Stock Price Trend Forecasting and Stock Selection using Supervised Learning Methods

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ABSTRACT

In this paper, we are going to present and review a more feasible method to predict the stock movement with higher accuracy. The first thing we have taken into account is the dataset of the stock market prices from the previous year. The dataset was pre-processed and tuned up for real analysis.

Stock market prediction is an act of trying to determine the future value of a stock other financial instrument traded on a financial exchange. This paper explains the prediction of a stock using Machine Learning. The technical and fundamental or the time series analysis is used by most of the stockbrokers while making the stock predictions. The programming language is used to predict the stock market using machine learning is Python. In this paper, we propose a Machine Learning (ML) approach that will be trained from the available stocks data and gain intelligence and then uses the acquired knowledge for an accurate prediction. In this context this study uses a machine learning technique called Support Vector Machine (SVM) to predict stock prices for the large and small capitalizations and in the three different markets, employing prices with both daily and up-to-the-minute frequencies.

KEYWORDS - Stock Market, Machine Learning, Predictions, Support Vector Machine, Data Pre-processing, Data Mining, Dataset, Stock, Stock Market.

1. INTRODUCTION

Quantitative traders with much money from stock markets buy stocks derivatives and equities at a low price and later on selling them at a high price. The trend in a stock market prediction is not a new thing, and yet this issue is kept being discussed by various organizations.

The stock market is an aggregation of various buyers and sellers of stock. A stock in general represents ownership claims on business by a particular individual or a group of people. The attempt [3] to determine the future value of the stock market is known as a stock market prediction. The prediction is expected to be robust, accurate and efficient. The system must work according to the real-life scenarios and should be well suited to real-world settings. The system is also expected to take into account all the variables that might affect the stock's value and performance. There are various methods and ways of implementing the prediction system like Fundamental Analysis, Technical Analysis, Machine Learning, Market Mimicry, and Time-series aspect structuring. With the advancement of the digital era, the prediction has moved up into the technological realm. The most prominent and [3] promising technique involves the use of Artificial Neural Networks, Recurrent Neural Networks, that is the implementation of machine learning. Machine learning involves artificial intelligence which empowers the system to learn and improve from past experiences without being scheduled time and again.

Traditional methods of prediction in machine learning use algorithms like Backward Propagation, also known as Backpropagation errors. Lately, many researchers are using more of ensemble learning techniques. It would use low price and time [3] lags to predict future highs while another network would use lagged highs to predict future highs.

The probable stock market prediction target can be the future stock price or the volatility of the prices or market trend. In the prediction, there are two types like a dummy and a real-time prediction which is used in stock market prediction system. In Dummy prediction, they have defined some set of rules and predict the future price of shares by calculating the average price. In the real-time prediction, compulsory used the internet and saw the current price of shares of the company.

Computational advances have led to the introduction of machine learning techniques for predictive systems in financial markets. In this paper, we are using a Machine Learning technique, i.e., Support Vector Machine (SVM) to predict the stock market, and we are using Python language for programming.

2. Methodology

Classification is an instance of supervised learning where a set is analyzed and categorized based on a common attribute. From the values or the data are given, classification draws some conclusion from the observed value. If more than one input is given, then classification will try to predict one or more outcomes for the same. A classifier that are used here for the stock market prediction includes SVM classifier. A Support Vector Machine (SVM) is a discriminative classifier that formally defined by the separating hyperplane. In other words, the given labelled training data (supervised learning), the algorithm outputs the optimal hyperplane which categorizes new examples. In the two-dimensional space this hyperplane is a line dividing a plane into two parts where in each class lay in either side.

Support Vector Machine (SVM) is considered to be as one of the most suitable algorithms available for the time series prediction. The supervised algorithm can be used in both regression and classification. The SVM involves in plotting of data as a point in the space of n dimensions. These dimensions are the attributes that are plotted on particular co-ordinates. SVM algorithm draws a boundary over the data set called the hyper-plane, which separates the data into two classes, as shown in Fig 1.

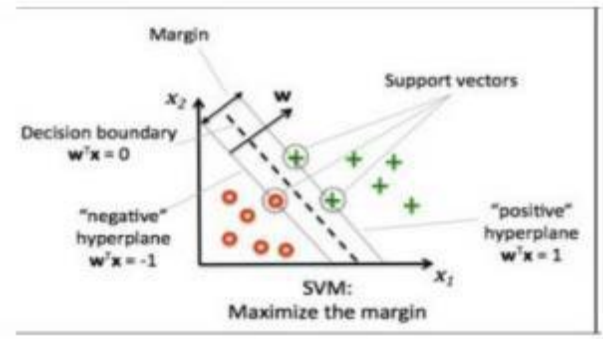


Figure 1: The Support Vector Machine Decision Making Boundary

The hyper-plane is a decision boundary which is later extended or maximized on either side between the data points. Considering the same figure, if μ is some unknown data point and w is a vector which is perpendicular to the hyperplane, then the SVM decision rule will be

