NYC Marathon

The Effect of Marathon Road Closures on Ride Service Times

Yining Zhao, Justin Goh, Eugene Tan, Bradley Turcios, Ronald Smith

Background

- NYC Marathon - Largest Single Event in NYC
- Significant Road Closures
  - Over 42 streets closed to traffic
  - No Buses allowed to cross 5th Ave
- Increased Human Traffic
  - Spectators wanting to view the race
  - Runners trying to get to the start line, and heading home after the race

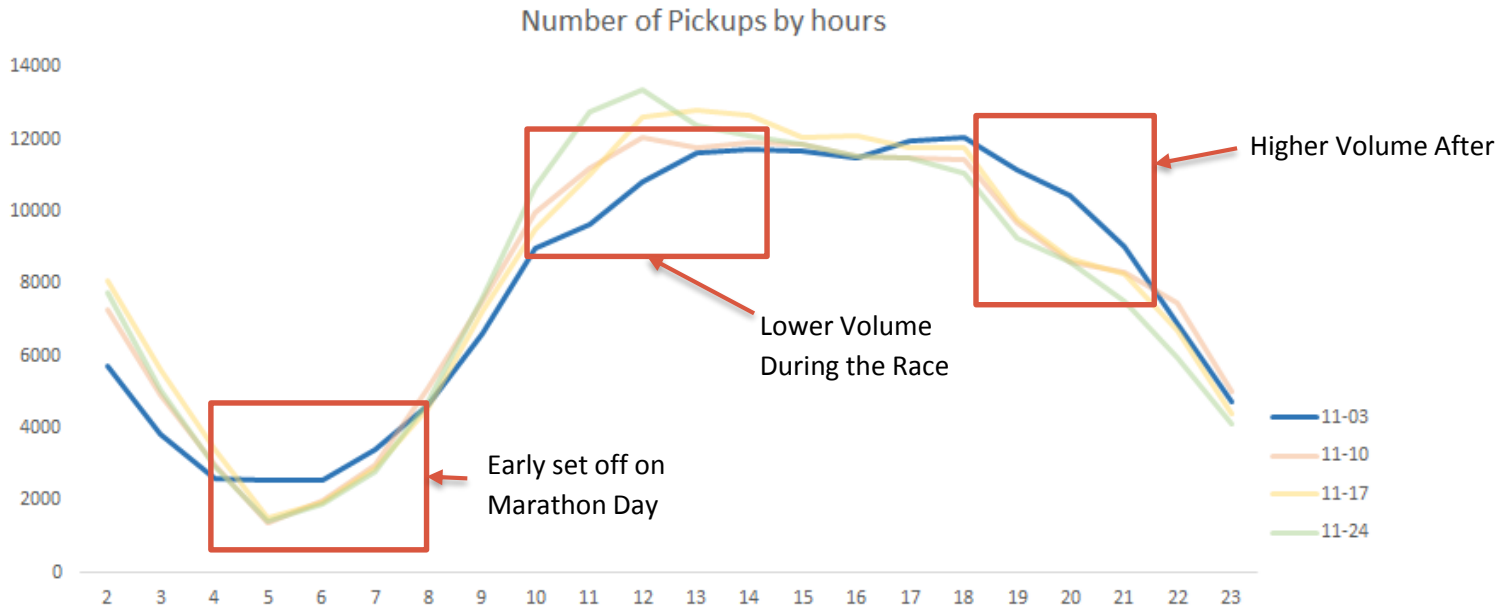
Problem Statement

- New Yorkers have a hard time getting around on race day
- How can road closures be planned to minimise disruption to service times

