



Businesses & Venues Data Analysis of Boston

Introduction

- o Boston is one of the most historically abundant cities in the United States.
- o It is the capital of the Massachusetts, and it has about 26 neighborhoods in total which cover an area of 49 square miles.
- o The city has an estimated population of 692,600 in 2019 making it the most populated city in New England.
- o Boston is placed among the top 30 most economically powerful cities in the world and is highly innovative because of presence of academia, access to venture capital, and the presence of many high-tech companies.

Problem

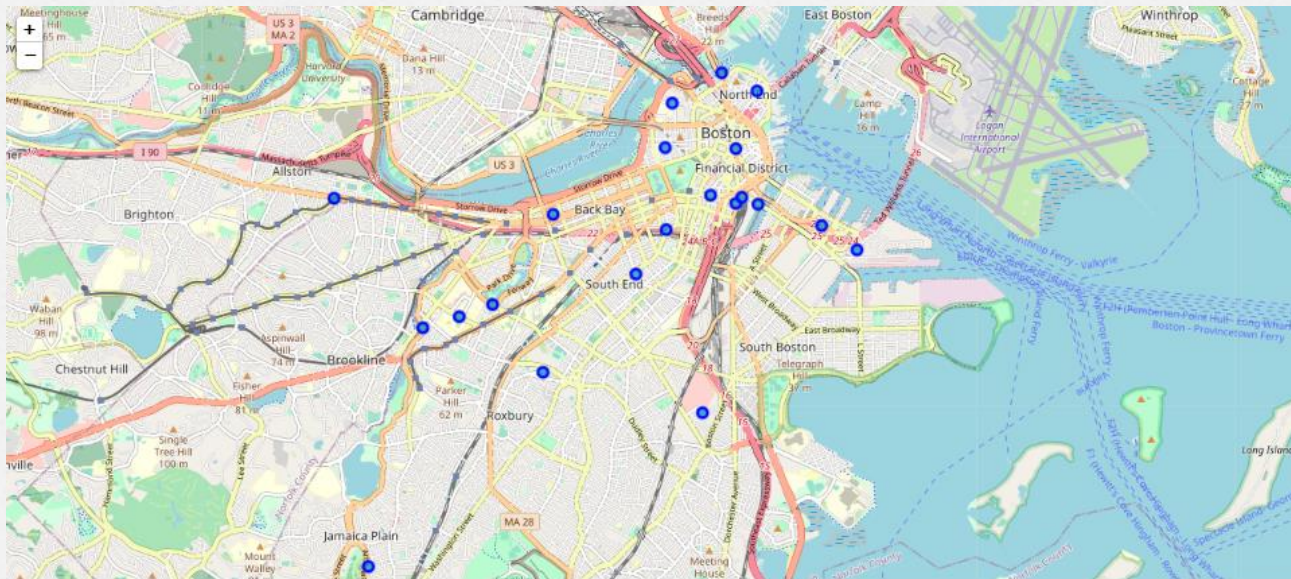
- To help a contractor, business entrepreneur/start up who is trying to start their own business.
- Where they locate their business depends in part on the location of the target market/customers, business partners, and their personal preferences.
- Here, we create a map and cluster the neighborhood venues in Boston to provide venue density and provide information that will guide investors/startups where to best locate their businesses in Boston City e.g. service, consulting, food store etc.

Data Description

- ***Boston neighborhoods dataset*** was used from Analyze Boston, which is Boston City's open data hub. This dataset was used for visualization purposes for zoning exploration.
- ***Foursquare API*** was used to help provide the information needed to segment and cluster the neighborhoods in the city of Boston. As well as, the most common venue categories in each neighborhood in Boston was used to create a map of the venue density in Boston City.
- ***Certified business directory dataset*** was used from Analyze Boston to determine which neighborhood has the most small/local business in Boston.

