PHASE 1

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Problem Statement

Despite the abundance of financial data, accurately predicting stock prices remains extremely challenging due to the complex, volatile, and nonlinear behavior of stock markets. Traditional statistical methods often struggle to model sudden shifts, hidden patterns, and market anomalies. This project aims to harness AI and time series analysis techniques to improve prediction accuracy, uncover hidden trends, and provide more reliable forecasting models. The ultimate goal is to support investors and analysts in making smarter, data-driven decisions.

Objective of the Project

The objective of this project is to develop an AI-powered model that accurately predicts future stock prices based on historical data using time series analysis techniques.

Specific goals include:

- Extracting meaningful patterns from historical stock price data.
- Building machine learning and deep learning models (like LSTM, ARIMA) for forecasting.
- Comparing model performances to select the best predictive approach.
- Providing easy-to-interpret forecasts to aid investment decision-making.
- Handling challenges like noise, missing data, and market volatility in predictions.

Scope of the Project

This project focuses on building a predictive system using historical stock data without considering external factors like news, political events, or global crises.

The scope includes:

- Data collection from public financial databases (Yahoo Finance, Alpha Vantage, etc.).
- Focusing on selected major stocks or indices for manageability.

- Applying machine learning and deep learning time series models.
- Evaluating model performance using standard metrics like RMSE and MAE.
- Visualizing historical trends and future predictions.
- Developing a basic interface or dashboard for displaying predictions (optional).

High-Level Methodology

1. Data Collection:
a. Source historical stock data from APIs like Yahoo Finance, Alpha Vantage, or Kaggle datasets.
2. Data Preprocessing:
a. Handle missing data, remove outliers, normalize/standardize values, and convert into time series format.
3. Exploratory Data Analysis (EDA):
a. Identify trends, seasonality, patterns, and correlations in stock prices.
4. Feature Engineering:
a. Create technical indicators (e.g., Moving Averages, RSI) and lag-based features.
5. Model Development:

a. Train models like ARIMA, LSTM, GRU, and Prophet; tune hyperparameters for better results.

6. Model Evaluation:

a. Use error metrics (RMSE, MAE, MAPE) to assess and compare model performance.

7. Prediction and Visualization:

a. Forecast stock prices for short-term and medium-term periods and visualize results.

Tools and Technology

• Programming Languages: o Python

• Libraries and Frameworks:

o NumPy, Pandas (data manipulation) o Matplotlib, Seaborn, Plotly (visualization) o Scikit-learn (ML models and metrics) o TensorFlow, Keras, PyTorch (deep learning) o Statsmodels (ARIMA modeling) o Facebook Prophet (time series forecasting) • Data Sources:

o Yahoo Finance, Alpha Vantage API, Quandl, Kaggle • Development Environment:

o Jupyter Notebook, Google Colab, VS Code

• Version Control:

o Git, GitHub

• (Optional) Cloud Platforms:

o AWS, Google Cloud, or Heroku (for model deployment)

TEAM MEMBERS:

- **M.GAYATHRI**
- **ESWARAN.M.R**
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PHASE 2

Cracking the market code with AI driven stock price prediction using time series analysis

