

Chapter 66

Algorithmic Machine Learning for Prediction of Stock Prices

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ABSTRACT

Stock markets and relevant entities generate enormous amounts of data on a daily basis and are accessible from various channels such as stock exchange, economic reviews, and employer monetary reports. In recent times, machine learning techniques have proven to be very helpful in making better trading decisions. Machine learning algorithms use complex logic to observe and learn the behavior of stocks using historical data which can be used to predict future movements of the stock. Technical indicators such as rolling mean, momentum, and exponential moving average are calculated to convert the data into meaningful information. Furthermore, this information can be used to build machine learning prediction models that learn different patterns in the data and make future predictions for accurate financial forecasting. Additional factors that are being used for stock prediction include social media influences and daily news on trading stocks. Considering these qualitative and quantitative features at the same time result in improved prediction models.

INTRODUCTION

Machine Learning refers to a concept in which a machine has been programmed to learn specific patterns from historical data using powerful algorithms and make predictions in future based on the patterns it learnt. Machine learning is a branch of Artificial Intelligence (AI), the term proposed in 1959 by Arthur

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Samuel who defined it as the ability of computers or machines to learn new rules and concepts from data without being explicitly programmed.

This idea has stretched out its effect to the financial markets because of the rapid and revolutionary advancements in Artificial Intelligence (AI) and Machine Learning (ML). Since last two decades, markets have turned out to be more inclined towards high frequency trading as compared to traditional trading schemes. Stock markets generates huge amount of information on daily basis which can be accessible from various channels such as stock exchange, economic reviews, employer monetary reports etc. Therefore, it is helpful to analyze market data and get useful insights about securities to make better trading decisions. In the past, several studies have been done to predict stock prices. Different natural inspired algorithms have been proposed for stock prediction. Genetic algorithms have been studied with neural networks (Fang et. al, 2014). Different hybrid evolutionary algorithms have been proposed (Bisoi and Dash, 2014). Five algorithms Flower Pollination Algorithm (FPA), Bat algorithm (BA), Modified Cuckoo Search (MCS), Artificial Bee Colony(ABC), and Particle Swarm Optimization (PSO) were proposed. These algorithms selected the best parameters to train and optimize Least Square- Support Vector Machine (LS-SVM). The problem with those algorithms was that they couldn't overcome the overfitting and were falling in local minima (Hegazy, Soliman, and Salam, 2015). Not only the statistical data of stocks but also the textual information can make huge effects on stocks. News articles have been used with the stock prices for prediction (Li, Xiaodong et. al, 2014). Twitter sentiment analysis has been done on stocks (Ranco et. al, 2015). By incorporating the textual information with the financial information also gives better results than models which uses financial information only (Lee, Surdeanu, MacCartney, and Jurafsky, 2014). Topic modeling has been studied where topic based sentiment analysis was done by using LDA tool (Nguyen and Shirai, 2015). The events occurring in the real world can make significant effects on stock markets. Event driven stock price prediction has been studied in detail where the information about the events was extracted from the web-scale data (Ding, Zhang, Liu, and Duan, 2014). Deep learning models have proposed by using news text (Ding, Zhang, Liu, and Duan, 2015). Following the events, the news on media and public sentiments can also change the behaviour of investors and can have great influence over stock market (Li, Qing et. al, 2014). Multiple classifiers have been trained for short term and long term stock price prediction by using the historical data stocks (open, high, low & close prices) ((Patel, Shah, Thakkar, and Kotecha, 2015) Ballings, Van den Poel, Hespeels, and Gryp, 2015).

Hedge fund traders are now more biased towards the programs that will take over their daily trading business in order to maximize returns. Quantitative hedge funds have been developing and creating different machine learning based algorithms to make trading decisions. AI based programs make statistical analysis for a security, become aware of buying and selling correlations, examine market developments, and make trading decisions based on the overall findings. As the quantity of data increases, these prediction models can enhance their overall performance through the years. That is what makes them a smart bet for stock marketplace traders seeking to take emotion out of the equation. Over the time, approaches have been enhanced, which uses sophisticated and efficient algorithms to parse the content of news feed and calculating their impact on particular company's stock price. As for a long term trading decision, news about the particular security can significantly impact its price over the time. Machine learning algorithms can be used to analyze sentiments from that information and calculate its impact on a security.

It has likewise been persuasive in instructing personal computers to drive autos and in addition, interpreting languages, and now, investors are depending on this technology to make better trading

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