Random Forest Classifier

1. Model Implementation

We implemented a Random Forest classifier using 'mean_return' and 'volatility' as features. The model was trained on weekly data from 2020–2022 and tested on 2023–2024.

2. Accuracy

The classifier achieved an accuracy of 99.05%. This indicates that it correctly classified nearly all weeks in the testing period.

3. Confusion Matrix

Confusion Matrix: [[58, 1], [0, 46]]

This means the model made only 1 misclassification: one Red week was incorrectly predicted as Green. All Green weeks were correctly classified.

4. True Positive Rate (Sensitivity)

TPR = 100.00%. The model identified all Green weeks correctly, showing excellent sensitivity.

5. True Negative Rate (Specificity)

TNR = 98.31%. The model also performed very well at recognizing Red weeks, with only one false positive.

6. Trading Strategy vs. Buy-and-Hold

Using the Random Forest model's predictions, a trading strategy was simulated:

• Final portfolio using Random Forest strategy: $1042.70

• Final portfolio using Buy-and-Hold strategy: $925.86

Conclusion: The Random Forest–based trading strategy outperformed the traditional Buy-and-Hold approach.

7. Conclusion

The Random Forest classifier was highly accurate and reliable. It achieved perfect sensitivity and near-perfect specificity, making it an excellent candidate for stock trend prediction. Its trading strategy also delivered superior financial returns.