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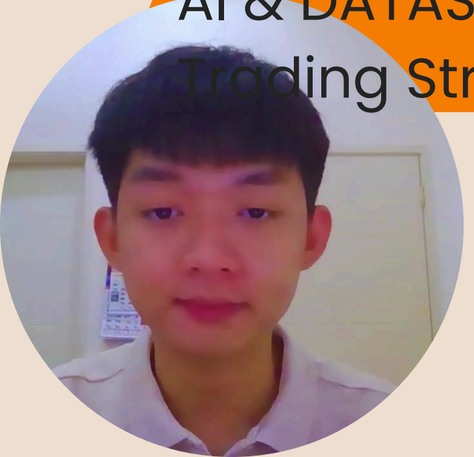
VHACK 2025

TEAM FISHING

AI & DATASCIENCE Case Study 1: Self-Learning Trading Strategies



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Team Member Introduction

Tan Jun Cheng

Goey Chew Hong

Lim Cong Sheng

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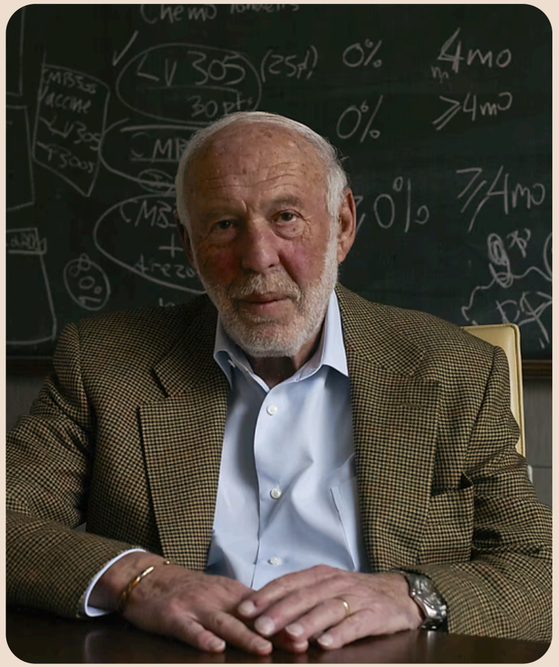
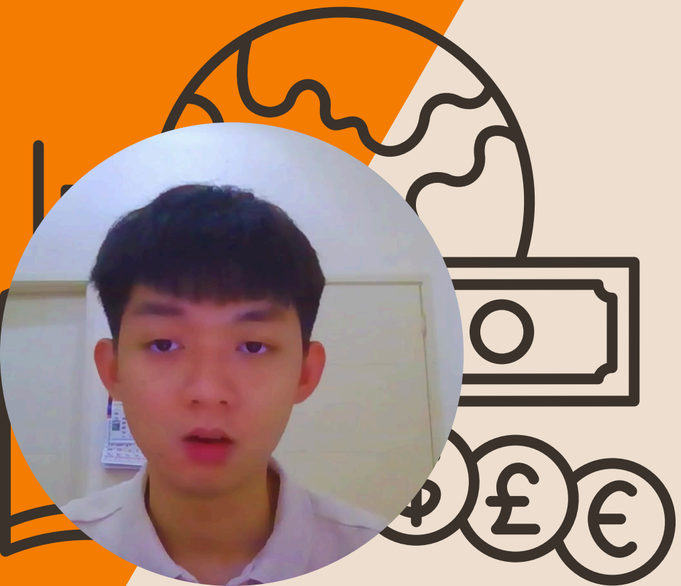
Chosen Case Study and Reason(s)

AI & DATASCIENCE Case Study 1: Self-Learning Trading Strategies

Warren Buffett
Fundamental analysis
Average annual return: ~20%



Jim Simons
Quantitative analysis
Average annual return: ~66%



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Proposed Solution

Systematic CTA Strategy

On-Chain Leading Factors

Machine Learning Based Model

Mathematical Approach

Implement Through Code, Cloud and API

Emotionless Execution

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On-Chain Factors

closed price - raw, std 6, std 24

taker buyer sell ratio -
raw, sma 6, sma 24

coinbase premium index -
raw, 6hours lag, 24hours lag

inflow, outflow & netflow

exchange whale ratio

Coin: Bitcoin

Time Frame: 1 Hour

Exchange: Data based on Binance

Period: 02-01-2022 ➔ 24-03-2025

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Data Preprocessing & Feature Engineering

