

# Comparison of stock price prediction using Facebook Prophet and ARIMA methods

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## Introduction

Automated forecasting of stock prices and trends is an active area of interest in machine learning. A variety of time-series statistical and machine learning based forecasting techniques have been developed over the years. In this work, we compare and evaluate the performance of a recently forecasting technique, Prophet, developed by Facebook for predicting stock trends and prices. For comparison, we applied the Prophet and a traditional auto-regressive integrated moving average (ARIMA) model to predict the patterns of five stocks: Apple, Tesla, Facebook, Netflix, and Google. The performance of the two methods was compared using the root-mean square error (RMSE) statistic. The results show that the Prophet method provides more accurate predictions (RMSE: 181.2) compared to the ARIMA method (RMSE: 52467.7). We have implemented a Python-based tool for stock prediction and forecasting using the Prophet and ARIMA methods.

## Methodology

Tools used: Python (pandas, yfinance – Yahoo Finance API, Facebook prophet, scikit-learn, and statsmodels)

Data used: The software uses the Yahoo Finance API to download the stock exchange data

Forecasting analysis: Python module prophet is used for forecasting analysis to predict the future stock prices. Prophet is an established method for forecasting time-series data for multiple applications. For comparison purposes, the auto-regressive integrated moving average (ARIMA) method implemented in Python module statsmodels is used

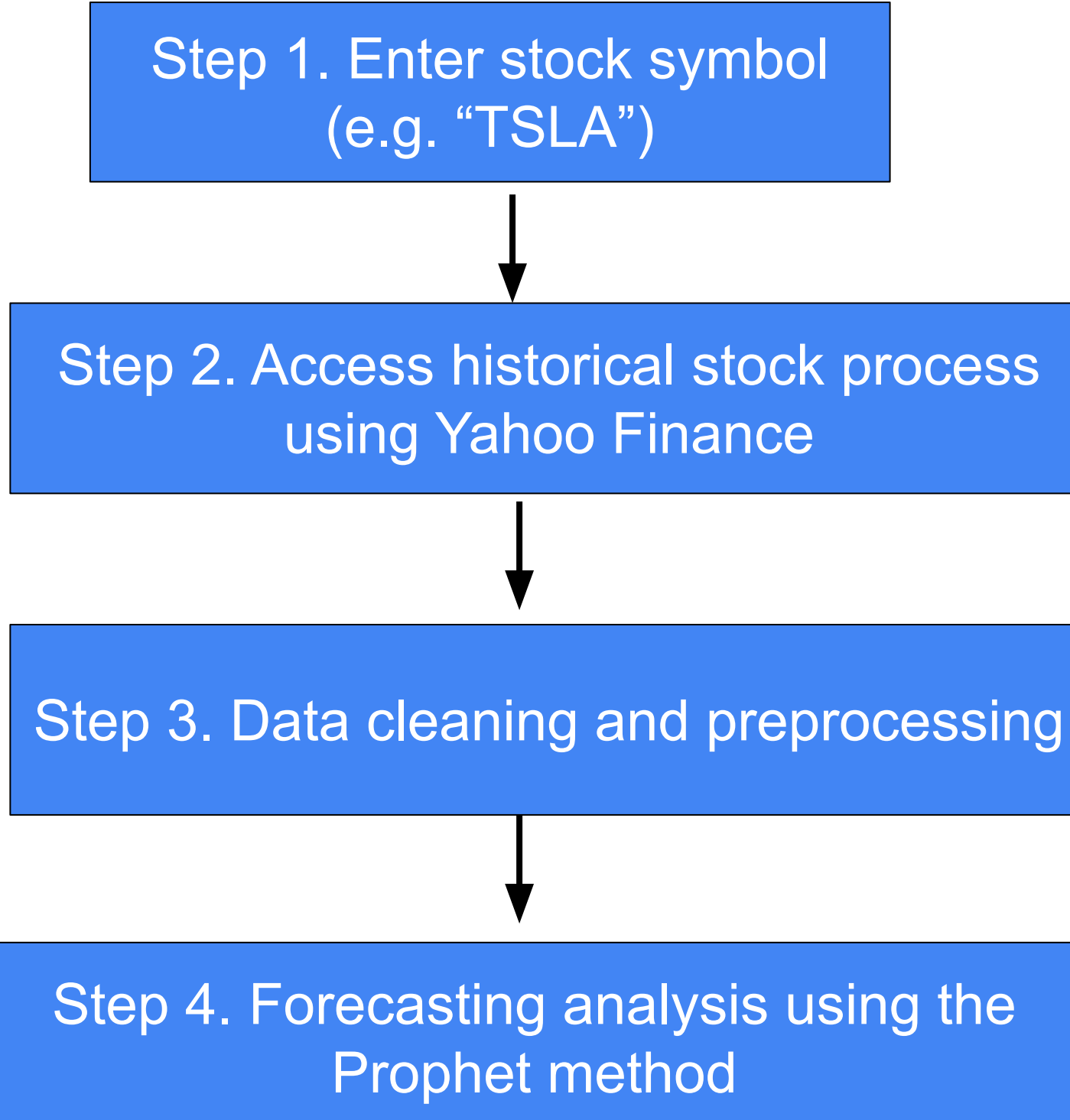
Performance evaluation: The Yahoo Finance data for the last 5 years was downloaded for five stocks (TESLA, Apple, Facebook, Google, and Netflix). The data was split into training and test sets. Error calculation between the actual and predicted prices in the test set was performed using the root mean square error implemented in the mean\_squared\_error\_function in the sklearn module