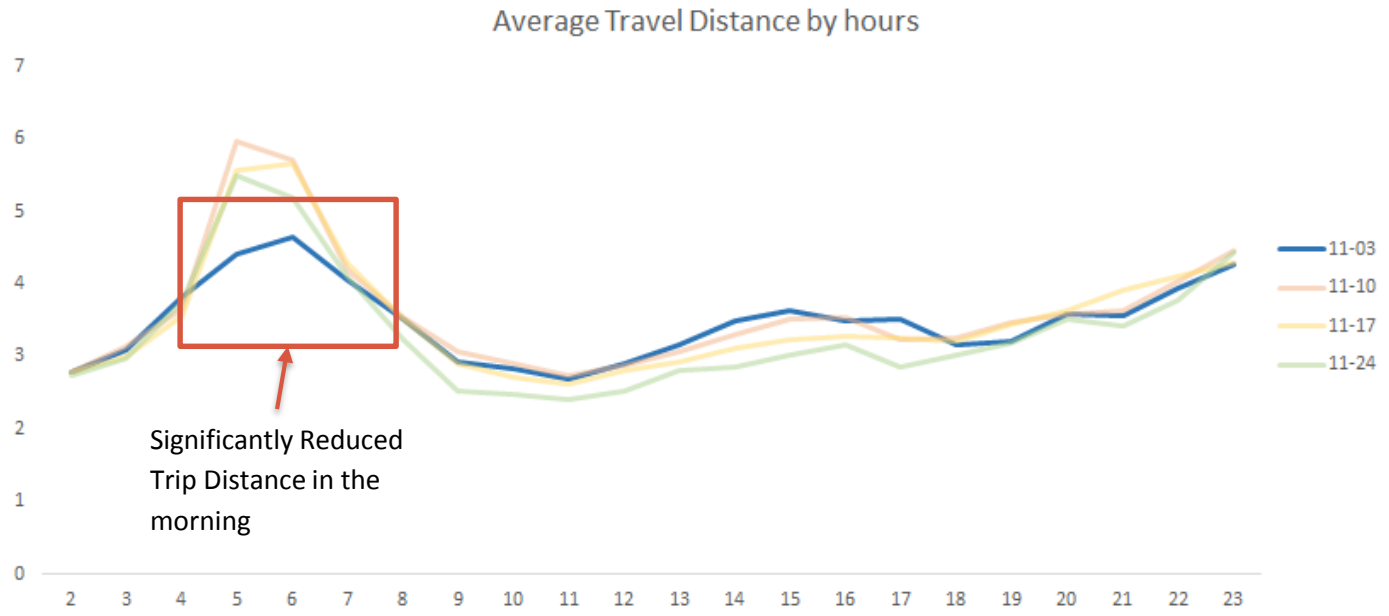
Goal

- Develop a model to investigate the effect of specific road closures on taxi service times
- Develop heuristics to guide selection of roads for closure

