Find the Best Location to Open an Ice Cream Shop in Boston Area

Introduction

Selecting a location for a business is one of the most important decisions in running a business. Business decision makers need to consider different factors in finding the right location for the business, such as financial factors, market factors, and the factors that will affect their demand and revenue. This project can help those who are planning to open a new business such as an ice-cream shop and need to find the best location for the shop in a city.

Business Problem

Starting a new business in a metropolitan city such as Boston can be challenging. Boston has 23 neighborhoods with various places that attract tourists and people to visit. Neighborhoods of Boston are different in terms of different factors that can directly or indirectly affect the success chance of business. It is important to evaluate those 23 neighborhoods based on the factors that affect running a successful business such as the number of competitors, and the potential demand in each of the neighborhoods. Budget limitations in renting or buying a place also play an important role in this decision making especially for small businesses.

In this project, we want to help a client to find the best neighborhood in Boston to open an Ice Cream shop. An ice cream shop is good to be near a place where many people visit such as near a cinema, park, garden, playground, etc. My client has a limited budget, and I need to consider it in my search. Also, a neighborhood that has fewer competitors is less risky for starting a new business.

Data

1. Extract the information about the neighborhoods of Boston

   We need to extract the 23 neighborhoods of Boston along with the median one-bedroom rent price (as an estimate of the renting price of the shop) of each neighborhood. For this purpose, we will use the following website and apply BeautifulSoup website scraping library to extract the data. http://realestate.boston.com/renting/2019/02/19/median-one-bedroom-rent-price/

2. Transform the data into pandas dataframe

3. Use GeoPy Python package to get the latitude and the longitude coordinates of all the neighborhoods of Boston

4. Map the neighborhoods using Folium Python library

5. Use Foursquare API to get information about some venues around these neighborhoods

   A. Looking for a group of venues in walking distance (500 meters) of each of these neighborhood.

   We considered Movie Theater, Playground, Park, Garden, Water Park, General Entertainment, Stadium, Amphitheater, Aquarium, Street Art, Beach, Recreation Center, Pedestrian Plaza venues. These venues are places that many people usually visit them for entertainment and hence we will have good demand for ice cream around them. The list of all venue categories of FourSquare can be found in the following link:

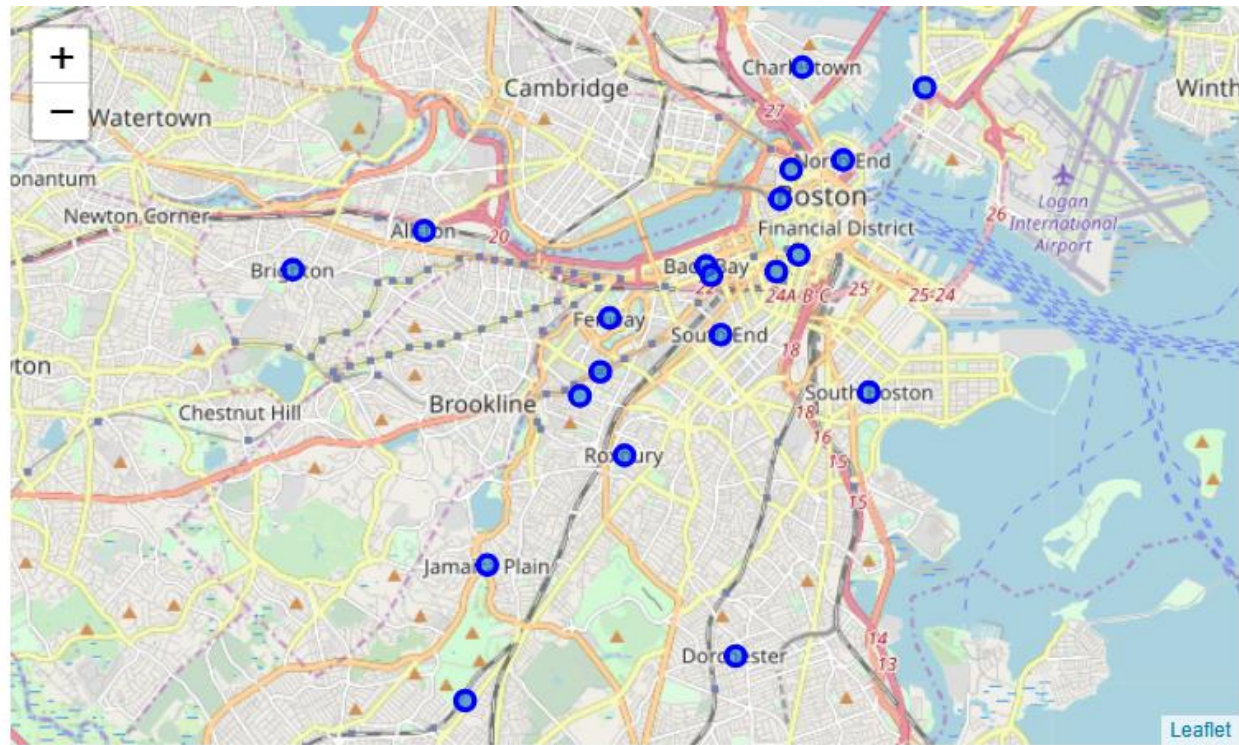   https://developer.foursquare.com/docs/resources/categories.

