Literature Survey: Time Series Forecasting Models for Stock Price Prediction

Introduction

Stock price prediction is challenging due to its inherent complexity and dynamic nature. Numerous machine learning and statistical models have been applied to forecast stock prices, providing insights into market trends and assisting investors in making informed decisions. In this literature survey, we explore various time series forecasting models and evaluate their performance in predicting Apple stock prices.

1. Autoregressive Integrated Moving Average (ARIMA) Model

The ARIMA model is a widely used statistical method for time series forecasting. It combines autoregressive (AR), differencing (I), and moving average (MA) components to capture the underlying patterns in time series data. ARIMA has been applied extensively in financial markets due to its simplicity and effectiveness in modelling stationary time series.

In our analysis, the ARIMA model demonstrated superior performance in predicting Apple stock prices compared to other models. By decomposing the time series into trend, seasonality, and residual components, ARIMA effectively captures the underlying patterns and fluctuations in stock prices. The mean squared error (MSE) metric revealed that the ARIMA model achieved the lowest prediction error among the models evaluated, indicating its accuracy in forecasting Apple stock prices.

2. Convolutional Neural Network (CNN) Model

Convolutional Neural Networks (CNNs) have gained popularity in time series forecasting tasks due to their ability to capture spatial dependencies within sequential data. In our study, we implemented a CNN model to predict Apple stock prices based on historical price data. By

leveraging convolutional layers to extract temporal features, the CNN model demonstrated competitive performance in capturing complex patterns in stock price movements.

However, despite CNN's capability to capture local patterns and dependencies, its performance in predicting Apple stock prices trailed slightly behind the ARIMA model. The mean squared error analysis revealed that the CNN model exhibited marginally higher prediction errors than the ARIMA model. While CNNs offer flexibility and scalability, they may require extensive hyperparameter tuning and feature engineering to achieve optimal performance.

3. Long Short-Term Memory (LSTM) Model

Long Short-Term Memory (LSTM) networks are a type of recurrent neural network (RNN) designed to model temporal and long-range dependencies in sequential data. LSTM models have been widely adopted in time series forecasting tasks, including stock price prediction.

In our evaluation, the LSTM model demonstrated promising results in predicting Apple stock prices. With its ability to retain long-term memory and capture temporal dependencies, the LSTM model effectively captured the underlying patterns and trends in stock price movements. However, the LSTM model's performance, as measured by the mean squared error, was slightly higher than the ARIMA model.

4. Support Vector Regression (SVR) Model

Support Vector Regression (SVR) is a machine learning algorithm that extends support vector machines (SVMs) to regression tasks. SVR has been applied to time series forecasting because it handles nonlinear relationships and high-dimensional data.

The SVR model exhibited competitive performance in predicting Apple stock prices in our analysis. The SVR model effectively captured nonlinear relationships in the data by incorporating a radial basis function (RBF) kernel and regularization parameters. However, the SVR model's prediction accuracy, as measured by the mean squared error, was higher than the ARIMA model.

Conclusion

In conclusion, our literature survey highlights the effectiveness of different time series forecasting models in predicting Apple stock prices. While each model offers unique advantages and

capabilities, the ARIMA model emerged as the top performer in accuracy, outperforming other models evaluated in this study. The ARIMA model's simplicity, interpretability, and accuracy make it valuable for stock price prediction tasks. However, future research may further explore hybrid approaches and ensemble techniques to improve prediction accuracy and robustness in stock price forecasting.