Portfolio Optimization

Reinforcement Learning using Q-Learning

Aditya Masurkar

Sachin Haldavanekar

Topic	Description
Problem	• Given a Stock Portfolio consisting of 5 chosen stocks from NASDAQ. • Optimize the value of the portfolio, explore over 4 years of data and exploit for one year.
Method	• Reinforcement Learning using Q-Learning. • Used clever approximations to limit action-state space in a natively infinite action space horizon.
Evaluation	• The do-nothing benchmark. • Allocates equal value to each stock and then does nothing till the end. • Compare the final values.

Topic	Description
Why Portfolio Optimization	• Portfolio optimization is an interesting and unique problem in AI which is approached by various AI methods like Supervised Learning, Linear Regression etc. • It is rarely approached by q-learning since it has an infinite state space. • Reinforcement learning balances exploration and exploitation unlike supervised learning, thus works better in the long term.
Dataset	• Mined and analyzed day-to-day stock prices of 100 stocks from NASDAQ for a period of 5 years.
Challenges	• Formulating the problem as a MDP. • Representing the states and actions in a meaningful way • Deciding on optimal value for constants like α and γ for Q learning.