

# *RISKY COMMUTES FOR CYCLISTS IN BOSTON*

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# OVERVIEW

- The City of Boston is the largest city in Massachusetts with 800,000 inhabitants and 1.3 million commuters.
- The City of Boston provides insights on the locations of neighborhoods, fatalities and incidents.
- This project identifies incident hotspot neighborhoods and suggests less incident prone neighborhoods of travel for users.
- The project helps Boston cyclists be better prepared to travel in the neighborhoods they pass through. Given the appropriate data, the problem is:
  - What level of risk is there in commuting through the Boston neighborhoods and streets to avoid?

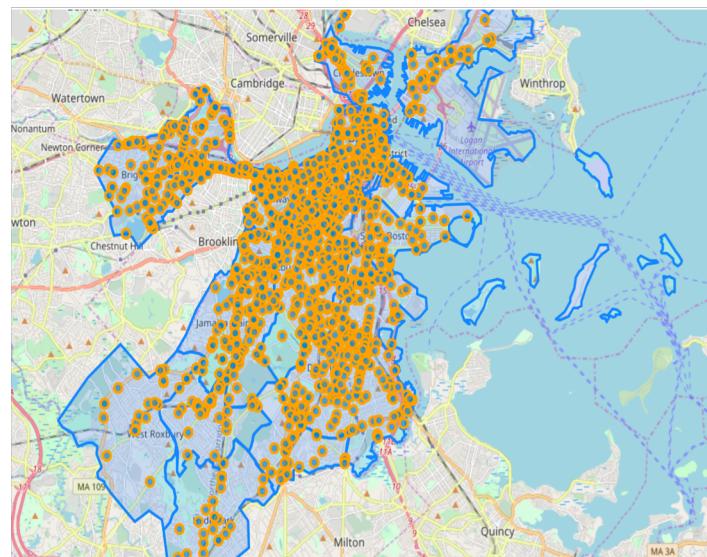
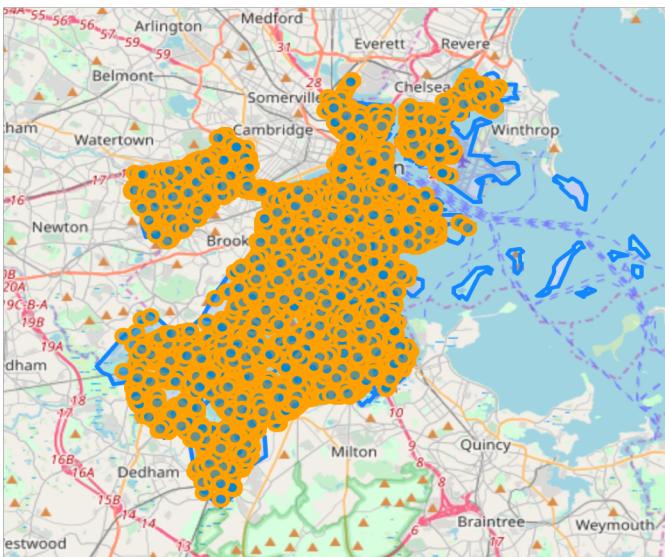
# Data acquisition and cleaning

- The data sets used in the analysis are:
  - Vision Zero Crash Records
    - Crash <https://data.boston.gov/dataset/vision-zero-crash-records>
    - Fatality <https://data.boston.gov/dataset/vision-zero-fatality-records>
  - Boston Neighborhoods
    - <https://data.boston.gov/dataset/boston-neighborhoods>
- The data is in the GeoJSON and CSV format and generally contains more data on all traffic incidents. The incidents need to be pruned to the usable portion (only bike). The CSV data needs to be augmented with neighborhood related data. (pinpoint where each incident occurs)

| <u>_id</u>  | <u>date_time</u> | <u>mode_type</u>                  | <u>location_type</u> | <u>street</u> | <u>xstreet1</u> | <u>xstreet2</u> | <u>x_cord</u> | <u>y_cord</u> | <u>lat long</u> | <u>neighborhood</u> |
|---|------------------|-----------------------------------|----------------------|---------------|-----------------|-----------------|---------------|---------------|-----------------|---------------------|
| 2015-01-21 15:07:00,ped,Street,CENTRE ST,RITCHIE ST,LAMARTINE ST, | 764320.75,294290 | 8.64,-71.1000694606,42.3227879775 |                      |               |                 |                 |               |               |                 |                     |