Figure 1: the 23 neighborhoods of Boston selected for this study

In total, we found 214 venues in Boston. The following plot shows that the most frequent venue is Park.
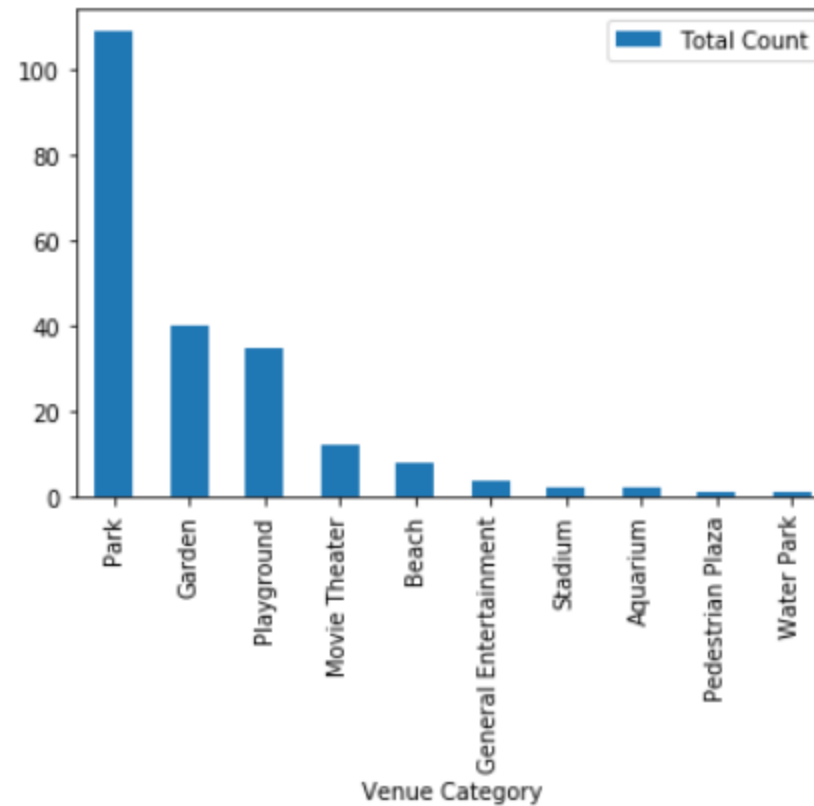
Figure 2: Total number of venues from each category around Boston neighborhoods

We removed Jamaica Plain neighborhood from the investigation as there was no Movie Theater, Playground, Park, Garden, Water Park, General Entertainment, Stadium, Amphitheater, Aquarium, Street Art, Beach, Recreation Center, Pedestrian Plaza venues in walking distance of this neighborhood.

B. Looking for Ice cream shops within walking distance of each of the neighborhoods

   In order to get an understanding of the competitors in each neighborhood, we searched for Ice cream shops within walking distance (500 meters) of each of the neighborhoods. In total, 23 Ice Cream Shop were found in Boston Area.

Please refer to Appendix 1, for a complete table of the neighborhoods with average rent, number of ice cream shops, and top 5 most common venues around each neighborhood.

