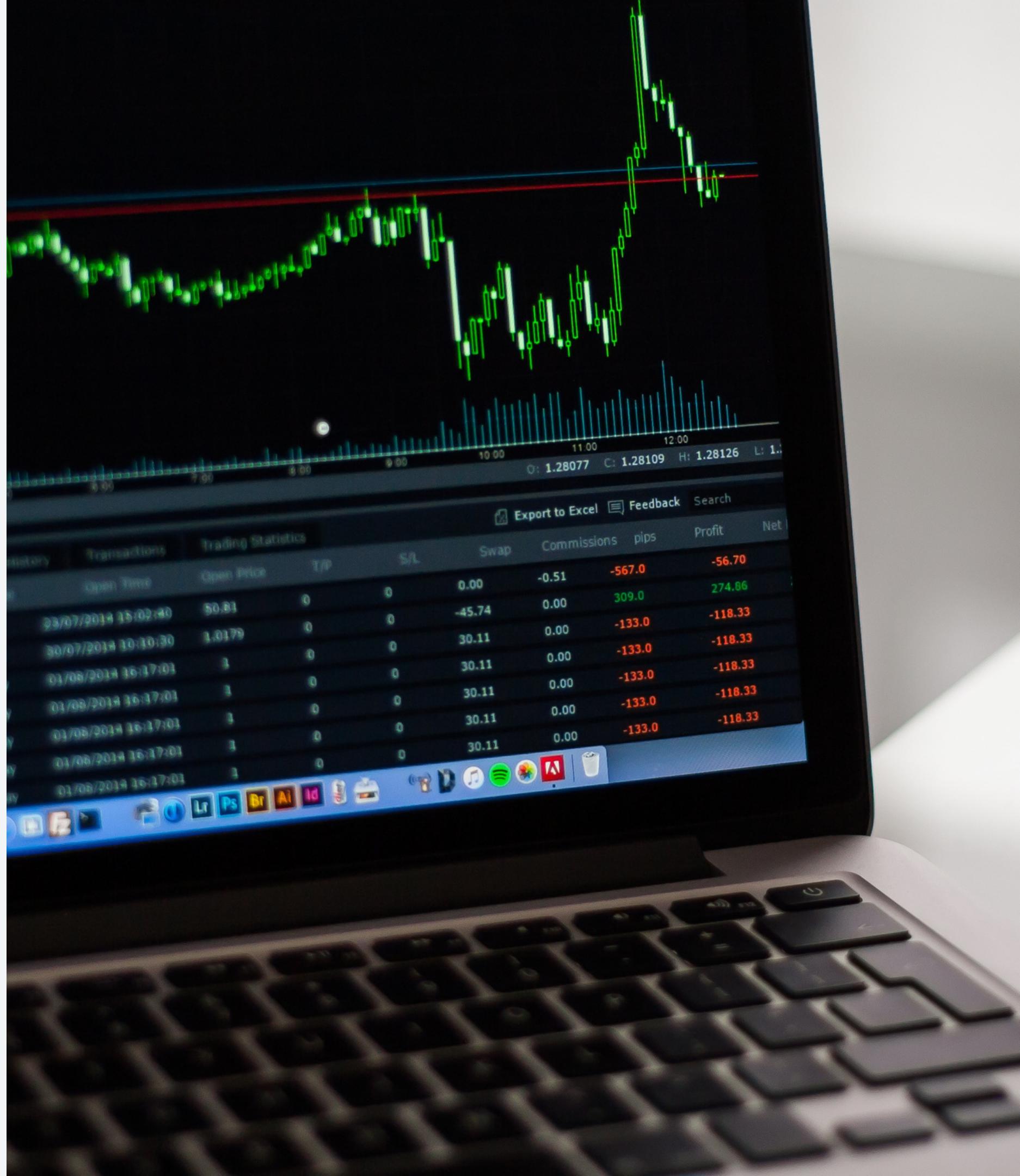


# MICROSOFT STOCK PRICE PREDICTION



# PROJECT OVERVIEW

- The project is aimed at analyzing and predicting Microsoft's stock prices.
- The aim of the project is to use predictive models (ARIMA, LSTM, and FB Prophet) to forecast Microsoft's stock prices, improve investment decision-making, optimize trading strategies, provide actionable insights, and enhance decision support tools.
- The data used in the project is acquired from Yahoo Finance, containing Microsoft stock market information from January 1, 2010, to 21, 2023. The dataset includes columns such as Date, Open, High, Low, Close, Volume, and Adj Close, providing insights into the stock's performance and trading activity.



