A STRATEGIC ANALYSIS OF NVIDIA STOCK PERFORMANCE AND GROWTH TRAJECTORY

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AGENDA

EXECUTIVE SUMMARY
DATA
EXPLORATORY DATA ANALYSIS(EDA)
MODELLING METHOD
FINDINGS
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EXECUTIVE SUMMARY

BUSINESS PROBLEM

In today's dynamic technology sector, investors face significant challenges in making informed decisions about NVIDIA Corporation (NVDA) stock. The semiconductor industry's inherent volatility, combined with external economic pressures, complicates accurate stock performance forecasting. The core issue is to establish a robust analytical framework that can accurately predict NVDA's stock trends, mitigate investment risks, and enhance returns by delivering timely and precise investment insights.

OBJECTIVE

Our goal is to deliver a comprehensive analysis of NVIDIA Corporation (NVDA) stock, offering actionable insights for investors and stakeholders. By applying advanced data science methodologies, we aim to evaluate the stock's historical performance, uncover key market trends, and forecast future price movements. This analysis will support informed investment decisions, optimize portfolio strategies, and provide a deeper understanding of NVIDIA's impact within the broader tech industry.

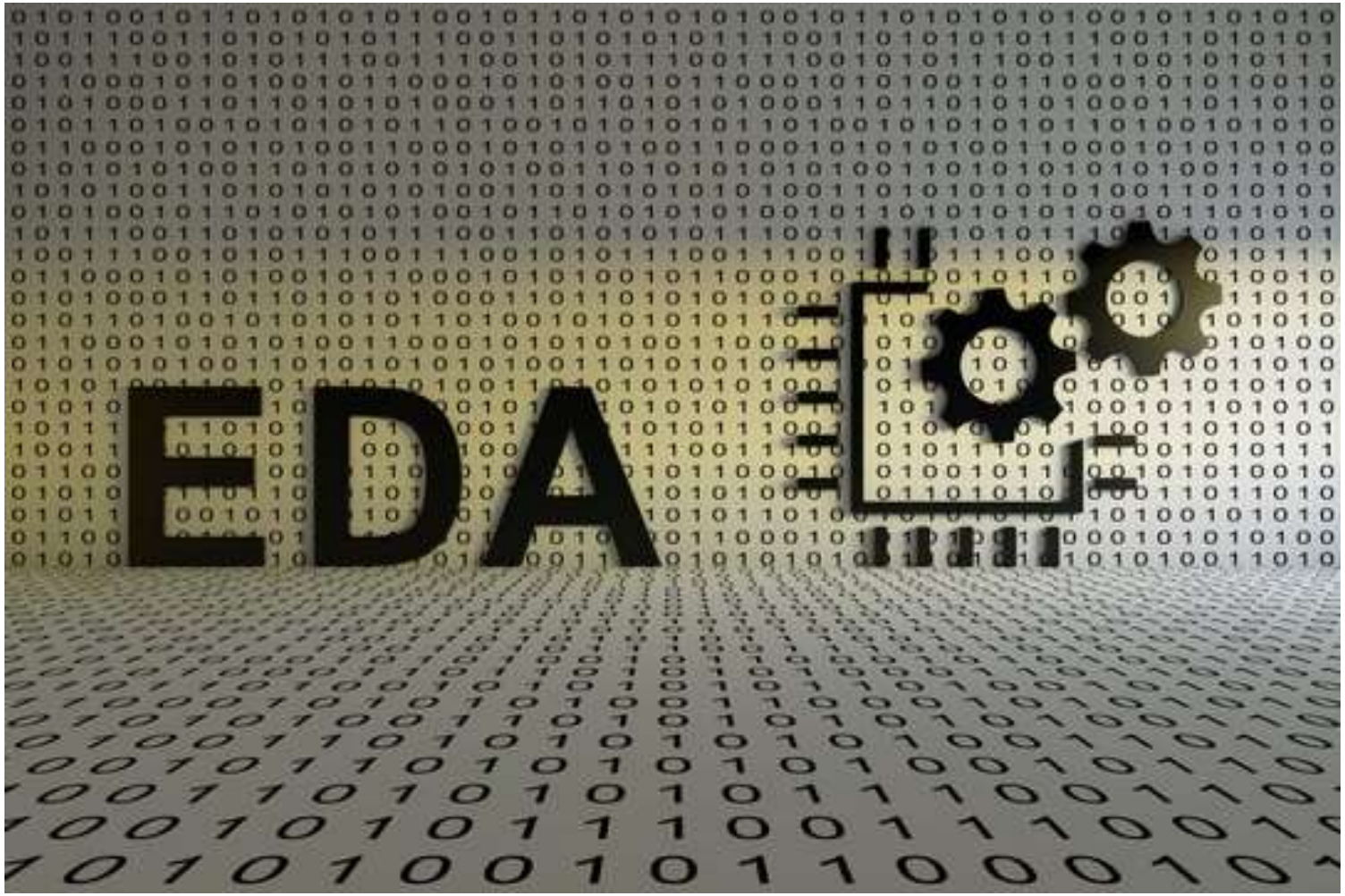
PLAN OF THE PROJECT

DELIVERABLE	DETAILS	DUE DATES	STATUS
DATA&EDA	**Identify the trends and patterns**	**11-05-2024**	**COMPLETED**
Methods and Findings, Recommendations	Finding out the methods	11-12-2024	COMPLETED
Final Presentation	FINAL COMPLETION DECK	12-03-2024	PENDING

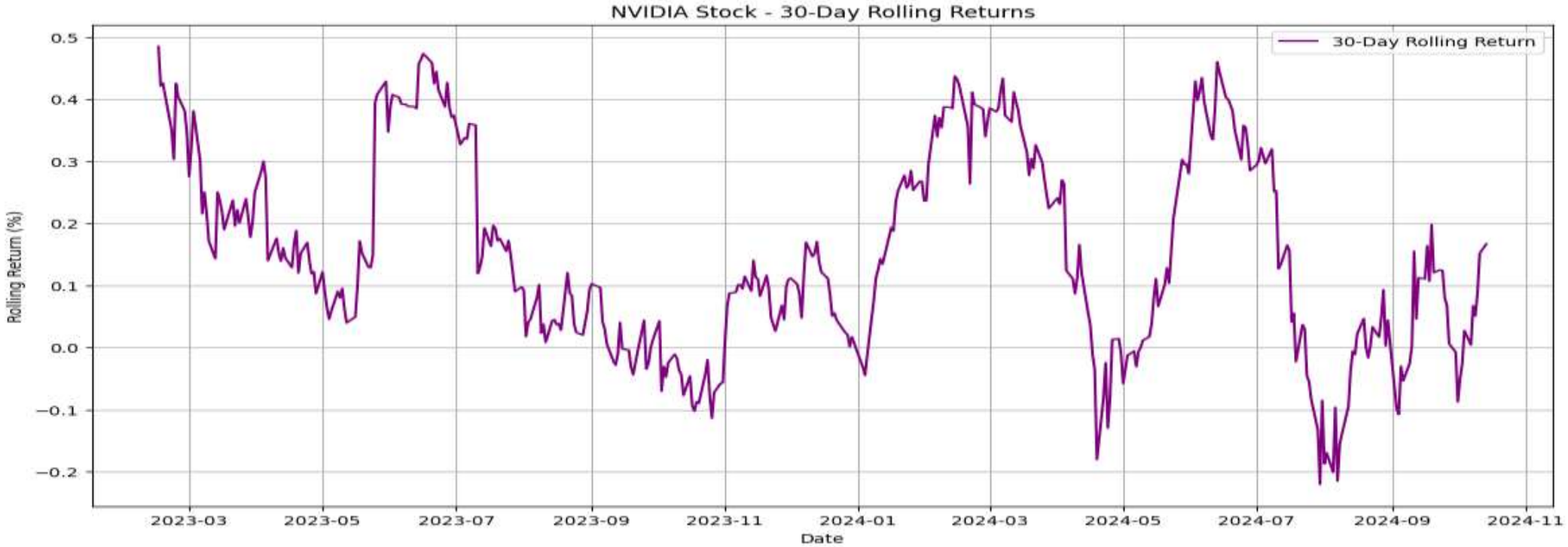

data

DATA

DATA SOURCE : Kaggle
Data Features: Date, open, high, low, close, volume, adj close
Sample size: 449 records
Time Period: January 2023 – October 2024