Methodology

To start a new business, we need to select neighborhoods with fewer competitors. For this purpose, we will remove the neighborhoods with more than one ice cream shops. We will use K-means clustering to classify the neighborhoods based on the nearby venues and their frequencies (except the ice cream shop category). To make the decision, we will sort the neighborhoods in each cluster based on their average rent price. A neighborhood with a greater number of venues, no ice cream shop, and a lower price will be the best option

   I. Remove neighborhoods with more than one ice cream shop

Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Average Rent	Latitude	Longitude	Ice Cream Shop
Bay Village, MA, USA	Park	Movie Theater	Garden	Playground	Beach	21	2,700	42.350011	-71.066948	0.0
Brighton, MA, USA	Park	Beach	Water Park	Stadium	Playground	3	1,850	42.350097	-71.156442	0.0
Charlestown, MA, USA	Playground	Park	Garden	Water Park	Stadium	7	2,600	42.377875	-71.061996	1.0
Chinatown, MA, USA	Park	Movie Theater	Playground	Garden	Pedestrian Plaza	21	3,000	42.352217	-71.062607	1.0
Dorchester, MA, USA	Park	Garden	Water Park	Stadium	Playground	2	1,875	42.297320	-71.074495	0.0
East Boston, MA, USA	Park	Water Park	Stadium	Playground	Pedestrian Plaza	4	1,800	42.375097	-71.039217	0.0
Hyde Park, MA, USA	Park	Movie Theater	Water Park	Stadium	Playground	2	1,625	42.255654	-71.124496	1.0
Longwood Medical Area, MA, USA	Park	Playground	Garden	Water Park	Stadium	14	2,300	42.336168	-71.099527	1.0
Mattapan, MA, USA	Park	Water Park	Stadium	Playground	Pedestrian Plaza	1	1,500	42.272321	-71.086995	0.0
Mission Hill, MA, USA	Park	Playground	Garden	Water Park	Stadium	10	2,100	42.332926	-71.103214	1.0
Roslindale, MA, USA	Playground	Water Park	Stadium	Pedestrian Plaza	Park	2	1,700	42.291209	-71.124497	0.0
Roxbury, MA, USA	Park	Playground	Garden	Water Park	Stadium	7	1,780	42.324843	-71.095016	1.0
South Boston, MA, USA	Park	Beach	Stadium	Water Park	Playground	6	2,800	42.333431	-71.049495	0.0
South End Boston, MA,USA	Park	Garden	Playground	Movie Theater	Water Park	24	2,700	42.341310	-71.077230	0.0
West Roxbury, MA, USA	Playground	Water Park	Stadium	Pedestrian Plaza	Park	1	1,810	42.279265	-71.149497	0.0

II. Cluster the neighborhoods

Run k-means to cluster the neighborhood into 5 clusters based on the frequency of different venue categories (except ice-cream shop) around them.