## Implementation

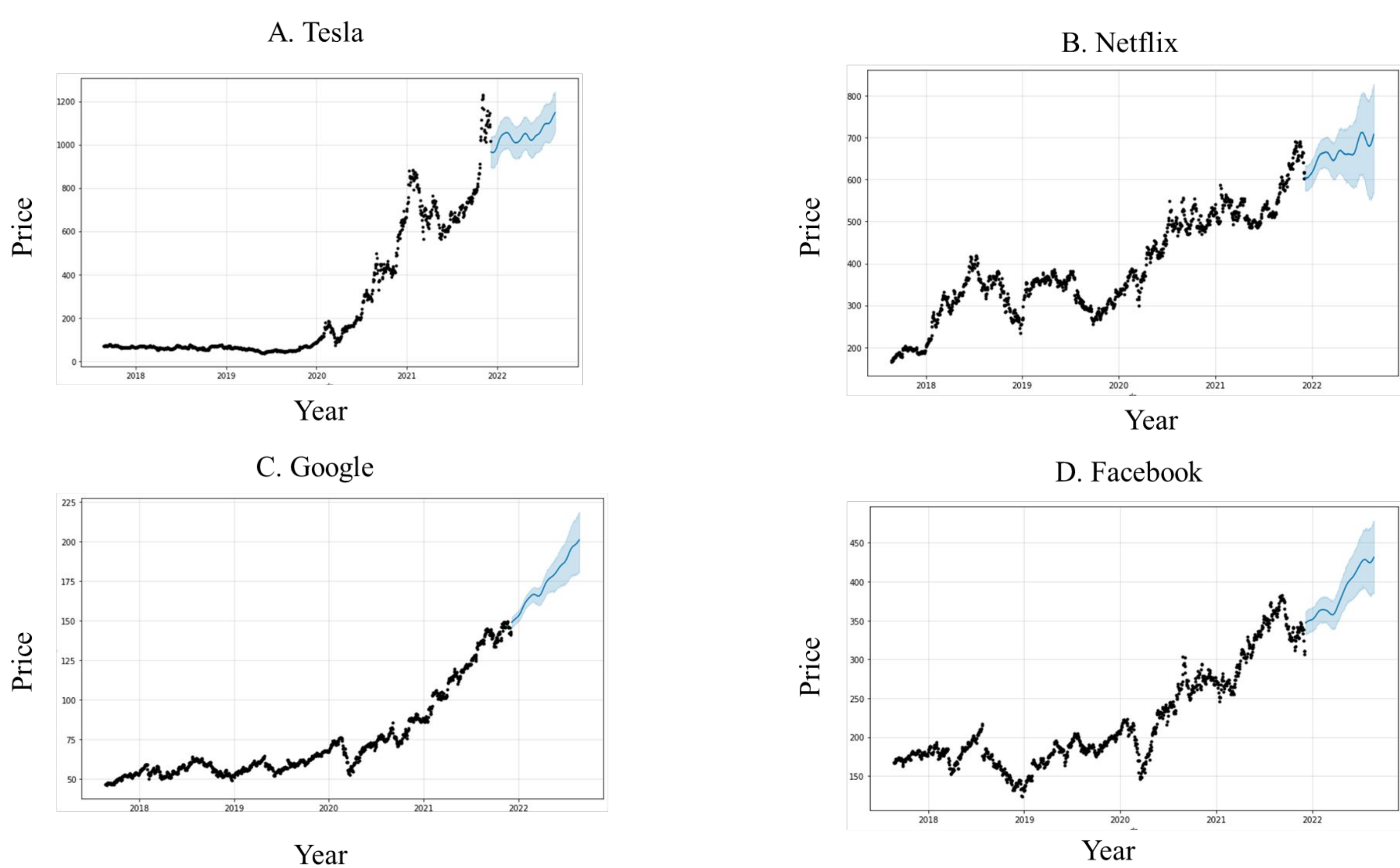
The software includes several stages:

- User provides the stock symbol of interest (e.g. TSLA for Tesla)
- The Yahoo Finance API is used to download the historical stock data for the last 5 years
- The Pandas module is used for data cleaning and other preprocessing steps
- The Prophet method is used for forecasting stock prices for the next 180 days using the historical stock prices
- In addition, the average stock price for the next 180 days is also reported

