Ideal Location for Vending Machines in Boston Using Data Science

Coursera Capstone

Vending Machine location is Critical

- Most popular places to install vending machines include apartment complexes, hotels, retail stores, and auto shops. [Vending Group]
- The best way to maximize profit is by pinpointing locations that would be ideal for installing a vending machine.

Strategic Placement of Vending Machines

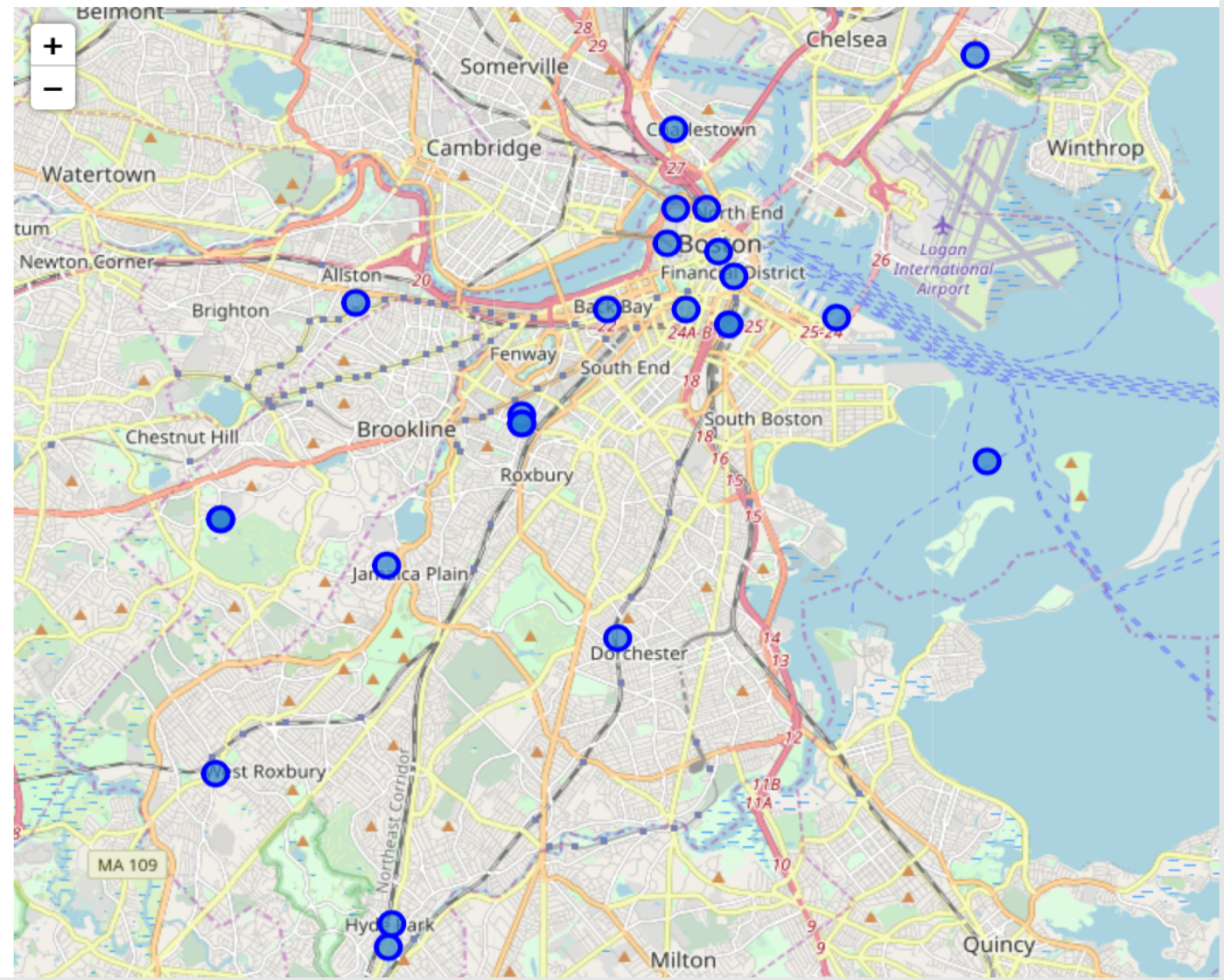
- Areas that already attract large numbers of people.
  - Find these places by looking at the frequency of venue searches
- Locations of high foot traffic and ones that lack businesses that sell snacks and drinks within walking distance.

