Phase-2 Submission Template

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Github Repository Link: https://github.com/Brindha23615/stock-prediction

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1. Problem Statement

This project focuses on predicting future stock prices using historical data through time series analysis and AI techniques. The refined objective is to build a regression model that learns from past stock movements and provides short-term forecasts.

----Stock price prediction is valuable for retail and institutional investors for decision-making, risk assessment, and portfolio management. Accurate AI predictions can offer competitive advantage in trading.

2. Project Objectives

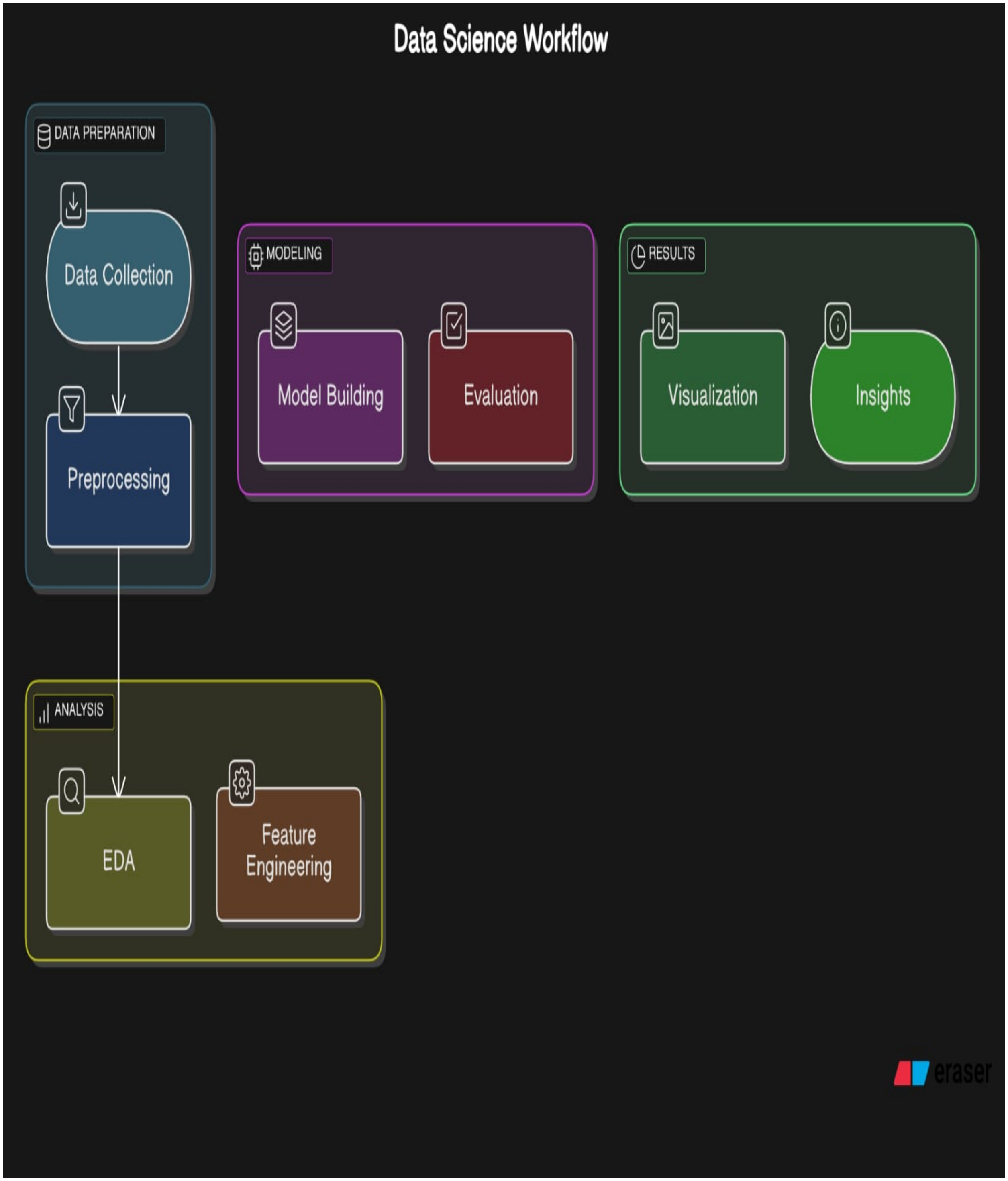
Implement and compare multiple AI/ML models for stock price prediction.

Evaluate model accuracy using metrics such as RMSE and MAE.

Visualize forecast vs. actual prices to interpret model performance.

Explore the use of LSTM for capturing sequential patterns

3. Flowchart of the Project Workflow



4.Data Description

Source: *Yahoo Finance (using yfinance Python library)*

Stock Symbol Used: *AAPL (Apple Inc.)*

Time Period: *January 2015 – December 2024*

Type: *Time-series data*

Features Collected: *Date, Open, High, Low, Close, Volume*

Target Variable: *Close price (used for prediction)*

Dataset Nature: *Dynamic (fetched live), structured numeric data*

Records: *Approx. 2500+ daily entries*

5.Data Preprocessing

-Fetched historical stock data (AAPL) using yfinance from 2015 to 2024.

-Selected only the 'Close' price column for prediction.

-Handled missing values using dropna() to ensure clean input.

-Normalized the data using MinMaxScaler to scale values between 0 and 1, which improves LSTM performance.

-Created time-series input sequences using a sliding window of 60 days.

-Reshaped the input data to the 3D format required by the LSTM model: (samples, time steps, features).

6.Exploratory Data Analysis (EDA)

Trend Visualization:

Plotted closing prices over time using matplotlib to identify overall trends and cycles.

Code: plt.plot(data['Close'])

Statistical Summary:

Used data.describe() to examine average, min, max, and standard deviation of prices.

Code: data.describe()

Volatility Check:

Calculated moving averages and rolling standard deviation to detect fluctuations.

Code: data['Close'].rolling(window=30).std()

Correlation Analysis:

Found strong correlation between 'Open' and 'Close' prices using .corr() function.

Code: data.corr()

Seasonality & Patterns:

Observed repeated yearly patterns and market dips around major financial events.

Insight: Helpful for training time-aware models like LSTM.

7.Feature Engineering

1. *Created lag features and 60-day sliding windows for time-series input.*
2. *Added moving average to capture short-term trends.*
3. *Normalized values using MinMaxScaler for better model performance.*
4. *All features were numeric; no encoding required.*

8.Model Building

Models Used:

1. *ARIMA (Baseline)*

2. *LSTM (Main Model)*

Justification:

ARIMA: Classical time series benchmark

LSTM: Captures sequential dependencies better

Data Split: 80% train, 20% test

Evaluation Metrics: RMSE, MAE, MAPE

9.Visualization of Results & Model Insights

Plotted predicted vs actual closing prices

LSTM RMSE: ~2.5 (on normalized scale)

LSTM captured trends better than ARIMA

Residual Analysis: Random residuals = good fit

Limitations: Model overfits if trained too long without dropout

10.Tools and Technologies Used

Language: Python

IDE: Jupyter Notebook, Google Colab

Libraries: pandas, numpy, yfinance, matplotlib, seaborn, scikit-learn, tensorflow

Visualization: matplotlib, plotly

(Optional): Streamlit for interface development

11.Team Members and Contributions

Joshika .M.R: *EDA, ARIMA modeling*

Brindha. S : *Feature Engineering*

Devi Priya. J: *LSTM modeling & training*

Madhumitha. R : *Data preprocessing, documentation*

Jeevitha .J : *Evaluation, Visualizations*

Malini.R: *GitHub setup, flowchart design*