



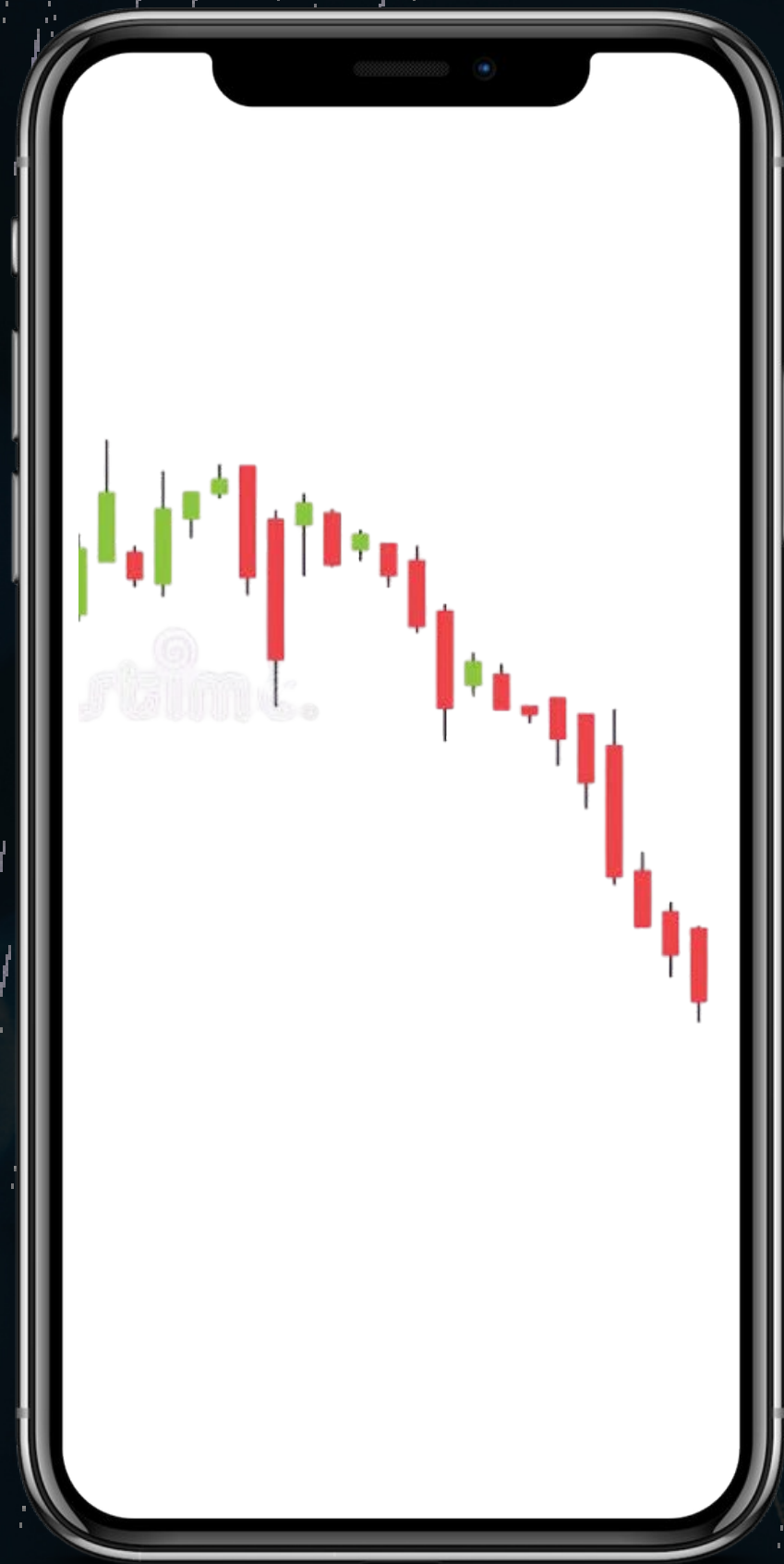
Reinforcement Learning

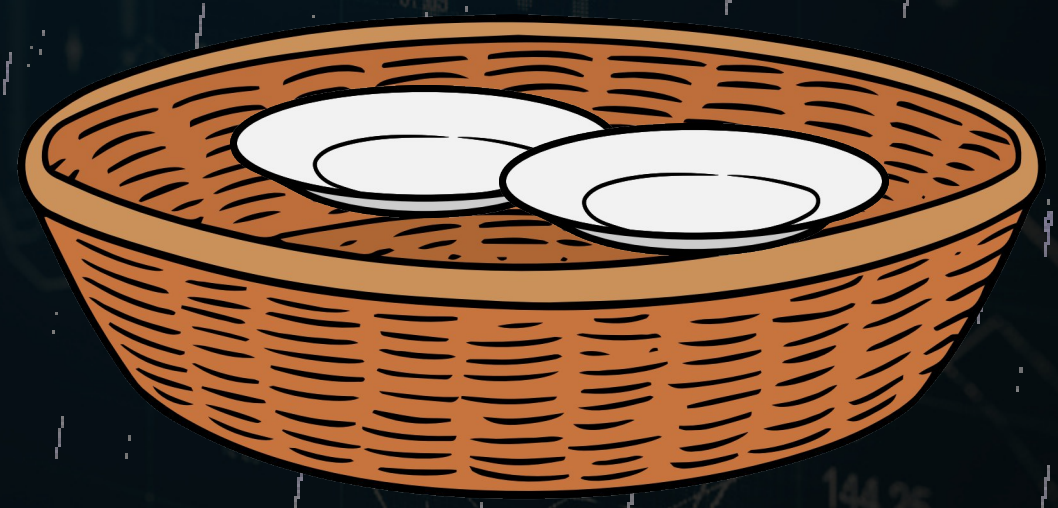
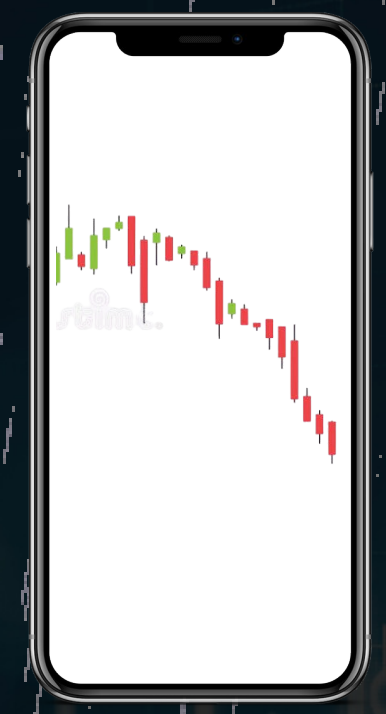
Application in Finance

How to become Elon Musk in 15 minutes.

