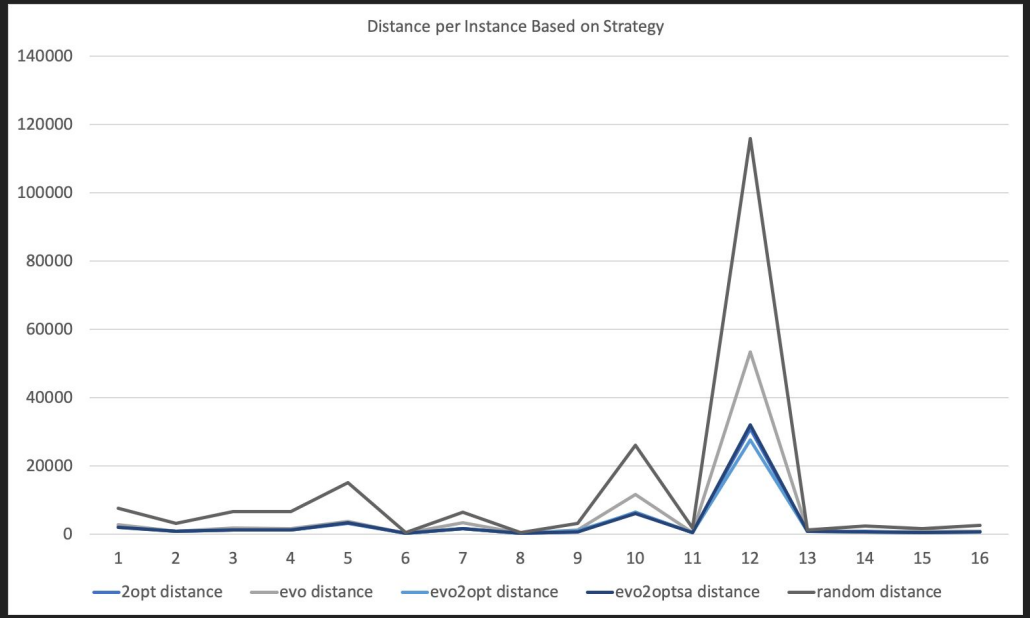
Transportation Logistics

Aansh Shah (ashah3), Zachary Horvitz (zhorvitz)

