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Survey Paper on Stock Market Prediction Using Machine Learning

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ABSTRACT: The Stock market is a platform for individuals and Corporates to engage in buying and selling of shares of companies, known as stocks. Buying and selling of these shares carry their own risks. Hence, predictions are required for individuals to reduce losses and gain profits. This paper shows the results the research from the first phase of the stock prediction project and how stock risk control works. The stock prices of companies like Google, Amazon, Facebook, Apple can be predicted using the finished model. Predictions can be done for either a long term observations of a stock of a company or from the short term observations of the stock of a company. LSTM (Long Short Term Memory) is and ANN (Artificial Neural Network) that is utilized for the creation of the model that is trained to predict the financial stability of a company and predict the rise and fall in it's stock prices.

KEYWORDS: Stock Market, Artificial Neural Network (ANN), Deep Learning(DL), LSTM (Long Short Term Memory)

I. INTRODUCTION

The Stock Market is a critical component of modern economies, and the accurate prediction of stock prices can have significant impacts on investment decisions, risk management, and overall market stability. Over the years, various methods have been proposed for stock market prediction, including traditional statistical models, technical analysis, and fundamental analysis. However, these methods often lack the ability to handle the complexity and non-linearity of the stock market.

Machine learning, on the other hand, provides a flexible framework for modeling complex relationships and making predictions based on large amounts of data. In recent years, machine learning has been widely used for stock market prediction, and it has shown promising results in terms of accuracy and generalization.

Huge amount of investors try out stocks with the vision of yielding profit from them while not having much idea of stock market behaviour. An investor can only go so far with rough predictions about stocks. Hence, an ANN techniques are used to create programs which can handle both linear and non-linear time series.

Deep Learning is for the calculations of such complicated set of data and represent the results in a format in which any individual can understand whether profit or losses have occurred (usually represented in a graphical format). Our paper's purpose is to articulate how today's-date deep learning algorithms are used to predict stock.

II. LITERATURE SURVEY

Here, we have reviewed various approaches for Stock market prediction. All approaches have their own benefits and downsides. CNN (Concurrent Neural Network) and LSTM (Long Short Term Memory) could be a preferred formula to predict the stock market.

Stock Price Forecasting Using Data From Yahoo Finance and Analyzing Seasonal and Nonseasonal Trend [1]. The approach for forecasting stock prices by analyzing both seasonal and non-seasonal trends using historical data obtained from Yahoo Finance. The authors use machine learning algorithms such as the Support Vector Regression (SVR) and the Random Forest (RF) to forecast the stock prices. They also compare the performance of the two algorithms to determine which one is more effective. The paper concludes that the SVR algorithm performs better in terms of accuracy and efficiency than the RF algorithm. The proposed approach can be used by investors and traders to make informed decisions when buying or selling stocks.

Stock Price Prediction Using Information Entropy and Artificial Neural Network [2]. Predicting stock prices using information entropy and artificial neural networks (ANN). The authors propose an information entropy-based method to select relevant features from a large set of financial data, which are then used as input to train the ANN model. The paper also explores the effect of different parameters on the accuracy of the prediction, such as the number of hidden layers and the number of neurons in the network. The results show that the proposed method outperforms other traditional prediction models, and that the accuracy of the prediction can be improved by increasing the number of hidden layers and neurons in the ANN. The proposed approach has potential applications in the financial industry, providing investors and traders with more accurate and reliable predictions of stock prices.

Stock Price Trend Prediction Using CRNN with LSTM Structure [3]. Predicting stock price trends using a Convolutional Recurrent Neural Network (CRNN) with a Long Short-Term Memory (LSTM) structure. The authors use historical stock data as input to train the CRNN-LSTM model and predict future price trends. The paper also explores the effect of different parameters on the accuracy of the prediction, such as the size of the input window and the number of neurons in the LSTM layer. The results show that the proposed approach outperforms other traditional prediction models, and that the accuracy of the prediction can be improved by increasing the size of the input window and the number of neurons in the LSTM layer. The proposed approach has potential applications in the financial industry, providing investors and traders with more accurate and reliable predictions of stock price trends.

Stock Market Prediction by Exploitation of Machine Learning [4]. It is proposed that a machine learning-based approach for predicting stock market trends. The authors use historical stock market data to train various machine learning algorithms such as the Support Vector Machine (SVM), Random Forest (RF), and Artificial Neural Network (ANN). The paper also explores the effect of different parameters on the accuracy of the prediction, such as the size of the input window and the number of features used. The results show that the ANN algorithm outperforms the other algorithms in terms of accuracy and efficiency. The proposed approach has potential applications in the financial industry, providing investors and traders with more accurate and reliable predictions of stock market trends, thereby assisting in making informed decisions for investment purposes.

