A Relative Education of Arithmetic Means And Engine Learning Methods For Routine Price Prophecy

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Abstract— The stock market contains numerous challenges to investors, ranging from volatility and excessive workload of information to behavioral factors and market manipulation. accurate than machine learning approaches. approaches can help the system connect the features.

Keywords—stock market prediction, comparative study of conventional methods and machine learning methods, machine learning, graph, neural networks, deep learning, semantics, traditional machine learning, moving averages, ARIMA, statistical methods, stock market analysis.

INTRODUCTION

Accurately forecasting stock prices is a popular goal among investors, traders, and financial institutions.

These strategies are based on the notion that stock prices follow a random walk pattern and are impacted by previous prices and other economic factors. While these methodologies have had some success, they have limitations, particularly when it comes to predicting complicated and changing market situations.

In past years, there has been a surge of interest in the use of machine learning techniques to stock market forecasting. Machine learning algorithms are designed to learn from data and predict patterns and relationships in that data.

Machine learning techniques for stock market prediction have exhibited significant promise in terms of boosting prediction accuracy and efficacy. Machine learning algorithms can adapt to shifting market conditions and generate real-time predictions. They can also detect complicated patterns and correlations in data that traditional approaches may miss. Machine learning approaches have been used to anticipate stock prices, predict stock trends, and uncover market abnormalities.

We will compare and contrast the performance of traditional methods and machine learning approaches on stock market prediction in this review paper.

Moving averages, autoregressive integrated moving averages (ARIMA), and exponential smoothing are examples of traditional stock market prediction methods. ARIMA models estimate future prices using historical data and are particularly useful for identifying trends in the data. Exponential smoothing is a time-series forecasting technique that forecasts future values using a weighted moving average.

ANNs are artificial neural networks (ANNs) that are inspired by the structure and function of the human brain. They are especially useful for capturing complex data relationships. Decision trees are tree-like structures used to represent decisions and their potential outcomes. SVMs are supervised learning algorithms that are generally used for classification and regression analysis. Random forests are an ensemble learning algorithm that combines multiple decision trees to improve prediction accuracy.

LITERATURE REVIEW

10367, 8747, and 8709 points for trading rules 1, 2, and 3 respectively.

The proposed model had an accuracy of 79.7 percent on the IBM stock, 80.4 percent on the GOOGL stock, and 80.5 percent on the AAPL stock.

ARIMA: ARIMA model depends on autocorrelation mode to a large extent. In The AR term refers to the regression of a specific variable against itself in order to forecast the variable of interest.

Machine Learning Approaches

Furthermore, reducing the number of technical indicators lowers the accuracy of each algorithm in predicting stock market trends.

As previously demonstrated, machine learning is a very powerful tool with numerous applications. So far, we've seen that machine learning is heavily reliant on data. This paper [7] provides a clear understanding of how to implement machine learning.

Authors of [8] concluded that different algorithms are appropriate for different types of data provided. For linear data, the most relevant components are identified using the Linear Regression model and PCA (Principal Component Analysis). For binary data, Random Forest and Multilayer Perceptron (MLP) have been found to be the most appropriate methods.

DEEP LEARNING AND NEURAL NETWORKS: Deep learning models, which have shown superior to prior machine learning methods as far as predictive accuracy and speed are concerned, are being used with the growing data and wish for forecasts. In research [9], a common deeper study model for stock market prediction, the Long-Short Memory (LSTM) recurring neural network has been utilized. In this task, Python modules are used to automatically download historical market data to forecast future stock prices by fitting an LSTM model to data.

In paper [10], The authors created three stock price prediction models using various input features with distinct characteristics. They hypothesized that using implicit meaning data for effective stock price prediction via artificial neural networks would be beneficial. They investigate which features would be useful for stock price prediction.

The experimental results show that sequential minimal optimization is the best algorithm for predicting the closing price of a stock among the three algorithms tested.