Time Spent: 40 hours

Leaderboard Name: 036ebde0

Comparing Strategies

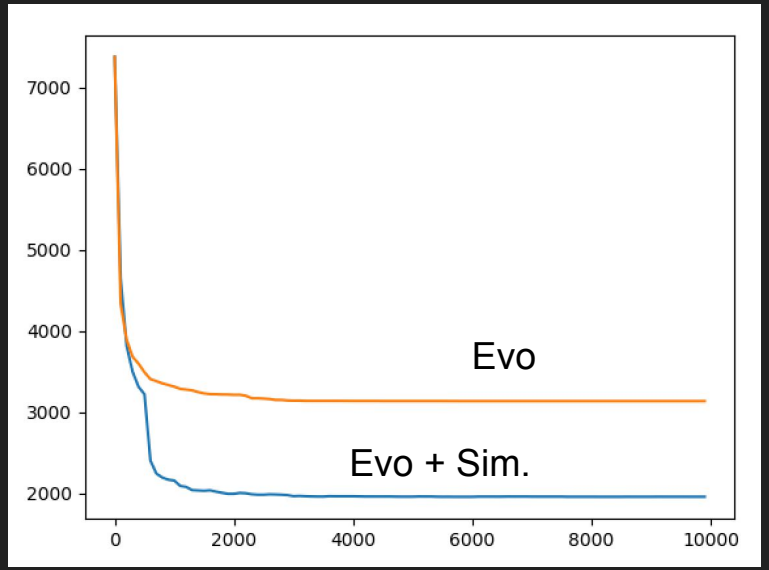


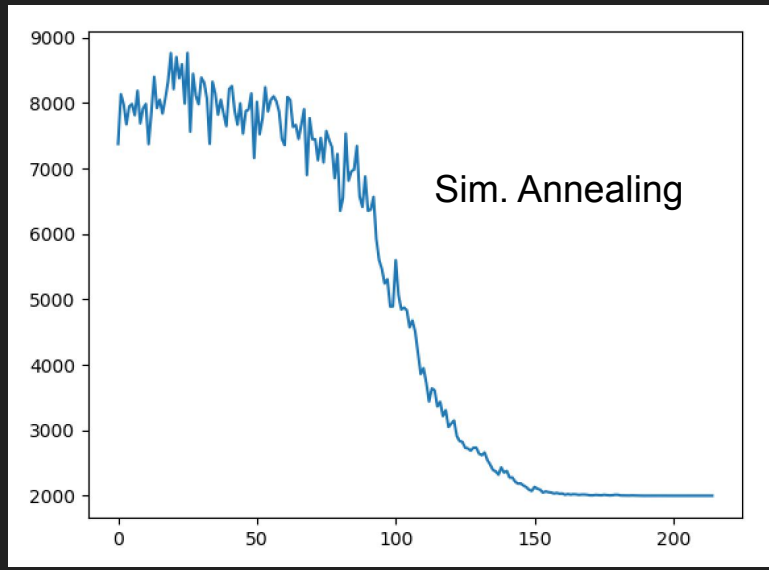
Effective: Evolution + 2-OPT, Evolution + 2-OPT + Simulated Annealing

Less Effective: Hill Climbing, Stochastic Hill Climbing, TABU Search, 2-OPT, Evolutionary Algorithm, Simulated Annealing and 2-OPT