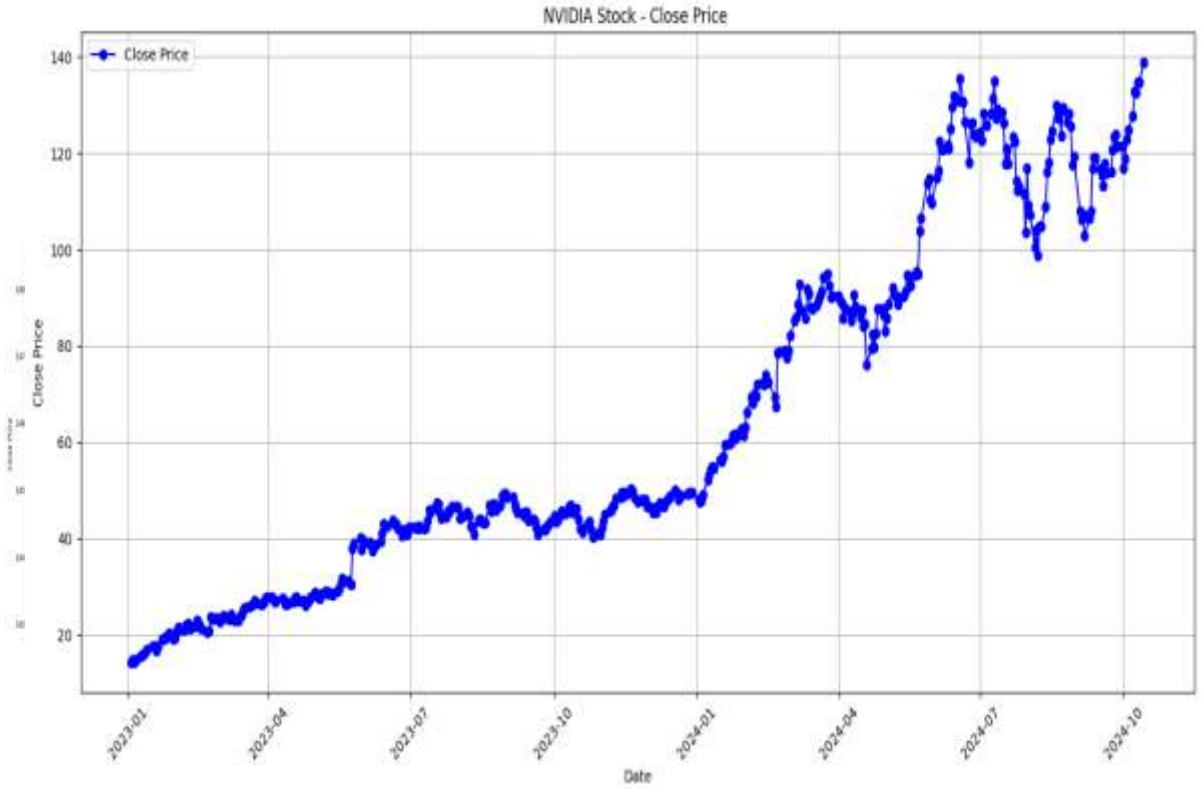

EDA

EXPLORATORY DATA ANALYSIS



This chart represents the 30-day rolling returns of NVIDIA's stock from early 2023 to late 2024.
Rolling returns show the average percentage change in stock price over the past 30 days, providing a smoothed view of performance trends.
Peaks indicate periods of strong performance or recovery.
Dips reveal times when the stock experienced sustained negative returns.
The rolling return metric helps in understanding medium-term trends, smoothing out daily volatility, and identifying longer-term performance patterns.
This analysis supports strategic decision-making by highlighting periods of consistent gains or losses.

NVDIA STOCK : HISTORICAL CLOSING PRICES



NVIDIA's stock shows a strong ability to bounce back after dips, highlighting its resilience and growth opportunities. This pattern reflects high investor confidence, which can be strategically used to guide investment decisions.

By understanding these ups and downs, investors can decide when to enter the market or adjust their current investments. Smart timing, especially during price dips, can lead to significant gains.

Knowing how NVIDIA recovers helps investors protect their investments during market downturns, reducing potential losses.

Staying alert to market changes is essential. A phased investment approach—spreading investments over time—can maximize returns while reducing risks

NVIDIA Stock: Close Price and Moving Average Insights

Close Price Trends:

The black line shows NVIDIA's stock price over time, illustrating growth with fluctuations.

20-Day SMA (Yellow Dashed):

Shows short-term trends by smoothing out price fluctuations.

50-Day SMA (Blue Dashed):

Provides a long-term view, reducing short-term noise.

