Urban Transit: Improving Commutes with Algorithms

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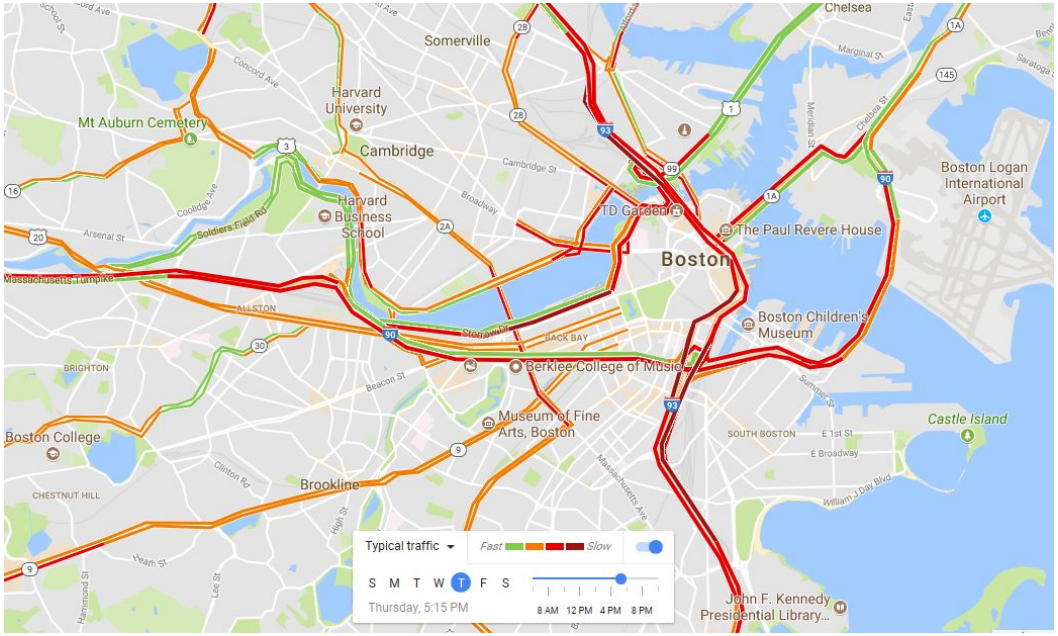
Can Data Science Improve Our Commutes?

1. Mitigating traffic congestion and public transit failures
2. Can data and algorithms add efficiency?
3. Reactive vs. Predictive



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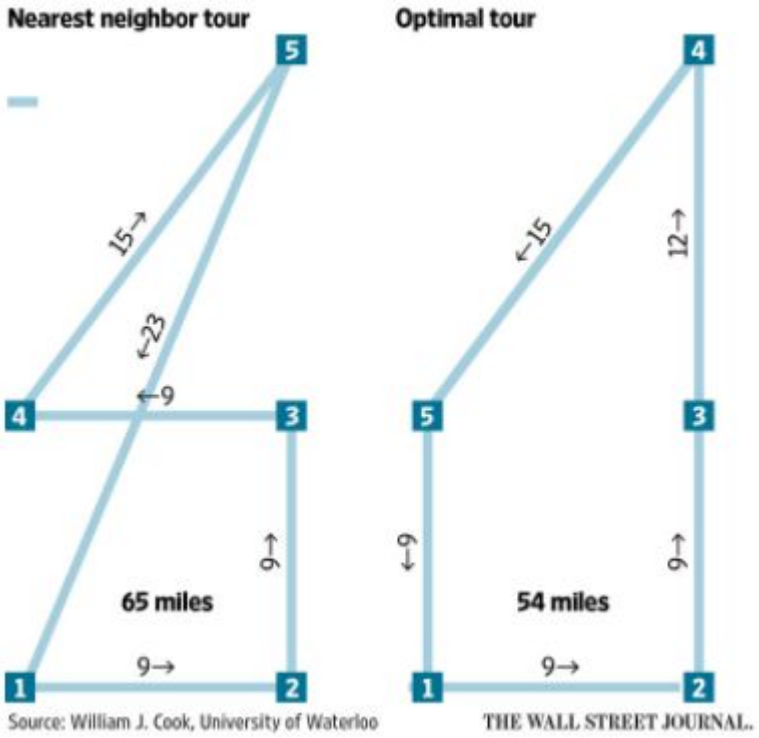
Data Science in Transit Today

1. Bureaucratic sclerosis
2. Real-time transit apps
3. Limited examples of data science in public domain
4. Financial incentives for developing algorithms

Analytical Methods

1. Consolidation of data sources

2. "Traveling Salesman Problem"



3. Machine learning to continually improve predictions
   a. Estimate probability of incidents by location
   b. Sub-models conditional on incidents
   c. Calculate new optimal routes in real- or ahead of time

Where to Look for Data

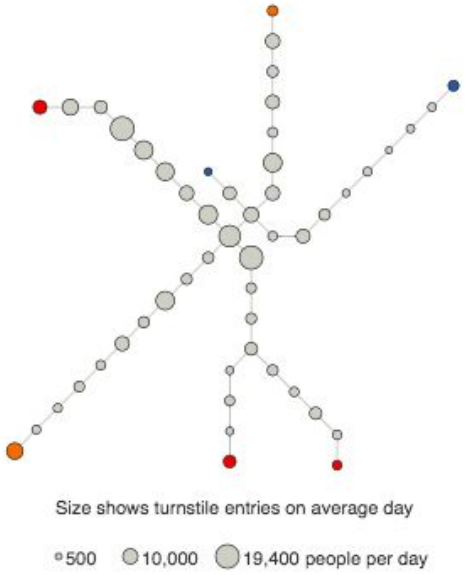
Source	Description	Benefits
Transit Usage Data	-Breakdown of every trip on transit, including entry and exit points and total time	-High-level overview of commuting patterns -Easy for public agency to obtain -Time stamps can help identify inefficiencies
Rideshare Data	-Data from each rideshare trip	-Highlights areas where public transit may be falling short -Gives door-to-door granularity
Traffic Monitor Data	-Traffic volumes at each intersection as monitored by sensors and cameras	-Can identify traffic choke points -Real time
Cell Phone Data	-Detailed information on every cell phone's movement	-Can be used to extract detailed movement and mobility and commuting patterns -No limitations

Data Limitations and Ethical Concerns

Source	Data Limitations	Data Accessibility	Problems or Ethical Concerns
Transit Usage Data	-Only for transit users -Not very granular	-Easily accessible, assuming we are partnering with government agency	N/A
Rideshare Data	-Only a part of the puzzle, complements other data sources	-Rideshare companies may be unwilling to share	-People may worry about being tracked, although data will be anonymized
Traffic Monitor Data	-Expensive to deploy cameras and sensors	-Easily accessible, assuming we are partnering with government agency	-People may worry about being tracked, although data will be anonymized and is not intended for this
Cell Phone Data	-Few, but may be difficult to clean and parse	-May not be accessible	-May not be possible to obtain -Big brother

What is the Final Product?

- Route-by-route analysis of current mass transit routes, highlighting issues and recommending improvements
- Detailed analysis of each major street and highway, highlighting issues and recommending improvements
- Ability to predict and respond to abnormal conditions



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Visual and Financial Persuasion

1. Data visualization via Google Maps
2. Appeals to emotion
3. Political persuasion

Future Research Questions

1. Planning and building new infrastructure is extremely costly and difficult. When is the right time?
2. It may be difficult to plan for induced demand (if you build it, they will come)
3. Applicability to other industries (airlines, long-distance rail, logistics, etc.)
4. City planning for special events (Olympics, conventions, presidential visits, etc.)

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