$\bar{w}\bar{\mu} + b \geq 0$ ..... (1)

The width w of the hyper-plane must be maximized the spread

$w = [2/ || w ||]$ ..... (2)

$w = (\max [2/|| w ||])$ ..... (3)

Applying lagrange's multiplier as

$L = 0.5|| w ||^2 \rightarrow -\sum \alpha_i [y_i (\omega_i x_i + b) - 1]$ ..... (4)

$L = \sum \alpha_i - 0.5 \Sigma_i \Sigma_j \alpha_i \alpha_j y_i y_j x_i x_j$ ..... (5)

The updated decision rule will be

$(\sum \alpha_i y_i x_i)\mu + b \geq 0$

Radial Basis Function (RBF)

Radial Basis Function (RBF)

In the machine learning, the radial basis function kernel, or RBF kernel, is a popular kernel function used in the various kernelized learning algorithms. In particular, it is most commonly used in support vector machine classification.

A radial basis function is a real-valued function whose value depends only on the distance from the origin, so that; alternatively on the distance from some other point, called a centre, so that. Any function which satisfies the property is a radial function.

RBF = Local Response Function

The RBF Kernel is nothing more than a low-band pass filter, which is well known in Signal Processing as a tool to smooth images. RBF Kernel acts as the prior that selects out smooth solutions.

The Radial basis function kernel is also called as the RBF kernel, or Gaussian kernel is a kernel that is in the form of a radial basis function (more specifically, a Gaussian function). The RBF kernel is defined as

KRBF (x, x') = exp [-y ||x -x'||2]

Where y is the parameter that sets "spread" of the kernel

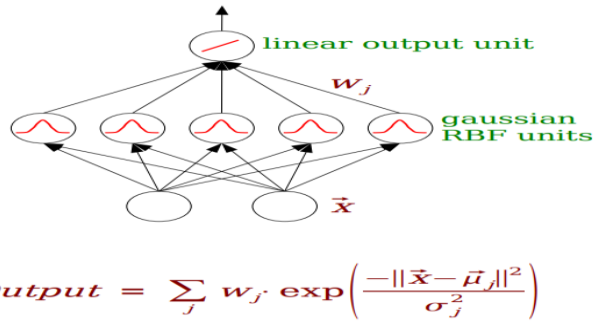


Figure 2: RBF Network

The RBF units provide a new basis set for synthesizing the output function. The radial basis functions are not orthogonal and are over complete.

3. Result

Steps for Stock Market Prediction

Steps for Stock Market Prediction

Step 1: This step is essential for the download data from the net. We are predicting the financial market value of any stock. So that the share value up to the closing date is download from the site.

Step 2: In the next step, the data value of any stock that can be converted into the CSV file (Comma Separated Value) so that it will easily load into the algorithm.

Step 3: In the next step in which GUI is open, and when we click on the SVM button, it will show the window from which we select the stock dataset value file.

Step 4: After selecting the stock dataset file from the folder it will show graph Stock before mapping and stock after mapping.

Step 5: The next step algorithm calculated the log2c and log2g value for minimizing error. So, it will predict the graph for the dataset value efficiently.

Step 6: In the final step algorithm display the predicted value graph of select stock, which shows the original value and the predicted value of the stock.

Our proposed system is to predict the price of the stock by analyzing its historical data.