Boston Can Be Segmented By Neighborhood

The 25 neighborhoods seem close together. Using Data Science, we find out that's not the case.

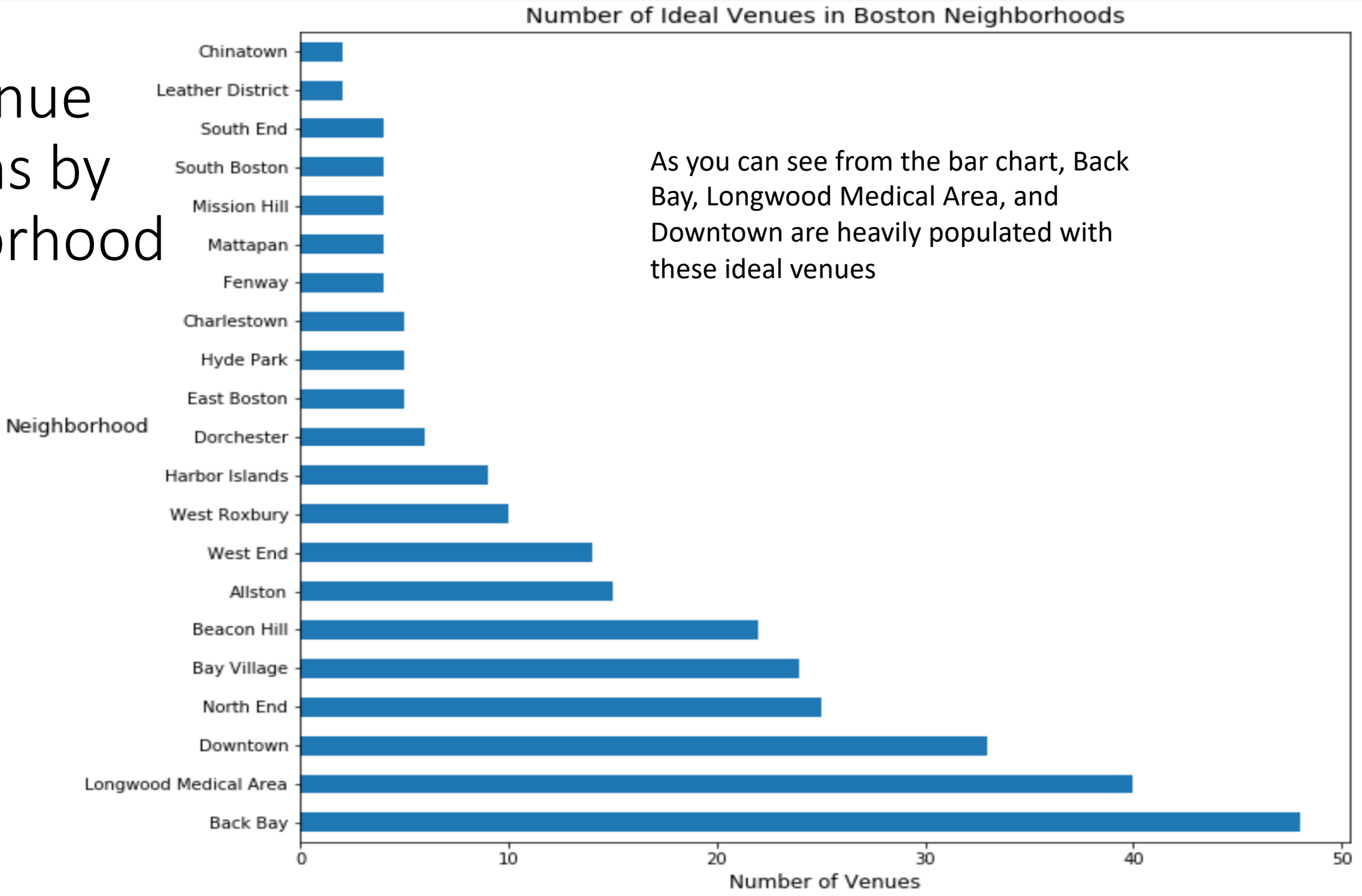
	Borough	Neighborhood	Latitude	Longitude
0	Boston	Jamaica Plain	42.310871	-71.125061
1	Boston	Leather District	42.347960	-71.056410
2	Boston	Back Bay	42.350266	-71.080978
3	Boston	Bay Village	42.350150	-71.065190
4	Boston	Downtown	42.355300	-71.055280
5	Boston	Roxbury	42.317982	-71.158508
6	Boston	Fenway	42.332670	-71.097910
7	Boston	Chinatown	42.347960	-71.056410
8	Boston	West Roxbury	42.278870	-71.159390
9	Boston	Beacon Hill	42.360291	-71.068680
10	Boston	Roslindale	42.317982	-71.158508
11	Boston	North End	42.365528	-71.060883
12	Boston	East Boston	42.389130	-71.007050
13	Boston	Brighton	42.317980	-71.158510
14	Boston	Mission Hill	42.334000	-71.097908
15	Boston	Dorchester	42.299780	-71.078840
16	Boston	Mattapan	42.252159	-71.124947
17	Boston	Longwood Medical Area	42.358990	-71.058630
18	Boston	South End	42.332670	-71.097910
19	Boston	South Boston	42.332670	-71.097910
20	Boston	Charlestown	42.377760	-71.067320
21	Boston	South Boston Waterfront	42.326810	-71.004650
22	Boston	Harbor Islands	42.349010	-71.034700
23	Boston	Hyde Park	42.255810	-71.124130
24	Boston	West End	42.365650	-71.067270
25	Boston	Allston	42.351140	-71.131440

