COMPARISON OF SUPPORT VECTOR MACHINE AND LONG SHORT-TERM MEMORY FOR STOCK MARKET ANALYSIS

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Abstract: *The stock price prediction methods used by the individual stock traders vary depending on the accuracy of the method and on the trader. In this paper we can see the comparison between the two prominent methods of predictions. The Support Vector Machine method and the Long Short Term Memory method. The methods are chosen from machine learning and deep learning respectively.*

KEYWORDS: Stock Market, Data Prediction, Long Short Term Memory, Machine Learning, Deep Learning

1. INTRODUCTION

Financial markets are one of the most interesting inventions of our time. They have had a huge effect on many fields like industry, education, employment, technology and therefore on the economy. A stock market is a public market for the sale of company stock and its derivatives at an agreed price. Shares represent an ownership claim on the product, and consequently a claim on potential sales. The stock market is also called the secondary market because it includes trading between two investor. Stock market brings investors together to buy and sell their stake. Stock market gets stakeholders together to buy and sell their share. Shareholders in the stock market want to maximize their returns by buying or selling their investments at a suitable time. Many new technologies and procedures have been suggested over the years to try and forecast stock prices via many avenues, thanks to the demanding and ever-changing landscape of stock markets. Machine learning and artificial neural network techniques have been used more to get the accurate of predictions. Companies list shares of their stock on an exchange in a mechanism called an initial public offering, or IPO. Investors buy those shares, which helps the company to raise capital to expand its business. Investors may then buy and sell these stocks among themselves, and the exchange monitors the supply and demand of each listed stock. That supply and demand help decide the price for each security, or the levels at which stock market players that is the investors and traders are willing to buy or sell. Computer algorithms usually do most of the calculations. Buyers give a "bid," or the highest price they're willing to pay, which is typically smaller than the price sellers "ask". The most important drawback is that you will lose your entire investment if the stock price falls to zero. If the company goes bankrupt, stock owners are compensated after bondholders. Of this reason, stock investing may be an emotional rollercoaster. If investors believe the economy is slowing or declining, they may then invest in bonds, which are a safer investment, but they do come with their own risks. Bonds offer a fixed return over the life of the bond, and usually perform well during the contraction period of the business cycle. When stock market prices decline less than 10 percent, that's known as a stock market correction. When prices fall that much or more in one day, it's known as a stock market crash or the financial crisis. A bad crash might even cause a recession. Therefore, in the recent times market analysis is done using advanced computer algorithms.

2. RELATED WORK

The paper discusses a solution to the difficult of the researchers and analysts even investors who are into the research area of stock price prediction. Recurrent neural networks (RNN) [1] is one of the most powerful models for processing sequential data. Long Short-Term memory is that successful RNNs architectures. The paper mainly deals with the prediction of stock returns of NIFTY 50 using LSTM. We collection of 5years of historical data of NIFTY 50 and used it for the training and validation purposes for the model. Root Mean Square Error (RMSE) is being used for analyzing the efficiency of the system. The usage of RMSE is an excellent general purpose error metric for numerical predictions. Recurrent Neural Network and Long Short-Term Memory unit is one of the most precise forecasting technology which helps investors, analysts or any person interested in investing in the stock market by providing them a good knowledge of the future situation of the stock market.

[2] The proposed paper consists of three stage using a technique Support Vector Machine (SVM). The system uses technical analysis to calculate the indicators based on collected historical data. Different variable selection methods are applied to select variables that describe datasets. SVM helps us in constructing the forecasting model. Evaluation of the effectiveness of variable selection techniques in construction is done through comparing the performance of the proposed model with the standard SVM based method. Support Vector Machines are mainly used for solving classification and regression problems in time series domain. SVMs exhibits better performance and resistant to over-fitting problems, which helps in the stock market prediction task SVM technique is combined with variable selection methods to construct the prediction model, initially by technical analysis which determines the most important indicators based on the historical data. Whereas, data normalization is done to normalize the original data into one scale. Variable selection techniques were applied to choose the influential variables for prediction model. Later, prediction model is constructed using support vector machines for regression. Finally, Comparative analysis is conducted to examine the effectiveness of the proposed model.

[3] Purposed paper deals with the investigation of relation between equity prices and aggregate investment in European countries which includes France, Germany, Italy, the Netherlands and the United Kingdom. Several econometric approaches are used which includes Granger causality test and impulse-response function calculated from a vector autoregressive model (VAR). The VARs are identified using the Cholesky recursive scheme. The variables are ordered with precedence, which helps in theoretical considerations. Share index is ordered first, followed by investments and output. The development of investments in the short and medium run depends more heavily on expectations and reacts more sensitively to interest rates than, for example, consumption. But demand should determine investment on a long-term basis. An investigation of the cross-correlation indicates that the two variables fluctuate simultaneously. So, predetermined ordering of the two variables is not necessary. Here the output stand before the investments in equipment and allow for a contemporaneous impact of the output on investment. Results are not very sensitive to the ordering of the variables.

