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INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
(Int Peer Reviewed Journal)
Vol. 04, Issue 09, September 2024, pp : 823-825

e-ISSN : 2583-1062

Impact Factor : 7.001

A SURVEY ON STOCK PRICE PREDICTION USING MACHINE LEARNING

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DOI: https://www.doi.org/10.58257/IJPREMS35981

ABSTRACT

With the increasing use of machine learning techniques for stock price detection has gained significant attention in recent years. This survey aims to provide an overview of the various methodologies and approaches employed in this domain. The study analyzes the application of machine learning algorithms for stock price prediction, focusing on their performance, accuracy, and effectiveness. Different types of features used in modeling, such as technical indicators, sentiment analysis, and financial news, are also explored. Furthermore, this survey presents an evaluation of the challenges and limitations encountered in stock price detection using machine learning, including data availability, model over fitting, and market volatility. By examining the existing literature and research advancements, this survey contributes to a comprehensive understanding of the current state of stock price detection using machine learning and identifies potential areas for future research and improvement.

Keywords— Deep learning, Stock Price Prediction, LSTM, RNN, Neural Network

1. INTRODUCTION

Stock price prediction is a crucial and challenging task in the financial domain, with significant implications for investors, traders, and financial institutions. The ability to forecast future stock prices accurately can potentially yield substantial profits and mitigate risks. In recent years, there has been a surge in interest and research efforts focused on leveraging machine learning techniques to enhance stock price prediction models. This survey aims to provide an in-depth exploration of the various methodologies and approaches used in stock price prediction using machine learning. The study seeks to shed light on the current state of the field by examining the performance, accuracy, and effectiveness of different machine learning algorithms employed for this task.

The predictive power of machine learning algorithms lies in their ability to uncover complex patterns and relationships within historical stock market data. Various types of features, such as historical price trends, trading volumes, technical indicators, sentiment analysis from social media, and financial news, are utilized to capture relevant information for modeling. By analyzing the existing literature and research advancements, this survey aims to identify the strengths and limitations of different machine learning techniques for stock price prediction. Challenges such as data availability, model over fitting, market volatility, and interpretability are also discussed, providing insights into the practical implementation of these models. Moreover, this survey endeavors to highlight the potential applications and benefits of accurate stock price prediction, including portfolio management, algorithmic trading, risk assessment, and investment decision-making. Overall, this survey serves as a comprehensive resource for researchers, practitioners, and enthusiasts interested in understanding the current landscape of stock price prediction using machine learning. It provides valuable insights into the state-of-the-art techniques, identifies areas for improvement, and paves the way for future advancements in this exciting and rapidly evolving field. In conclusion, this survey paper serves as a comprehensive guide to the current landscape of news classification using ml and NLP techniques. By synthesizing the existing knowledge and highlighting research gaps, it aims to inspire further advancements in this field, enabling more efficient and accurate organization and retrieval of news articles in the digital era.

A. Stock Price Prediction Using Deep Learning

Stock price prediction using deep learning has emerged as a promising approach due to the ability of deep neural networks to learn complex patterns from large volumes of data. This technique involves training deep learning models, such as recurrent neural networks (RNNs) or long short-term memory (LSTM) networks, on historical stock market data to predict future price movements. By capturing temporal dependencies and nonlinear relationships, deep learning models have shown potential in improving the accuracy of stock price prediction. However, challenges such as data

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preprocessing, model over-fitting, and market volatility need to be addressed for effective implementation of deep learning in stock price prediction.

B. Stock Price Prediction Using RNN

RNNs are widely used for stock price prediction due to their capability to capture sequential dependencies. By retaining information from previous time steps, RNNs can model patterns in stock market data, such as historical prices and trading volumes. Techniques like LSTM and GRU address the vanishing gradient problem and improve the network's ability to capture long-term dependencies. Challenges include data preprocessing, selecting the right architecture and hyperparameters, handling market volatility, and preventing overfitting. Despite these challenges, RNNs offer promising results in stock price prediction and remain a prominent area of research in the dynamic realm of stock markets.

2. BACKGROUND AND RELATED WORK

Many researchers, authors have published many research papers of their results in the stock price prediction field. Here we are explaining some of the famous work that has been carried out in the recent past.