Presented by **Team 6**



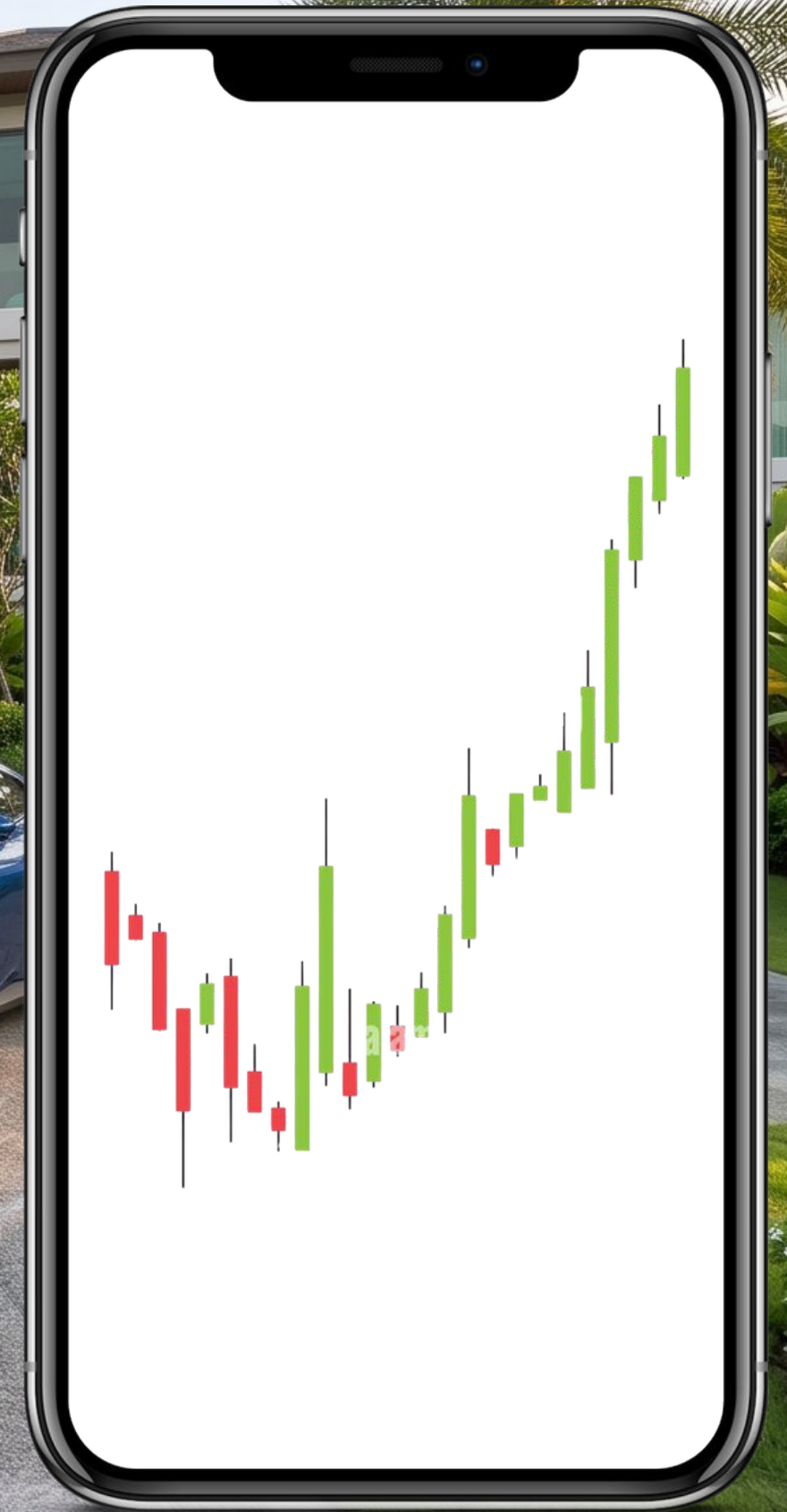






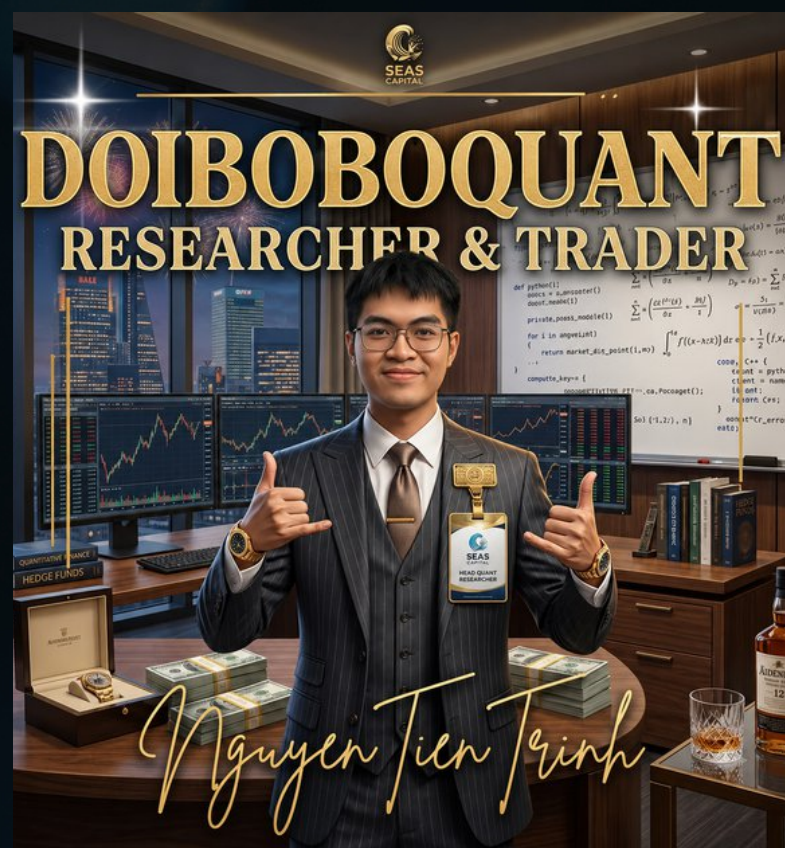
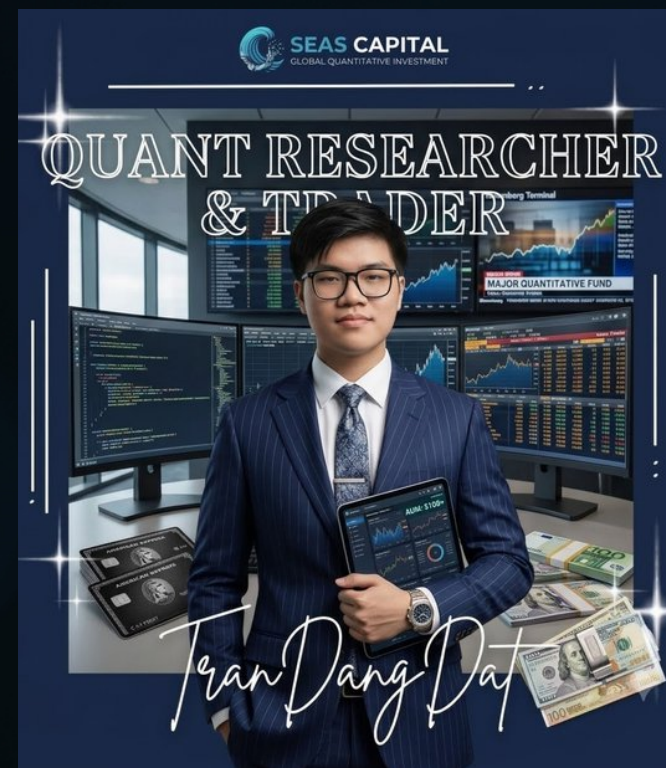
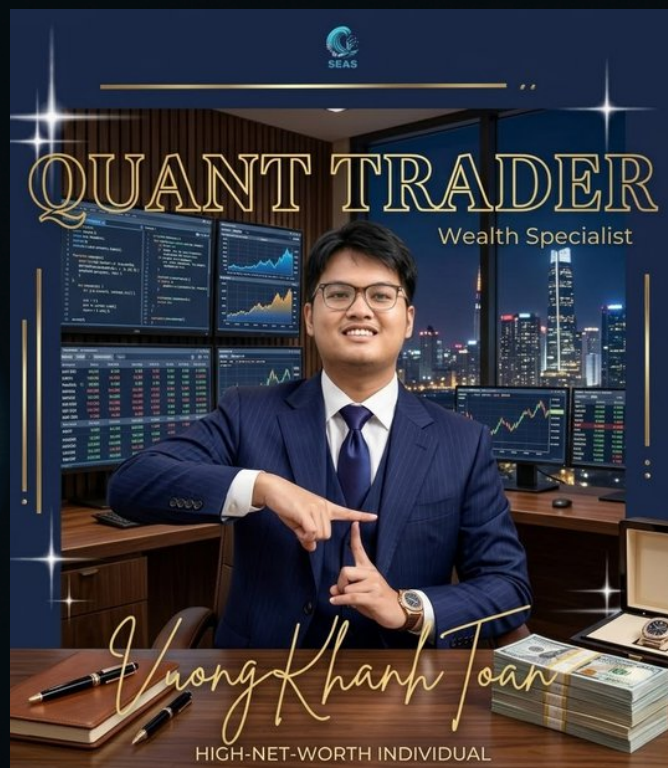
Khủn quá

Đạt tỷ phú





Our Best Team





Advisors



Nguyen Phu Vinh



Do Chau Tuan



Nguyen Vu Anh Ngoc

Outline

01 Introduction

- Reason for choosing the topic
- Goal of the project

03 Conclusion

- Summary the key insight
- Q&A

02 Main content

- Introduce about RL model in asset allocation
- Training and testing pipeline
- Final chart result and key insight
- Testing on real time data





1

Introduction

- Reason for choosing the topic
- Goal of the project





Introduction

Big Picture:

- Current Reality (Big Picture): Financial markets are highly complex, noisy, and non-linear. Traditional forecasting models often only "predict prices" rather than directly providing an "optimal trading strategy."



What is the research gaps?





Introduction

There is a need for a trial-and-error learning approach capable of optimizing long-term decision sequences (e.g., balancing profit and risk) instead of merely focusing on short-term prediction errors.



Main Content

- Introduce about RL model in asset allocation
- Training and testing pipeline
- Final chart result and key insight
- Testing on real time data



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Asset Allocation

Definition

Distributing capital across multiple assets to maximize returns while minimizing risk.