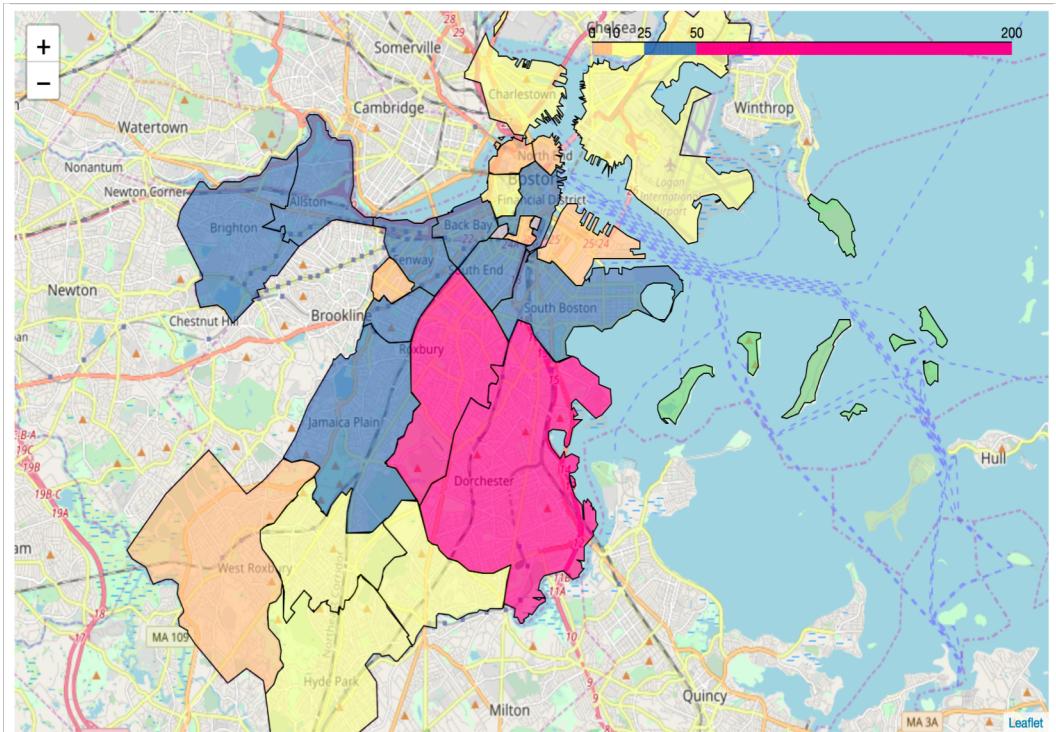
- The data is from 2015 to end of 2018.

# View of All and Bike Incidents



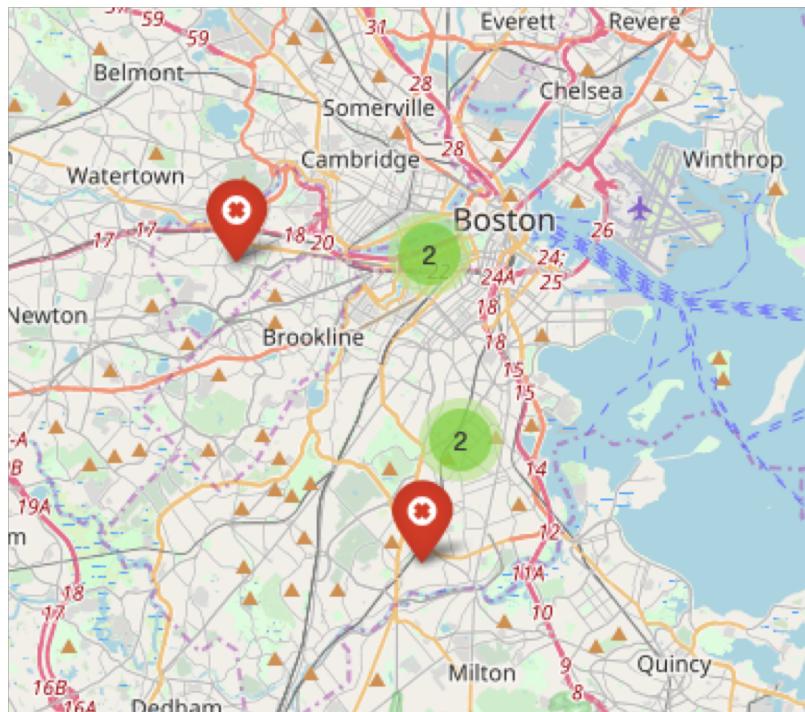
- The first image highlights the locations of all incidents.
- The second image highlights the location of just the bike incidents.
  - The second image shows the Boston Islands and the Airport have no Bike incidents.