# OBJECTIVES

## **Primary objectives**

- Forecast Microsoft's stock prices (01/01/2010 - 06/21/2023) using ARIMA, LSTM, and FB Prophet models.
- Achieve a model with Mean Absolute Error (MAE)  $< 10$  as the desired outcome.
- Compare predictive models against the baseline model (ARIMA) to demonstrate significant improvement.
- Evaluate performance metrics: MAE, Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE).

## **Secondary Objectives:**

- Optimize trading strategies by integrating predicted stock prices, focusing on the Moving Averages Bouncing strategy.
- Extract actionable insights from historical stock market data and effectively communicate them to stakeholders.
- Enhance decision support tools by developing user-friendly interfaces for easy access to predictions and insights.

# BUSINESS UNDERSTANDING

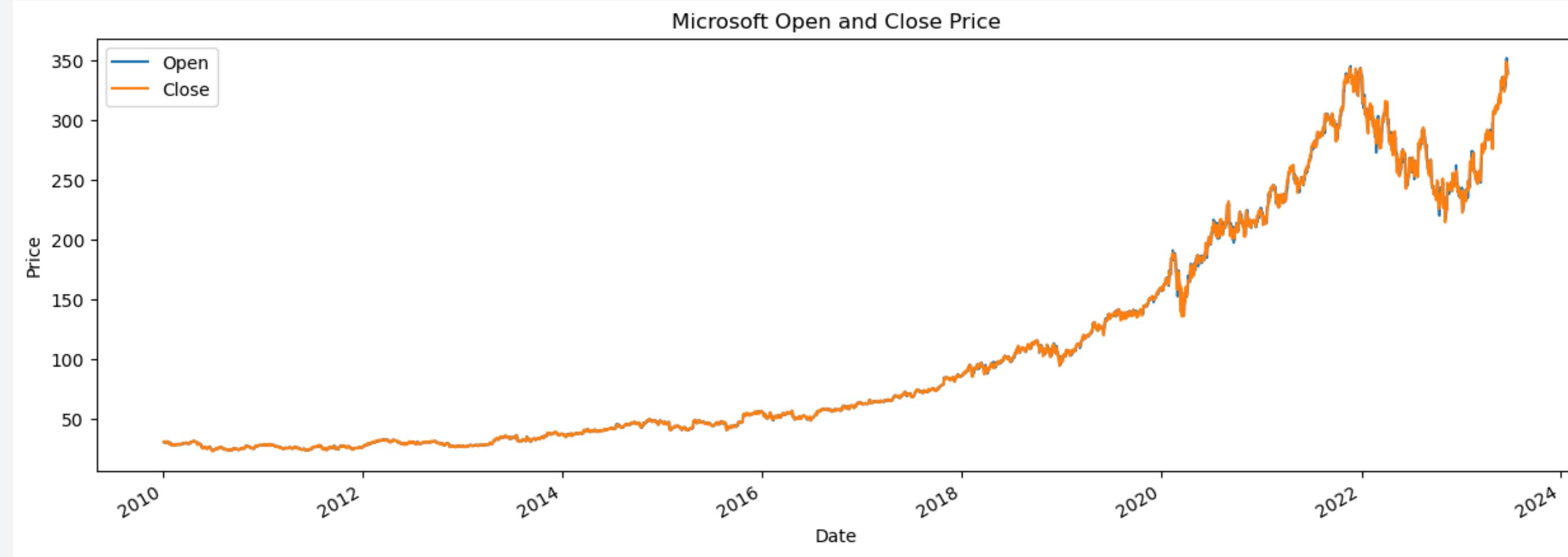
- Stock market: Markets and exchanges for buying, selling, and issuing publicly traded company shares.
- Formal exchanges and OTC marketplaces: Institutionalized platforms for stock trading.
- Regulatory compliance: Adherence to established regulations in conducting financial activities.
- Multiple trading venues: Numerous stock trading platforms within a country or region.
- Securities: Transactions involving stocks and other types of securities.



