Brooklyn, NYC, USA Skate Parks Analysis

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1 Introduction

1.1 Business Problem

There may not be enough skate parks in the New York City, particularly in Boroughs outside of Manhattan. Some of the existing skate parks may be suffering from overcrowding. Also, in certain cases, some neighborhoods may have access to a larger number of skate parks, which in turn could result in underutilization. I am interested in seeing which neighborhoods might benefit from additional skate parks in their area versus neighborhoods that are fortunate to have more than enough. Another factor is that will be distance between a neighborhoods to the nearest skate park. More specifically, within a 3 mile (4828.032m) radius.

For this assignment, I will focus of the borough of Brooklyn. The methodology used can also be applied for other NYC boroughs and neighborhoods analysis.

1.2 Audience/Stakeholder

My target audience and/or Stakeholder would be the **New York City Department of Parks and Recreation**.

The **New York City Department of Parks and Recreation** (nycgovparks.org), also called **Parks Department** and **NYC Parks**, is the department of the government of New York City responsible for maintaining the city's parks system, preserving and maintaining the ecological diversity of the city's natural areas, and furnishing recreational opportunities for city's residents and visitors (Wikipedia).

2 Data

2.1 "Brooklyn Neighborhoods by Population" website

An internet search was conducted in order to find the best source of data for the detailed breakdown of the number of people per Brooklyn neighborhood. Many of the sites only had summarized data and/or the neighborhood data was stored within multiple layers of the website(s). Therefore, the best source was collected from Brooklyn Neighborhoods By Population. Unfortunately, this site only had the populations of the main neighborhoods. While this was the case, this information was nonetheless helpful for this project.

The table was pulled using Python and the Beautiful Soup Library. Following this, the data was stored into a Pandas dataframe.

Brooklyn Neighborhoods By Population

Rank	Neighborhood	Population
1	Bedford-Stuyvesant	157,530
2	Bensonhurst	151,705
3	Bushwick	129,239

2.2 New York Dataset

Dataset from https://cocl.us/new_york_dataset because this contains all of the data related to the New York boroughs and neighborhoods. Such as, the name of the borough; the name of the neighborhood; and the coordinates for both areas.

The geopy library to get the latitude and longitude values of Brooklyn. In addition, this data allowed me to map the neighborhoods.

	Borough	Neighborhood	Latitude	Longitude
0	Brooklyn	Bay Ridge	40.625801	-74.030621
1	Brooklyn	Bensonhurst	40.611009	-73.995180
2	Brooklyn	Sunset Park	40.645103	-74.010316
3	Brooklyn	Greenpoint	40.730201	-73.954241
4	Brooklyn	Gravesend	40.595260	-73.973471

2.3 Foursquare

My focus was to bring in all skate parks venues within a 3 miles (4828.032 meters) radius. Any radius that was greater than this will create an overlap and an increase in the number of available skate parks within a given neighborhood.

During this analysis I used the Foursquare's API/Endpoints to pull the following data:

- Venue Name
- The Venue's Latitude & Longitude
- The Venue's category so that I can filter on skate parks
- The Neighborhood that the Venue is located
- The Neighborhood's Latitude & Longitude

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Bay Ridge	40.625801	-74.030621	5050 Skatepark	40.628053	-74.074548	Skate Park
1	Bay Ridge	40.625801	-74.030621	Millennium Skate Park	40.640938	-74.030570	Skate Park
2	Bay Ridge	40.625801	-74.030621	Fort Hamilton Roller Hockey	40.638216	-73.999462	Skate Park
3	Bensonhurst	40.611009	-73.995180	Skate	40.607003	-73.959730	Skate Park
4	Bensonhurst	40.611009	-73.995180	Fort Hamilton Roller Hockey	40.638216	-73.999462	Skate Park

