution:**

An Evolutionary approach of Neuro-evolution to train the Neural Networks which to replicate the Natural methods of selection in Nature. These methods will be useful either to change the weights or both the weight and architecture. The first step in this approach is to make populations dependent on solutions followed by assessing them on fitness. Here we find generating the next population evaluation depending on previous fitness calculations. The new output is then added to the new population but can be mutated before getting added. The target should not be known till there is a better way of evaluation of fitness values.

## **2. Literature Review:**

ANN has been used for solving many problems because of the problem-solving approaches. (Samek & Varachha, 2013) (Yodele et al., 2012) showed a mixed version with the combinations of the fundamental and technical analysis of the stock market's indicators to predict the prices of the stocks in the future. (Yodele et al., 2012) (Y Kara & A Boyacioglu, 2011) has presented the 2 models which indicated the movement of the stock prices with the help of ANN and Support Vector Machine. By conclusion, the ANN model worked more significantly. (Y Kara & A Boyacioglu, 2011) (Qi & Zhang, 2008) presented the best model for trend time series with the help of Neural Networks. Four different approaches of raw Data, Raw data with the index of time, differentiated modeling for various trends patterns, and de-trending were used there. They concluded that Neural Networks perform better for prediction. (Y Kara & A Boyacioglu, 2011) (Qi & Zhang, 2008) placed the idea of the applications of ANN for the extrapolation of data belonging to the East Mediterranean rivers in Turkey. ANN has provided the prediction of conventional methods. Patterns are extracted by Neural Networks from the noisy data. The system is introduced first and then the networks by ANN. The idea behind the Neural Networks is to learn first and predict later with the available data. These properties came from the human brain's functioning. ANN has also worked in applications and the execution of the complex functions. (Fausett, 1994).

### **3. Prediction Models:**

#### **3.1. ANN Model:**

ANN models were proposed in 1944 by Warren McCullough and Walter Pitts. ANN are the non-linear structures working the same as the Human Brains. The idea behind ANN was derived by the structures of the Neurons in the Human Brain. Neural Nodes of the Human Brain are interrelated in the form of Net. They are the same as the E-Brain consisting of billions of Neuron Nodes. Information from the brain is processed by the ANN. Thousands of Artificial neurons are found in ANN. Neural Nodes get the information to use it to predict for trading purposes. ANN uses the rule of directions like back-propagation as humans need instructions and directions to get an outcome from the available information.

#### **3.2. SVM Model:**

Vapnik has developed the SVM model and it is most widely used nowadays. It is a supervised machine learning method. The base of SVM working is Statistical theory and risk minimization in the structures. For both regression and classification problems, the SVM method is applicable. Still for classification problems it is used. SVM also focuses on the upper limit contraction to get the generalized form of the errors. This approach works on back propagation. This also works on minimizing the empirical method of error reduction. Each data item can be plotted with n-dimensional spaces with the feature values.

#### **3.3. LSTM:**

Long Short-Term Memory Network (LSTM) can be used for building the models to predict the stock prices on Google for the short term. LSTMs are a kind of Recurrent Neural network for understanding long-term dependencies. It can be used for processing and prediction of data in time-series.

All LSTM are found in chain-like structures. Commonly RNNs have a single layer of Neural Networks. Whereas LSTM has four layers of Neural Networks for the communications of the neurons extraordinarily.

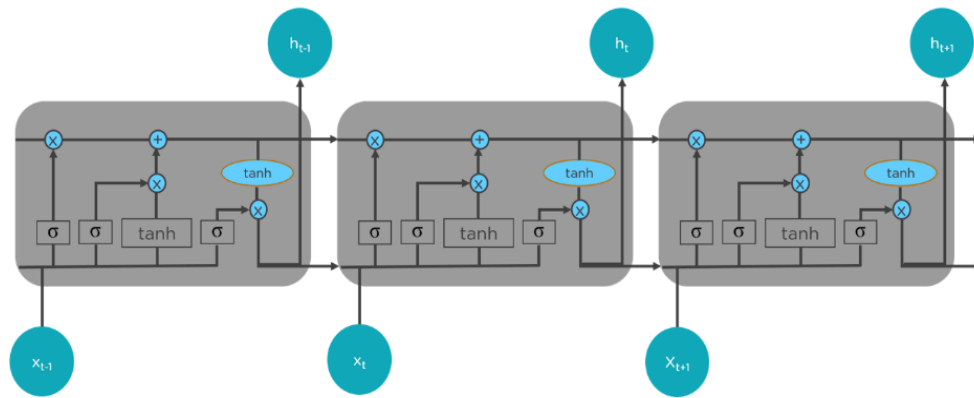


Figure.1: Long Short-Term Memory Network

LSTM has the following three-step processes:

- i) Which information is to be removed from the cell in that time period is decided here. With the help of the sigmoid function, this can be decided. Current input values and the previous steps help this process.
- ii) Two functions are there in the second layer, Sigmoid and Tanh Functions. The Sigmoid function finds out which values can be (0 or 1). Weightage to the passed values is provided by the Tanh Functions.
- iii) In the third step final output can be decided. First, the Sigmoid function is to be run. After this which part of the cell can give the output. Then the corresponding cell can be put in the tanh function to give the values between -1 and 1, then to multiply it by the output of the Sigmoid Gate.

### 3.4. Time Series Analysis:

A time series is the number of observations recorded with respect to time. These observations can be recorded daily, weekly, monthly and so on depending on the frequencies and the objectives. The four main components of the all-time series are enlisted below. Each component provides the aspects of the movements of the observations of the time series.

The following are the components of time series:

- i) Trend: An increasing or decreasing behavior of the series over time is predicted here.
- ii) Seasonality: The repeating patterns of the behavior cycles of the series over time are evaluated here.
- iii) Cyclic: These are the repeating patterns of the series over time but not same as that of the seasonality. The frequency of this is not same.

- iv) Noise: It is also called as error component. It is a random irregularity which is found in the time series which cannot be explained.

To make the preliminary time series by decomposing the time series into above components. The meaningful information about the characteristics of time series can be provided in the preliminary time series. The prediction of future behavior for understanding of the previous observations is done here. In the field where data is collected for different time, this approach can be used.

#### 4. Materials:

Forecasting uses the contextualization and description of the two data sets as below:

- 1) Stock Market indexes
- 2) Currency Exchange Rates

Two types of databases can be used as below:

- 1) The Daily Stock Data of eight stock market indices.

*Table.1: Summary statistics for the closing price for the eight stock market indices.*

Index	Count	Mean	Minimum	Maximum	Standard Deviation
<b>IXIC</b>	3375	5005.10	1268.64	14,138.78	2897.71
<b>NYA</b>	3375	10,046.22	4226.31	16,590.43	2457.78
<b>N100</b>	3424	838.54	434.61	1248.14	179.82
<b>GDAXI</b>	3375	10,046.22	4226.31	16,590.43	2457.78
<b>NGE</b>	2054	28.15	7.88	65.48	17.79
<b>J580.J0</b>	2324	36,946.57	20,716.48	48,467.67	6700.48
<b>N225</b>	3275	15,942.95	7054.98	30,467.75	5638.76
<b>000001.SS</b>	3255	2859.56	1706.70	5497.90	574.05

2) Closing Prices of the six Currency exchange rates

*Table.2: Summary statistics for the closing price of the six currency exchange rates.*

Currency	Count	Mean	Minimum	Maximum	Standard Deviation
ZAR/USD	3488	0.097	0.05	0.15	0.028
NGN/USD	3487	0.0063	0.002	1.00	0.02
GBP/USD	3487	1.49	1.14	2.03	0.18
EUR/USD	3474	1.25	1.03	1.59	0.13
RMB/USD	584	0.14	0.13	0.15	0.004
JPY/USD	3474	0.01	0.007	0.01	0.001

*Both datasets can be obtained from Yahoo Finance.*

## 5. Conclusion:

For financial forecasting, the uses of neural networks especially Recurrent Neural Networks can be used. The performance of different Neural Network models has been compared here. The study of the different approaches to forecasting is completed here. Dataset and the databases which can be used for forecasting in trading and financial decisions are mentioned. An overview of ANN with respect to forecasting was helpful to relate the working of Machine Learning and trading. Participation of Neural Networks in the study of Time Series and decision-making is an important milestone, which can be completed within a few years.

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