For prediction, LSTM (Long Short-Term Memory) is used. It uses the most recent trading data and analysis indicators as input.

The success of recurrent neural networks (RNNs) in sequential data processing inspired the authors of paper [14]. As a result, they introduced an ensemble RNN approach (long short-term memory, gated recurrent unit, and Simple RNN) to forecast stock market movements. They applied sentiment analysis and the sliding window method to extract only the most representative features rather than extracting tens of thousands of features using traditional natural language processing methods. Their experimental results validate the efficacy of these two methods for feature extraction and demonstrate that the proposed ensemble approach outperforms other models in comparison

TIME SERIES ANALYSIS: In paper [15], The authors represented stock prices as time series and used normalized data in conjunction with a recurrent neural network model. The predicted values were found to be very close to the actual values.

Authors of [16] noticed the influence of the daily sentiment scores of various social media platforms such as twitter can influence the investors to buy/sell the stocks of company which can ultimately affect the stock value. In this paper, Authors have employed sentimental analysis as one of the indicators and gathered data from various platforms like Yahoo Finance, considering tweets (positive, negative or neutral) as features for prediction. They used opening and closing prices of stock for respective companies.

In order to extrapolate predictions, the data must be preprocessed. In paper [17], The authors attempted to predict the historical prices of TCS- Tata Consultancy Services and measured their accuracy for different epochs and batch sizes while avoiding the effects of data pre-processing. The model is then applied to the tweets associated with it. This work aimed to provide a comprehensive view of various data changes and the fidelity obtained.

GRAPH BASED APPROACHES: There has recently been a surge in interest in using graph-structured data in computer science research communities. Paper [18] proposed a hierarchical attention network for stock prediction (HATS) that predicts the stock market using relational data. Our HATS method selectively aggregates information on various relation types and adds it to the representations of each company. The experimental results show that performance can vary depending on the relational data used. HATS, which can automatically select information, outperformed all existing methods.

In paper [19], To simulate stock momentum spill over in the real market, authors developed a novel bi-typed and hybrid market knowledge graph. Then, to learn the stock momentum spill over features on the newly constructed MKG, they proposed a novel Dual Attention Networks equipped with both inter-class attention module and intraclass attention module. To test their method, they created two new datasets, CSI100E and CSI300E. The empirical experiments on the constructed datasets demonstrated that their method can successfully improve stock prediction with bi-typed and hybrid relational MKG via the proposed DANSMP.

EVALUATION OF BOTH METHODS

The various methods used to predict share market prices are broadly classified into two categories:

Conventional Methods

Moving Averages – This method forecasts future prices by taking the average of a stock's closing prices over a given time period. This method is simple and straightforward, but it may not produce accurate results.

ARIMA – The Auto Regressive Integrated Moving Average (ARIMA) method forecasts the next value in a series based on the previous values. It requires stationary data, and selecting parameters can be difficult.

Both of the conventional methods' performance is summarized in the table below. It represents the variance in performance of same algorithm on changing datasets and complexity of algorithm:

Machine Learning Methods

Traditional Machine Learning Methods: There are traditional approaches such as linear regression analysis and logistic regression analysis.

Deep Learning and Neural Networks: Deep learning methods are a subset of machine learning techniques that leverage artificial neural networks with multiple layers to learn hierarchical representations of data. These methods have achieved remarkable success in various domains, including computer vision, natural language processing, and speech recognition. Many of these techniques make use of RNNs and LSTMs, which are subsets of RNNs.

Time Series Analysis Methods: This strategy employs forecasts and projections of discrete time data. Time series analysis is a statistical technique used to analyze and make predictions based on data collected at regular intervals over time. It is widely used in various fields, including finance, economics, weather forecasting, and stock market analysis.

Graph-Based Approaches: The stock market is frequently compared to a network of interconnected nodes where a change in one component affects the pricing of other components.