3 Methodology

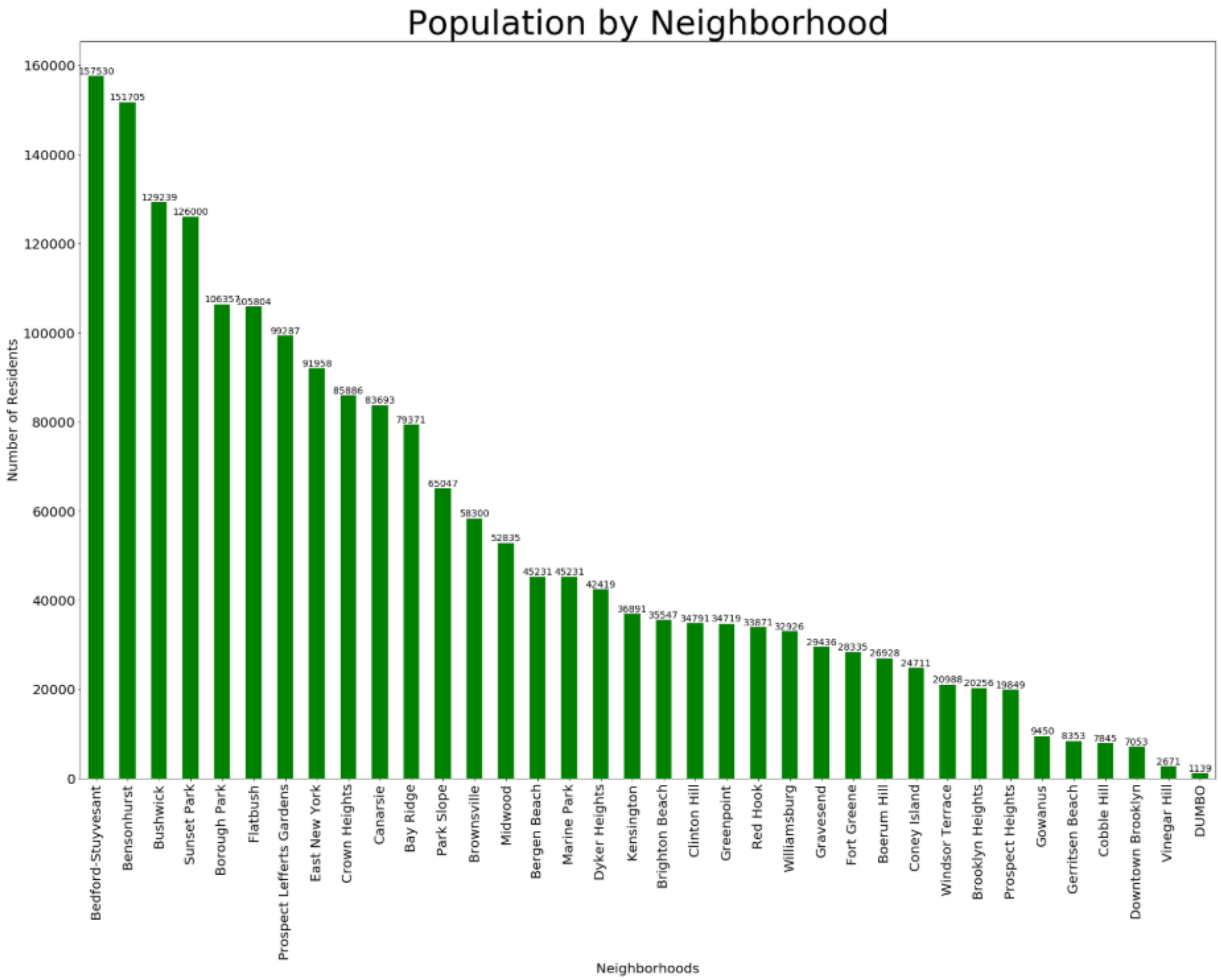
The approached taken for the project was to first determine the data that would be necessary to for the analysis. For the population of the each of the main Brooklyn neighborhoods, an internet search was carried out.

The next set for the data was to capture data from the **New York Dataset** that was provided during one of the labs.