## Results

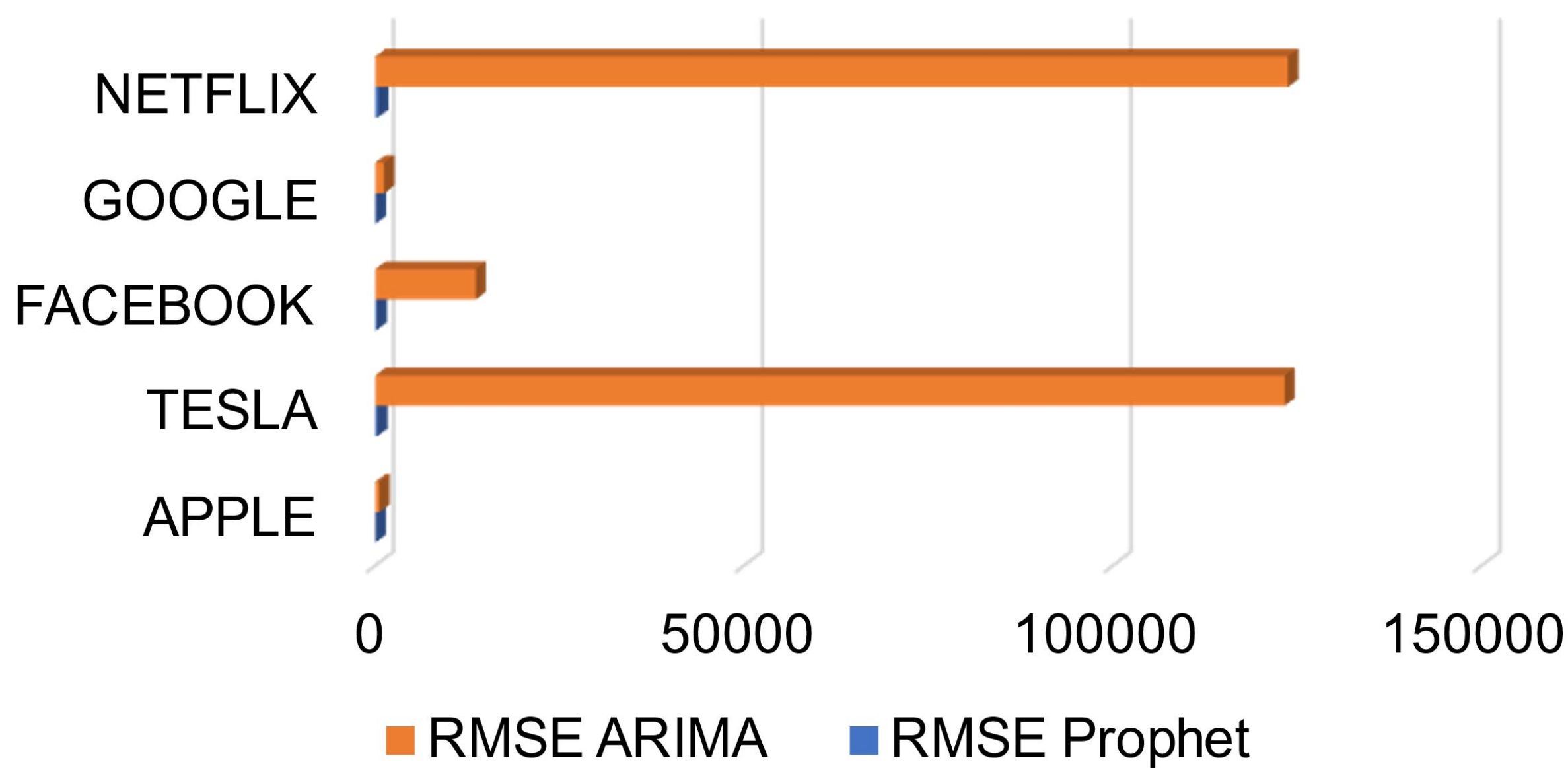


**Figure 1.** Overview of the different stages of the stock forecasting system implemented in Python



**Figure 2.** Sample output of the stock forecasting analysis which shows the predicted trend for the next 6 months

## Comparison between Prophet and ARIMA methods



**Figure 3.** Performance evaluation of Facebook Prophet and ARIMA methods based on the root mean square error calculation between the actual and predicted prices

## Conclusions

- We have implemented a prototype system for predicting stock prices and trends using the Facebook Prophet method and the historical stock data downloaded using Yahoo Finance
- The performance evaluation results show that the Prophet method provides better prediction accuracy compared to the ARIMA method
- The limitation of this methodology is that it is solely dependent on the historical stock data and discards and circumstantial, political, natural disasters, and other situations that impact the stock market
- Additional work and evaluation is required to improve the performance of the system and account for multi-dimensional factors that impact stock prices in addition to historical data

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