Github Repository Link

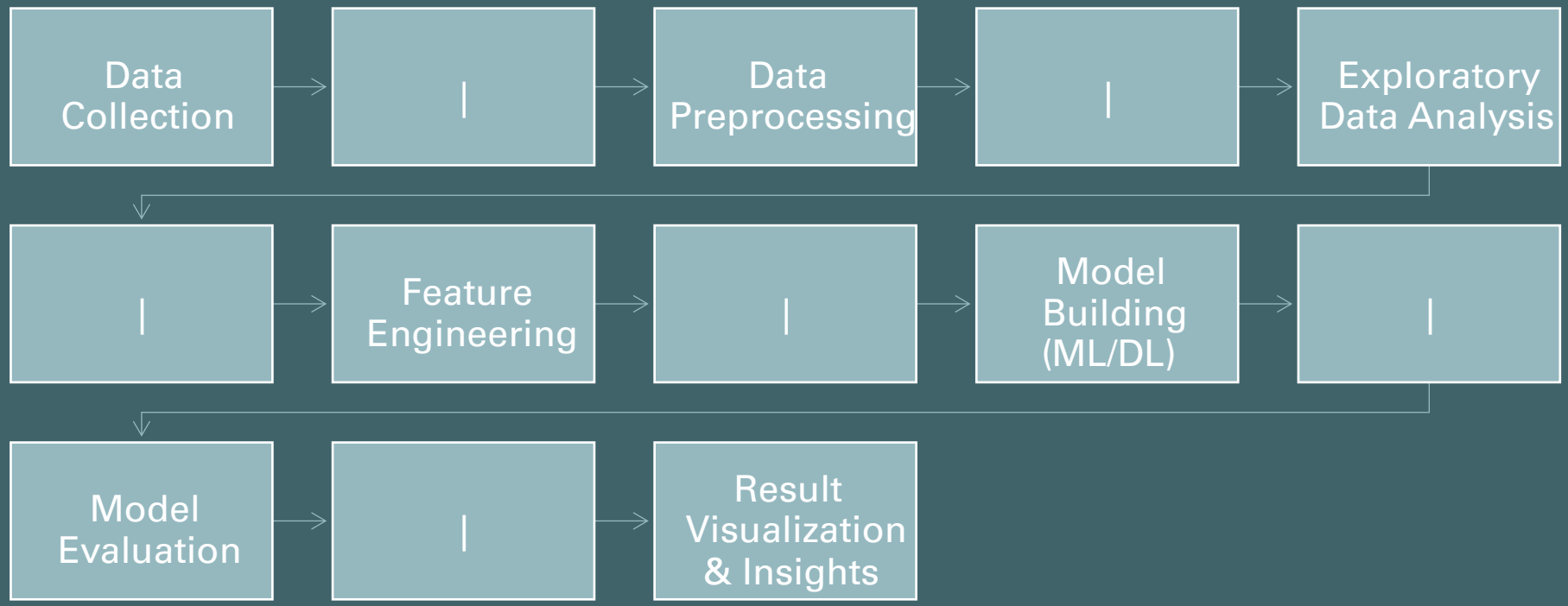
Problem Statement

The stock market is highly volatile and influenced by numerous dynamic factors. Predicting stock prices accurately remains a major challenge due to the complexity and non-linearity of financial data. This project aims to leverage AI and time series analysis techniques to forecast stock prices and provide actionable insights for investors.

Project Objectives

- To collect and preprocess historical stock data for analysis.
- To explore patterns and trends using time series exploratory analysis.
- To engineer relevant features that improve model performance.
- To develop and evaluate machine learning and deep learning models for stock price prediction.
- To visualize the predictions and compare model performances.
- To derive insights for practical investment decision-making.

Flow Chart of the Project Workflow



Data Description

- Source: Yahoo Finance, Alpha Vantage, Quandl, etc.

Features:

- Date
- Open Price
- High Price
- Low Price
- Close Price
- Volume

- Technical Indicators (SMA, EMA, RSI, MACD, etc.)

Data Preprocessing

- Handle missing values (forward fill/backward fill)
- Convert date to datetime object and set as index
- Normalize/scale numerical features
- Feature selection and reduction (if needed)

Exploratory Data Analysis (EDA)

- Time series decomposition (trend, seasonality, residuals)
- Moving averages visualization
- Correlation matrix of indicators
- Volatility & returns analysis

Autocorrelation (ACF) and Partial Autocorrelation (PACF) plots

Feature Engineering

- Lag features (previous n days' prices)
- Rolling window statistics (mean, std, etc.)
- Date-time features (day, month, year, weekday)
- Technical indicators (RSI, MACD, Bollinger Bands)

Model Building

- Machine Learning Models:
- Linear Regression
- Random Forest Regressor
- XGBoost
- Deep Learning Models:
- LSTM (Long Short-Term Memory)
- GRU (Gated Recurrent Unit)
- Transformer-based time series models

Visualization of Results & Model Insights

- Actual vs Predicted prices plot
- Error metrics (RMSE, MAE, MAPE)
- Cumulative returns visualization
- Feature importance (for ML models)
- Confidence intervals for predictions

Tools and Technologies Used

- Languages: Python
- *Libraries:
- Data: Pandas, NumPy
- Visualization: Matplotlib, Seaborn, Plotly
- ML/DL: scikit-learn, XGBoost, TensorFlow/Keras, PyTorch
- Time Series: statsmodels, fbprophet, tslearn
- IDE/Notebook: Jupyter Notebook, VS Code
- Version Control: Git/GitHub

TEAM MEMBERS:

- **M.GAYATHRI**
- **R. GEETHAPRIYA**
- **MR. ESWARAN**
- **S. GANESHKUMAR**

Thank you