The following table demonstrates the performance of machine learning modern methods used in the references using various models:

ANALYSIS OF MAJOR CONTRIBUTIONS

After the evaluation of both conventional methods and machine learning methods, it has been identified that no single algorithm can be referred as best algorithm. Each of the algorithms have their advantages and disadvantages. The pros and cons of the all the stock market prediction techniques are described in table formats category wise.

Conventional Methods

The conventional methods include moving averages and ARIMA, which are broadly used for prediction purpose by statisticians and stock market predictors. It has been observed that the conventional methods work better for short-term forecasting than long-term predictions. Stock market depends on basic variables and many extra factors like sentiments and economic conditions, whereas Conventional methods assume that there is a linear relationship between variables. This is one of the reasons which limits the performance of conventional statistics-based methods.

Category	Merits	De-Merits
Moving Averages	Moving averages provide a clearer picture of the overall trend and can help filter out short-term market volatility by averaging out data over a specified time window.	Unusual market events, extreme price movements, or data irregularities can all distort the moving average calculation and reduce prediction accuracy.

MERITS AND DEMERITS OF CONVENTIONAL METHODS

Machine Learning Methods

The machine learning approaches for stock market prediction can be broadly categorised as Traditional machine learning algorithms, deep learning & neural networks, time series analysis methods and graph-based approaches.

Traditional machine learning algorithms, such as linear regression, decision trees, or support vector machines, provide clear rules or coefficients, making it easier to decipher the factors driving stock market predictions.

The stock market generates a massive amount of data, which includes historical price data, trade volumes, news mood, and macroeconomic factors. Deep learning models can process and learn from this massive amount of data, perhaps leading to increased forecast accuracy.

Time series analysis methods are created primarily for capturing and analysing temporal patterns and dependencies in data. These methods, in the context of stock market prediction, can discover trends, seasonality, and other recurring patterns in historical stock price data. Time series research provides insights into probable future price changes by capturing these trends.

Graph-based approaches use network analysis tools to glean significant insights from market structure. Degree centrality, betweenness centrality, and eigenvector centrality are all centrality measures that can be used to identify influential stocks, sectors, or market indices. By focusing on key entities and their relationships within the market network, these measurements can help to construct more accurate prediction models.

MERITS AND DEMERITS OF MACHINE LEARNING METHODS

Traditional machine learning algorithms

Merits : Allow the use of interpretable features like technical indicators, fundamental financial ratios, and economic indicators. They frequently treat each data point separately, failing to recognize the sequential dependencies and temporal dynamics inherent in stock market data. This can make it difficult for them to

detect trends, seasonality, or longterm patterns. In the area of stock market prediction, where obtaining huge volumes of labelled data might be difficult, these algorithms can produce useful forecasts with smaller sample sizes. These algorithms are susceptible to extreme values and can be influenced by market anomalies or data errors, potentially affecting the model's performance and reliability.

CONCLUSION AND FUTURE SCOPE

It is worth noting that predicting stock prices is challenging due to the market's inherent randomness and the numerous external factors that influence it. While no single method can guarantee accurate forecasting, combining multiple techniques or employing ensemble methods to improve forecasting performance is frequently advantageous. Whereas, during the study of various algorithms for stock market prediction, it has been found that moving averages work well with small datasets of historical data for descriptive analysis. And, among those of the machine learning algorithms, Artificial Neural Networks have shown the highest average accuracy in many research papers. With respect to the comparison of conventional methods and machine learning approaches, research works cited in this review paper have shown that the conventional statistical methods are not able to consider semantic factors which makes them less accurate as compared to machine learning approaches. Machine learning approaches have been studied as four different categories in this review paper. Among these categories, deep learning and neural networks are found as most appropriate choice for making automated models for continuous predicting stock market systems. Whereas, Random Forest, a traditional machine learning approach, can be the optimum choice for small datasets using binary mixed inputs. Graph based methods used along with these approaches can facilitate the system in connecting the features.

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