This data set has minority-owned and woman-owned businesses, small and small local businesses, and veteran and service disabled veteran-owned small businesses.
- ***Food establishment inspection dataset*** was used from Analyze Boston to find the all the active food establishment found in the Boston City. This was used to analyze the most neighborhoods with the most cuisines and restaurants
- ***Community center dataset*** was used from Analyze Boston to find the all the community centers/social venues found in the Boston City. This was used to analyze the most neighborhoods with the most social venues and activities.

A map of Boston was produced with its neighborhoods superimposed on top

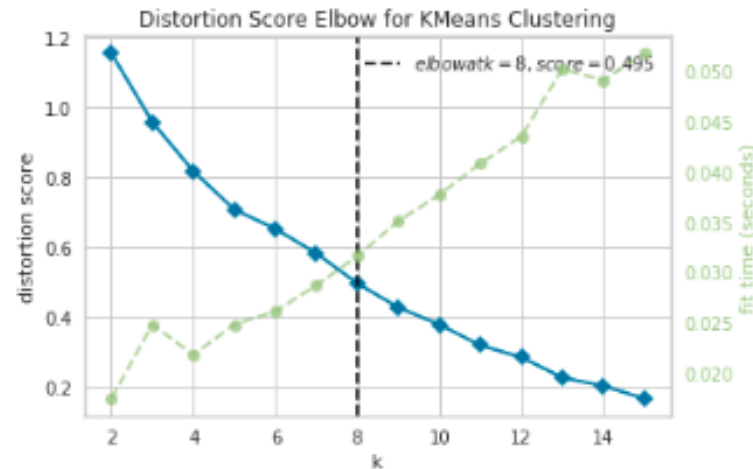


Top 10 most common venues for each neighborhood in Boston

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Allston	Metro Station	Pharmacy	Market	Park	Fried Chicken Joint
1	Back Bay	Clothing Store	Coffee Shop	Hotel	Women's Store	Accessories Store
2	Bay Village	Theater	Sandwich Place	Seafood Restaurant	Bakery	French Restaurant
3	Beacon Hill	Pizza Place	French Restaurant	Italian Restaurant	Hotel	Music Venue
4	Brighton	Coffee Shop	Yoga Studio	Pizza Place	Gym / Fitness Center	Thai Restaurant
5	Charlestown	Park	Pizza Place	Donut Shop	Sports Bar	Bar
6	Chinatown	Chinese Restaurant	Bakery	Asian Restaurant	Coffee Shop	Sandwich Place
7	Dorchester	Coffee Shop	Italian Restaurant	Bakery	Sandwich Place	American Restaurant
8	Downtown	Hotel	Sandwich Place	American Restaurant	Historic Site	Park
9	East Boston	Bakery	Chinese Restaurant	American Restaurant	Sandwich Place	Coffee Shop
10	Fenway	Art Museum	Café	Art Gallery	Park	Coffee Shop
11	Harbor Islands	Seafood Restaurant	Coffee Shop	American Restaurant	Boat or Ferry	Donut Shop
12	Hyde Park	Liquor Store	Supermarket	Pizza Place	Wings Joint	Pharmacy
13	Jamaica Plain	Park	Pet Store	Bakery	Plaza	Record Shop
14	Leather District	American Restaurant	Mobile Phone Shop	Coffee Shop	Gym	Department Store
15	Longwood	Coffee Shop	Café	Donut Shop	Falafel Restaurant	Sandwich Place
16	Mattapan	Park	Construction & Landscaping	Event Service	Pizza Place	Ice Cream Shop
17	Mission Hill	Sandwich Place	Café	Coffee Shop	American Restaurant	Pharmacy
18	North End	Italian Restaurant	Pizza Place	Park	Bakery	Seafood Restaurant
19	Roslindale	Bookstore	Pet Store	Italian Restaurant	Bus Line	Latin American Restaurant
20	Roxbury	Pharmacy	Rental Car Location	Pizza Place	Donut Shop	Bus Station
21	South Boston	Chinese Restaurant	Bakery	Asian Restaurant	Sandwich Place	Bubble Tea Shop
22	South Boston Waterfront	Seafood Restaurant	Music Venue	American Restaurant	Café	Steakhouse
23	South End	Wine Bar	American Restaurant	Park	Mexican Restaurant	Wine Shop
24	West End	Hotel	Donut Shop	Pizza Place	Bar	Museum
25	West Roxbury	Home Service	Pizza Place	Train Station	Bagel Shop	Food