- **Train-test split model**
- **Train split**: 02-01-2022
  → 20-03-2024 (2 year **~70%**)
- **Test split**: 25-03-2024 → 25-03-2025 (1 year **~30%**)
- **Standard Scale**r applied
- **Volatility-aware signal generation** (Filters based on standard deviation of price)
- **3-class signal labeling**:

→ **Long (Buy)**: If future return > +4.5% and volatility is low.

→ **Short (Sell)**: If future return < -5% and volatility is low.

→ **Neutral (Hold)**: If volatility is high.

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Machine Learning Models

- **Hidden Markov Model (HMM)**: Used for regime detection (identifies market conditions).
- **Convolutional Neural Network (CNN)**: Used for classification of trading signals (long, short, neutral).
- **Random Forest Classifier**: Used for feature importance analysis.
- **Principal Component Analysis (PCA)**: Used for dimensionality reduction.
- **K-Means Clustering**: Used for optimal cluster selection (elbow method).

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Entry & Exit Logic

Entry:

- HMM detects the current market regime.
- CNN predicts whether to go long, short, or neutral based on the last 32 timesteps.

Exit:

- Profit target of +4.5% (Take Profit - TP).
- Stop loss of -5% (Stop Loss - SL).
- If market conditions shift (regime changes), exit early.

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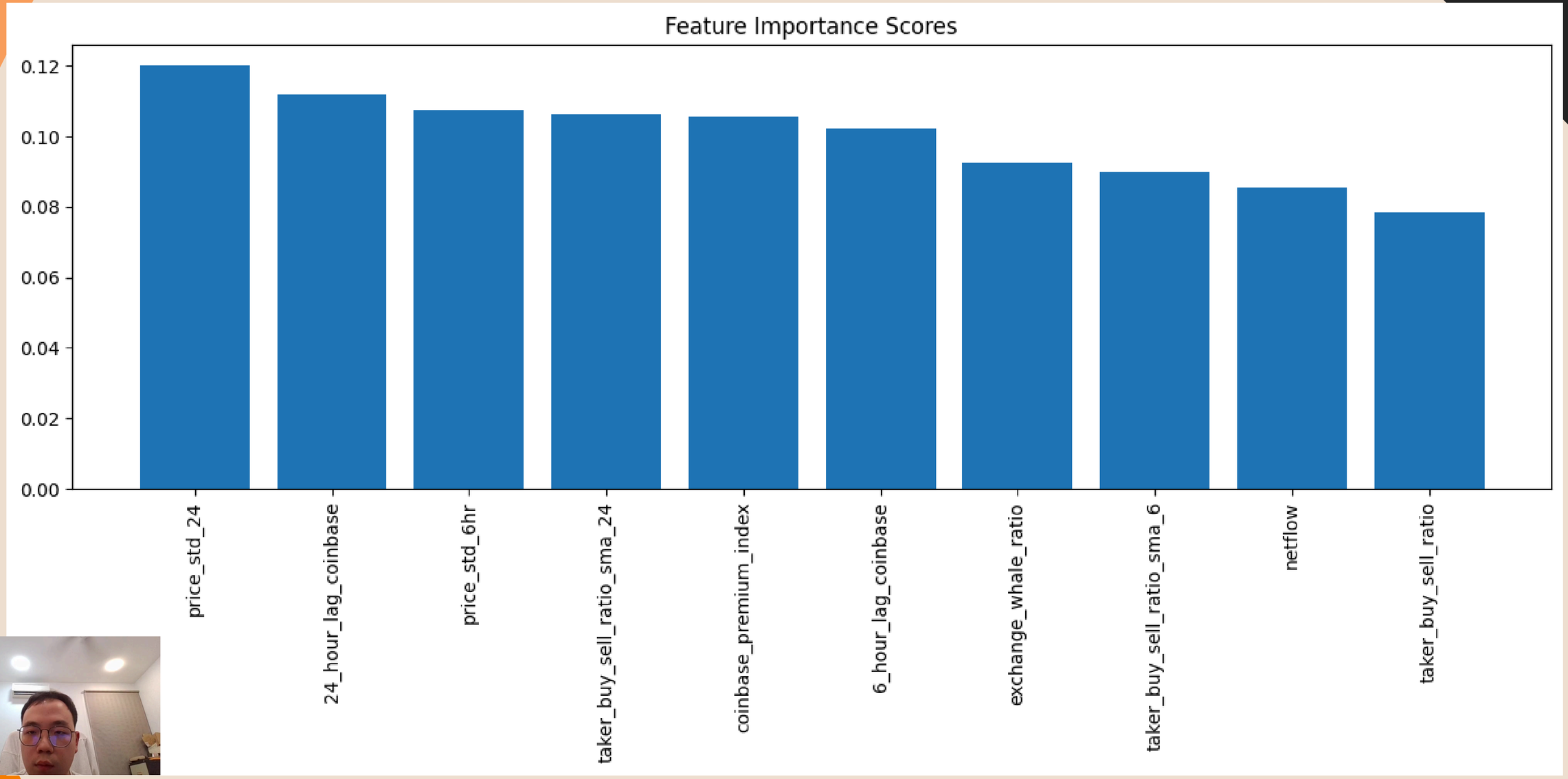
Feature Importance Scores