Objectives

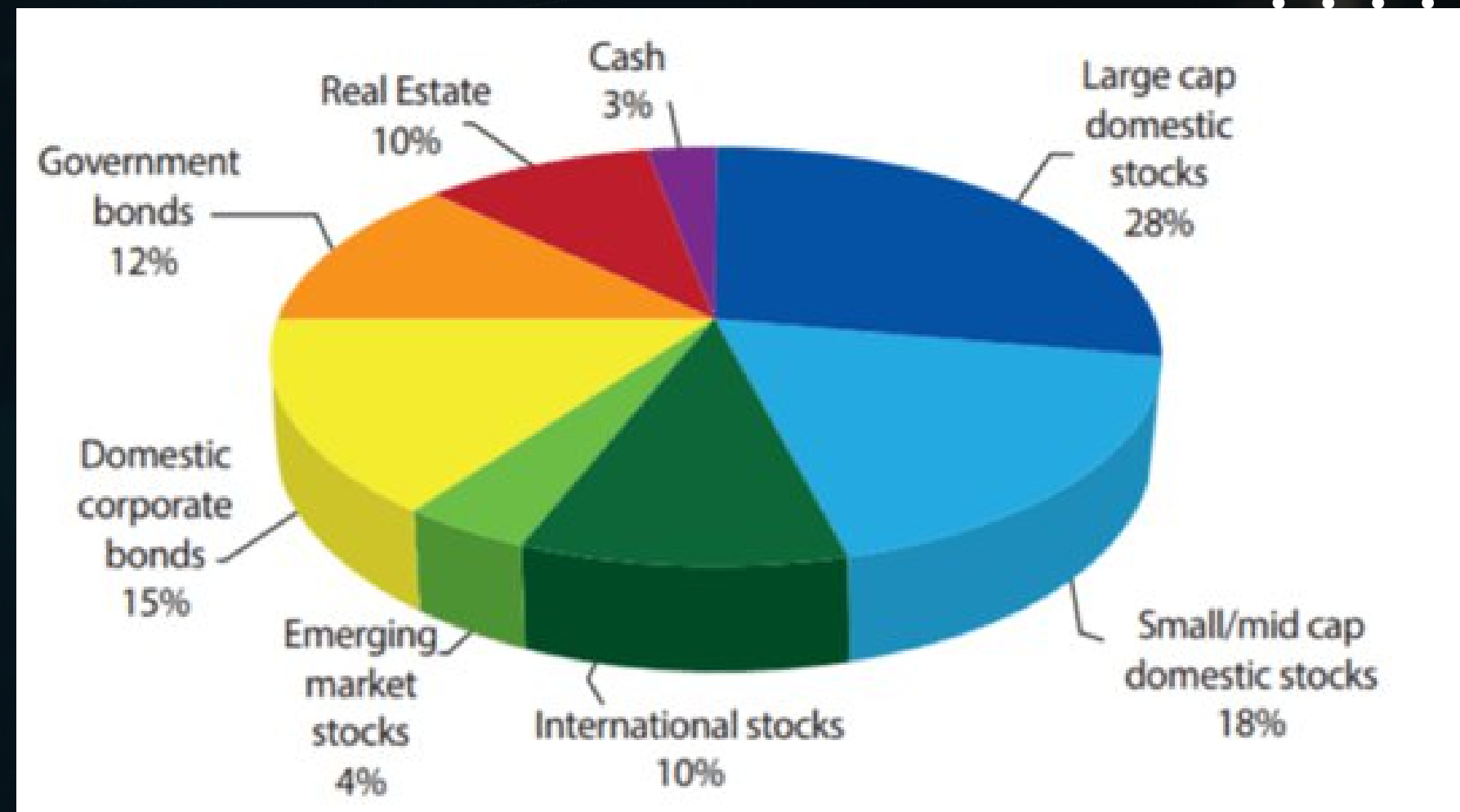
Maximize expected return

Reduce risk through diversification

Balance risk and reward

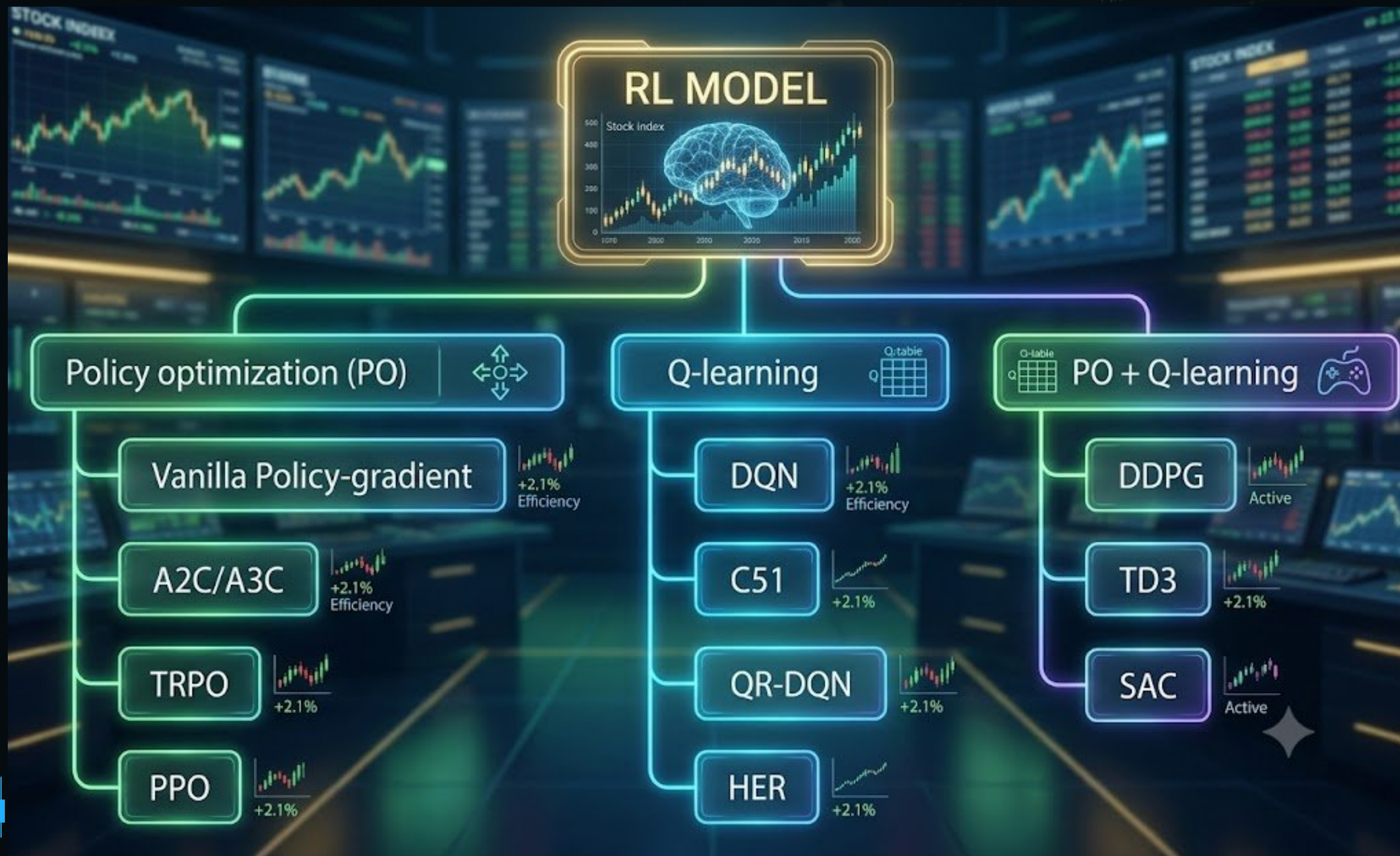
In our project

The agent learns how much capital to allocate to each stock (or cash), rather than only making Buy / Sell / Hold decisions.