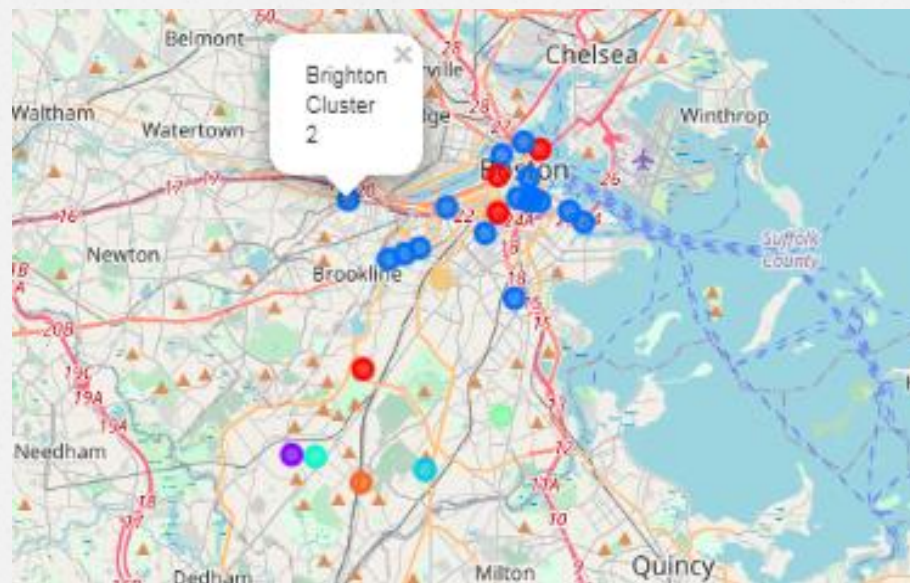
Methodology

- K-means clustering algorithm was used to cluster the neighborhoods based on the venues.
- Elbow method was used to determine the optimal k value.



Results

- A map with the clusters of the Boston neighborhoods was created with the name and cluster as point markers superimposed on top as shown below.



Clustering of neighborhoods in Boston based on venues

Cluster 1: Malls, Historic sites, Hotels and Dinning

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Jamaica Plain	0	Park	Bakery	Pet Store	Art Gallery	Library
Bay Village	0	Theater	Seafood Restaurant	Sandwich Place	Hotel	Bakery
North End	0	Italian Restaurant	Pizza Place	Park	Bakery	Seafood Restaurant
Beacon Hill	0	Pizza Place	Italian Restaurant	French Restaurant	Outdoor Sculpture	Kids Store

Cluster 2: Multiple social venues (Park, Malls, Historic sites, Nightclubs) & dining venues

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Mission Hill	2	Sandwich Place	Pharmacy	American Restaurant	Coffee Shop	Café
Longwood	2	Café	Coffee Shop	Falafel Restaurant	Sushi Restaurant	Sandwich Place
Leather District	2	American Restaurant	Department Store	Coffee Shop	Mobile Phone Shop	Chinese Restaurant
Chinatown	2	Chinese Restaurant	Bakery	Asian Restaurant	Coffee Shop	Sandwich Place
South End	2	Park	Wine Bar	American Restaurant	Gift Shop	Theater
Back Bay	2	Clothing Store	Coffee Shop	Hotel	Bookstore	Ice Cream Shop
East Boston	2	Bakery	Chinese Restaurant	Coffee Shop	American Restaurant	Sandwich Place
Charlestown	2	Pizza Place	Sports Bar	Park	Hotel	Bar
West End	2	Hotel	Donut Shop	Pizza Place	Bar	Café
Downtown	2	Historic Site	Sandwich Place	Hotel	American Restaurant	Park
Fenway	2	Art Museum	Café	Park	Restaurant	Gym
Brighton	2	Coffee Shop	Pizza Place	Yoga Studio	Taco Place	Nightclub
Dorchester	2	Coffee Shop	Sandwich Place	Italian Restaurant	Bakery	Hotel
South Boston Waterfront	2	Seafood Restaurant	Restaurant	American Restaurant	Steakhouse	Donut Shop
South Boston	2	Chinese Restaurant	Bakery	Asian Restaurant	Sandwich Place	Bubble Tea Shop
Harbor Islands	2	Seafood Restaurant	Coffee Shop	Donut Shop	American Restaurant	Boat or Ferry