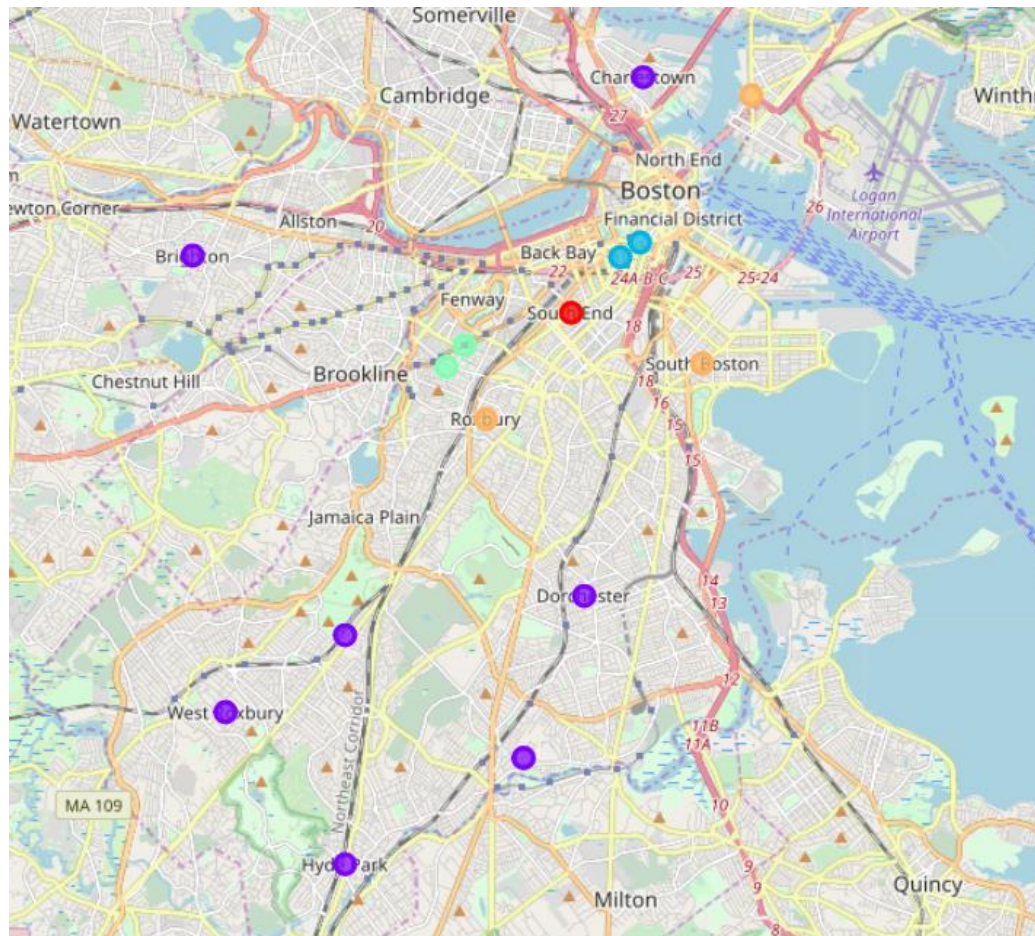## III. Map the clustered neighborhoods

Figure 3: Use KMeans to cluster the neighborhoods of Boston into 5 classes

Results

The result of 5 clusters are specified in this section. The neighborhoods in each cluster are sorted based on their average rent price:

Cluster 1:

Neighborhood	Average Rent	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Ice Cream Shop
South End Boston, MA,USA	2,700	Park	Garden	Playground	Movie Theater	Water Park	24	0.0

Cluster 2:

Neighborhood	Average Rent	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Ice Cream Shop
Mattapan, MA, USA	1,500	Park	Water Park	Stadium	Playground	Pedestrian Plaza	1	0.0
Hyde Park, MA, USA	1,625	Park	Movie Theater	Water Park	Stadium	Playground	2	1.0
Roslindale, MA, USA	1,700	Playground	Water Park	Stadium	Pedestrian Plaza	Park	2	0.0
West Roxbury, MA, USA	1,810	Playground	Water Park	Stadium	Pedestrian Plaza	Park	1	0.0
Brighton, MA, USA	1,850	Park	Beach	Water Park	Stadium	Playground	3	0.0
Dorchester, MA, USA	1,875	Park	Garden	Water Park	Stadium	Playground	2	0.0
Charlestown, MA, USA	2,600	Playground	Park	Garden	Water Park	Stadium	7	1.0

Cluster 3:

Neighborhood	Average Rent	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Ice Cream Shop
Bay Village, MA, USA	2,700	Park	Movie Theater	Garden	Playground	Beach	21	0.0
Chinatown, MA, USA	3,000	Park	Movie Theater	Playground	Garden	Pedestrian Plaza	21	1.0

Cluster 4:

Neighborhood	Average Rent	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Ice Cream Shop
Mission Hill, MA, USA	2,100	Park	Playground	Garden	Water Park	Stadium	10	1.0
Longwood Medical Area, MA, USA	2,300	Park	Playground	Garden	Water Park	Stadium	14	1.0

Cluster 5:

Neighborhood	Average Rent	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Ice Cream Shop
Roxbury, MA, USA	1,780	Park	Playground	Garden	Water Park	Stadium	7	1.0
East Boston, MA, USA	1,800	Park	Water Park	Stadium	Playground	Pedestrian Plaza	4	0.0
South Boston, MA, USA	2,800	Park	Beach	Stadium	Water Park	Playground	6	0.0