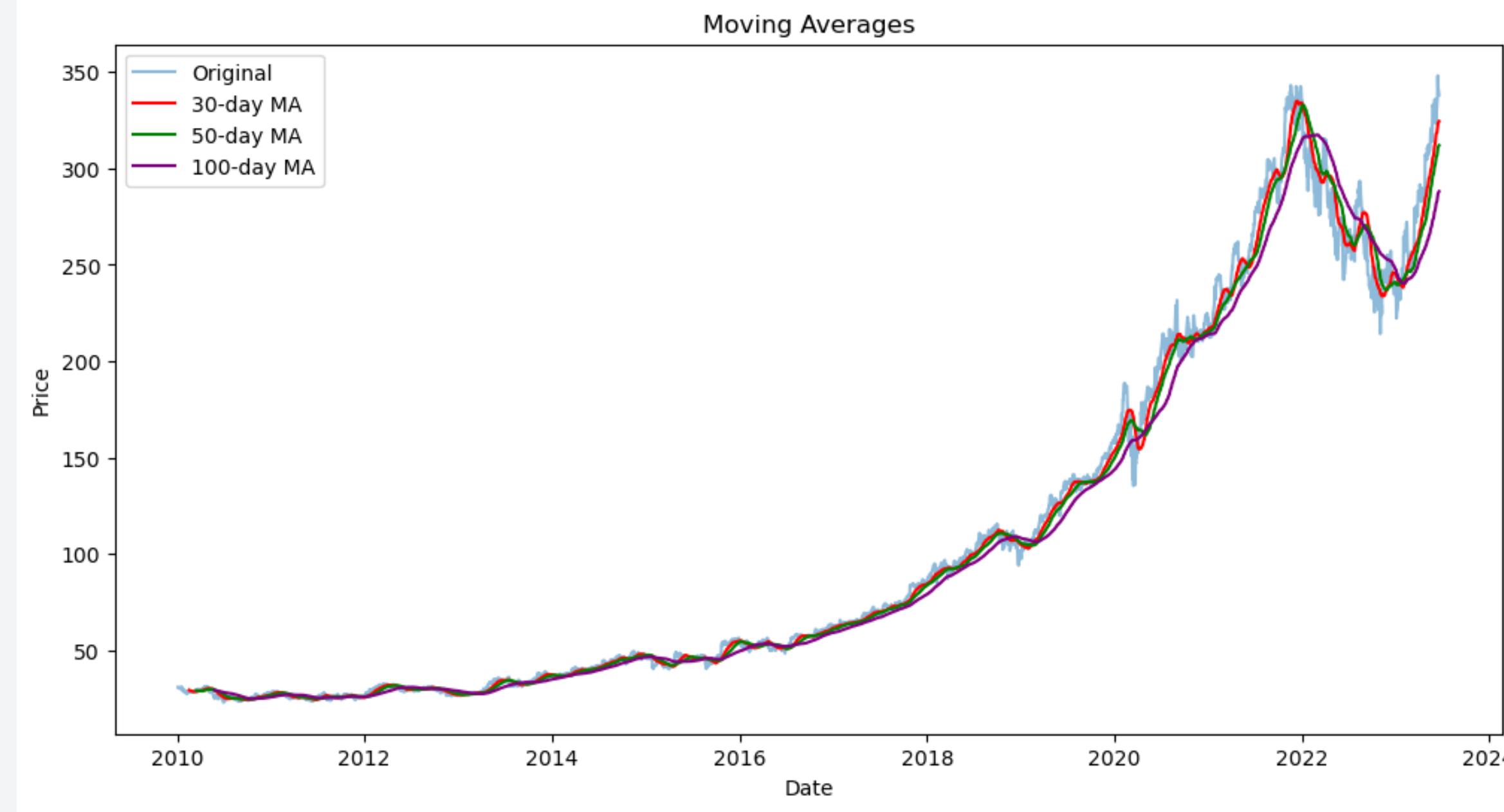
# DATA UNDERSTANDING:

- Date: Trading day in yy-mm-dd format.
- Open: Initial trading price at market open.
- High: Peak price reached during the trading day.
- Low: Lowest price observed during the trading day.
- Close: Final traded price at market close.
- Volume: Number of shares traded on the trading day.
- Adj Close: Adjusted closing price considering dividends, stock splits, and other corporate actions.





It is noticeable that the open and close prices share a similar pattern throughout the plotted period. They tend to move in tandem, rising and falling together. This synchronous behavior suggests a strong correlation between the opening and closing prices of Microsoft stock.



- The 30-day Moving Average of the daily price change is positive, indicating an upward trend in the stock price.
- The 50 day Moving Average of the daily price change is positive, indicating an upward trend in the stock price.
- The 100 day Moving Average of the daily price change is positive, indicating an upward trend in the stock price