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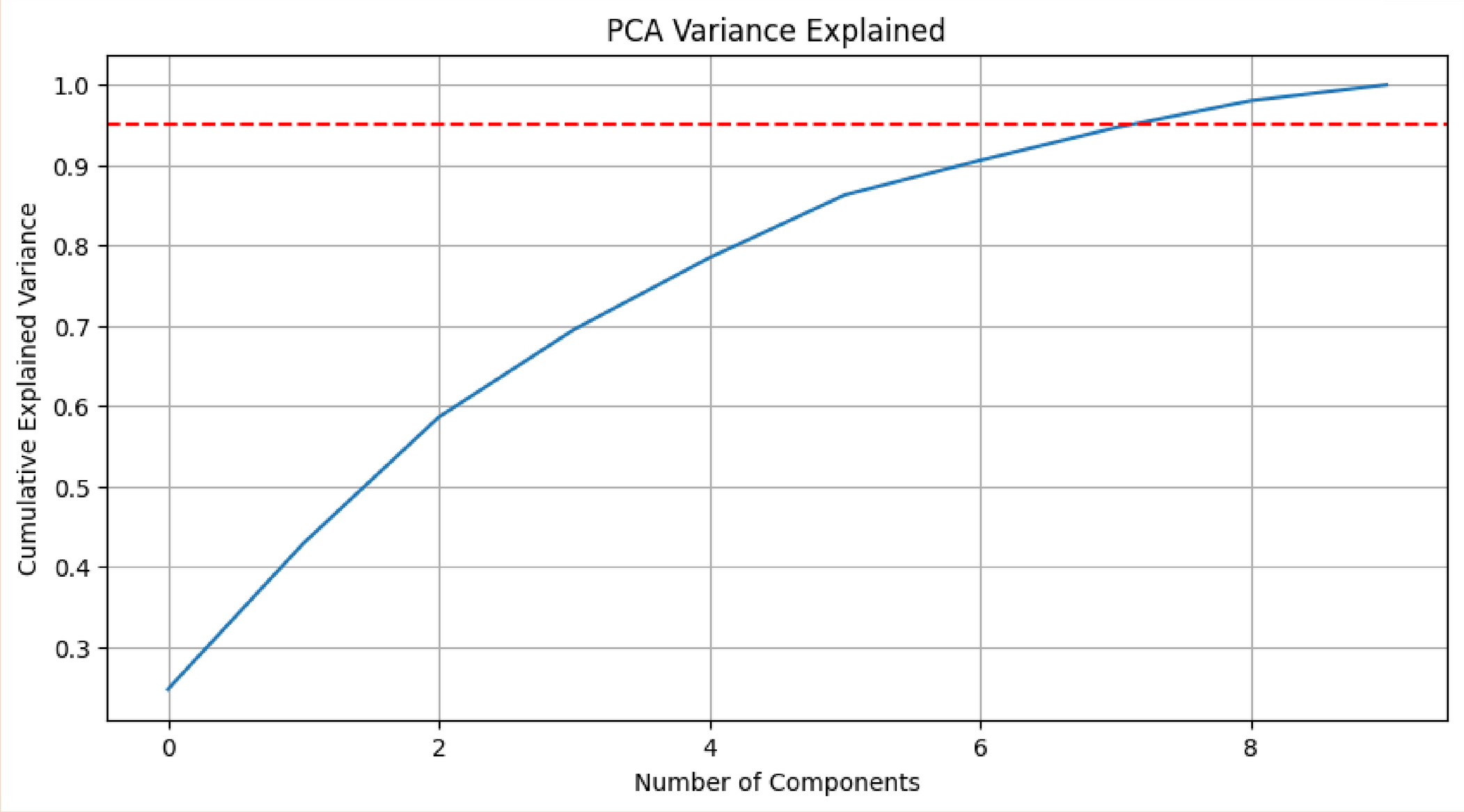
Principal Component Analysis



