What I have done:

OOS Technical Analysis

- Using Technical Indicator to generate **Trading Signal** for each stock
- Combing Trading Signal with **ML model**
- Using Trading Signal to **Backtest**
- Write **metrics** and plot **graph** to demonstrate result
- Save metrics as **.csv** and graph as **.png** to output file path

Problem:
the result return is not satisfying for most stock
Can not generate portfolio

Introduction

What is a Portfolio?
A portfolio is a collection of financial assets like stocks, bonds, and commodities held by an investor. The goal of portfolio management is to maximize returns while minimizing risk through diversification and strategic allocation.

What is Backtesting?
Backtesting is the process of testing a trading strategy using historical data to evaluate its performance. This allows researchers and traders to assess how a model would have performed in the past before applying it to real capital.

Technical vs. Fundamental Analysis
Technical Analysis focuses on historical price patterns, volume, and indicators like MACD, RSI, and moving averages to forecast future price movements.
Fundamental Analysis evaluates a company's financials (e.g., revenue, earnings, P/E ratio), management, industry, and macroeconomic conditions to estimate intrinsic value.

Solution:
Add a new module in our Technical Analysis Class:
Design a muti-factor model to generate portfolio

📌 **Multi-Factor Model Expression (Linear Form)**

$$\text{Score}_i = \beta_1 \cdot f_{1i} + \beta_2 \cdot f_{2i} + \cdots + \beta_k \cdot f_{ki} + \epsilon_i$$

- Score_i: Composite score for stock i

- $f_{1i}, f_{2i}, \ldots, f_{ki}$: Factor values for stock i (e.g., momentum, valuation, volatility)

- $\beta_1, \beta_2, \ldots, \beta_k$: Weights assigned to each factor

- ϵ_i: Residual term (unexplained variance)

X - factor choosing:
Fundamental: PE、ROE、EPS...
Technical: MACD、RSI、KDJ
Y - return of a stock

- Using **Cross-sectional Regression** to estimate beta for each factor in each period
For example:
- Using Estimated beta and factor value to give a **score** for each stock
- Long Stocks with **highest 10%** score and Short Stocks with **lowest 10%** score
- Construct Portfolio as above and Backtest
- Compare the result with the Benchmark

Data Source: Yahoo Finance