

## Stock Price Modeling and Strategy Backtesting

### 1. Introduction

This project integrates stock price forecasting with trading strategy evaluation. It investigates both non-sequential and sequential machine learning models to predict stock returns and simulate real-world intraday trading performance based on those forecasts.

### 2. Methodology

#### Stock Price Prediction:

- Engineered features using technical indicators (e.g., EMA, MACD, RSI), market sentiment scores, and calendar-based seasonality.
- Applied a sliding window approach to construct sequences and capture time-series dependencies.
- Trained and evaluated a range of models:
  - *Non-sequential*: Logistic Regression, Random Forest
  - *Sequential*: RNN, LSTM
- Framed the task as a next-day return prediction, then reconstructed predicted prices from forecasted returns.
- Evaluated model performance using MAE, RMSE, and MAPE.

#### Backtesting:

Simulated daily intraday trades to evaluate strategy win rates using different decision rules based on predicted prices.

- **Benchmark:** Buy if the previous day's return was positive.
- **Strategy 1:** Buy if predicted price > previous day's close.
- **Strategy 2:** Buy if predicted price > close two days ago.
- **Strategy 3:** Buy if predicted price > EMA5.
- **Strategy 4:** Buy if predicted price > EMA10.

### 3. Limitations and Future Improvements

- **Model Refinement:** Future work could incorporate hyperparameter tuning, more advanced architectures (e.g., Transformer-based models), and additional macroeconomic or fundamental indicators.
- **Strategy Enhancement:** Enhance trading logic with position sizing, stop-loss mechanisms, and evaluation of short-selling or multi-asset strategies.