In [18] authors presented an approach combining two distinct fields for analysis of stock exchange. The system combines price prediction based on historical and real-time data along with news analysis. In this work LSTM (Long Short-Term Memory) is used for predicting. It takes the latest trading information and analysis indicators as its input. For news analysis, only the relevant and live news is collected from a large set of business. The filtered news is analyzed to predict sentiment around companies. The results of this both analyses are integrated together to get a response which gives a recommendation for future increases.

In [19] authors give a hybrid modeling technique for stock price prediction based on numerous machine learning and deep learning models. The results clearly suggest that the LSTM-based univariate model, which uses one-week historical data as input to estimate the closing value of the Reliance Industries Limited time series the next week, is the most accurate.

As per [1], the stock price forecasting problem has traditionally been approached from two camps: Statistical Techniques and ML Techniques. Statistical techniques operate from the assumption that the underlying relationship between the stock prices and their drivers is linear. However, financial time-series (such as stock price data) are non-linear and noisy, therefore making ML methods, which can handle such data characteristics, the better forecaster of the two approaches [1]. Fueled by advancements in computing power over recent years, the use of computing in making trading decisions has increased commensurately [1]. Although ML techniques have been "widely accepted to studying and evaluating stock market behavior", there is not an identified set of indicators and methodology that can be used to consistently forecast stock prices effectively.

Souza et al. [9] investigated the profitability of TA as applied to the stock markets. Authors searched for evidence that fundamental analysis and technical analysis complement each other. An automated trading system is developed to simulate transactions in this portfolio using technical analysis techniques. The average showed that the system exceeded the value invested. The sample portfolio from Russia and India showed very strong returns. The work utilized two types of moving average: SMA, EMA over a varying number of days.

Authors [10] proposed the deep LSTM Neural Network (NN) with embedded layer and the LSTM-NN network with automatic encoder to forecast the stock as traditional NN algorithms may incorrectly predict the stock market. The accuracy achieved with LSTM –NN with embedded layer is better. The maximum accuracy achieved is 57.2%. Xiong et al. [13] used economic variables and LSTM to predict the volatility of the S&P index with the Google trend. Yu [13] applied the deep NN and LSTM to forecast the trading data of the Amazon stock. The highest prediction accuracy achieved is 54%. It is mentioned that the effect of the deep NN was better than LSTM.

Authors [16] utilized RNN to forecast the prices of the three stocks. When using economic variables as input and the historical data, he found that the forecast price fitted the actual price better.

3. FINDINGS OF THE SURVEY

This survey on stock price prediction using machine learning reveals several key findings.

First, various machine learning algorithms, including support vector machines (SVM), random forests, and deep learning models, have been applied to stock price prediction tasks. Deep learning models, particularly recurrent neural networks (RNNs) and long short-term memory (LSTM) networks have shown promising performance in capturing temporal dependencies and improving prediction accuracy. Second, the use of additional features such as technical indicators, sentiment analysis, and financial news can enhance stock price prediction models by incorporating valuable information from multiple sources. Third, challenges such as data availability, model over fitting, and market volatility pose

significant obstacles to accurate stock price prediction using machine learning techniques. Overall, this survey highlights the potential of machine learning in stock price prediction, identifies successful methodologies, and emphasizes the need for further research to address the challenges and limitations in this domain.

4. CONCLUSION

This survey provides valuable insights into the state of stock price prediction using machine learning techniques. It highlights the effectiveness of various algorithms, with deep learning models such as RNNs and LSTMs showing promise in capturing temporal dependencies and improving prediction accuracy. The inclusion of additional features, such as technical indicators and sentiment analysis, has been found to enhance the predictive power of these models. However, challenges such as data availability, model over fitting, and market volatility remain significant hurdles. Addressing these challenges requires further research and innovation to ensure robust and reliable stock price prediction.

Despite these challenges, machine learning offers great potential in the field of stock price prediction, opening doors to improved portfolio management, risk assessment, and investment decision-making. By continuing to explore and refine these methodologies, researchers and practitioners can make significant strides towards more accurate and reliable stock price prediction models in the future

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