Initial Exploration



Initial Exploration

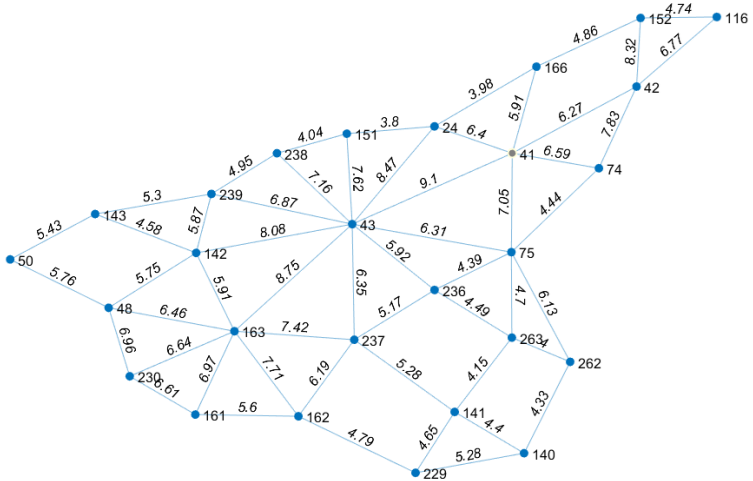


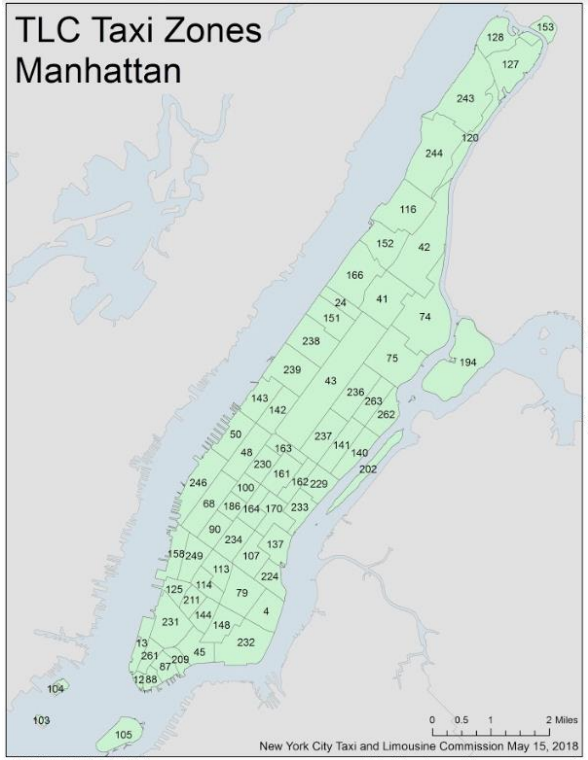
Step 1:Creating a Network

NYC Taxi Control Data
11/10/2019
11/17/2019
11/24/2019

Input

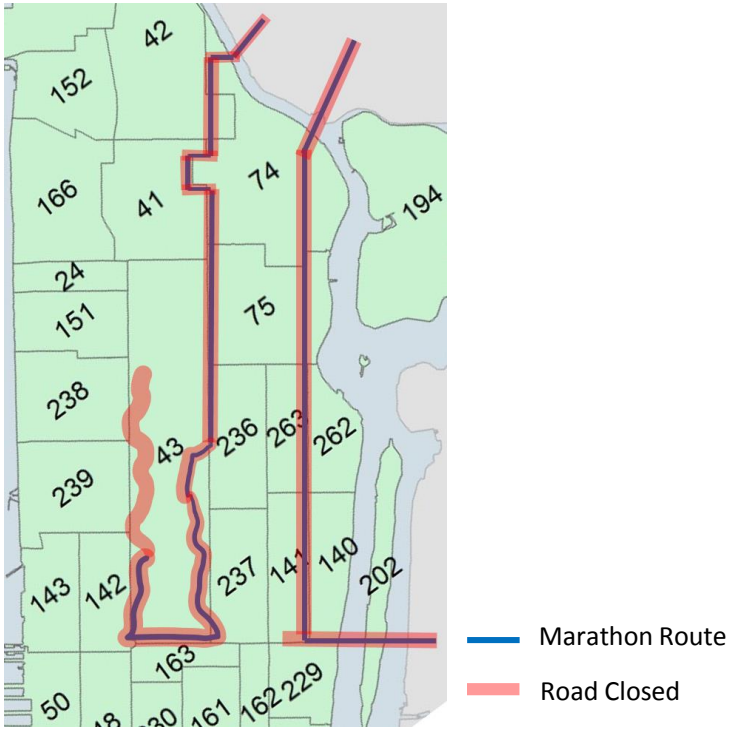
- Network Design
- Nodes: Taxi-Zone
- Edges: Taxi-Zone to Taxi-Zone appearing in Data
- Edge Costs: Mean of Travel Time from Taxi-Zone to Taxi-Zone





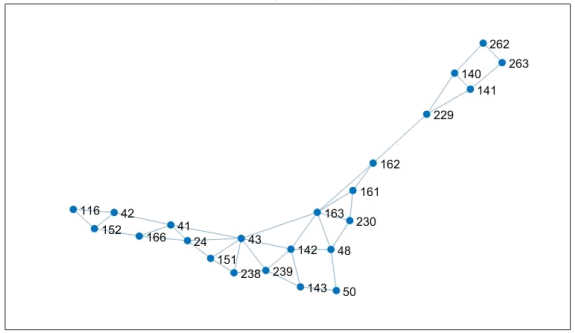
Step 2: Simulating Road Closures

Road Closure	Taxi Zones Affected
Central Park	43
1st Ave	140, 262
5th Ave	74, 75, 236, 237