Discussion

According to the result of our analysis, South End Boston (in cluster 1) is the best neighborhood to open an ice cream shop in Boston. It has the greatest number of total venues and is expected to attract many people to visit. This neighborhood with 12 parks, 7 gardens, 4 playgrounds, and one movie theater and no ice cream shop within walking distance is the best option. However, the final decision is dependent on the budget of the client to rent the place. According to the budget limitations of the client, we can find other neighborhoods and select the one with the greatest number of venues and a smaller number of ice cream shops around. This clustering can also help our client compare different neighborhoods to make a better decision. For example, South End Boston is a better option comparing to both neighborhoods in cluster 3 as has less average rent price, a larger number of venues, and no ice cream shop around.
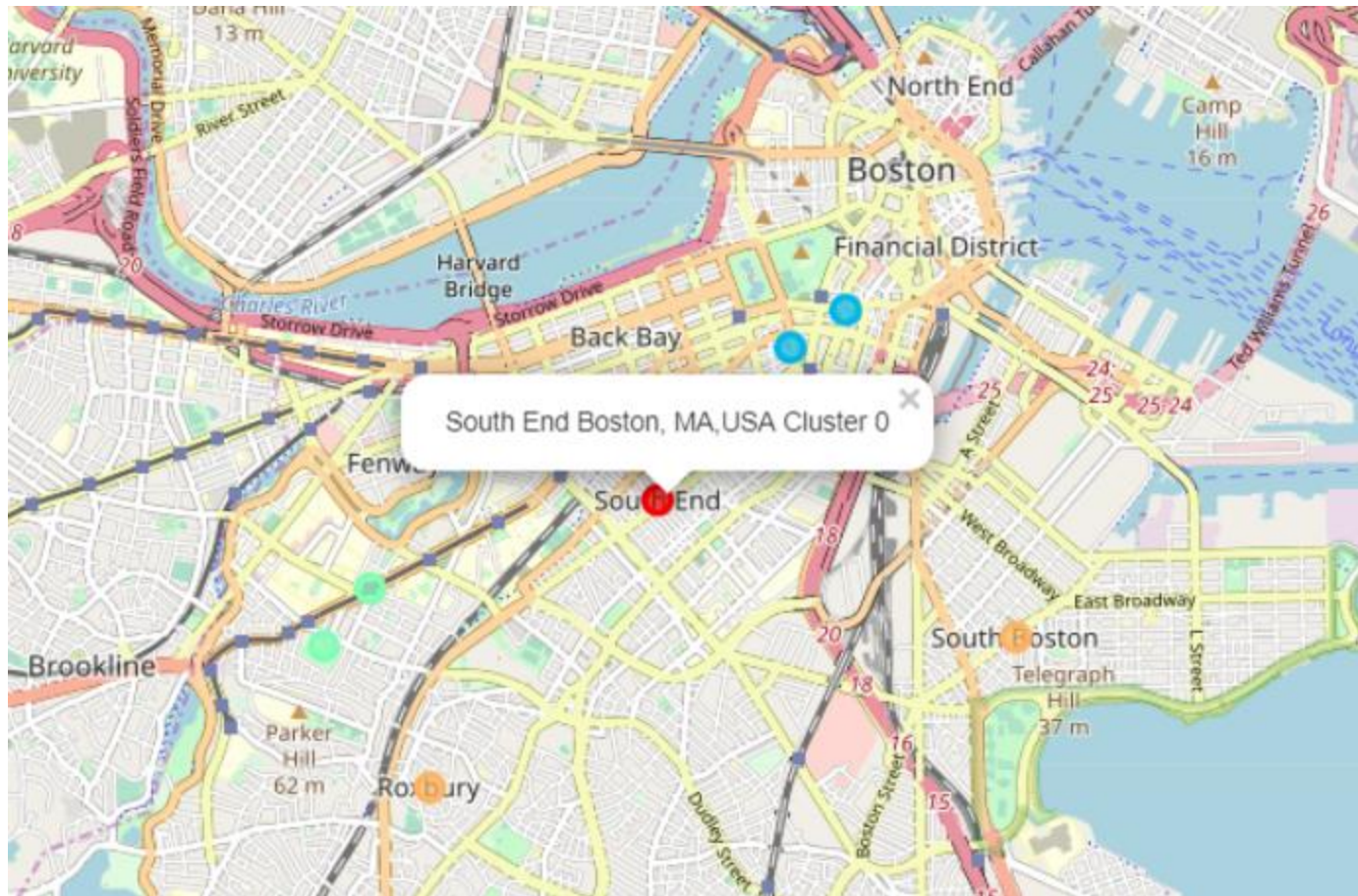
Figure 4: South End Boston with 12 parks, 7 gardens, 4 playgrounds, and one movie theater and no ice cream shop within walking distance is the best option