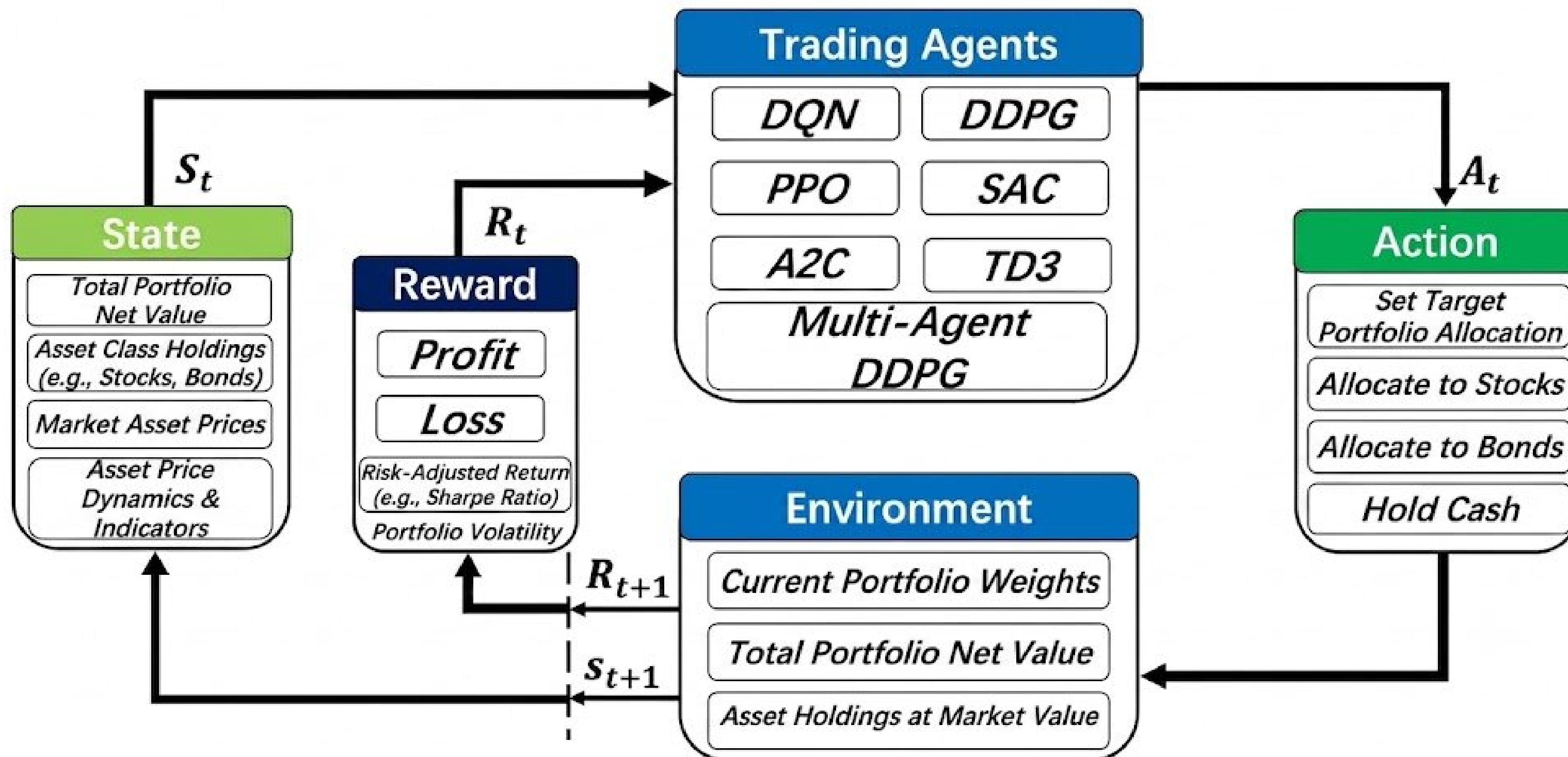




Model Category

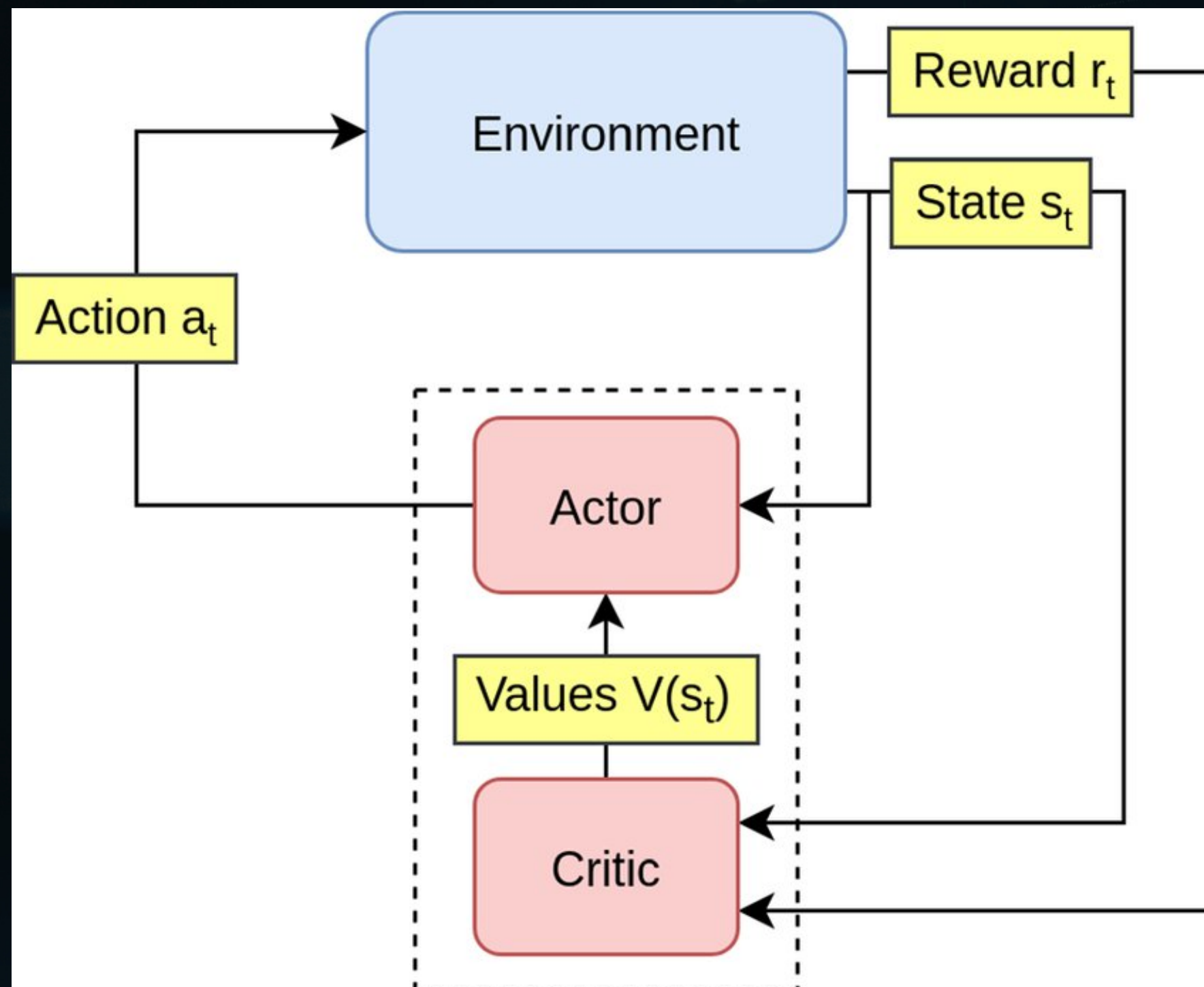


The general pipeline of RL





Actor Critic Based



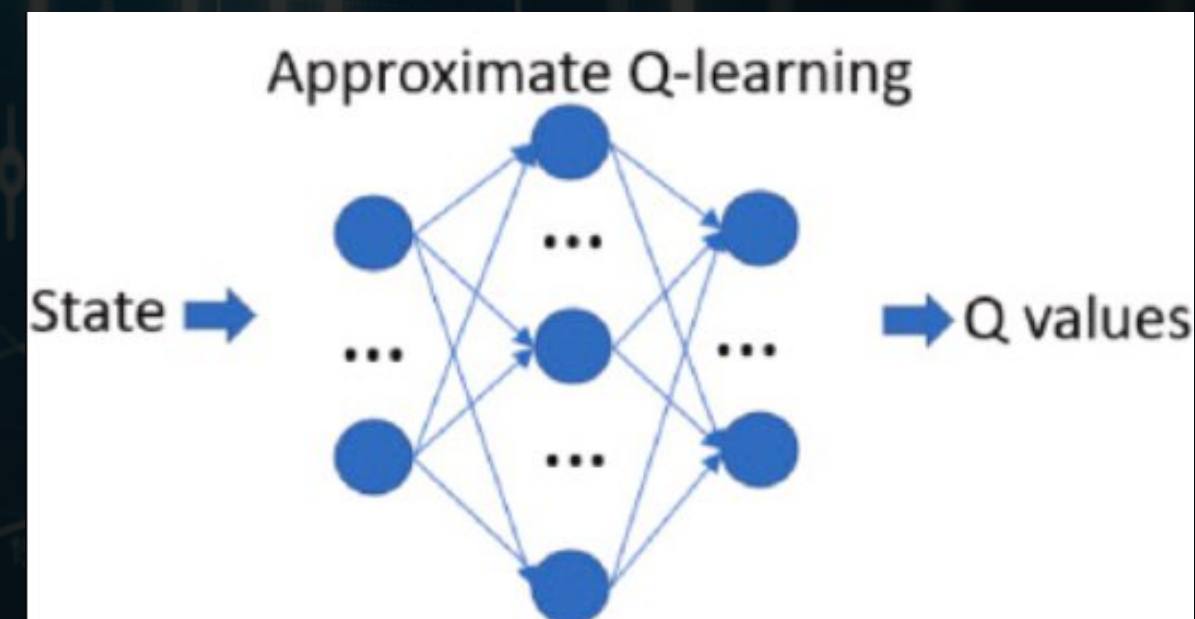
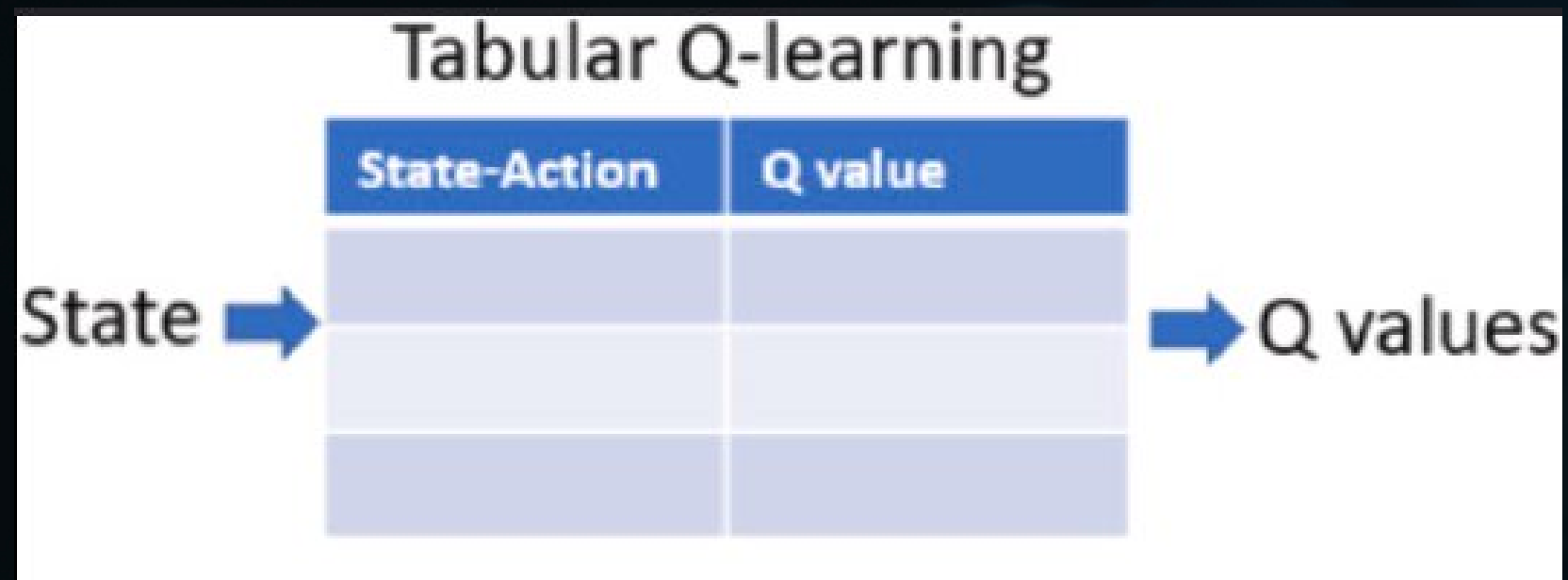


Q learning and DQN

Q - value function

$$\underbrace{Q(S_t, A_t)}_{\text{New Q-value estimation}} \leftarrow \underbrace{Q(S_t, A_t)}_{\text{Former Q-value estimation}} + \underbrace{\alpha}_{\text{Learning Rate}} [\underbrace{R_{t+1}}_{\text{Immediate Reward}} + \underbrace{\gamma \max_a Q(S_{t+1}, a)}_{\text{Discounted Estimate optimal Q-value of next state}} - \underbrace{Q(S_t, A_t)}_{\text{Former Q-value estimation}}]$$

