

Optimization Problems

Basic Idea of Project

- Solve and code two optimization problems: the Traveling Salesman Problem (TSP), and the Portfolio Investment Problem (PIP)
- TSP: Find the shortest route such that you visit every city and return to the original city.
- PIP: Create a stock portfolio such that you maximize a given expected return while also being constrained by a maximum portfolio value and minimum Sharpe Ratio (risk tolerance) value.

Methods of Solving the Problems

- The main goal of these problems was to use Genetic Algorithms / Programming for the solution.
- The main idea of Genetic Programming is to create a bunch of possible solutions by first selecting a best percentage of the previous solutions, and then mixing two solutions together (crossover) or changing a single solution (mutation).
- This is basically a natural evolution of the solutions by defining which solutions are generally best at each step. The evolution of the solutions automatically solves for the best parameters for each variable over time.

Skills Learned

- Defining cost functions and solving for them under certain constraints / initial conditions.
- Genetic Programming
- Class based programming in Python
- Evolution based (unsupervised) learning