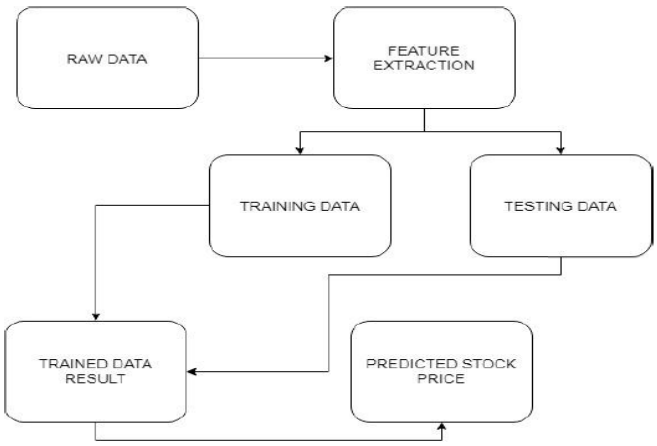


Figure 3: Flow Diagram Design

4. Discussion

Feature Name	Description	Formula
σs	Stock price volatility. This is an average over the past n days of percent change in the given stock's price per day.	$\frac{\sum_{i=t-n+1}^{t} \frac{C_i - C_{i-1}}{C_{i-1}}}{n}$
Stock Momentum	This is an average of the given stock's momentum over the past n days. Each day is labeled 1 if closing price that day is higher than the day before, and −1 if the price is lower than the day before.	$\frac{\sum_{i=t-n+1}^{t} y}{n}$
σi	Index volatility. This is an average over the past n days of percent change in the index's price per day.	$\frac{\sum_{i=t-n+1}^{t} \frac{I_i - I_{i-1}}{I_{i-1}}}{n}$
Index Momentum	This is an average of the index's momentum over the past n days. Each day it is labeled 1 if closing price that day is higher than the day before, and −1 if the price is lower than the day before	$\frac{\sum_{i=t-n+1}^{t} d}{n}$

Figure 4: Formula Implemented

The xlxs file contains the raw data based on which we are going to publish our findings. There are eleven columns of eleven attributes that describe the rise and fall in stock prices.

DATE	TRADING CODE	LTP	HIGH	LOW	OPENP	CLOSEP	YCP	TRADE	VALUE (mr	VOLUME
28-12-2017	1JANATAMF	6.4	6.5	6.4	6.4	6.4	6.5	79	1.888	2,94,720
27-12-2017	1JANATAMF	6.5	6.5	6.4	6.5	6.5	6.5	73	1.295	2,00,062
26-12-2017	1JANATAMF	6.5	6.6	6.4	6.5	6.5	6.5	103	4.119	6,30,548
24-12-2017	1JANATAMF	6.6	6.6	6.4	6.5	6.5	6.5	46	0.654	1,01,104
21-12-2017	1JANATAMF	6.6	6.6	6.4	6.4	6.5	6.4	24	0.241	37,098
20-12-2017	1JANATAMF	6.4	6.5	6.4	6.4	6.4	6.4	37	0.296	45,885
19-12-2017	1JANATAMF	6.4	6.6	6.4	6.5	6.4	6.5	55	1.387	2,16,529
18-12-2017	1JANATAMF	6.4	6.5	6.4	6.4	6.5	6.4	36	0.141	21,817
17-12-2017	1JANATAMF	6.5	6.5	6.4	6.5	6.4	6.6	118	2.904	4,52,125
14-12-2017	1JANATAMF	6.5	6.6	6.5	6.6	6.6	6.6	36	0.596	90,597

Figure 5: Raw Data

This is a pictorial representation of the data present in our xlxs file. This particular file contains 121608 such records. There are more than ten different trading codes available in the dataset, and some of the records do not have relevant information that can help us train the machine, so the logical step is to process the raw data. Thus we obtain a more refined dataset which can now be used to train the machine.

	DATE	TRADING CODE	LTP	HIGH	LOW	OPENP	CLOSEP	YCP	TRADE	VALUE (mn)	VOLUME
0	2018-08-16	1JANATAMF	6.2	6.3	6.1	6.2	6.2	6.2	56	0.757	122741
1	2018-08-16	1STPRIMFMF	11.2	11.2	10.9	11.0	11.1	10.9	145	2.640	238810
2	2018-08-16	AAMRANET	80.1	80.4	78.5	78.5	79.7	78.3	545	15.488	195035
3	2018-08-16	AAMRATECH	30.8	31.6	30.7	31.0	30.9	31.0	195	5.100	164899
4	2018-08-16	ABB1STMF	6.1	6.1	5.9	6.0	6.1	6.0	109	11.214	1857588

Figure 6: Calculate Head

This is the result of using the head(). Since we are using the pandas library to analyze the data, it returns the first five rows. Here five is the default value of the number of rows it returns unless stated otherwise.

