

# Hamming Distance-Based Classifier

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## 1. Model Implementation

We implemented a simple 1-nearest neighbor classifier using Hamming distance. The features 'mean\_return' and 'volatility' were discretized into 3 bins. For each test week, we found the closest matching week from the training data using Hamming distance.

## 2. Accuracy

The model achieved an accuracy of 86.67% on the test set (2023–2024). This suggests the distance-based approach was quite reliable in capturing weekly trends.

## 3. Confusion Matrix

Confusion Matrix:  $\begin{bmatrix} 54 & 5 \\ 9 & 37 \end{bmatrix}$

The classifier correctly predicted 54 Red weeks and 37 Green weeks, while making 5 false positives and 9 false negatives.

## 4. True Positive Rate (Sensitivity)

TPR = 80.43%. This shows the model correctly identified most of the Green weeks, which are typically weeks to invest.

## 5. True Negative Rate (Specificity)

TNR = 91.53%. This indicates the classifier was also strong at recognizing Red weeks (non-investment weeks).

## 6. Trading Strategy vs. Buy-and-Hold

Using the predicted labels, a weekly trading strategy was simulated:

- Final Portfolio (Hamming Strategy): \$1297.83
- Final Portfolio (Buy-and-Hold): \$925.86

The Hamming-based strategy significantly outperformed the Buy-and-Hold approach, highlighting its practical utility.

## **7. Conclusion**

Despite its simplicity, the Hamming classifier produced accurate predictions and outperformed a basic Buy-and-Hold strategy. Discretizing continuous financial features and using a nearest neighbor logic proved surprisingly effective.