Map with Markers of Each Neighborhood



Using the table in the previous slide, and utilizing Folium, it's notice how spread out the locations really are.

Ideal Venue Locations by Neighborhood



As you can see from the bar chart, Back Bay, Longwood Medical Area, and Downtown are heavily populated with these ideal venues

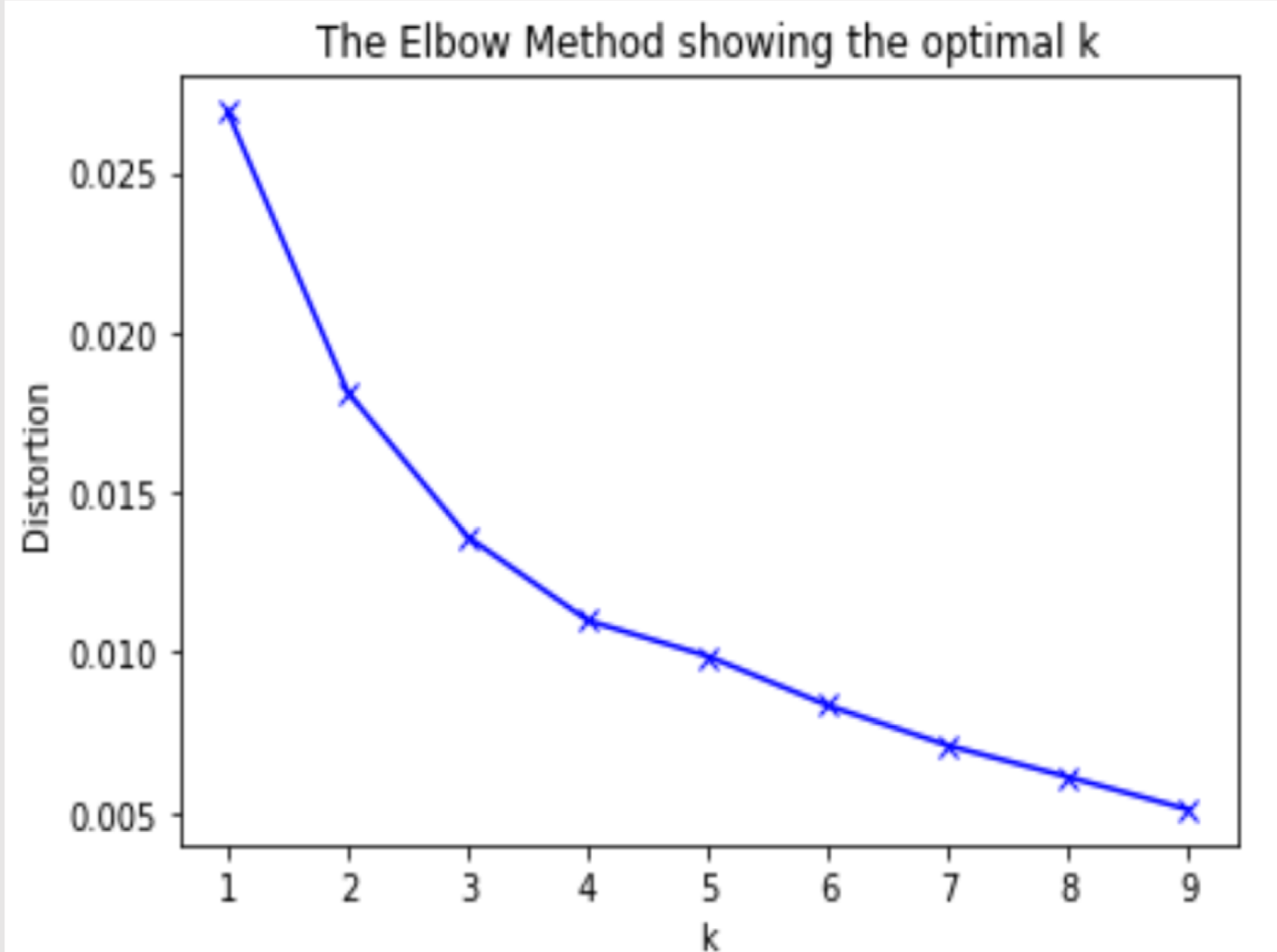
Top 10 Venues in Each Neighborhood
(first 5 rows)

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Allston	Bar	Gym / Fitness Center	Rock Club	Department Store	Board Shop	Pharmacy	Dive Bar	Clothing Store	Liquor Store	Scenic Lookout
1	Back Bay	Sporting Goods Shop	Hotel	Cosmetics Shop	Clothing Store	Salon / Barbershop	Pet Store	Furniture / Home Store	Men's Store	Women's Store	Plaza
2	Bay Village	Theater	Hotel	Hotel Bar	Performing Arts Venue	Comedy Club	Smoke Shop	Gym	Lounge	Movie Theater	Event Space
3	Beacon Hill	Hotel Bar	Museum	Gift Shop	Kids Store	Clothing Store	History Museum	Health & Beauty Service	Gym	Optical Shop	Other Repair Shop
4	Charlestown	Yoga Studio	Bank	Pharmacy	Pet Store	Shopping Mall	Zoo Exhibit	Furniture / Home Store	Dive Bar	Dry Cleaner	Electronics Store