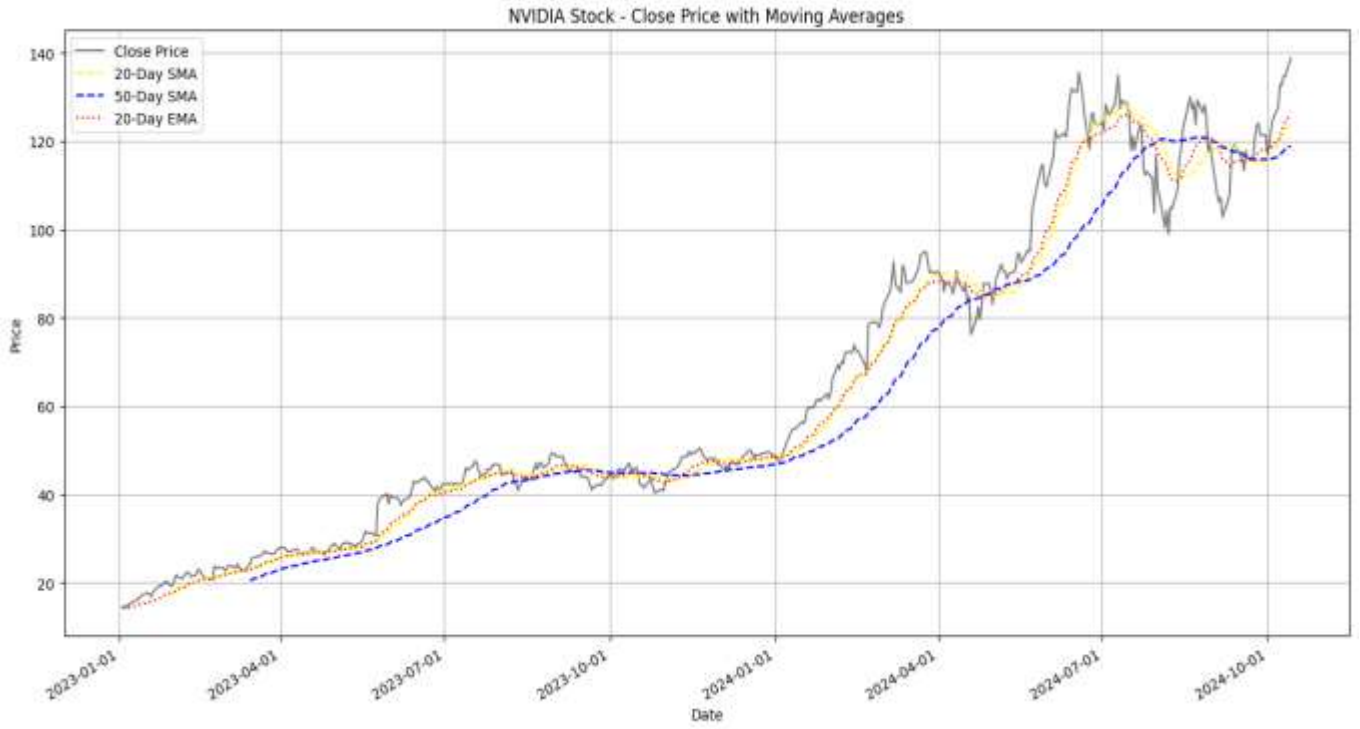
20-Day EMA (Red Dotted):

Reacts faster to price changes, focusing on recent data.