Conclusion

We used the information about the neighborhoods of Boston to help my client to select the best location to open an ice cream shop in Boston. We considered number of competitors, demand for ice cream, and budget limitations to find the best location options. This project has some limitations. First, we have limited the location options to the neighborhoods of Boston, however considering more specific locations such as particular streets can improve the accuracy of our decision. Second, we used the median of one bedroom rent price in each neighborhood

as an estimate of the rent price. Third, we limited our investigation for the venues within 500 meter of the neighborhoods and changing it can affect the clusters. Also, we considered equal weight for different venues and as an extension one can consider different weights for different venues (for example being near a beach has more impact on the demand for ice cream comparing to being near a pedestrian plaza).

Appendix 1:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	# of venues	Average Rent	Latitude	Longitude	Ice Cream Shop
0	Allston, MA, USA	Playground	Water Park	Stadium	Pedestrian Plaza	Park	1	1,950	42.355434	-71.132127	2.0
1	Back Bay, MA, USA	Park	Playground	General Entertainment	Garden	Water Park	6	2,900	42.350707	-71.079730	2.0
2	Bay Village, MA, USA	Park	Movie Theater	Garden	Playground	Beach	21	2,700	42.350011	-71.066948	0.0
3	Beacon Hill, MA, USA	Garden	Park	Playground	Water Park	Beach	14	2,400	42.359820	-71.066162	3.0
4	Boston Downtown, MA,USA	Park	Playground	General Entertainment	Garden	Beach	8	3,050	42.349327	-71.078655	2.0
5	Brighton, MA, USA	Park	Beach	Water Park	Stadium	Playground	3	1,850	42.350097	-71.156442	0.0
6	Charlestown, MA, USA	Playground	Park	Garden	Water Park	Stadium	7	2,600	42.377875	-71.061996	1.0
7	Chinatown, MA, USA	Park	Movie Theater	Playground	Garden	Pedestrian Plaza	21	3,000	42.352217	-71.062607	1.0
8	Dorchester, MA, USA	Park	Garden	Water Park	Stadium	Playground	2	1,875	42.297320	-71.074495	0.0
9	East Boston, MA, USA	Park	Water Park	Stadium	Playground	Pedestrian Plaza	4	1,800	42.375097	-71.039217	0.0
10	Fenway, MA, USA	Park	Garden	Playground	Stadium	Movie Theater	17	2,450	42.343451	-71.097716	3.0
11	Hyde Park, MA, USA	Park	Movie Theater	Water Park	Stadium	Playground	2	1,625	42.255654	-71.124496	1.0
12	Longwood Medical Area, MA, USA	Park	Playground	Garden	Water Park	Stadium	14	2,300	42.336168	-71.099527	1.0
13	Mattapan, MA, USA	Park	Water Park	Stadium	Playground	Pedestrian Plaza	1	1,500	42.272321	-71.086995	0.0
14	Mission Hill, MA, USA	Park	Playground	Garden	Water Park	Stadium	10	2,100	42.332926	-71.103214	1.0
15	North End, MA, USA	Park	Garden	Playground	General Entertainment	Water Park	22	2,300	42.365097	-71.054495	3.0
16	Roslindale, MA, USA	Playground	Water Park	Stadium	Pedestrian Plaza	Park	2	1,700	42.291209	-71.124497	0.0
17	Roxbury, MA, USA	Park	Playground	Garden	Water Park	Stadium	7	1,780	42.324843	-71.095016	1.0
18	South Boston, MA, USA	Park	Beach	Stadium	Water Park	Playground	6	2,800	42.333431	-71.049495	0.0
19	South End Boston, MA,USA	Park	Garden	Playground	Movie Theater	Water Park	24	2,700	42.341310	-71.077230	0.0
20	West End, MA, USA	Park	Garden	Playground	Movie Theater	General Entertainment	21	2,195	42.363919	-71.063899	2.0
21	West Roxbury, MA, USA	Playground	Water Park	Stadium	Pedestrian Plaza	Park	1	1,810	42.279265	-71.149497	0.0