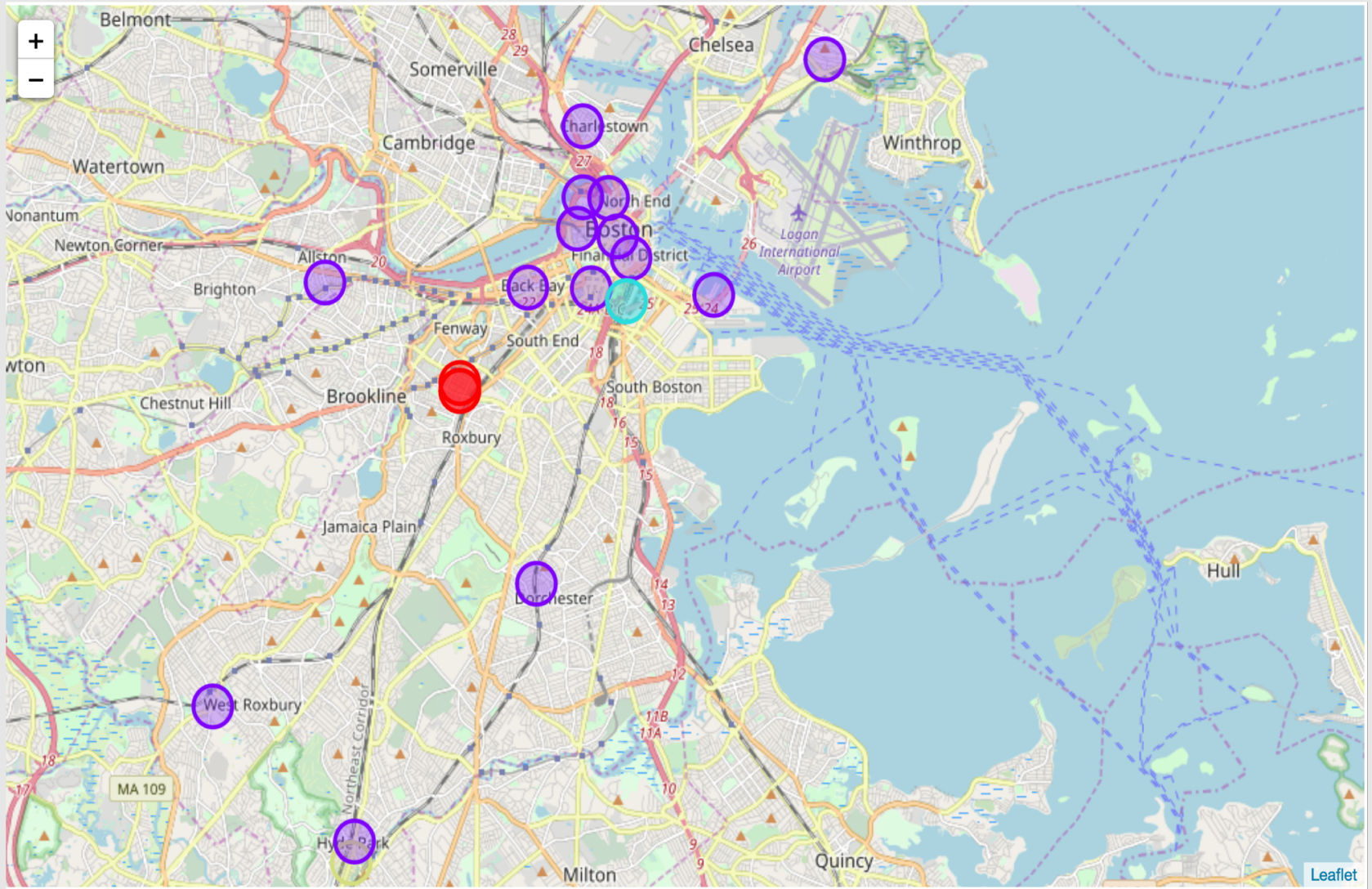
Machine Learning

K-Means Clustering: Finding the Optimal k

K-means clustering uses an algorithm to create initial estimates for the k (4 in this project) centroids and iterates between solving for the Euclidean distance, as well as recomputing centroids by taking the average of the centroid's cluster.