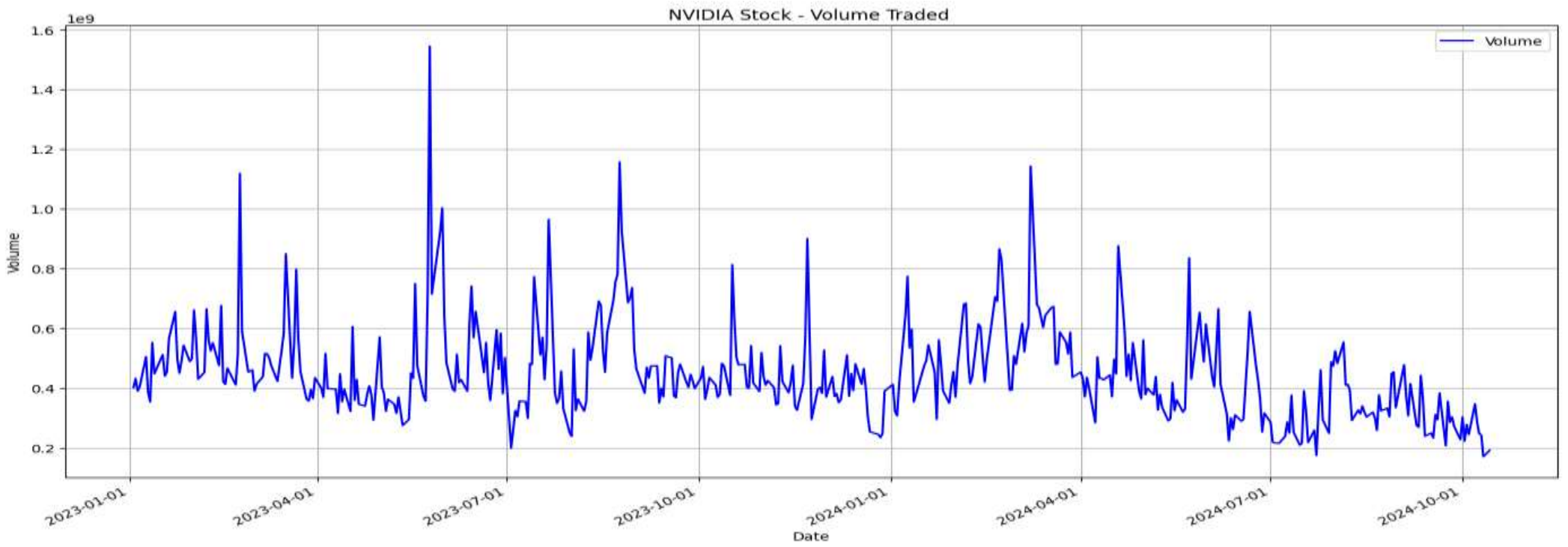
Trend Signals:

When the short-term moving average crosses above the long-term, it may indicate an upward trend.

Use moving averages to time market entries/exits.



Understanding Trading Volume spikes



High trading volume occurs during key events like product launches or earnings reports.

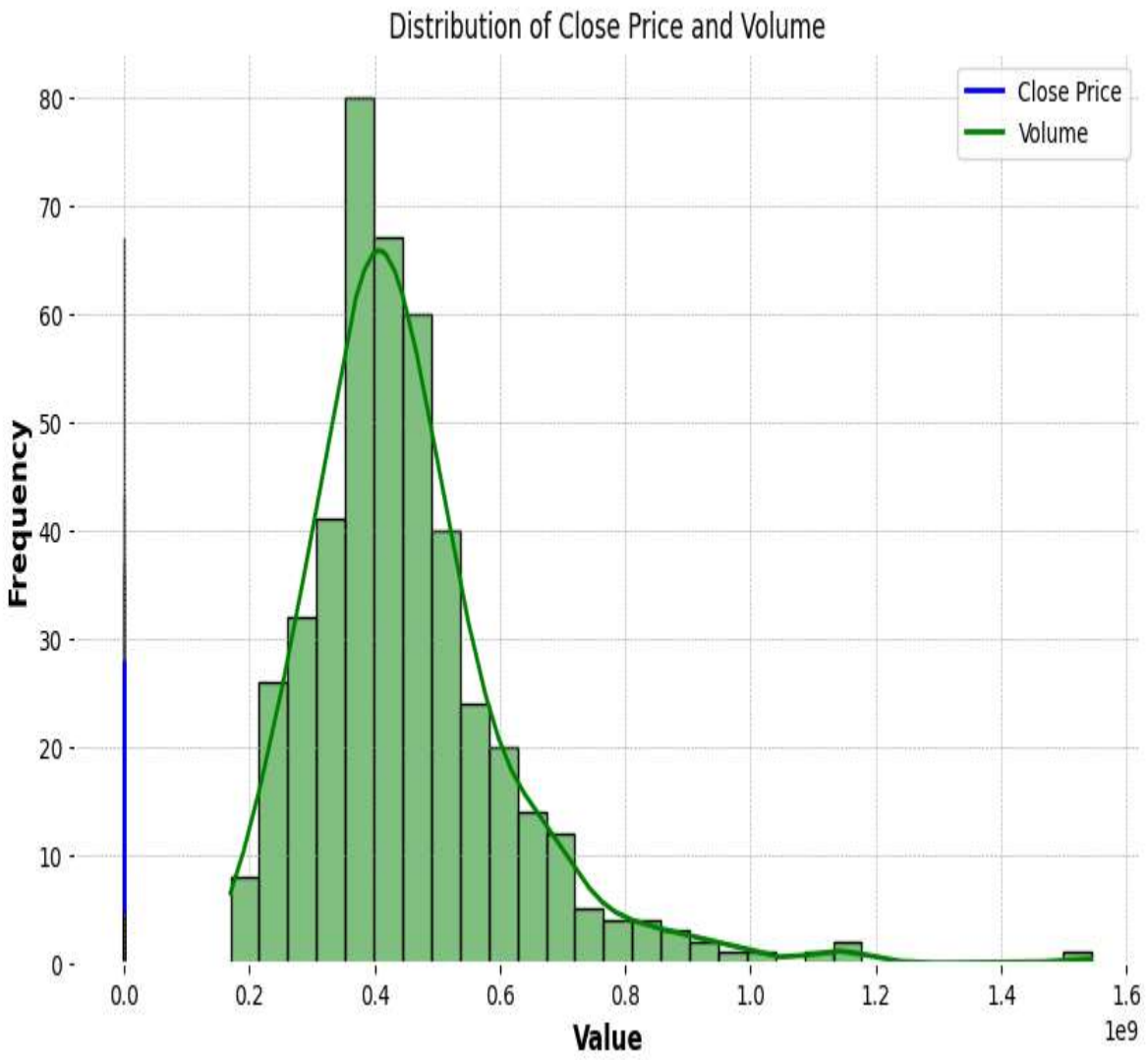
Increased volume shows strong interest, often driven by positive news or major updates