Figure 7: Time series plot of GP

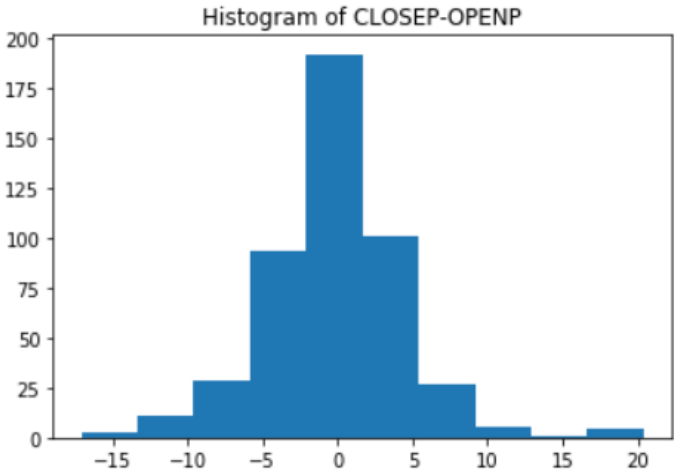


Figure 8: Histogram of CLOSEP-OPENP

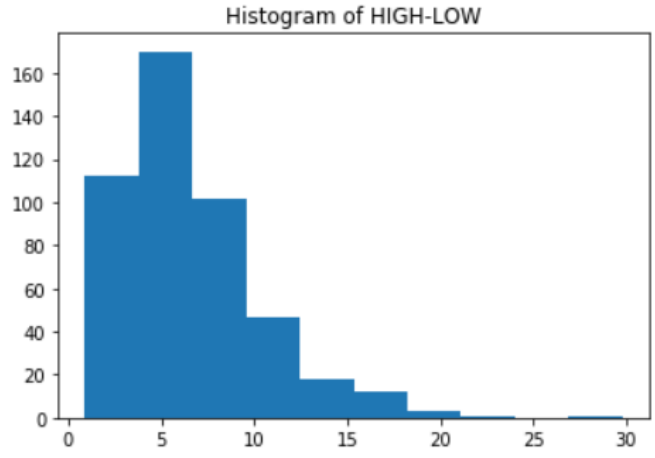
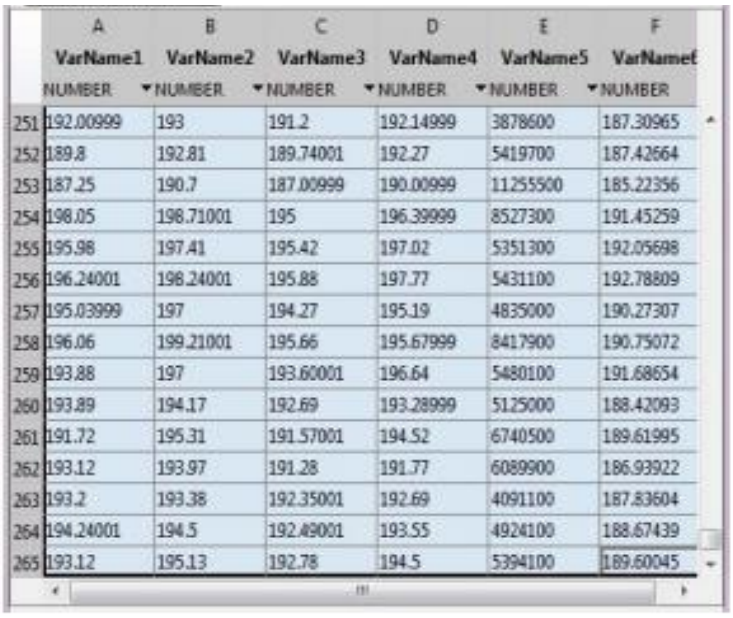


Figure 9: Histogram of HIGH-LOW



	A	B	C	D	E	F
	VarName1	VarName2	VarName3	VarName4	VarName5	VarName6
	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER
251	192.00999	193	191.2	192.14999	3878600	187.30965
252	189.8	192.81	189.74001	192.27	5419700	187.42664
253	187.25	190.7	187.00999	190.00999	11255500	185.22356
254	198.05	198.71001	195	196.39999	8527300	191.45259
255	195.98	197.41	195.42	197.02	5351300	192.05698
256	196.24001	198.24001	195.88	197.77	5431100	192.78809
257	195.03999	197	194.27	195.19	4835000	190.27307
258	196.06	199.21001	195.66	195.67999	8417900	190.75072
259	193.88	197	193.60001	196.64	5480100	191.68654
260	193.89	194.17	192.69	193.28999	5125000	188.42093
261	191.72	195.31	191.57001	194.52	6740500	189.61995
262	193.12	193.97	191.28	191.77	6089900	186.93922
263	193.2	193.38	192.35001	192.69	4091100	187.83604
264	194.24001	194.5	192.49001	193.55	4924100	188.67439
265	193.12	195.13	192.78	194.5	5394100	189.60045

Figure 10:Result

5. Conclusion

In the project, we proposed the use of the data collected from different global financial markets with machine learning algorithms to predict the stock index movements. SVM algorithm works on the considerable dataset value, which is collected from different global financial markets. Also, SVM does not give a problem of overfitting. Various machine learning-based models are proposed for predicting the daily trend of Market stocks. Numerical results suggest high efficiency. The practical trading models built upon our well-trained predictor. The model generates higher profit compared to the selected benchmarks.

By measuring the accuracy of the different algorithms, we found that the most suitable algorithm for predicting the market price of a stock based on various data points from the historical data is the SVM algorithm. The algorithm will be a great asset for brokers and investors for investing money in the stock market since it is trained on a huge collection of historical data and has been chosen after being tested on a sample data. The project demonstrates the machine learning model to predict the stock value with more accuracy as compared to previously implemented machine learning models.

6. References

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