Tabular Q learning and DQN



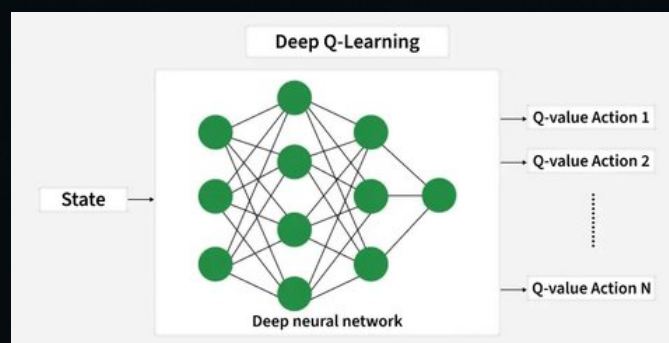


Upgraded Deep Q-network

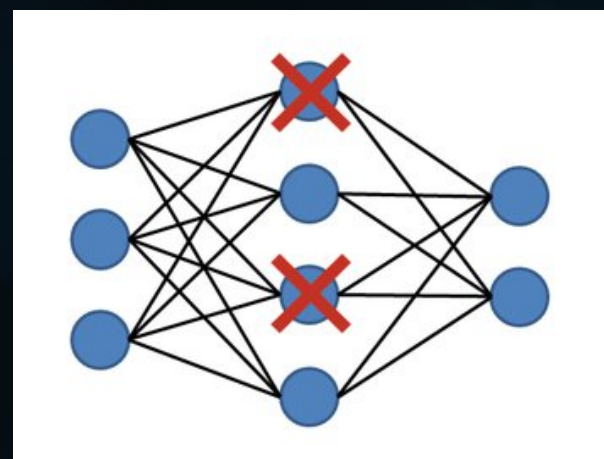


Components

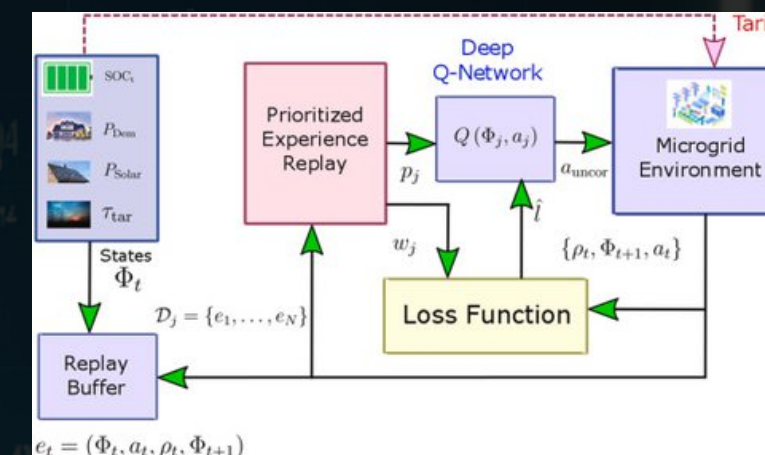
DQN



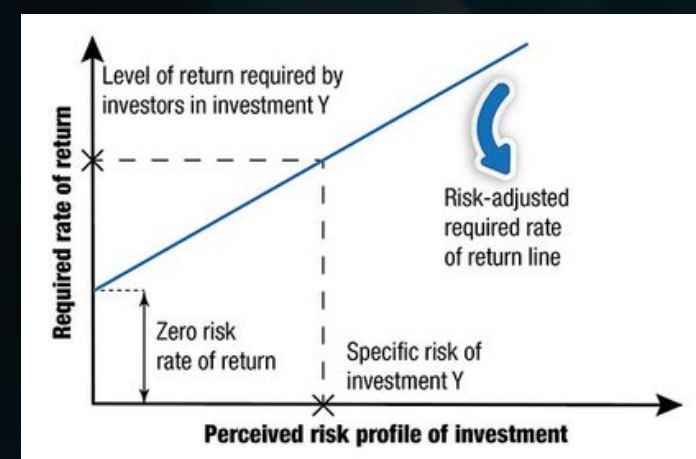
Dropout



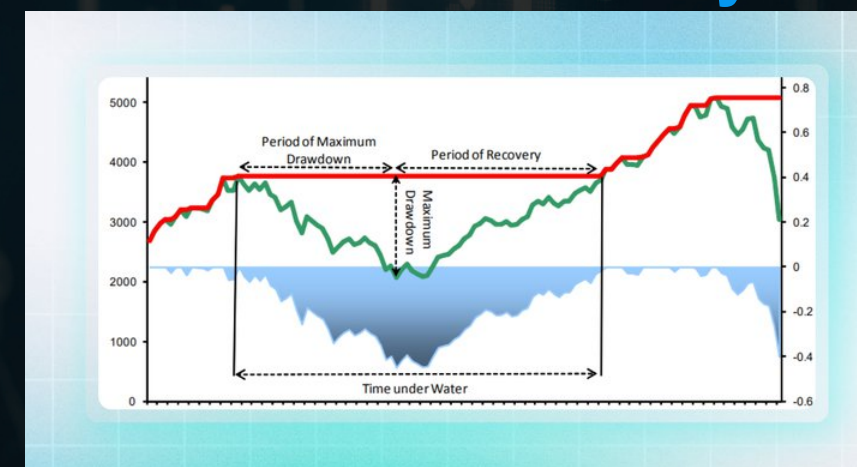
PER



Risk-Adjusted Return



Drawdown Penalty





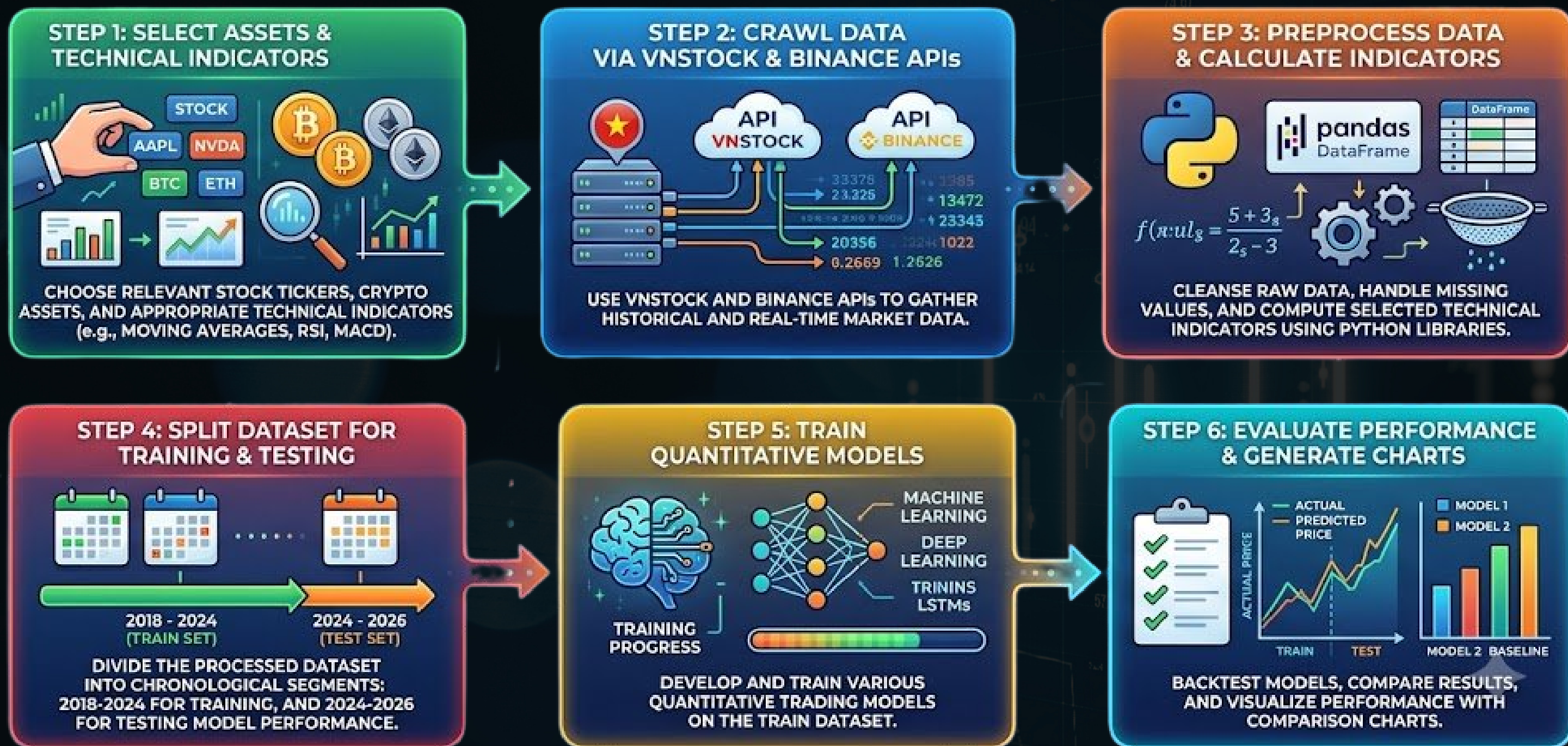
Cash and No Cash

Implement cash mode by treating it as an asset class with appropriate technical indicators.





Training pipeline





Dataset

FPT
Tech



HPG
Steel



VCB
Bank



BTC
Crypto



Portfolio

VNM
Milk



ETH
Crypto



VIC
Retail



PLX
Energy





Crawl and Preprocessing Data



**Crawl OHLCV data through
VNSTOCK, BINANCE API**



Technical Indicator

Trend: SMA_20, EMA_20, ADX, MACD, etc

Momentum: RSI,CCI,ROC

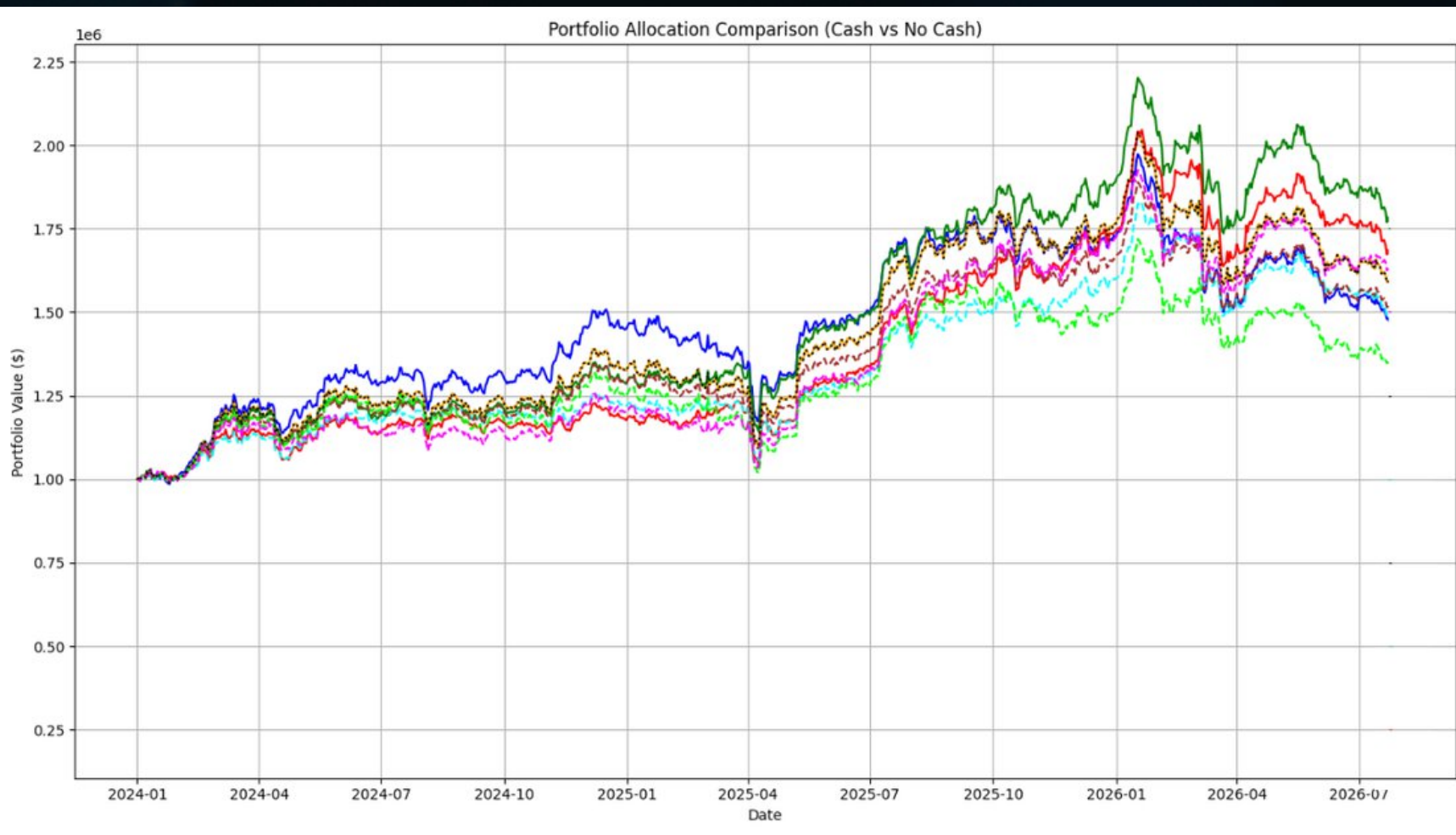
Volatility: ATR, Volatility, BBU,BBM, BBL

