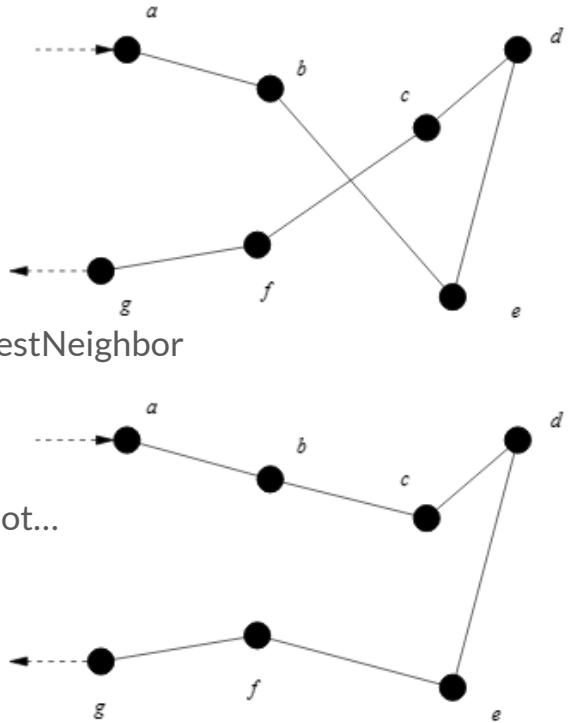
Vehicle Routing with Local Heuristics

Vignesh Pandiarajan, Suraj Anand
(Merengues, Prometheus)

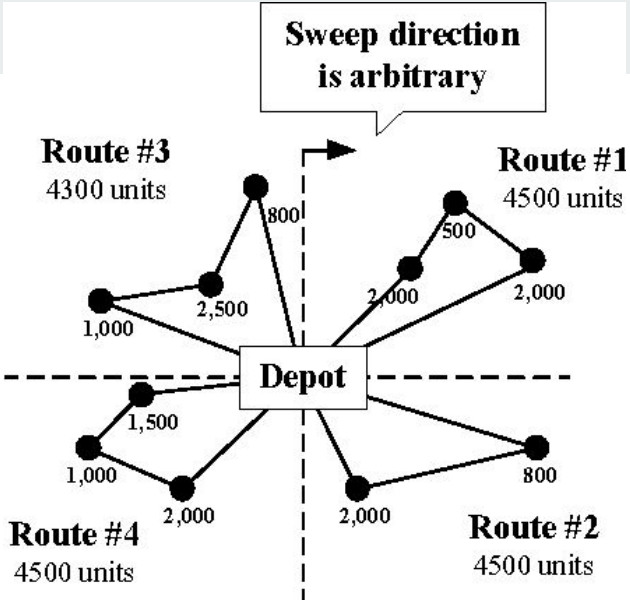
Initial Approach

- Began with Simulated Annealing
  - Moves
    - Swaps, Relocates, Reorders
  - Insertion Heuristics
    - Random, Two-Opt, Three-Opt, minCostInsertion, nearestNeighbor
  - Removal Heuristics
    - Random, Feasible, TopKRemoval
  - Exploring Infeasible & Feasible Instances or not...
    - Penalty Terms
  - Random Restarts



Further Steps

- Initialization Strategies
  - Greedy, Random, Polar (Sweep Algo)
  - Ensemble of initializations
  - Importance of Feasibility
- Local Search
  - Refactor for runtime and efficiency
  - Attempt to execute 9 simple moves, inspired by Prins, 2004



Further Steps

- Stagnation
  - Many operators implemented, but no change :(
  - Seeked guidance from others, attempted their approaches
  - key advice: do not assume 16_5_1.vrp has 16 customers
- Massive Performance Gain
  - Coded in Java, utilized static variables and lightweight arrays whenever possible
  - Allowed us to run multiple simulated annealings, multiple initializations

Conclusions

- Randomness Is Your Best Friend!
- Wrote 100s of lines of code that ended up being suboptimal
- Further Optimizations
  - Hyperparameter tuning
  - Fixing Local Search & exploring Genetics

Thank You!

- One of our favorite classes at Brown!
- Real World Applications & Competitive Nature!