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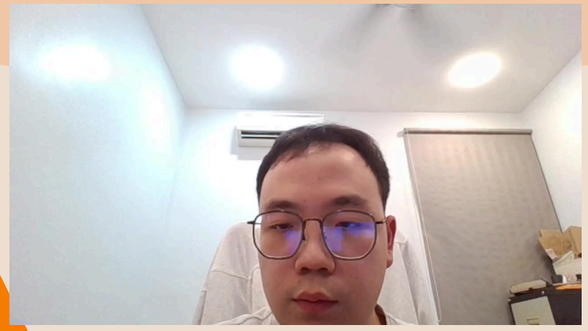
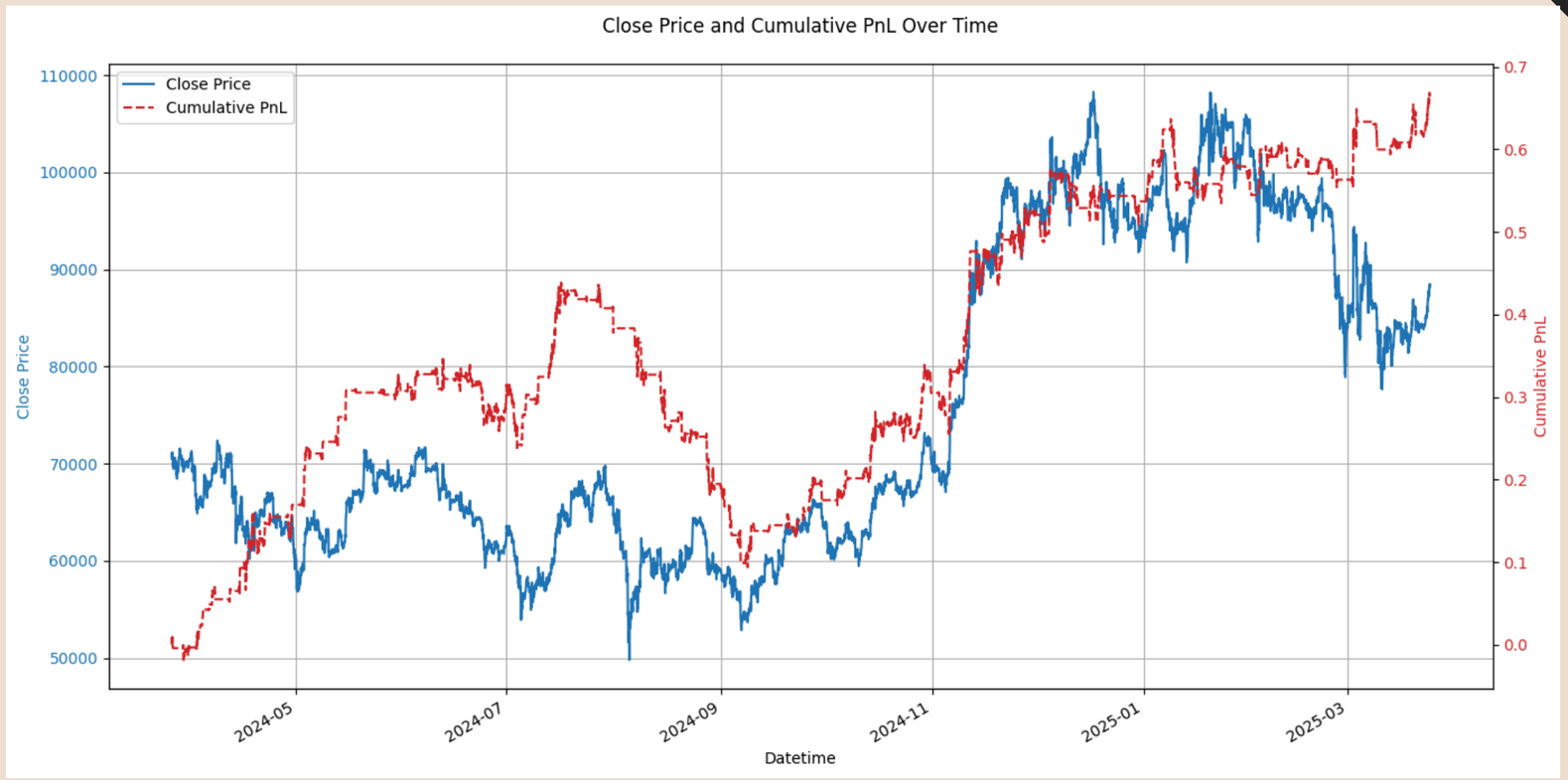
Performance Metrics & Equity Curve - Forward Test