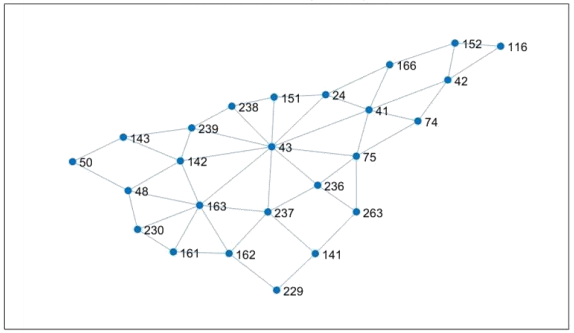


Step 2: Simulating Road Closures

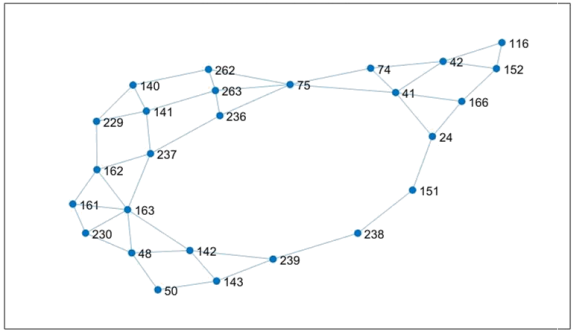
5th Avenue Closed, "74","75","236","237"



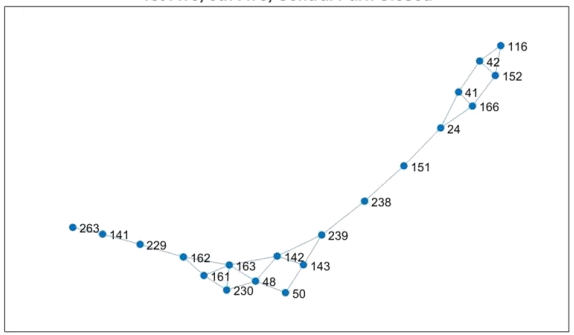
1st Avenue Closed, "140","262"



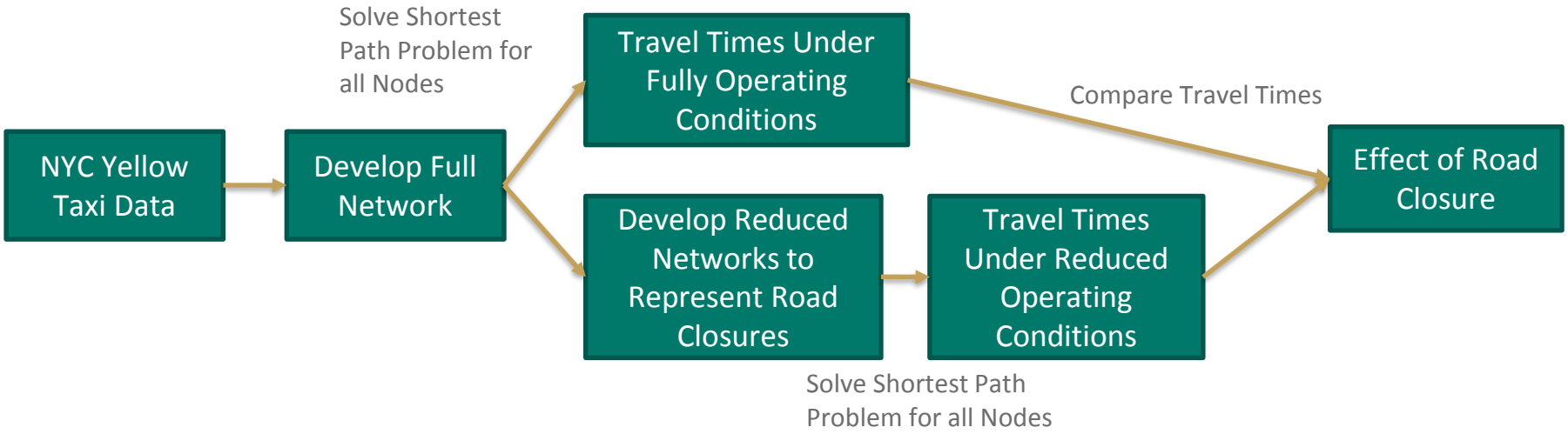
Central Park Closed, "43"