Volume: OBV, VWAP, MFI

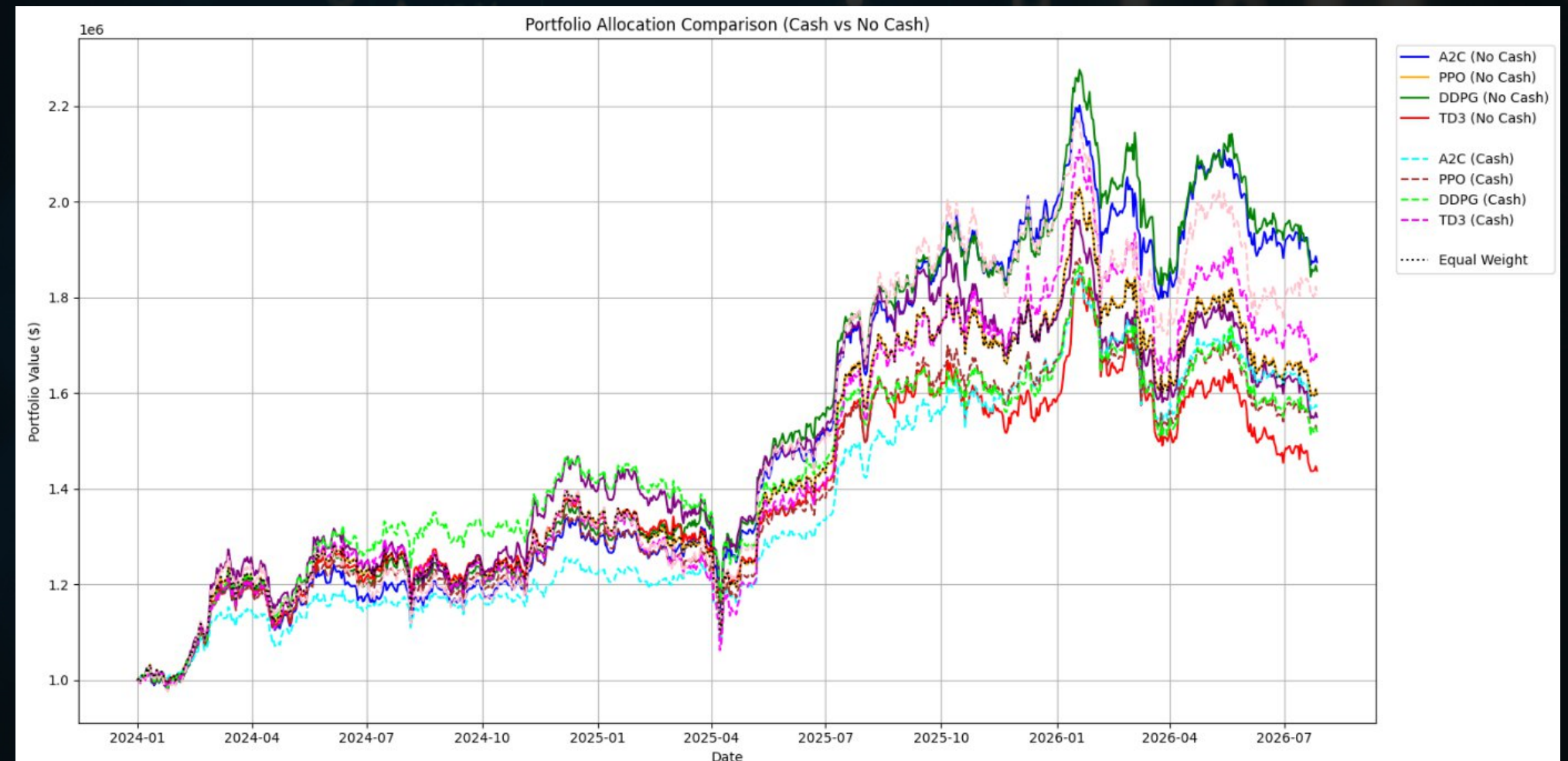


Benchmark

5 tech indicator



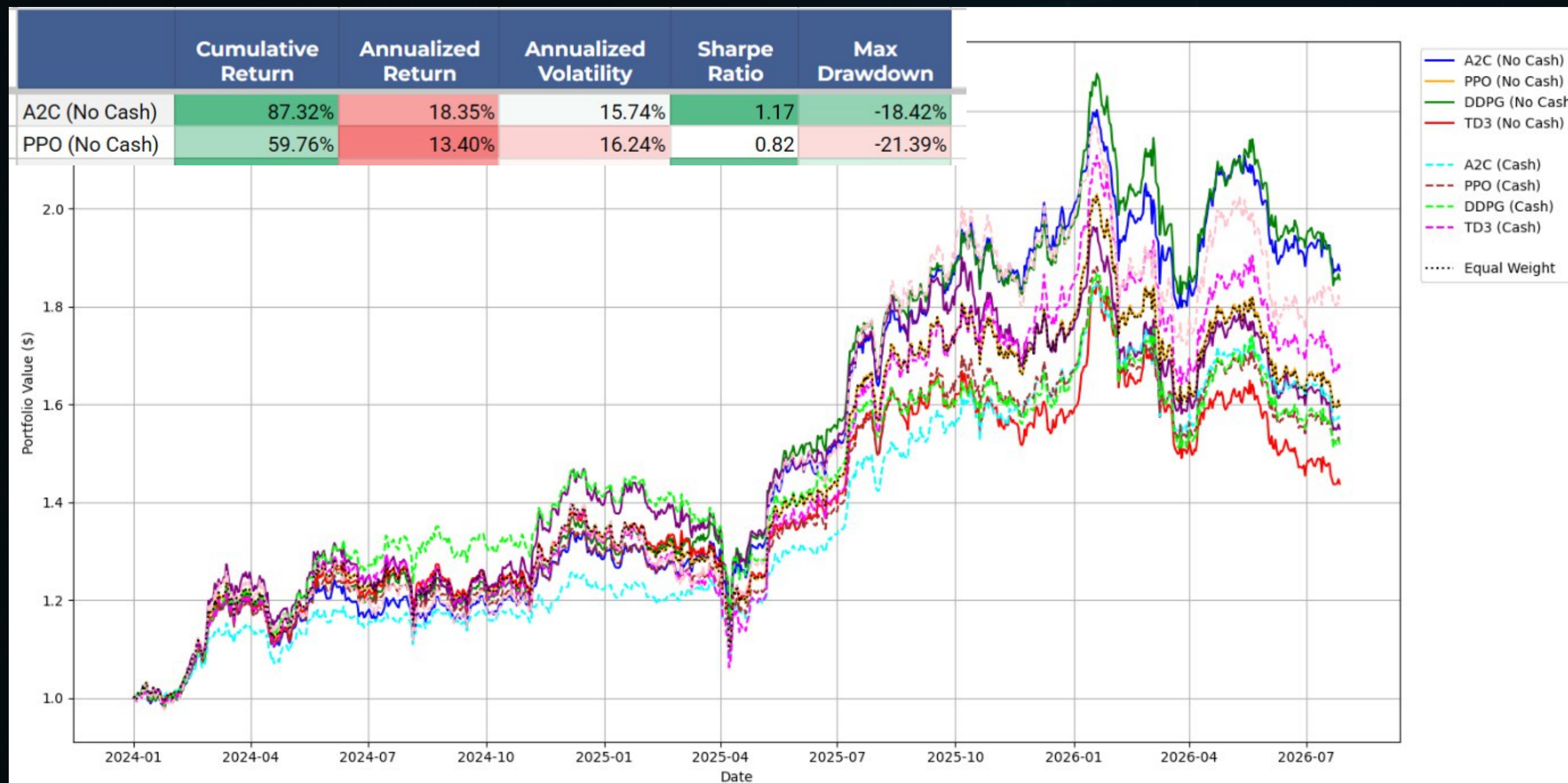
17 tech indicator





Benchmark

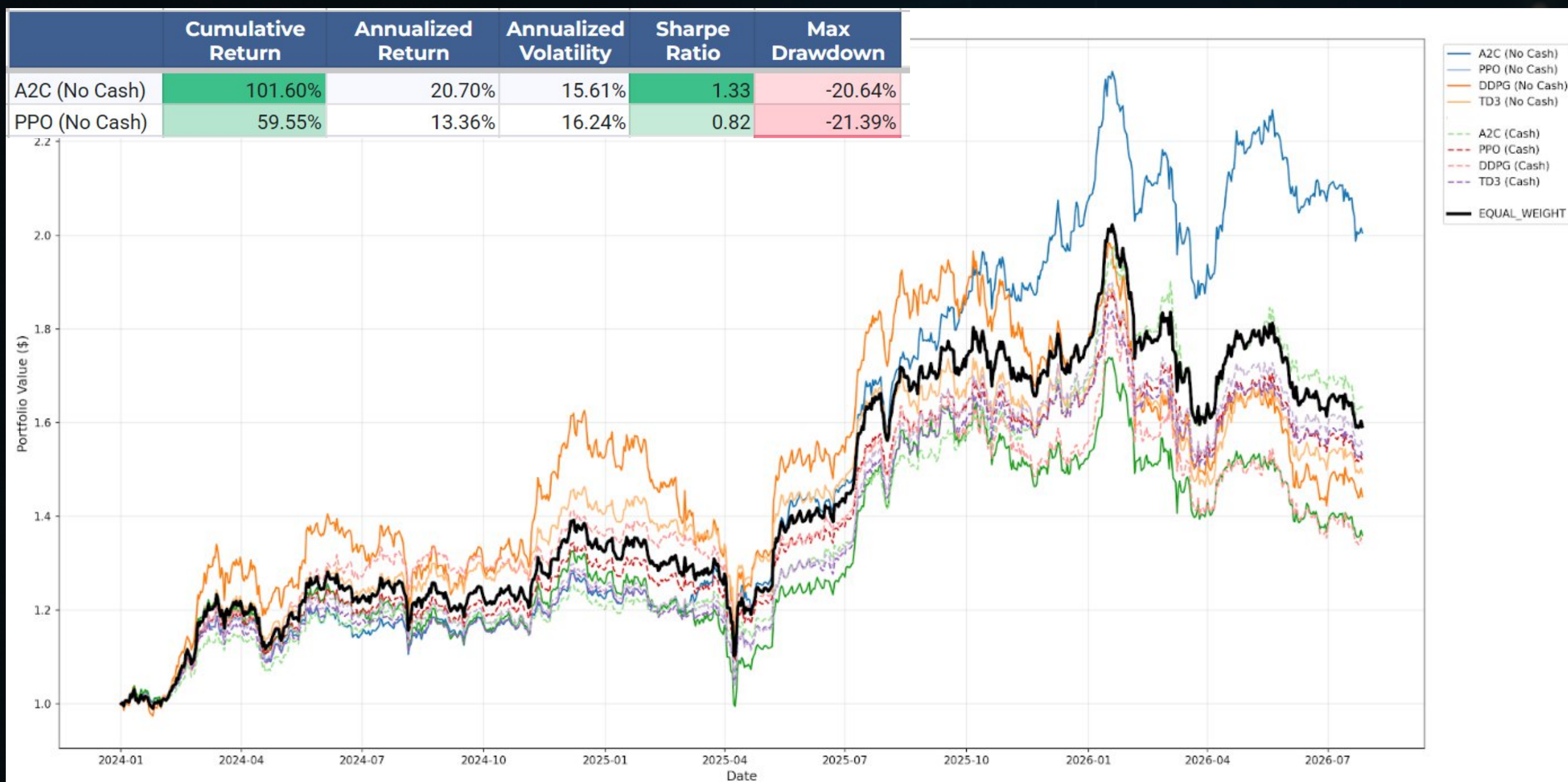
FEW STEP (PPO,A2C, DDPG, TD3 with 17 technical indicator)