# MODELING

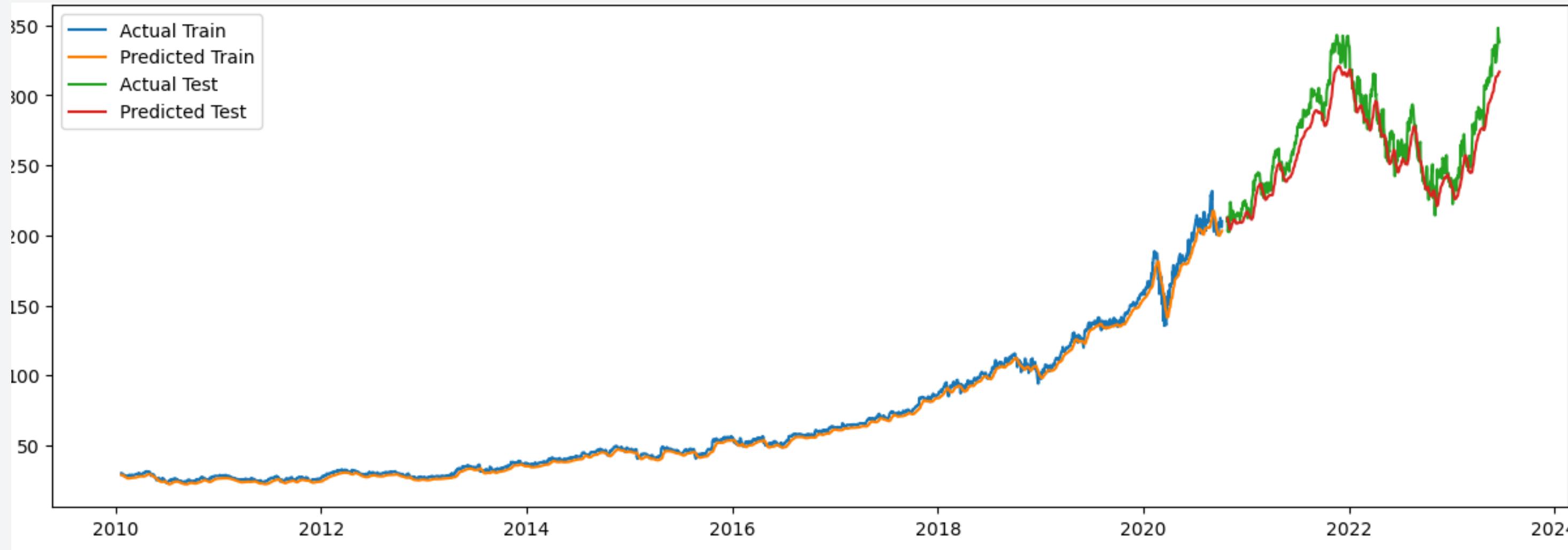
Models used were ARIMA, Auto ARIMA FbProphet, and LSTM. The most accurate model was LSTM.

## Best model: LSTM

LSTM(Long Short-Term Memory) is a type of recurrent neural network that can effectively capture sequential patterns and long-term dependencies in time series data. LSTM models have been widely used in financial forecasting tasks due to their ability to handle complex temporal relationships. By leveraging the strengths of LSTM, it is possible to improve the accuracy and performance of the stock price prediction task compared to the FB Prophet model.

- The LSTM model performed better than the other models with a Mean Absolute Error of 5.898.
- The model was then used to forecast the stock prices for the next 2 years.
- The forecasted prices were used to optimize trading strategies using the Moving Averages Bouncing strategy.

# EVALUATION



The plot of actual vs. predicted values for the training set shows that the model captures the general trend and patterns in the data. The prediction is perfectly done, following the trend as the actual values.

The MSE, RMSE, and MAE displayed are lower, an indication that the model is performing well in accurately predicting the target variable.

# RECOMMENDATIONS

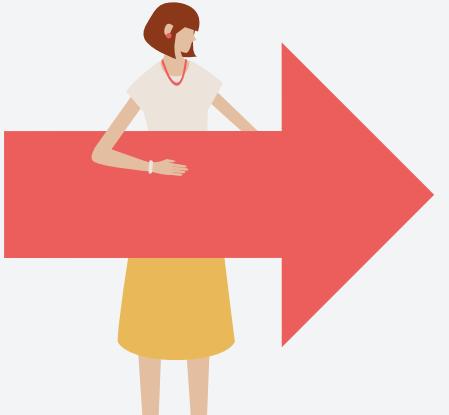
- Regularly Monitor and Update Models: The stock market is dynamic, and market conditions can change rapidly. Continuously monitor the performance of our model and update it with new data to ensure effectiveness and relevance.
- Implement mitigation measures for short-term investment to help avoid losses due to volatility and market fluctuations. This can be achieved by using the Moving Averages Bouncing strategy to optimize trading strategies.
- For long-term investment, the fb prophet model is the best model to use because it has an RMSE value of 71.1654, meaning it can be used for long-term predictions, slightly over 2 years prediction.





## NEXT STEPS

Consider incorporating advanced deep learning models (NLP) that can provide insights from company financials, industry trends, news events, and market sentiment to make well-informed investment decisions.



# TEAM MEMBERS

- Marwa Osman
- Victoria Nabea
- Kennedy Juma
- Grace Nekesa
- Paul Machau
- Josiah Okumu
- Mugangasia Bravin



Link to Github Repo [Link](#)