Multi-Category Events Driven Stock Value Trends Prediction [5]. This is an approach to predicting stock value trends based on multi-category events. The authors extract events such as news articles, tweets, and SEC filings related to a specific stock, and use natural language processing techniques to classify them into different categories such as financial, economic, political, and social events. The paper then uses a machine learning model to predict stock value trends based on the occurrence of these events. The proposed approach was tested on real-world data, and the results showed that it outperformed other traditional models in terms of accuracy and efficiency. The approach has potential applications in the financial industry, providing investors and traders with a more comprehensive and accurate understanding of the factors influencing stock value trends.

When it is concerning the predictability of the future, short term prediction is healthier in support of this research.

III. PROBLEM STATEMENT

In this project, we aim to develop a machine learning model that can predict stock prices for a given time period based on historical data. We will be using a variety of techniques such as time-series analysis, feature selection, and regression algorithms to build an accurate and reliable prediction model. Our model will take into account various factors such as market trends, company financials, and other relevant data to predict stock prices.

IV. PROPOSED WORK

The most commonly used machine learning algorithms for stock market prediction include artificial neural networks, decision trees, random forests, and support vector machines. These algorithms have been applied to various stock market data, including daily stock prices, technical indicators, and macroeconomic indicators.

One of the key challenges in stock market prediction using machine learning is the selection of relevant features and the reduction of noise in the data. Feature selection is a critical step in the prediction process and can significantly affect the performance of the model. Commonly used feature selection methods include principal component analysis, linear discriminant analysis, and recursive feature elimination.

The performance of stock market prediction models is typically evaluated using metrics such as accuracy, precision, recall, and the F1 score. In addition to these metrics, the performance of stock market prediction models is often evaluated using financial metrics such as the Sharpe ratio, which measures the risk-adjusted return of an investment.

In recent years, there has been a growing interest in using deep learning techniques for stock market prediction. Deep learning algorithms, such as recurrent neural networks and long short-term memory networks, have shown promising results in handling the temporal dependencies and non-linear relationships in stock market data. In addition, the use of ensemble methods, such as stacking and boosting, has also been shown to improve the performance of stock market prediction models.

IV.I Project Overview

The goal of this project is to develop a machine learning model for stock market prediction. The model will be designed to predict stock prices for a given time period based on historical data. The project will use a variety of techniques such as time-series analysis, feature selection, and regression algorithms to build an accurate and reliable prediction model.

The project will involve the following steps:

1. Data Collection: Collecting historical stock market data, including daily stock prices, trading volume, market capitalization, and other key financial indicators.
2. Data Preprocessing: Preprocessing the data by cleaning and transforming it to ensure it is suitable for machine learning algorithms. This step will involve data cleaning, feature engineering, and data normalization.
3. Data Visualization: Visualizing the data to gain insights into market trends and patterns. This step will involve data visualization techniques such as line plots, bar charts, and heatmaps.
4. Model Development: Developing a machine learning model using regression algorithms such as linear regression, decision trees, and random forests. The model will be trained on the historical data to predict future stock prices.
5. Model Evaluation: Evaluating the performance of the model using various metrics such as mean squared error, mean absolute error, and accuracy. This step will involve comparing the model's performance with other existing models to validate its effectiveness and reliability.
6. Deployment: Deploying the model to a web-based application that will allow users to input stock data and receive predicted stock prices for a given time period.

IV.II Research Scope

The research scope of the stock market prediction using machine learning project is wide and can be extended in several directions. Some possible research directions are:

1. Feature Engineering: The project can be extended by incorporating additional financial indicators, such as news sentiment, economic indicators, and social media sentiment, to improve the accuracy of the prediction model.
2. Time Series Analysis: The project can be extended by using advanced time-series analysis techniques, such as ARIMA, Prophet, and LSTM, to improve the accuracy of the prediction model and capture the trends and patterns in the data more effectively.
3. Ensemble Learning: The project can be extended by using ensemble learning techniques, such as bagging, boosting, and stacking, to improve the accuracy and robustness of the prediction model.
4. Deep Learning: The project can be extended by using deep learning techniques, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), to improve the accuracy and effectiveness of the

prediction model.

