Task 4 Report: Model Optimization and Final Results

Overview:

- Hyperparameter tuning was performed using **Grid Search with 5-fold cross-validation** over 27 parameter combinations for the Random Forest model.
- The goal was to optimize model parameters (`max_depth`, `min_samples_split`, `n_estimators`) to improve prediction performance.

Best Parameters Found:

- `max_depth`: 5
- `min_samples_split`: 2
- `n_estimators`: 100

Performance Metrics After Optimization:

Metric	Value
Accuracy	0.4897
Precision	0.7273
Recall	0.1013
F1 Score	0.1778
ROC AUC	0.6020

Backtest Metrics:

Metric	Value

Cumulative Return	2.48%
Sharpe Ratio	1.48
Max Drawdown	-1.22%

Summary:

- Despite systematic hyperparameter tuning, **no significant improvement in model performance or trading strategy results was observed** compared to the initial model.
- Metrics remain largely unchanged, indicating the model's predictive power is limited with the current features and data.
- The backtest results reflect the same modest but positive returns and risk metrics as before.

Conclusion:

- The current Random Forest setup appears **stagnant in performance despite optimization** efforts.
- Future improvements may require exploring **additional features, alternative modeling approaches (e.g., deep learning), or more sophisticated data preprocessing** to boost predictive accuracy and trading performance.