Bi-directional Search for a Shortest Path

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Research Experiences for Undergraduates (REU)

Computational Modeling Serving the City

Symmetry Helps: Bounded bi-directional dynamic programming for the elementary shortest path problem with resource constraints

- Giovani Righini, Matteo Salani (2006)

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The Problem

- Find the shortest path through a graph

- Satisfy a set of constraints
  - Cost function
  - Multiple cost functions
  - More specific rules/ways to frame

- Example (My Project): How best to reduce pollution exposure for middle school students in NE Portland?

The Approach

- Dynamic Programming
- Search from both the end and start node
- Extending better solutions
- Using constraints to limit the number of paths searched

Righini, Giovanni, and Matteo Salani. “Symmetry Helps: Bounded Bi-Directional Dynamic Programming for the Elementary Shortest Path Problem with Resource Constraints.” *Discrete Optimization*, Graphs and Combinatorial Optimization, 3, no. 3 (September 1, 2006): 255–73. https://doi.org/10.1016/j.disopt.2006.05.007.

An agent-based model of coffeeshop crowdedness

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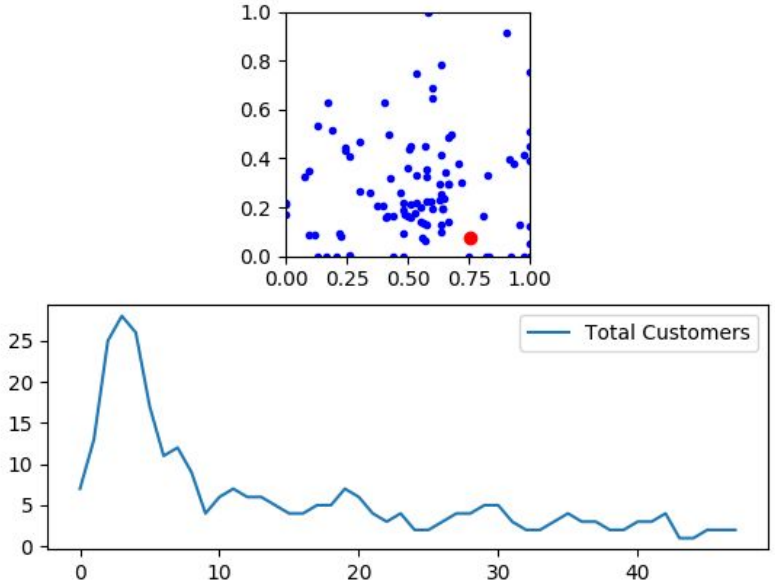
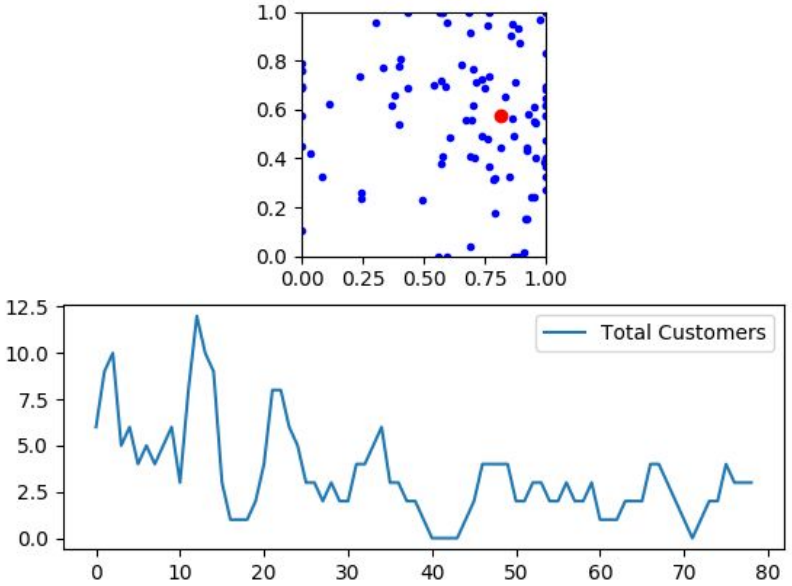
Modeling Ideas

- Tries to capture the time distribution of customers overall
- Two kinds of agents: shops and customers
- Gravitation towards shops based on proximity, crowdedness of shop, and tiredness of the customer
- Once in the shop there is a decrease of tiredness and an increasing random chance to leave and tiredness decreases

Red dots are coffeeshops and blue dots are agents





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