# Incidents per Neighborhood



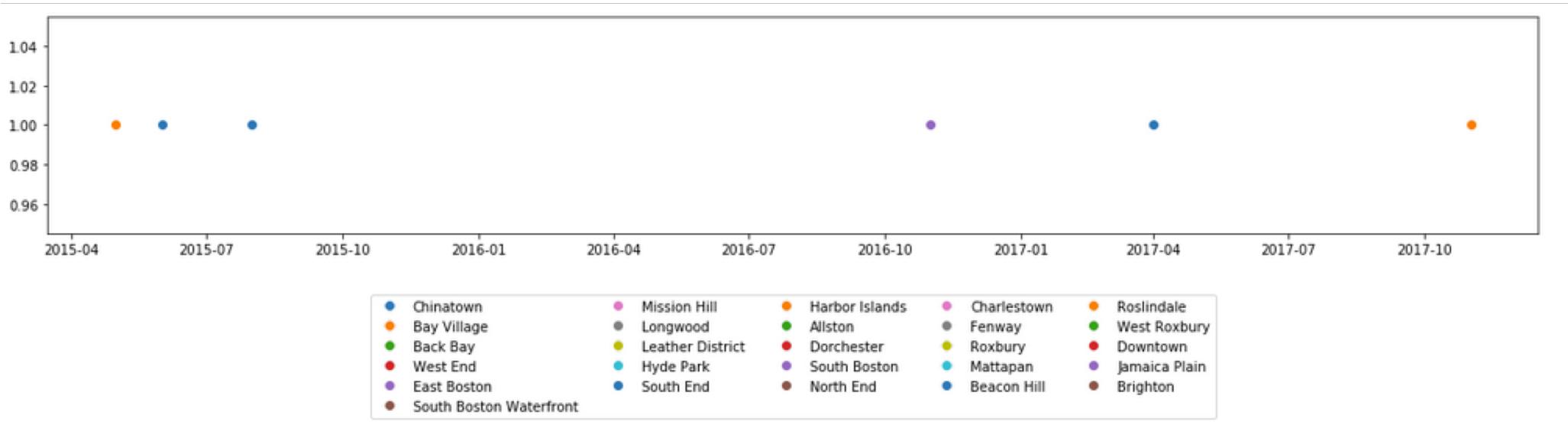
|                           |     |
|---------------------------|-----|
| • Dorchester              | 280 |
| • Roxbury                 | 204 |
| • Jamaica Plain           | 139 |
| • Allston                 | 136 |
| • Back Bay                | 131 |
| • Fenway                  | 115 |
| • Brighton                | 105 |
| • Downtown                | 87  |
| • South End               | 80  |
| • South Boston            | 75  |
| • Mission Hill            | 57  |
| • Charlestown             | 43  |
| • Beacon Hill             | 37  |
| • Roslindale              | 35  |
| • East Boston             | 34  |
| • Mattapan                | 30  |
| • Hyde Park               | 26  |
| • West End                | 24  |
| • South Boston Waterfront | 22  |
| • West Roxbury            | 21  |
| • North End               | 17  |
| • Chinatown               | 16  |
| • Longwood                | 15  |
| • Bay Village             | 3   |
| • Leather District        | 3   |