[4] Paper is focused on two topics, namely, stock analysis and stock prediction. Finally, we discuss potential challenges and possible future research directions. We organize the rest of this paper as follows. Financial markets provide a unique platform for trading and investing, where trades can be executed from any device that can connect to the Internet. With the advent of stock markets, people have the opportunity to have multiple avenues to make their investment grow. It also gave rise to different types of funds like mutual funds. Governments of most countries invest a part of their healthcare, employment, or retirement funds into stock markets to achieve better returns for everyone. Online trading services with people buy and sell stocks. The financial markets have evolved rapidly into a strong and interconnected global marketplace. Apart from traditional systems, stock market today are built using a combination of different technologies, such as machine learning, expert systems, and big data which communicate with one another to facilitate more informed decisions. This is where further research can play an important role in paving the way how stock markets will be analyzed and made more robust in the future. A various algorithms are used to evaluate whether they are powerful enough to predict for the longer term, because markets act like weighing machines in the long run having less noise and more predictability. Hybrid approaches combine statistical and machine learning techniques will probably prove to be more useful for stock prediction.

3. MACHINE LEARNING AND SUPPORT VECTOR MACHINE

Machine learning is a division in computer science where programs are written to enhance and learn from the event rather than being explicitly told what to do, training data is used to be able to make future decisions. There are categories in machine learning algorithms. Supervised machine learning algorithms will be able to apply what has been learned in the past to new data using defined examples to predict future occurrences. Starting from the scrutiny of a known training dataset, the learning algorithm produces an deduced function to make predictions about the output values. The program is able to provide goals for any new input after adequate training. The learning algorithm can also compare its output with the correct, intended output and find errors in order to alter the model accordingly. In comparison, unsupervised machine learning algorithms are used where the knowledge used to train is neither marked nor numbered. Unsupervised machine learning algorithms are utilized when the information used to train is neither classified nor tagged. Unsupervised learning explores how systems can infer a feature to define a hidden structure from unlabeled data. The device doesn't find out the right performance, but it explores the data and can draw inferences from datasets to explain hidden structures from unlabeled data. Semi-supervised machine learning algorithms fall right in between supervised and unsupervised learning, as they use both labeled and unlabeled data for training usually a small volume of labeled data and a large volume of unlabeled data. The systems that use this method are able to considerably boost learning accuracy and speed. Usually, semi-supervised learning is chosen when the acquired labeled data requires skilled band pertinant resources in order to train it and learn from it. Otherwise, collecting unlabeled data usually doesn't require additional capital. [6] The support vector machine (SVM) is a

training algorithm for learning classification and regression rules from data, for example the SVM can be used to learn polynomial, radial basis function (RBF) and multi-layer perception (MLP) classifiers. SVMs emerged from statistical learning theory; the aim being to resolve only the problem of interest without solving a more difficult problem as an intermediate step. SVMs are built on the structural risk minimization principle, closely related to regularization theory. This principle incorporates capacity control to avert over-fitting and thus is a partial solution to the bias-variance trade-off dilemma. Two key elements in the implementation and execution of SVM are the techniques of mathematical programming and kernel functions.

4. MACHINE LEARNING AND LONG SHORT TERM MEMORY (LSTM)

Over the years, various machine learning techniques have been used in stock market prediction, but with the increased amount of data and expectation of more accurate prediction, the deep learning models are being used nowadays which have proven their advantage over traditional machine learning methods in terms of accuracy and speed of prediction. Long-Short-Term Memory (LSTM) Recurrent Neural Network, one of the popular deep learning models, used in stock market prediction. Long-Short-Term Memory Recurrent Neural Network belongs to the family of deep learning algorithms. It is a recurrent network because of the feedback connections in its architecture. It has an advantage over traditional neural networks due to its capability to process the entire sequence of data [6].

LSTMs are an advanced version of recurrent neural networks. Recurrent neural networks (RNN) are a special type of neural network. LSTMs are a type of RNN that remember information over long periods of time, making them better suited for predicting stock prices. LSTMs are a type of RNN with gates inside of each LSTM cell. These gates inside LSTM cells help the LSTM decide what data is important to be remembered and what data can be forgotten even on long series of data. There three types of gates. They are the forget gate, the input gate, and the output gate. The forget gate takes the previous hidden state from the previous LSTM cell and the current input and multiples them. The input gate takes the previous hidden state multiplied by the input and passes it through a sigmoid. The output gate determines what the next concealed state should be. LSTMs are very powerful in sequence prediction problems because they're able to store past information. This is important in our case because the previous price of a stock is crucial in forecasting its future price. The LSTM model is created using Tensorflow library. These model contains Sequential which is for initializing the neural network, Dropout which is for preventing overfitting with dropout layers and Dense which is to add a densely connected neural network layer. The model also has LSTM layers with input shape which is equal to shape of the training data [7]. The LSTM model is trained on the historical stock price dataset and based on this future value of stock price is predicted.

Conclusion

Machine learning and Artificial Neural Network algorithms have been used to predict the direction of the stock market. These algorithms gave a descent prediction accuracy and made predictions on the historical stock market data. In this paper we compared SVM and LSTM for predicting stock prices. LSTM provides high accuracy when there is large dataset and also keeps track of the context-specific temporal dependencies between stock prices for a longer period of time while performing predictions when compared to SVM.

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