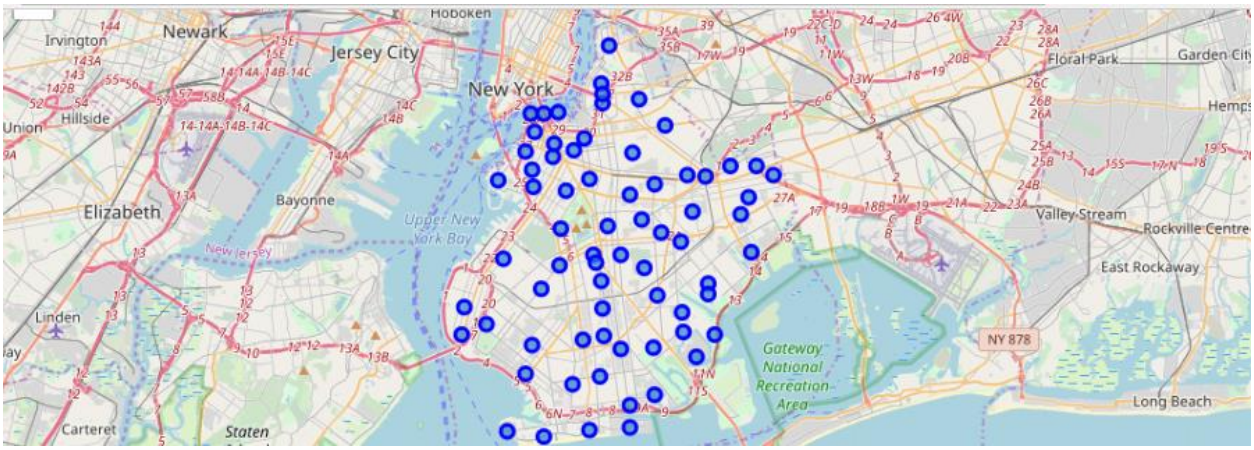
What also required was the geo location data for Brooklyn, as such the geopy library was used.

Lastly, data from the Foursquare website was used. The Foursqaure API utilizied to pull the data. The intent was to capture all of the skate park venues within a **3 mile (4828.032 meters)** radius.

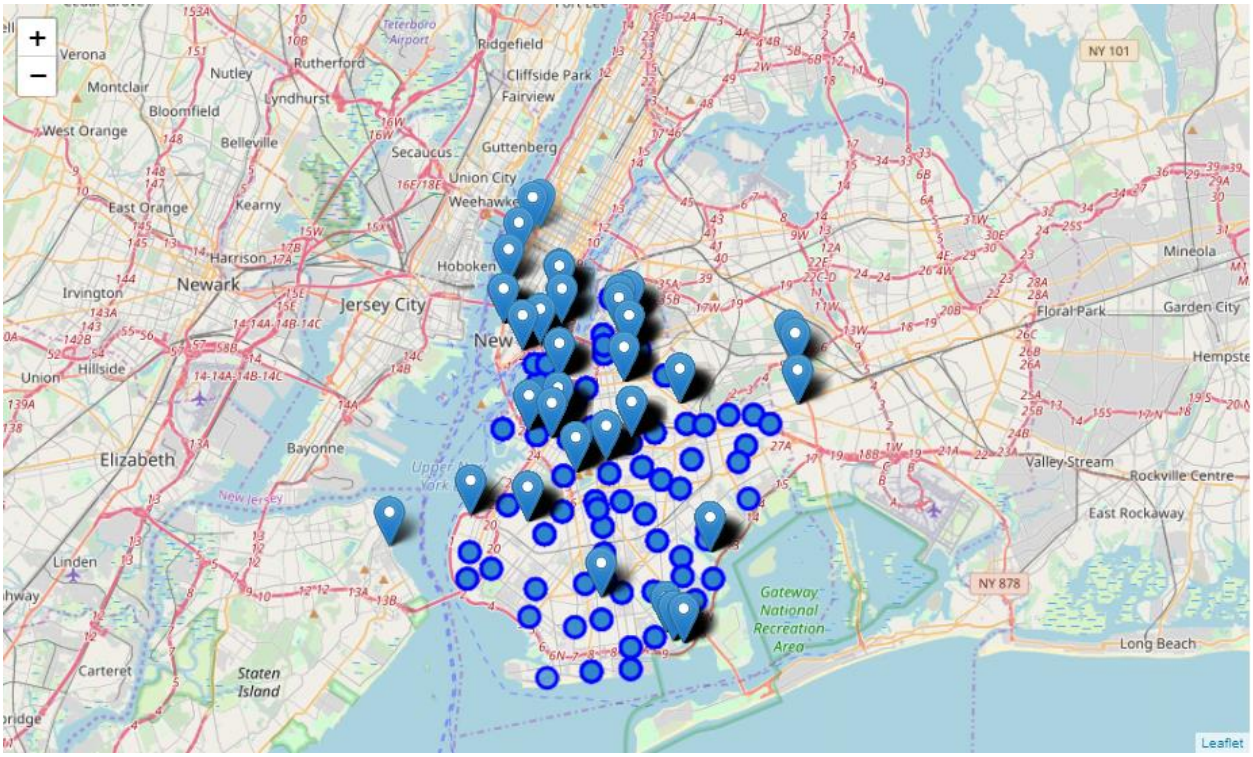
Once the data was captured and **cleansed** (**searching for skate parks, the result set returned ever venue that had the work "park" in it**), the Brooklyn population data by neighborhood was graphed to get a since of where most people lived. Note that the details on ages will not considered.