# Scenario 1 - Analyze the Fatalities per Neighborhood



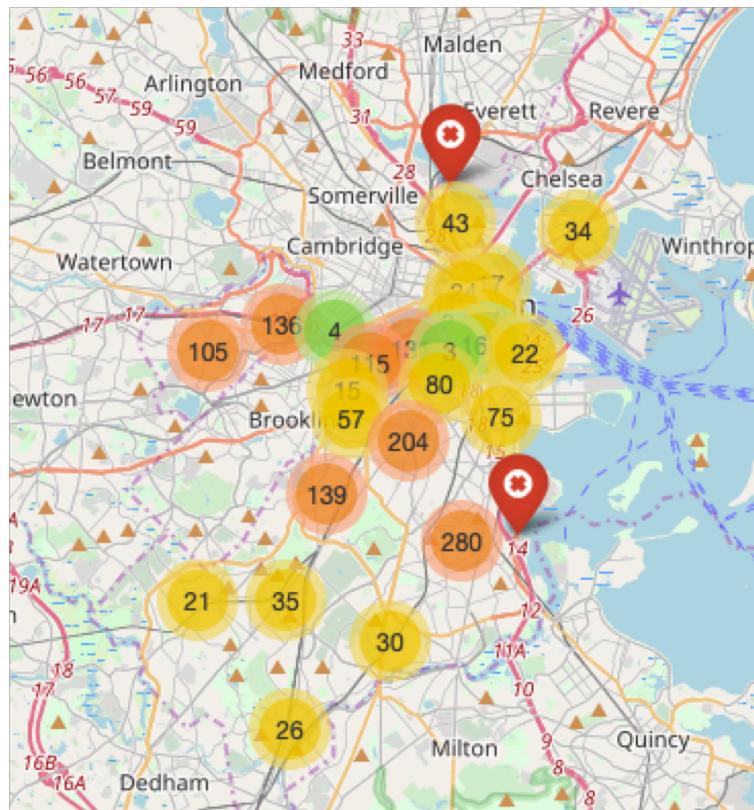
- There are only 6 occurrences.
  - Only two neighborhoods have more than one occurrence.
- 
- Data
    - Mattapan
    - Dorchester (2)
    - Back Bay (2)
    - Allston

## Scenario 2: Fatalities By Year and Month



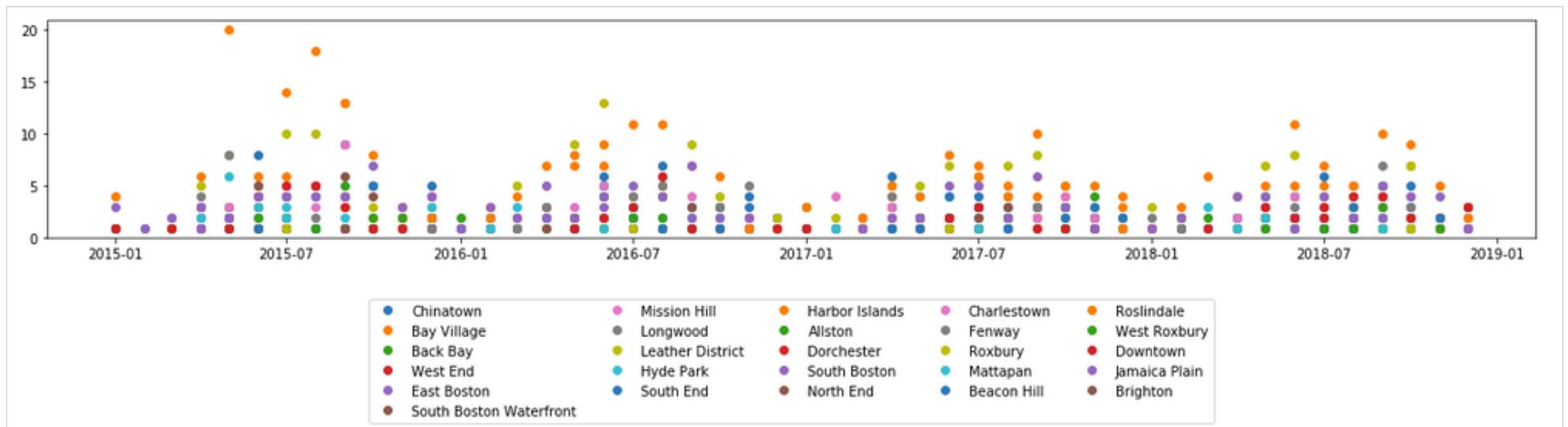
- 2015 had a strong concentration of incidents.
- A regression line would not provide any additional insight as the particular events are infrequent (while important and fatal).