Annualized Sharpe Ratio: 2.21
Max Drawdown (MDD): -34.4%
Trade Counts: 416.0
Annual Return: 67.2%
Calmar Ratio: 2.08
Trading Fees: 0.06%
Period: 25-03-2024 → 25-03-2025





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Business Model

Alpha's Performance Metrics

- Sharpe Ratio
- Annualized Average Return
- Max Drawdown (MDD)
- Calmar Ratio

Quant Firm

Subscription Based Model Investment

- Lower initial investment with monthly Dollar-Cost Averaging (DCA)
- Example: Reduce initial investment from 800k→ 500k, then 30k/month for a year
- Investors Benefits: Lower entry barrier for investing, Suitable for high-salaried professionals with limited initial capital, Reduces stress from market drawdowns
- Firm Upside: Steady and predictable recurring revenue which increase AUM overtime

Quant Strategist

Investors

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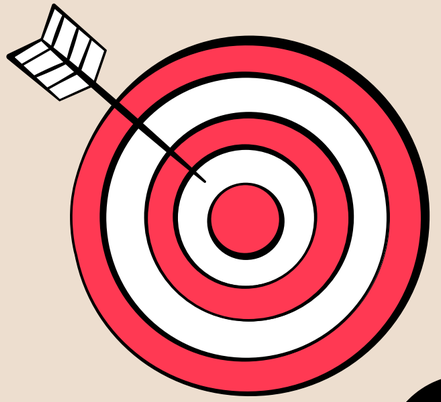
Market Segment

High-Net-Worth Individuals (HNWIs)

Private Investors



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High-Net-Worth Individuals (HNWIs)