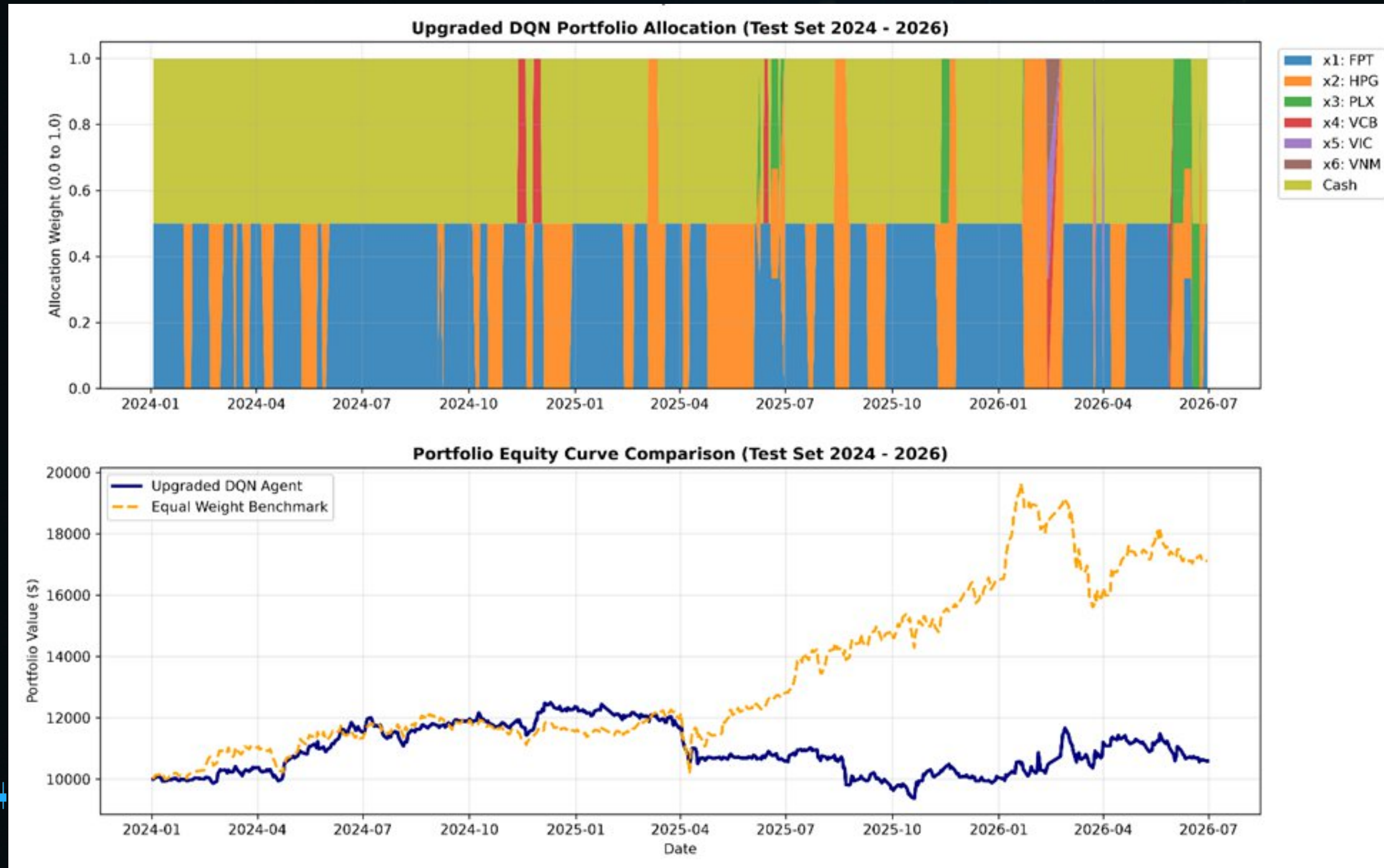
Benchmark

MORE STEP TRAINING (PPO,A2C, DDPG, TD3 with 17 technical indicator)



