CVRP with CPLEX ONLY

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CPLEX IS AWESOME!!!!
WE ONLY USED CPLEX!!!!

Thank You!

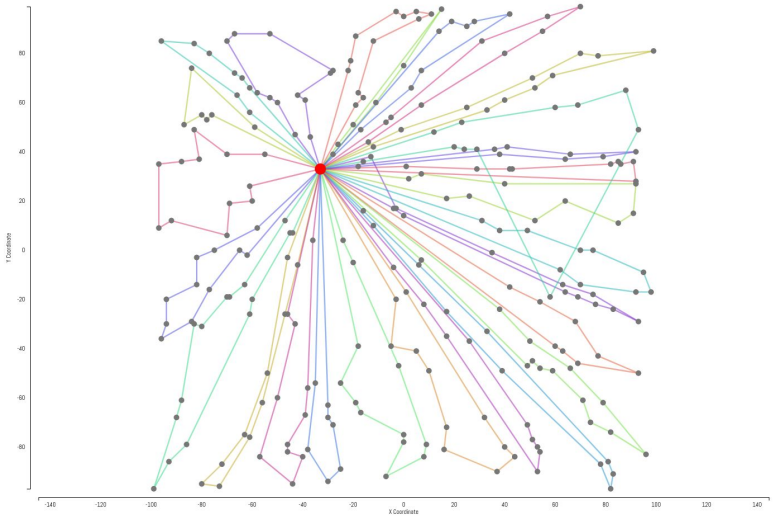
Any questions?

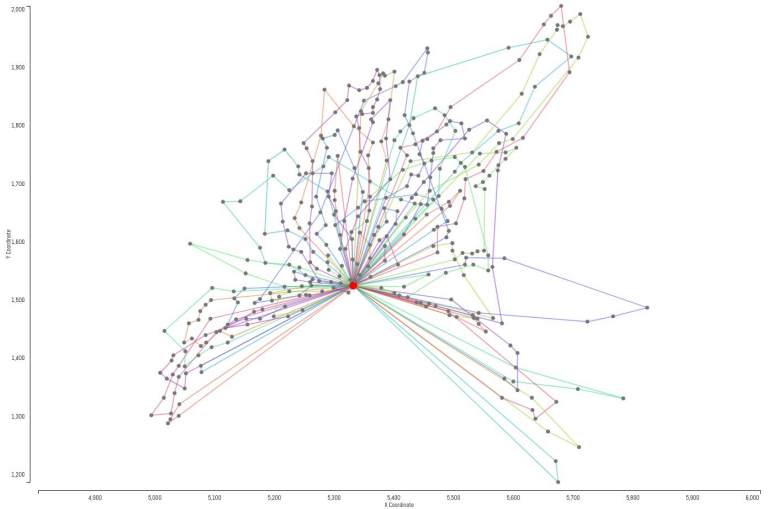
You cannot only use CPLEX

- Tried using CPLEX to produce an initial solution and then planned to use some local search method from there
  - Variables: 3D matrix of binary variables for if a vehicle traveled along a certain edge
    - Format of [vehicle, customer we're travelling from, customer we're travelling to]
  - Constraints:
    - 1. Vehicles leave each customer they visit
    - 2. Each customer is visited exactly once
    - 3. Every vehicles leaves and return to the depot
    - 4. Capacity
- Miller-Tucker-Zemlin formulation constraints to address sub-tours
- CPLEX did not terminate fast enough - so, we moved

Finding initial solutions

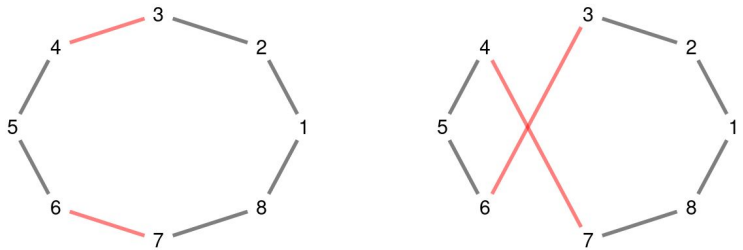
- Random
  - Assign customers to routes randomly
- k-nearest neighbor
  - Greedily assign customers to route based on distance to previous customer
  - Randomly choose one of k (1-5)
- Polar sweep
  - Order customers by polar angle
  - Greedily assign customers to routes in order
  - Tried first, but greedy can overassign vehicles
- Bin Packing **<- Our final choice**
  - Assign customers based on demand to bins (vehicle routes) if it does not exceed capacity
  - Can also search for “best” (lowest total distance increase) place to add customer





Perturbing the solution

- 2-OPT between two routes
  - Choose two random routes
  - Swap two random customers between them
- 2-OPT within a single route
  - Swap positions of two random customers



Simulated annealing

- Standard algorithm, initial 1000, factor 0.995
- Stagnation limit
  - Stop after 10,000 iterations with no improvement
- Randomized restarts
  - Restart after stagnation in a single annealing cycle
  - Slightly randomize bin packing by rotating the list of customers sorted by demand

Thank You!

Any questions?

~15 hours