101_11_2.vrp

Cost

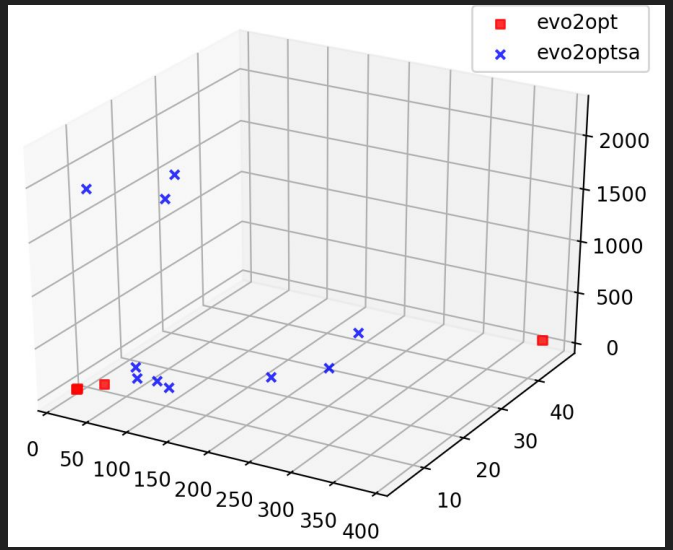


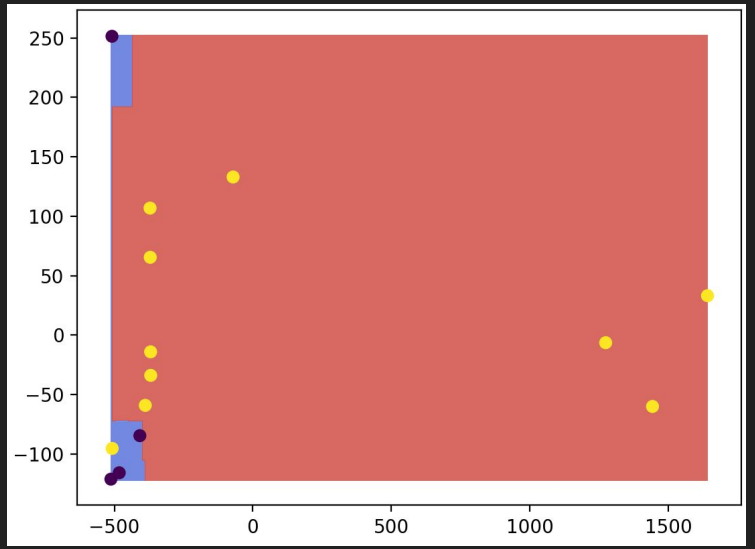


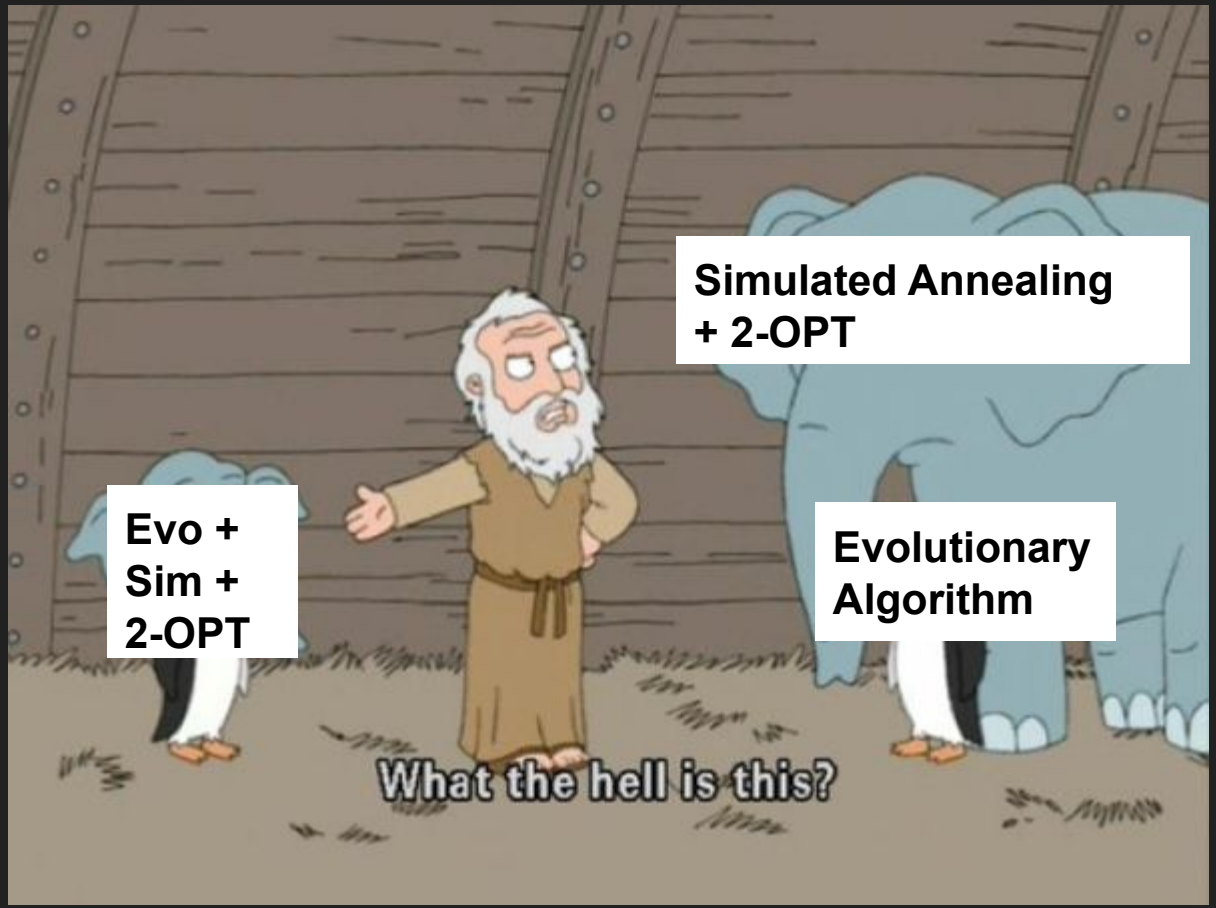
Iterations

Our Approach

- We create an ensemble strategy that combines evolution + 2opt and evolution + 2opt + simulated annealing via a decision boundary (radial basis function kernel) trained on (numCustomers, numVehicles, vehicleCapacity)