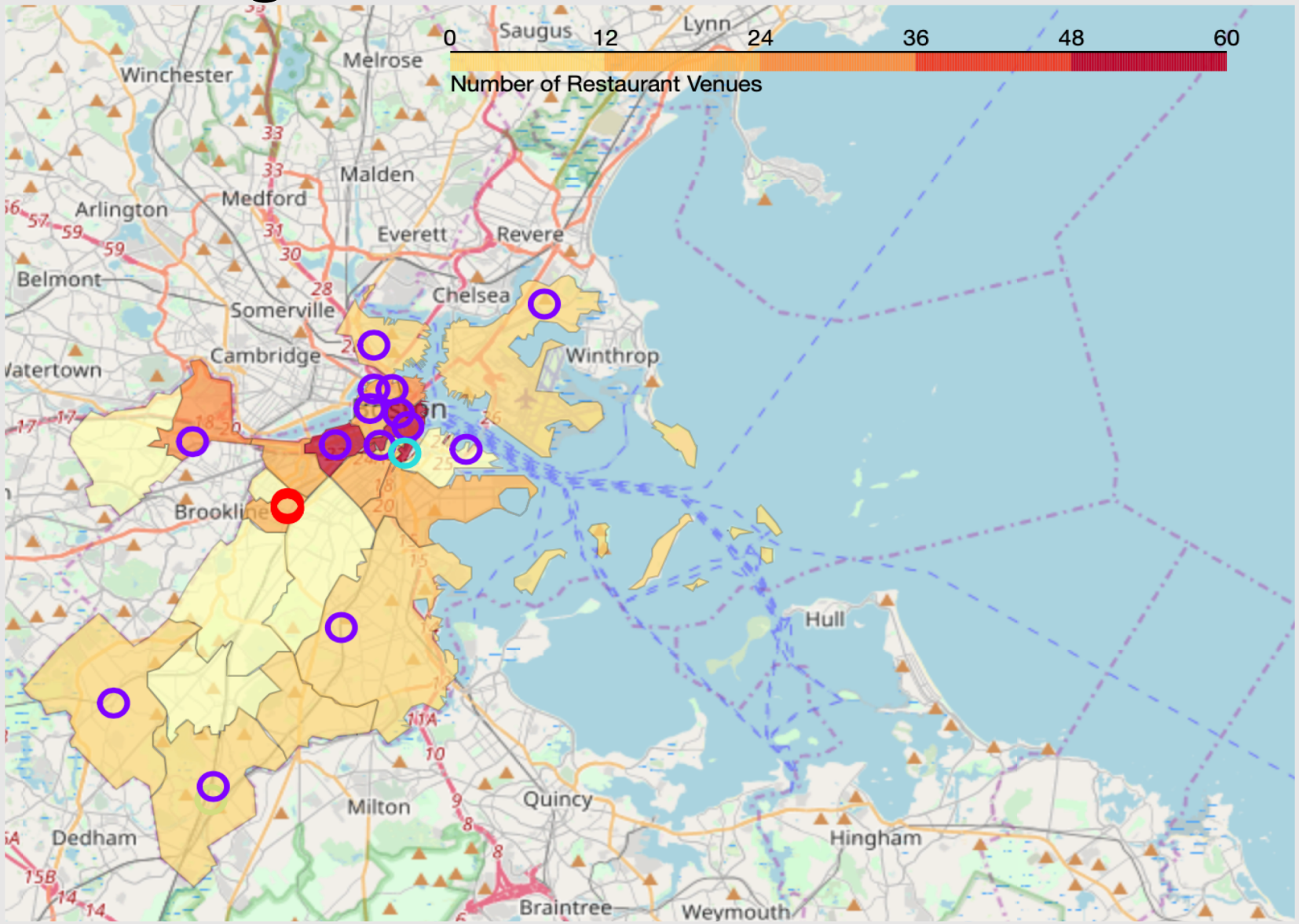


K-Means Clustering



Since I am trying to find “hubs” of highly frequented areas, k-means clustering is the best suited for this machine learning.

Visualizing Data



The ideal area is yellow or orange, and contains multiple circles, since that means those are areas with highly frequented venues than are not near many food locations.

The Next Steps

- Go to each location and find local businesses that would be willing to let you install a vending machine in or outside their store.

Thank You