More volume means easier buying/selling without big price changes.

Volume trends help spot the best times to buy or sell, maximizing gains.

Volume spikes can signal volatility, guiding smarter risk management.

Statistical Distribution of NVIDIA's Close Price and Volume



Close Price Distribution (Blue Curve):

The blue curve shows the range of NVIDIA's daily closing prices.

Most prices are concentrated around a central value, showing relative stability.

Slight right skew: Most days have lower prices, but a few days show much higher prices.

Volume Distribution (Green Curve):

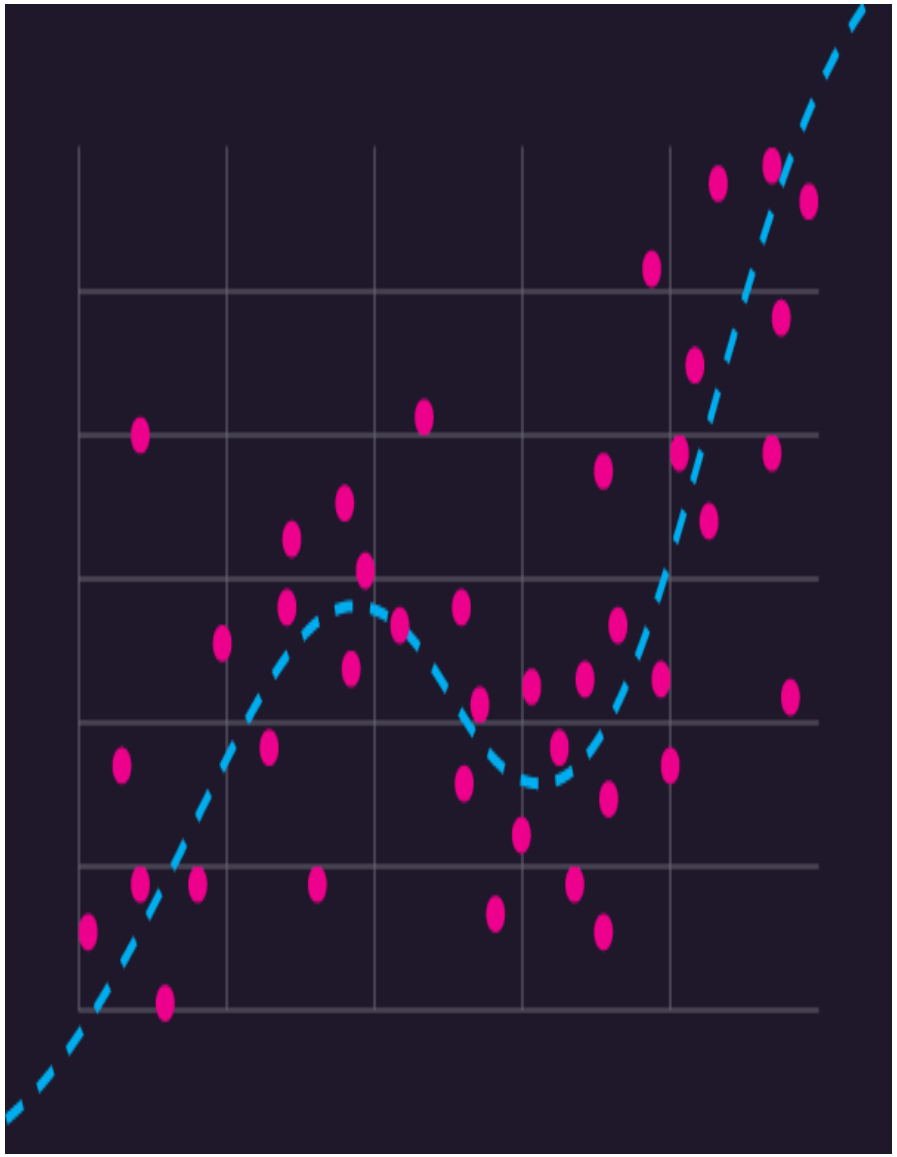
The green curve represents daily trading volumes.