Clustering of neighborhoods in Boston based on venues

Cluster 3: Service venues

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Mattapan	3	Park	Ice Cream Shop	Pizza Place	Event Service	Business Service

Cluster 4: Cultural dining venues

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Roslindale	4	Latin American Restaurant	Sandwich Place	Pet Store	Italian Restaurant	Chinese Restaurant

Cluster 5: Accommodation (bank, market, pharmacy) venues

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Allston	5	Bank	Pharmacy	Fried Chicken Joint	Fast Food Restaurant	Market

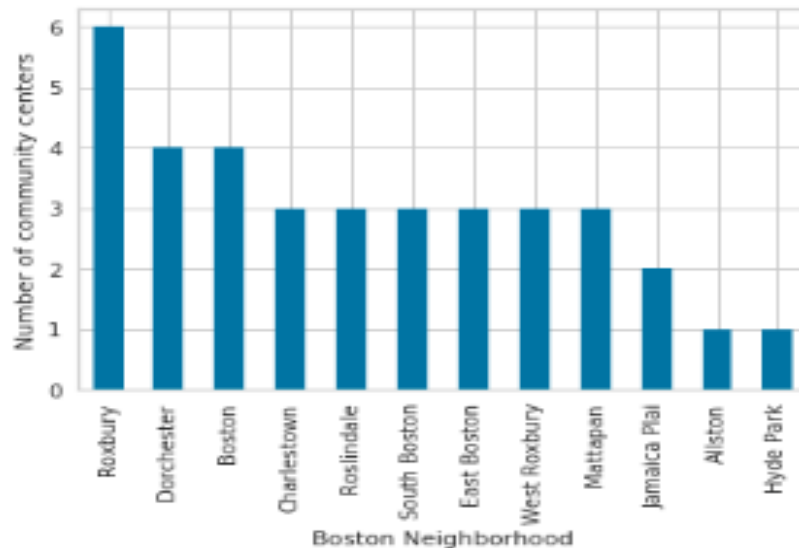
Cluster 6: Diverse food restaurants

Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Roxbury	6	Donut Shop	BBQ Joint	Pharmacy	African Restaurant	American Restaurant

Cluster 7: Drink/Food venues

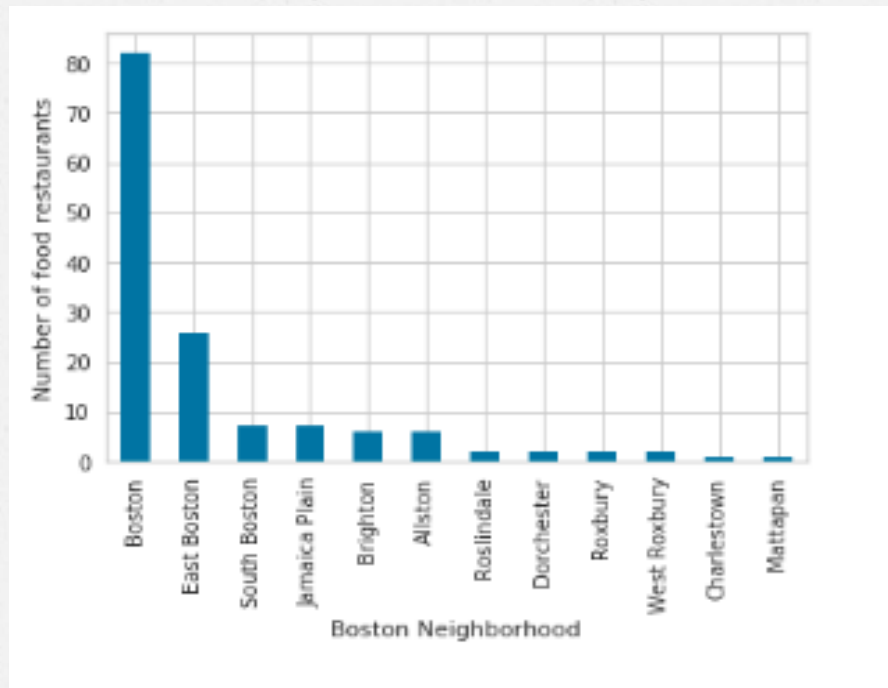
Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Hyde Park	7	Liquor Store	Pizza Place	Gym / Fitness Center	Mexican Restaurant	Buffet