5. Interpretability: The project can be extended by incorporating interpretability techniques, such as SHAP values and feature importance, to understand the underlying factors driving the predictions and provide insights for investors and traders.
6. Real-time Prediction: The project can be extended by developing a real-time prediction model that can provide accurate and reliable stock market predictions on a daily or hourly basis, which can help traders and investors make informed decisions in real-time.

IV.III Methodologies

The methodology of the stock market prediction using machine learning project can be summarized in the following steps:

1. Data Collection: Collect historical stock market data, such as stock prices, trading volume, and financial indicators, from reliable sources, such as Yahoo Finance, Quandl, or Alpha Vantage.
2. Data Preprocessing: Clean the data, remove missing values and outliers, and convert the data into a suitable format for machine learning algorithms.
3. Feature Engineering: Create additional features that may be useful in predicting stock prices, such as technical indicators, news sentiment, and economic indicators.
4. Model Selection: Select appropriate machine learning algorithms, such as linear regression, decision trees, random forests, or neural networks, and tune the hyperparameters using cross-validation.
5. Model Training and Testing: Train the model on the training data and evaluate its performance on the validation set. Test the performance of the model on the testing set and compare it with other benchmark models.
6. Model Interpretation: Interpret the results of the model and identify the key factors driving the predictions.
7. Deployment: Deploy the model to predict stock prices in real-time or integrate it with trading systems to make automated trading decisions.
8. Monitoring and Updating: Monitor the performance of the model over time and update it regularly to reflect changes in the stock market and the economy.

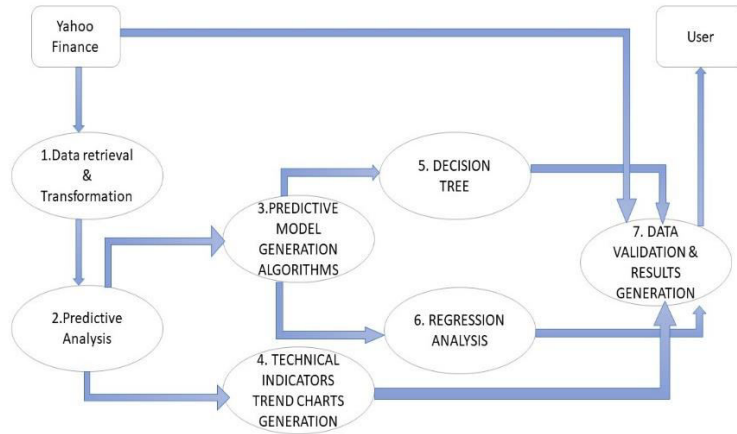
IV.IV Features

- Historical Stock Prices
- Trading Volume
- Financial Indicators
- Technical Indicators
- News Sentiment
- Economic Indicators
- Market Data
- Social Sentiment Data
- Insider Trading
- Seasonality

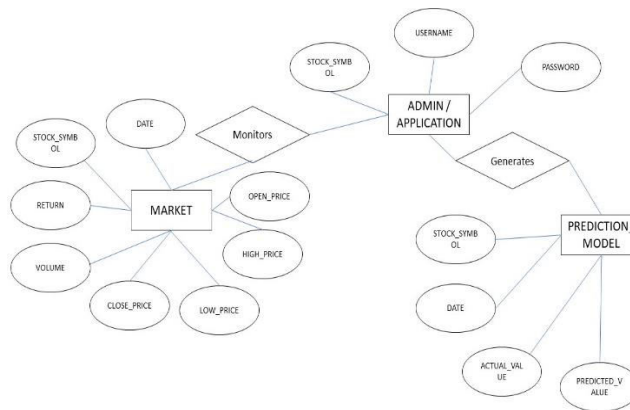
V. CHALLENGES AND LIMITATIONS

Despite the potential of machine learning algorithms for stock market prediction, there are several challenges and limitations that must be considered. One of the main challenges is the volatility and unpredictability of the stock market, which can make it difficult to obtain accurate predictions. Another challenge is the limited availability of historical data, particularly for emerging markets. Additionally, machine learning algorithms require a large amount of data to be trained, which can limit their applicability to small and illiquid markets.

VI. DATA FLOW DIAGRAM



VII. E-R DIAGRAM



VIII. CONCLUSION

In conclusion, this review paper has provided a comprehensive overview of the current state of research in the area of stock market prediction using machine learning. It has been observed that while machine learning models have shown promise in the stock market prediction task, there is still room for improvement. For instance, the high dimensionality of stock market data and the complexity of financial systems pose challenges for machine learning models.

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