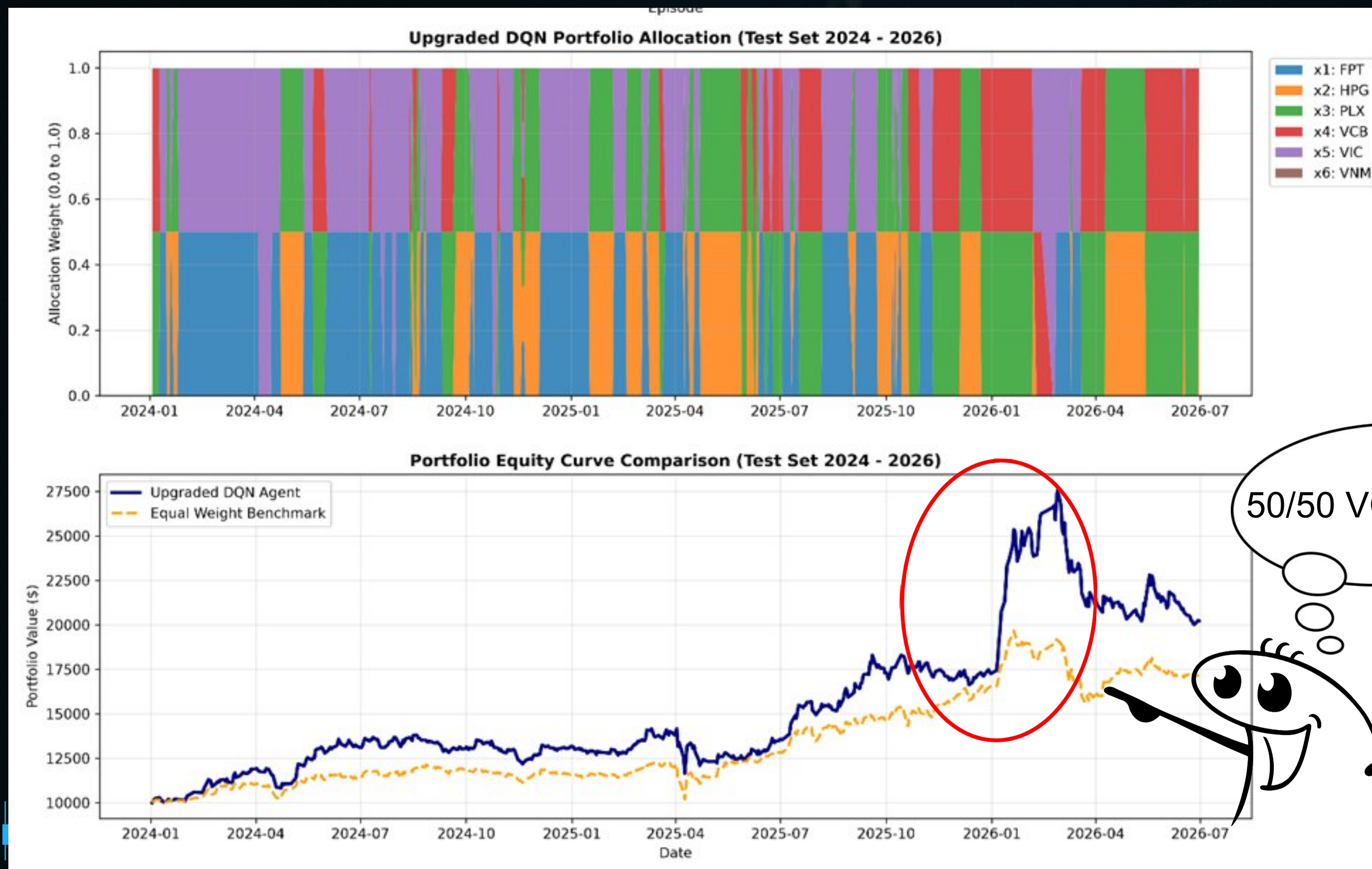


Upgraded Deep Q-network



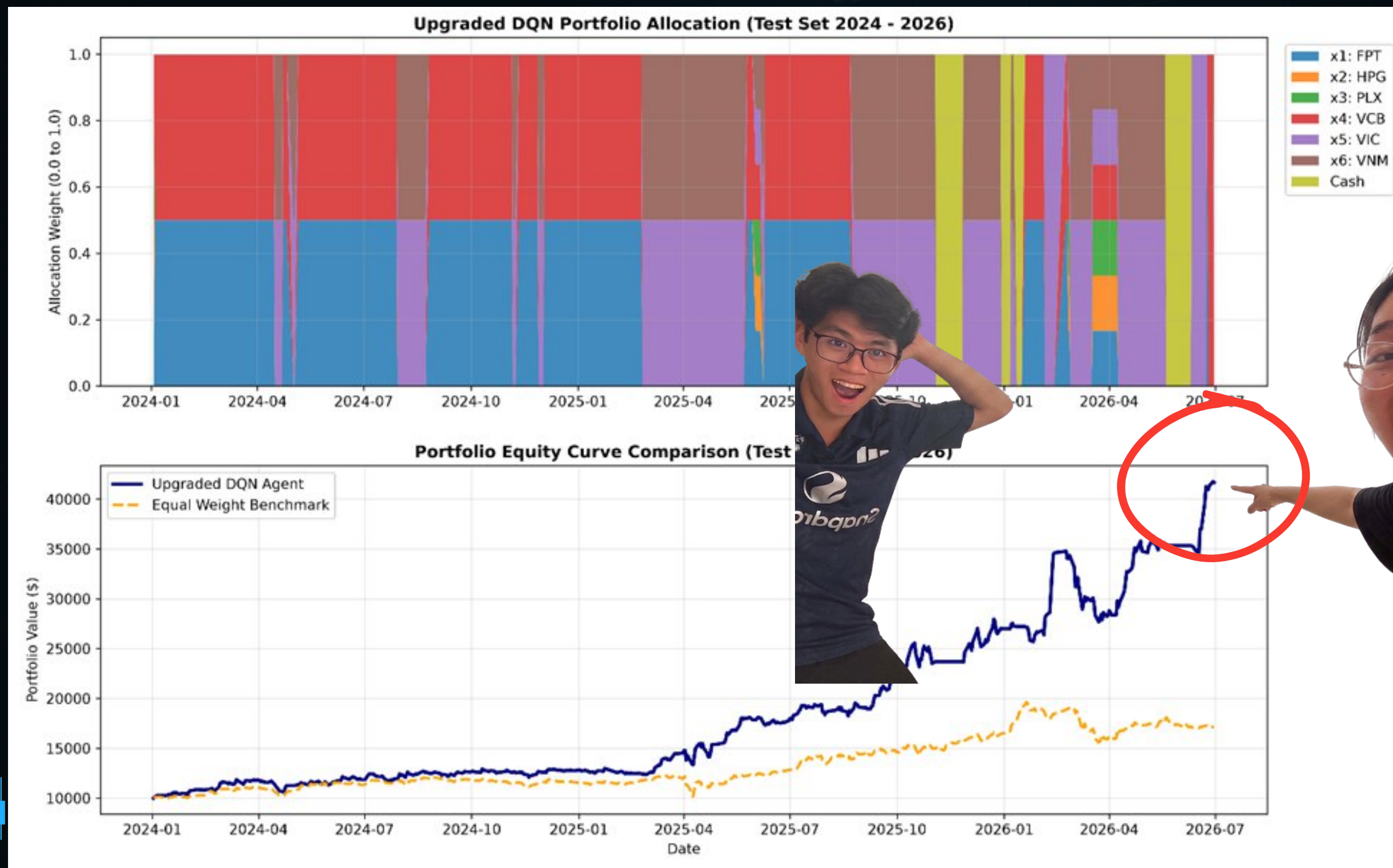


Upgraded Deep Q-network





Upgraded Deep Q-network

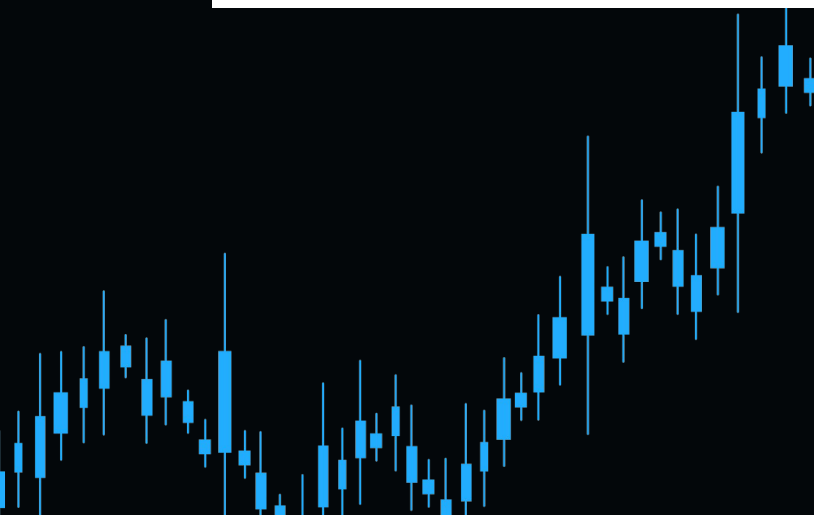
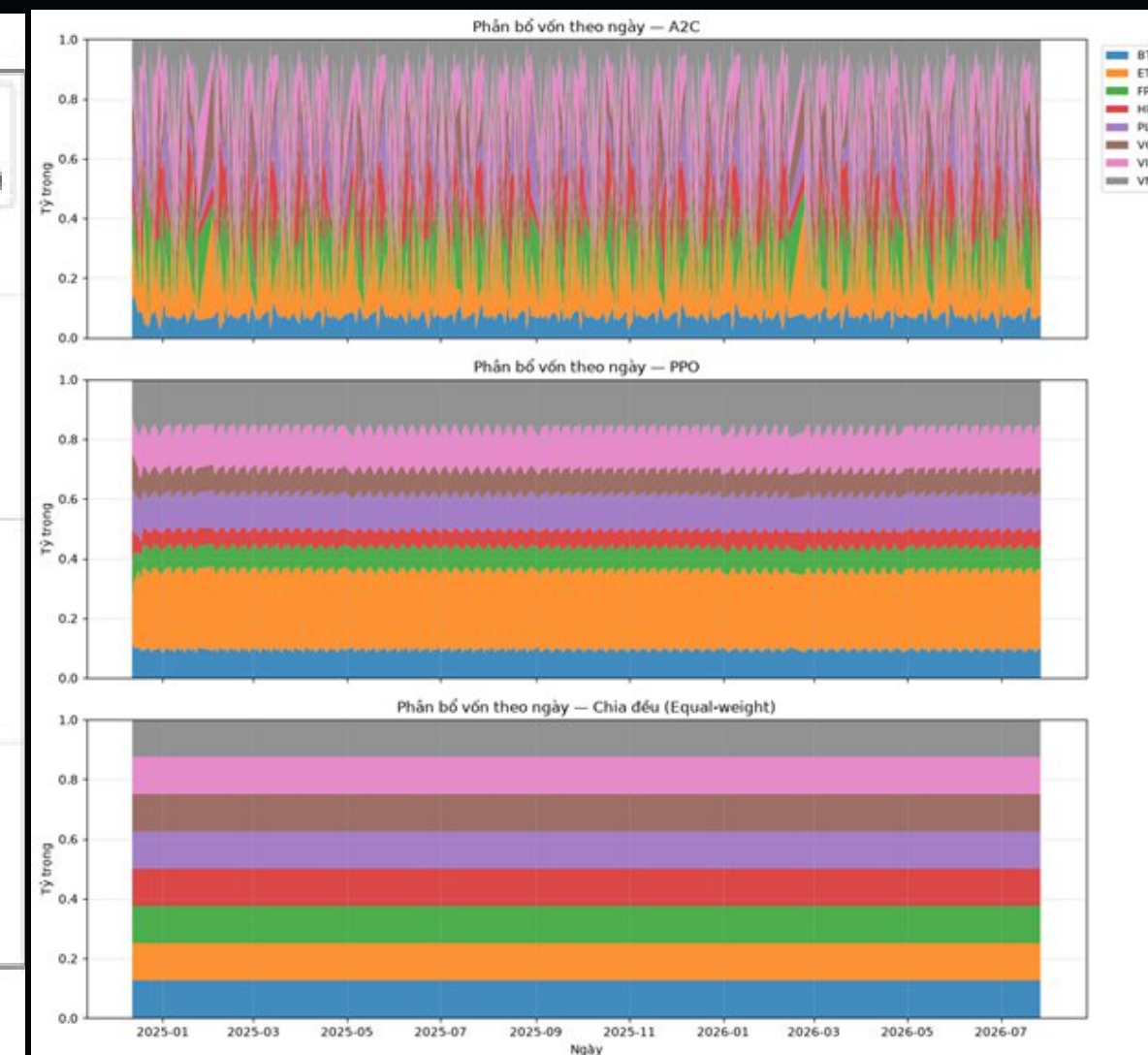
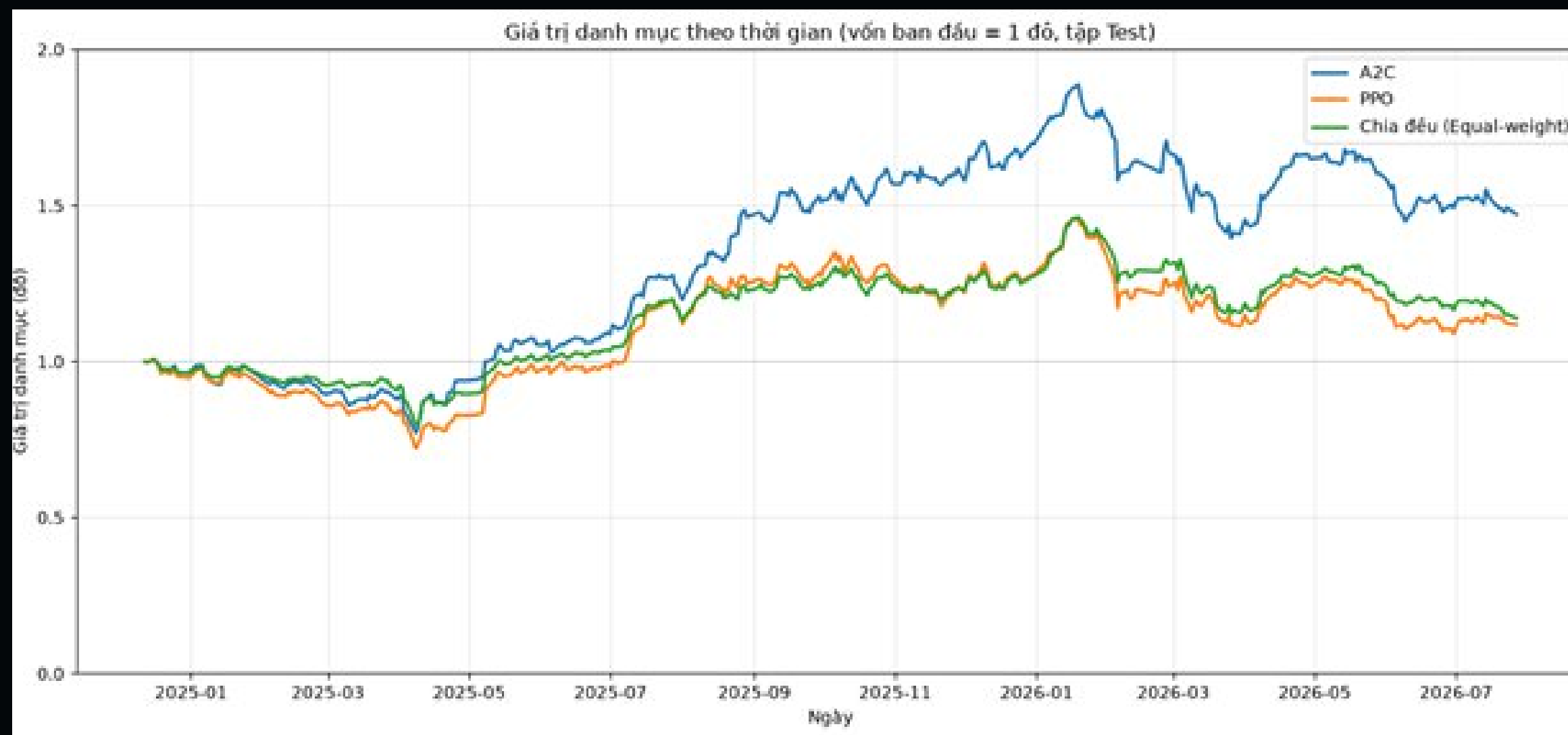


Attack and Defense



Benchmark

A2C and PPO training compared to equal weights





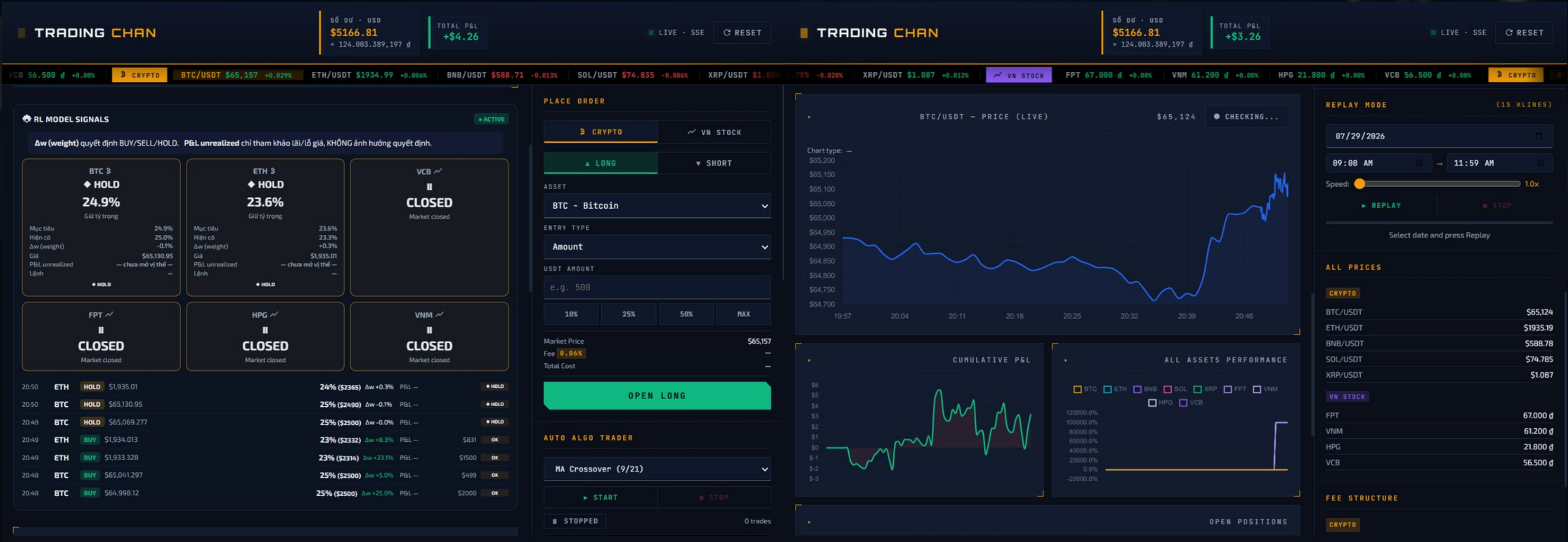
Benchmark

A2C and PPO training after updated entropy compared to equal weights





Prototype in real-time data





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Conclusion

- Summary the key insight
- Q&A





Summary

Insight 1: Reinforcement Learning could do asset allocation more efficiently than other methods like Equal Weights or Humans.

Insight 2: When markets experience significant impacts, individual models are still affected to some extent.

Insight 3: Surprisingly, models with a more aggressive playstyle receive more profit overall.



QnA

Me investing in a stock

That stock next day :