Most trading days have moderate volumes, but some show very high activity. The peak shows the most common trading volume range.

Helps predict typical stock behaviour, aiding in planning and forecasting.
High trading volumes can signal significant events or market volatility.
Knowing common price and volume ranges helps prepare for both regular and unusual market conditions.

MODELING METHOD

MODEL SELECTION



OUTCOME VARIABLE:
Forecasted closing price for NVIDIA stock, generated through the **Linear Regression model.**

FEATURES: Date, open, high, low, close, volume, adj close

MODEL TYPE : Linear Regression model

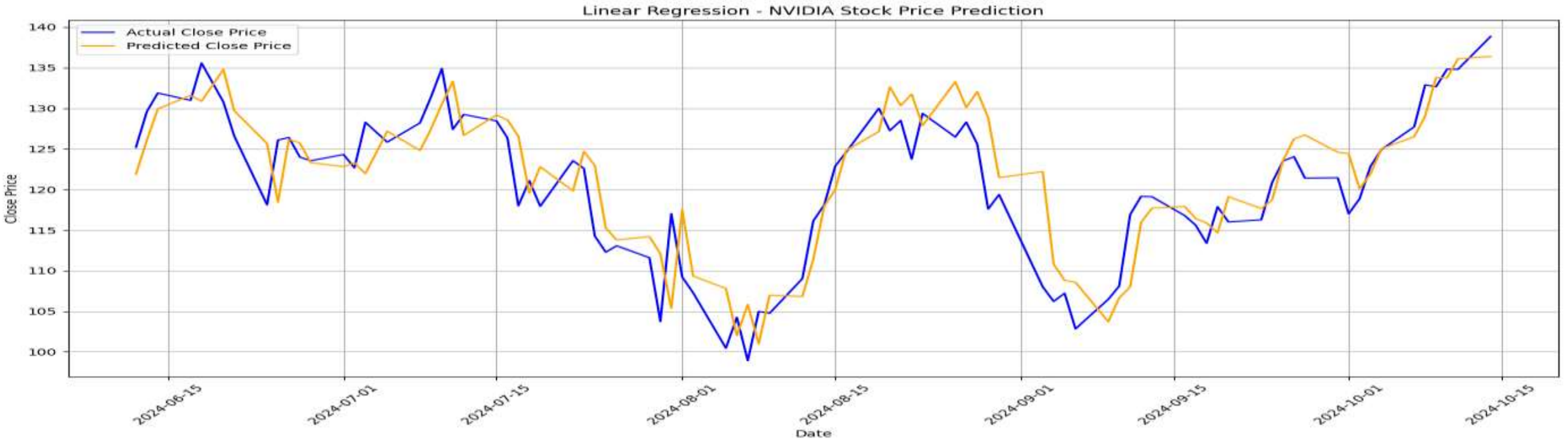
Simple and Interpretable: Linear Regression assumes a straight-line relationship between input features and the target variable, making it easy to interpret.

Predicts Stock Prices: Ideal for predicting NVIDIA's closing prices, capturing trends in stock movements based on historical data.

Minimizes Error: The model works by minimizing the difference (error) between predicted and actual values, measured by metrics like Mean Squared Error (MSE).

Quick to Train: Linear Regression is computationally efficient, making it fast to train and deploy.

Best Performance Here: Compared to other models tested, Linear Regression yielded the lowest MSE, showing better accuracy for this dataset.