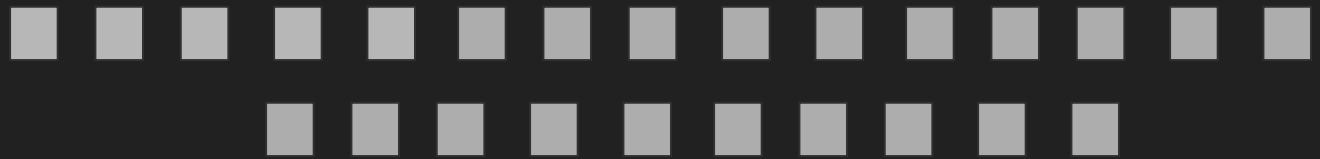





Simulated Annealing
+ 2-OPT
Evo +
Sim +
2-OPT
Evolutionary
Algorithm
What the hell is this?

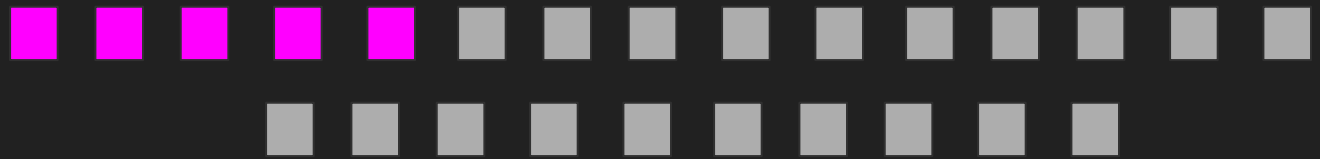
Evo-Sim-2

- Randomly initialize 100 valid solutions
- Select top 10 individuals
  - For each of the 100 pairs (including identical), we transfer a subsequence of arbitrary length
  - Reverse them with probability 0.1
- Every 500 steps, we run 2-OPT on the top 10 solutions, for a fixed number of iterations, with simulated annealing
  - Each time, we decrease the starting temperature parameter for the acceptance probability using a hyperbolic function



Evo-Sim-2

- Randomly initialize 100 valid solutions
- Select top 10 individuals
  - For each of the 100 pairs (including identical), we transfer a subsequence of arbitrary length
  - Reverse them with probability 0.1
- Every 500 steps, we run 2-OPT on the top 10 solutions, for a fixed number of iterations, with simulated annealing
  - Each time, we decrease the starting temperature parameter for the acceptance probability using a hyperbolic function



Evo-Sim-2

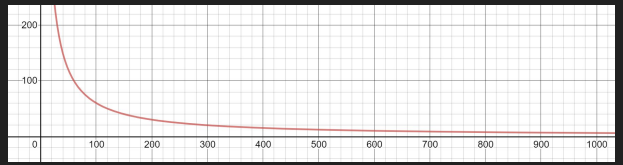
- Randomly initialize 100 valid solutions
- Select top 10 individuals
  - For each of the 100 pairs (including identical), we transfer a subsequence of arbitrary length
  - Reverse them with probability 0.1
- Every 500 steps, we run 2-OPT on the top 10 solutions, for a fixed number of iterations, with simulated annealing
  - Each time, we decrease the starting temperature parameter for the acceptance probability using a hyperbolic function

Evo-Sim-2

- Randomly initialize 100 valid solutions
- Select top 10 individuals
  - For each of the 100 pairs (including identical), we transfer a subsequence of arbitrary length
  - Reverse them with probability 0.1
- Every 500 steps, we run 2-OPT on the top 10 solutions, for a fixed number of iterations, with simulated annealing
  - Each time, we decrease the starting temperature parameter for the acceptance probability using a hyperbolic function

Evo-Sim-2

- Randomly initialize 100 valid solutions
- Select top 10 individuals
  - For each of the 100 pairs (including identical), we transfer a subsequence of arbitrary length
  - Reverse them with probability 0.1
- Every 500 steps, we run 2-OPT on the top 10 solutions, for a fixed number of iterations, with simulated annealing
  - Each time, we decay the starting temperature parameter for the acceptance probability using a hyperbolic function



Potential Next Steps

- More extensive hyperparameter tuning (e.g., temperature in simulated annealing, population size in evolutions)
- Create more granular decision boundaries by incorporating customer coordinates
- Early stopping: We run as long as we can
- Dealing with scale!
- Initialization is important: We should explore restarts