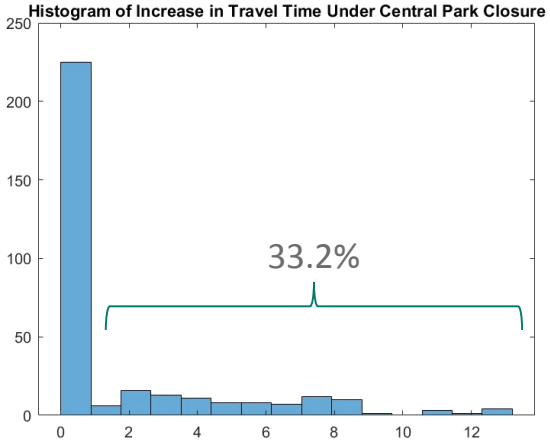
1st Ave, 5th Ave, Central Park Closed

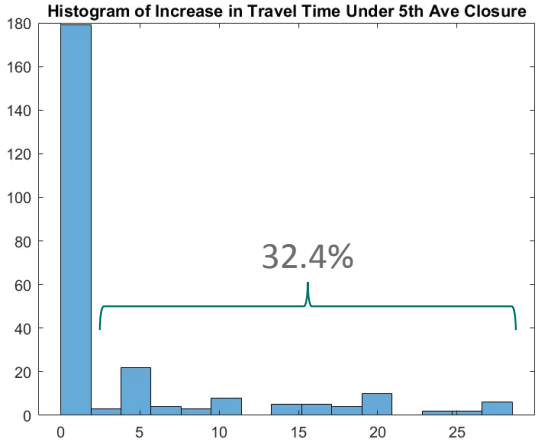


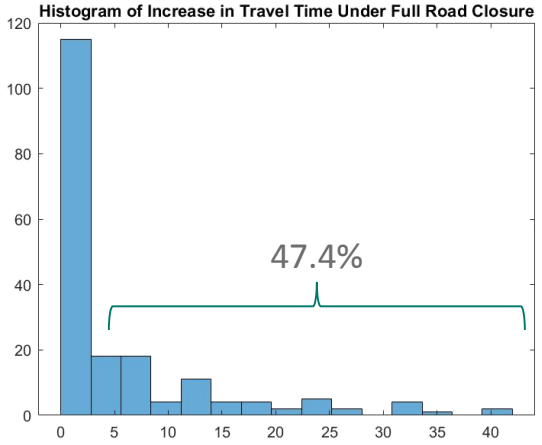
Step 3: Calculating Travel Times



Increase in Travel Time Due to Closures







1. Majority of Routes: No Change in Travel Time
2. Non-Linear Disruptive Effect of Incremental Road Closures
3. Corner Nodes are Less Disruptive (Closing 1st Avenue)