# Scenario 3: Analyze the Non-Fatal Traffic Incidents by Neighborhood



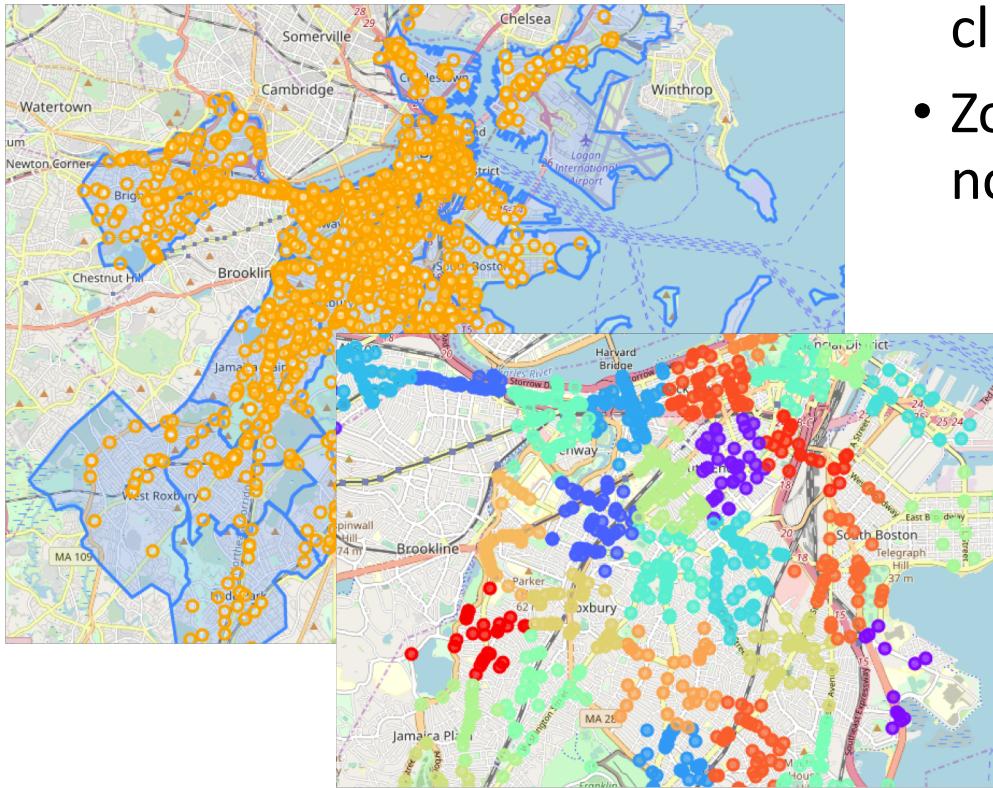
- There is a strong concentration of incidents toward the center of the city.
- The Top Five Neighborhoods are:
  - Dorchester 280
  - Roxbury 204
  - Jamaica Plain 139
  - Allston 136
  - Back Bay 131

# Scenario 4: Non-Fatal Traffic Incidents By Year-Month



The Total incidents have gone down over time, however there are peaks during the summer months.

# Scenario 5: Recommended Neighborhoods to Travel



- The incident patterns uncover clusters / groupings of incidents.
- Zoom shows a concentration and not a spread in certain areas:

Bicyclists should travel in the low cluster density districts.

West End  
South Boston  
Waterfront  
Chinatown  
North End  
Charlestown  
East Boston  
West Roxbury  
Bay Village  
Leather District

# Scenario 6: Streets to take care when Bicycling

- Avoid the following streets with a high number of clusters overlapping the street:
  - WASHINGTON ST 12
  - BEACON ST 9
  - CAMBRIDGE ST 7
  - COMMONWEALTH AVE 7
  - CENTRE ST 7
  - BOYLSTON ST 6
  - DORCHESTER AVE 6
  - COLUMBUS AVE 6
  - HUNTINGTON AVE 5
  - SOLDIERS FIELD RD 5

# Conclusion

- The City of Boston cyclists' take risks moving in traffic to their destinations.
- This analysis discovers many incident clusters in Dorchester and Roxbury neighborhoods and a number of streets to avoid Dorchester Avenue and Tremont Street.
- Armed with this information cyclists are better prepared to travel to their destinations, and the City of Boston is able to make investment decisions on infrastructure and policing to better support cyclists.
- There is an opportunity for further work, and the risks for cyclists may further be refined and more precisely calculated. To determine street level congestion, as a feature of the risk model, the model may use Waze Data Feeds to account for 'Moving Vehicles' – the data would need to be aggregated over time and used to predict when and where risk exists, and how-to re-pattern the cyclist commute habits.