Executive

Business Owner

Professionals

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Private Investor

Tech Entrepreneur

Angel Investor

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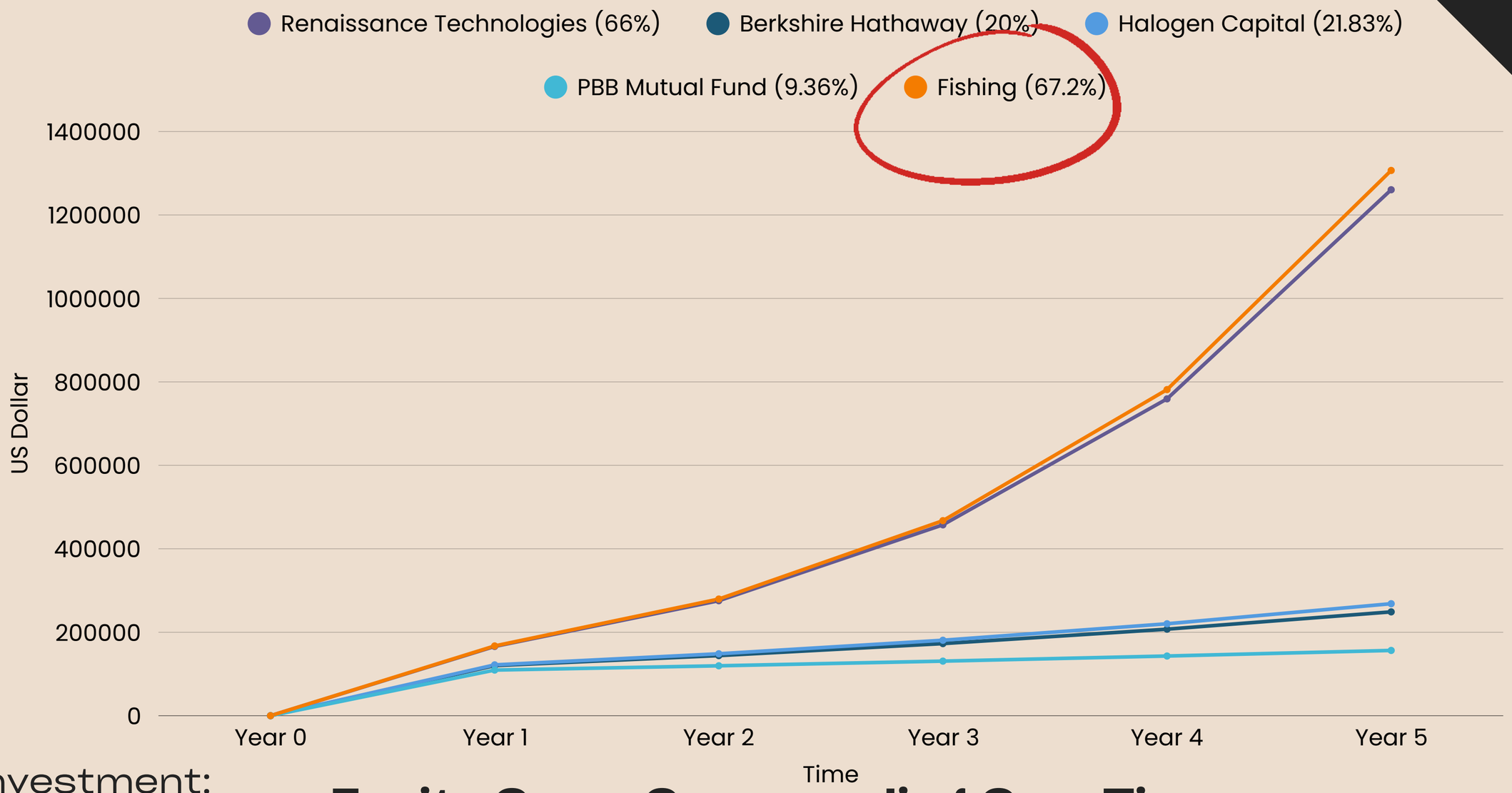
Competitor Analysis



Initial Investment:
100,000 USD

Equity Curve Compounding Over Time

Room for Future Improvement

- Fine-tuning CNN architecture for better accuracy.
- Explore other factors or machine learning model to achieve better performance.
- Develop more robust backtesting and forwardtesting model.