Community center and social activities in Boston neighborhoods



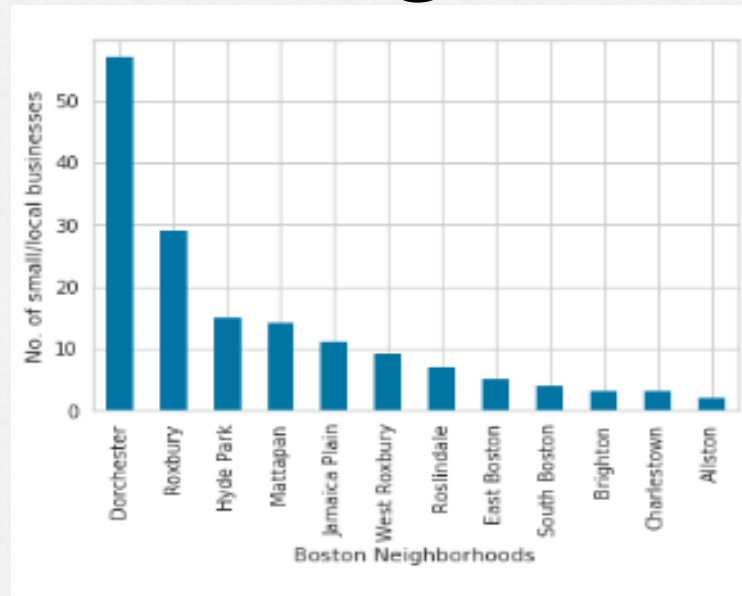
- Roxbury and Dorchester have the most community centers.
- These locations are for :
 - group activities
 - social support
 - public information
 - other purposes such as dining.

Food restaurants in Boston neighborhoods



Boston and East Boston have the most dining and food restaurants venues in the Boston area

Local/small businesses in Boston neighborhoods



Dorchester and Roxbury have the most minority-owned and woman-owned businesses, small and small local businesses, and veteran and service disabled veteran-owned small businesses in the Boston area.



Discussion



- o Boston is a populous city with lots of innovations with a lot of access to venture capital and the presence of many companies and businesses. It has many historic sites, social activities and dining services provided for its population. There are about 26 neighborhoods in Boston and each is diverse and populous with different venues.
- o K-means clustering method was used to classify the neighborhoods in Boston to determine which areas have which category of venues. It was found that a cluster of 8 provides the best fit for the model. The cluster of the neighborhoods were plotted on the Boston map to show the distribution of venues.
- o Dorchester and Roxbury have the most community centers for social activities and gathering, as well as, small/local business. Food restaurants are present in all the neighborhoods, but there is a higher concentration of such venues in the center of Boston and East Boston.

Conclusion and future directions



- o The modelling and data analysis performed in the project helps provide contractors information to know where best to locate to open their business.
- o With the use of the map visualization and the data visualization methods, better decisions can be made by contractors looking into opening a business e.g. retail, food or service venue in the Boston area.
- o More data is needed for larger and high-tech companies to provide information for startup/contractors looking to opening such company types in Boston.