NVIDIA Stock Price Prediction with Linear Regression

Objective: To predict NVIDIA's daily closing stock prices.
Model: Linear Regression provided reliable predictions closely aligned with actual values.
Outcome: Achieved a low error rate, indicating strong model accuracy.
Visualization: The graph shows predicted vs. actual prices, demonstrating the model's effectiveness in tracking stock trends.
The closing price is considered as market sentiment indicator. It is also used as target variable to forecast future prices.
Close prices are central to technical analysis which uses historical price data to identify trends and patterns. Indicators like moving averages and support/resistance levels rely on the close price to determine potential buy/sell signals.

NOTE: Refer to the appendix slide for technical reasoning


FINDINGS

FINDINGS FROM THE MODEL

Prediction Accuracy: The Linear Regression model accurately predicted stock price trends with a low Mean Squared Error (MSE) of 21.33. This indicates reliable performance in tracking the actual price movements.
Alignment with Actual Prices: The model's predictions closely follow the actual closing prices, as shown in the graph. This strong alignment suggests that it effectively captures patterns in NVIDIA’s stock trends.
Key Findings

Stable Performance: The model consistently performs well across different time periods, suggesting it can be used for short-term stock price forecasting.
Quick and Efficient: Linear Regression is computationally efficient, making it easy to implement and update regularly.
Simplicity: Provides interpretable results, making it easy to explain predictions and patterns to stakeholders.

RECOMMENDATIONS

& NEXT STEPS

RECOMMENDATIONS AND NEXT STEPS

1. Predictive Power of the Model:
The Linear Regression model demonstrated moderate predictive accuracy, with the predictions of NVIDIA's stock closely tracking actual market performance.
The model used past stock prices and moving averages to forecast future trends, which is useful for anticipating short-term price changes.
2. Based on our model performance, in future we can use the API to fetch the live data so that the model can predict the closing price even before the closing time.
Risk Management: The predictions can be used to manage risk in portfolios by anticipating price dips or rises. However, market volatility should still be considered.
3. Data-Driven Decision Making:
Leverage the model for data-driven decisions when tracking NVIDIA's stock, especially for traders looking for insights on stock price movements in the short term

4. Model Limitations and Considerations:
Model Limitations: While the Linear Regression model provides valuable insights, it is important to note that stock prices are influenced by many unpredictable factors (e.g., global events, investor sentiment) that this model does not account for.
Volatility: Stock prices can be volatile, and predictions may not always align perfectly with real-world fluctuations. Therefore, the model's predictions should be used as part of a broader investment strategy, rather than relied upon exclusively.

1. Expand Data and Features:
Broaden Feature Set: Incorporate additional indicators such as Volume, Sentiment Analysis from news, and Macroeconomic Data (interest rates, inflation, etc.) to improve accuracy.
Incorporate External Factors: Market news, tech trends, and competitor analysis can all impact stock prices—integrating these could make predictions more reliable.
2. Explore Advanced Models:
Move Beyond Linear Regression: While simple and effective, consider machine learning models like Random Forests or Gradient Boosting, which can capture more complex relationships in the data.
Neural Networks (LSTM or CNN) can be considered for deep learning to forecast more accurately over longer time periods.
3. Real-Time Prediction System:
Deploy Real-Time Predictions: Use the model to generate daily or weekly predictions, enabling more agile decision-making.
Automate Alerts: Set up automatic alerts based on the model's predictions, notifying investors of significant price changes, improving response time.
4. Evaluation and Testing:
Back test with Historical Data: Validate the model's effectiveness on past data to ensure predictions would have been accurate historically.
Monitor Model Performance: Continually evaluate the performance and adjust the model to optimize its predictive power


APPENDIX

DATA TRANSFORMATION

Technical Analysis: NVIDIA Stock Price Prediction Using Linear Regression

Model Architecture & Feature Engineering
Input Features:
Price Lags (t-1, t-2): Capture short-term price momentum
Technical Indicators: 20-day SMA & EMA for trend capture

Preprocessing: Standard Scaler normalization, 80/20 time-series split
Performance: MSE = 21.3 (RMSE ≈ $4.61)

Strengths Observed:
Strong trend capture in low-volatility periods, Effective price momentum tracking through lag features
There is Balance between trend (SMA) and reactivity (EMA)
Particularly accurate in $115-$125 range

Technical Limitations:
Over-smoothing during high volatility Prediction lag in sharp reversals.
Linear constraints limit pattern complexity capture, Higher deviation at price extremes (>$135)

Key Technical Insights:
EMA_20 provides crucial recent price weight

THANK YOU