Global Increase in Travel Time Due to Closures

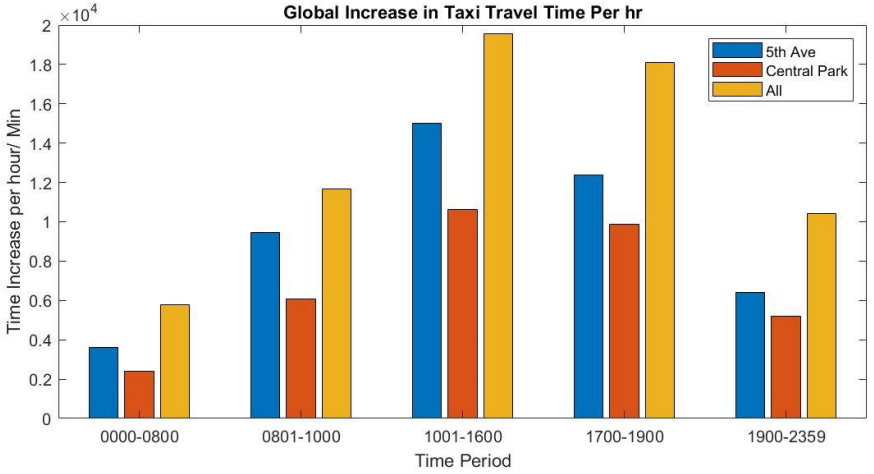
Estimating Demand Rates

Time	Node
00:00-08:00	Non-Peak
08:01-10:00	Peak
10:01-16:00	Non-Peak
17:00-19:00	Peak
19:00-23:59	Non-Peak

5 Demand Rates per Zone

Approximating Dropoff Location

Uniformly Distributed By Zone



Closed Road	Mean Time Increase
Central Park & Surrounding Roads	1.15 min/ ride
5th Avenue	1.94 min/ ride
1st Avenue, 5th Avenue, Central Park	2.94 min/ride

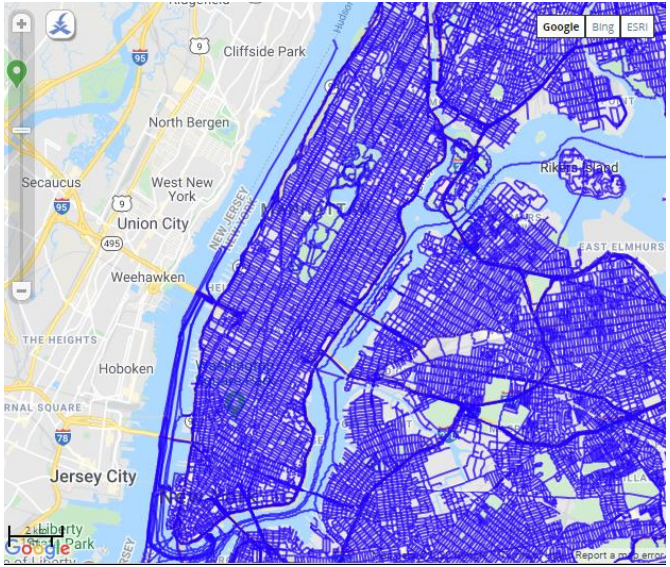
1. Global Increase in Travel Time = ∑Mean Increase in Travel Time per Zone x Demand per Zone
2. Mean Time Increase = Global Time Increase / Total No of Rides

Conclusions

- Impact of Closure of Roads during the New York Marathon
  - 47.4% of all Trips Ride Time Increased
  - 2.94 min/ride Increase
- Potential Planning Guidelines
  - Boundary/ Perimeter Road Closures have Least Impact
  - Reopen Roads by 10am will Mitigate Impact of Road Closures
- Limitation of Project
  - Use of Zones for Nodes in Lieu of Road Junctions
  - Results Shown Represent Worst Case Scenario

Further Work/ Improvements

- Increase Data Set
- Higher Resolution Network
  - Increased Accuracy
  - More Reflective of Road Closures rather than Zonal Closures
- Changing the Objective
  - Defining Optimal in terms of Revenue
- Additional Constraints
  - Incorporate Race Considerations
  - (eg. Desirability of Roads to Runners)



Source: https://data.cityofnewyork.us/City-Government/NYC-Street-Centerline-CSCL-/exjm-f27b