APPLYING MACHINE LEARNING MODELS IN STOCK MARKET PREDICTION

Vignesh CK
MCA Scholar, Department of MCA, School of CS & IT, Jain (Deemed-to-be) University, Bengaluru

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ABSTRACT
This paper deals with the techniques of attempting to calculate the future value of a company stock or any other financial instrument which is being traded in a stock exchange. This prediction plays a great role in many financing and investing decisions. This calculation can be done by Machine learning by training a model to identify the trend from past data in order to predict the future. The main topic of study here will be the comparative analysis of the SVM and LTSM algorithms.

KEYWORDS: Machine learning, Stock price, Stock market, Support vector machine, neural network, long short term memory.

I. INTRODUCTION
Stock markets have been operating on the digital paradigm after the advent of Information Technology. Artificial Neural Networks, which serve as mathematical function approximators, make the crux of this application. The popularly implemented ANN in use for this is the feed forward network. Apart from that there are Back propagation networks. They utilize the backward propagation of errors algorithm to adjust weights in the model. SVM (Support vector machine) Algorithm along with Random Forest has had its implementation for stock prediction, which is included. A modified type of Recurring Neural Network called LSTM is also implemented. It memorizes historical or past data for prediction. The result of this project includes a brief conclusion for how the algorithm performs vis-a-vis the real world figures thereof.

SVM and Back propagation have shown reasonable accuracy in the previous studies [1] [2] [3] [4] [5] [6] [7] [8]. We cannot afford to tweak the model to improve the accuracy as the market operates in very volatile circumstances. This involves time series problems for which we need LSTM to analyse past data and come up with predictions.

II. DESCRIPTION
Problem statement was to predict increase or decrease in price for any given day in future. I addressed this as classification problem. The main goal is to compare performance of SVM and Back propagation algorithm’s results.

III. DATAFLOW DIAGRAM
The flow diagram can be briefly represented by this diagram.

Figure 1: Data Flow Diagram
First, the past data is fetched from the dataset. Then, it’s organised and plotted according to our project’s requirement. There are 2 sets created – the Training set and the Testing set.
After training a model, it’s tested using the test model. If the accuracy is reasonable, we can assume that the model is reasonably trained.

Once the predicted results are out, the model is saved after assessment and analysis. The accuracy of the model depends upon how the model is trained.

IV. ARCHITECTURE
The architecture of the model which we create briefly appears like this.

Parameters calculated for input dataset
The below mentioned are some of the other parameters. [9]

- **Momentum**: If price of stock is more than yesterday then the momentum for given day is +1 as there is an increase in price. It’s -1 if vice versa.
- **Volatility**: Represents how big or small the changes in values are. Volatility is the difference between values of today and yesterday, divided by the closing value of the previous day.
- **Index Momentum**: Calculated based on market performance for last 3 days. It’s an average of 3 days index momentum.
- **Index Volatility**: Calculated as the average index Volatility over the last 3 days.
- **Stock Momentum**: Calculated as the last 3 days’ average momentum for the given momentum.
- **Stock Price Volatility**: Calculated as the average of last 3 days of the given stock.

**Output**: If closing stock price for a stock today day is more than yesterday’s closing stock price for the same stock, then the corresponding output is denoted by 1 else it is denoted as 0.

2. Implementation of Algorithms
   1) **Support vector machine**

   SVM is the algorithm used for classification problems. It is a supervised learning model with associated learning algorithms that analyzes data used for classification and also regression analysis. A support vector machine (SVM) is a supervised machine learning model that uses classification algorithms for two-group classification problems. After giving SVM model sets of labelled training data for each category, they’re able to categorize new text.

   SVM using Scikit Learn Library [12] has been implemented in this study. Using python codes, import the library, try SVM on training dataset and later apply them on the test dataset.
II) Long Short Term Memory
LSTM [13] stands for Long Short Term memory. It is building block of a neural network (like perceptron which is use for supervised learning of binary classifiers). LSTM is an algorithm that consists of many blocks which are used to build a Recurring Neural Network. An LSTM block is typically composed of four parts. They are:
1. Cell
2. Input gate
3. Output gate
4. Forget gate
The cell remembers values over arbitrary time intervals therefore involving the concept of memory in the LSTM model. This is part of the cell’s primary duties.

3. Comparison of result and analysis
The purpose of this paper was to make sure that one among the many algorithms used, performs consistently and even better than others against which it has been run and tested numerous times. For each run of the algorithm, the prediction accuracy is calculated for the test data. Each algorithm mentioned above, was run and checked for more than 10 times. The same training dataset and testing dataset is never used for the same run. The accuracy results for each algorithm are mentioned below.

SVM Result
The SVM algorithm was run 30 times, as shown in Figure 6. The mean accuracy of these results is 65.20 while the standard deviation was 0.15. This shows the performance consistency of the SVM. It can be trained further with more datasets to improve the accuracy.

LSTM Result
The LSTM algorithm is also run 30 times, to get a better perspective while comparing. 66.83 was the mean accuracy for this algorithm. The standard deviation was 1.36 in this case. This performs well compared to SVM. Also there in no significant fluctuation in accuracy compared to other algorithms.

VI. FUTURE SCOPE
This model can be further trained and developed to carry out advanced tasks like volume deduction i.e. volume of the stock prices which can be sold/purchased in a way which is beneficial to
the investor. Past datasets can be used to train the model to gain more accuracy and get a better prediction which has a 70% or more accuracy. With inclusion of a variety of other factors that affect the stock prices, it can be used to provide accurate financial advice.

CONCLUSION

This project is a demonstration of the application of machine learning to solve the problems in stock prediction. The past data of the stocks was considered to train the model in a way where it could find out trends and patterns and thereby predict the data in future. This project also proved that LSTM worked better compared to back propagation and SVM algorithms. For this implementation, it can be summed up that incorporation of all the factors that affect stock performance being fed into neural network with proper data processing and filtering, a model which can predict stock market prices very accurately can be developed.

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