Stock Return Modeling and Strategy Backtest

1. Introduction

This project consists of two parts: predicting stock return direction and evaluating trading strategies through backtesting. It explores both sequential and non-sequential machine learning models to generate trading signals and assess their performance in real-world-like scenarios.

2. Methodology

Stock Return Prediction:

- Performed feature engineering using technical indicators (e.g., EMA, MACD, RSI), market sentiment, and seasonal patterns.
- Applied a sliding window approach to generate sequential data and capture temporal dependencies.
- Trained and evaluated:
  - **Non-sequential models:** Logistic Regression, Random Forest, Neural Network
  - **Sequential models:** RNN, LSTM
- Framed the problem as a binary classification task to predict next-day return direction.
- Assessed model performance using accuracy, precision, recall, F1 score, and AUC-ROC.

Trading Strategy Backtesting:

- Translated model predictions into trading signals, executing trades at the next day's open with transaction cost adjustments.
- Simulated portfolio performance over time, measuring cumulative return, Sharpe ratio, and maximum drawdown.
- Benchmarked model-driven strategies against a buy-and-hold approach to evaluate added value and robustness.

3. Limitations and Future Improvements

- **Model Refinement:** Further improvements could include hyperparameter tuning, additional market-driven features, or ensemble methods to enhance robustness.
- **Strategy Enhancement:** Incorporating more advanced strategies such as position sizing, risk management rules, or multi-asset frameworks could improve real-world applicability.