The neighborhoods were placed on a map to visualize their locations. Similarly, in order to visualize the location of each skate park in relation to a neighborhood, the skate parks and neighborhoods were plotted on a map.



Location of all of the Brooklyn Neighborhoods



Brooklyn Neighborhoods with the skate parks within a 3 miles radius

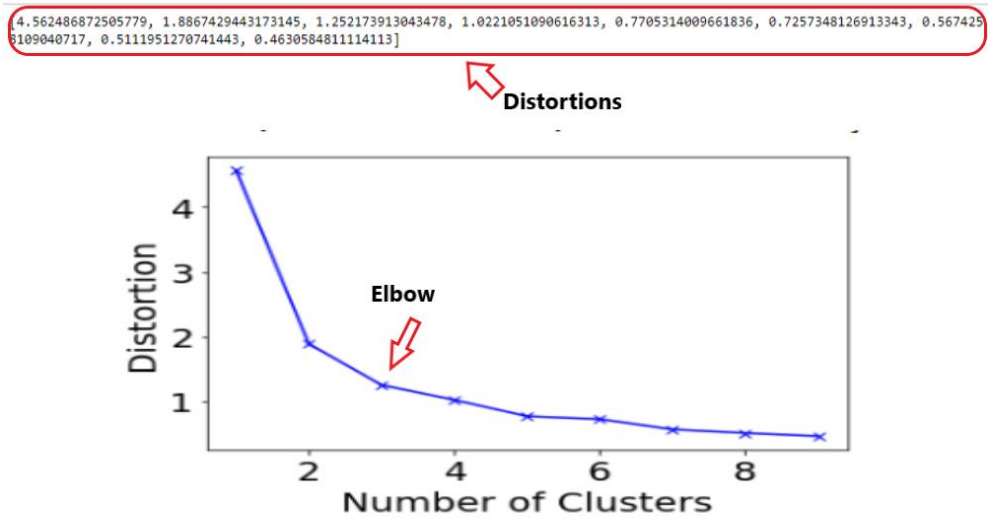
To assist with the best approach to take, the exact distances between each neighborhood to a skate park was calculated. The purpose is to see if **K-means clustering** should be based on distance. Another approach was to determine if the count of each skate park within a 3 mile radius of each neighborhood should be used.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	Distance (in miles)
0	Bay Ridge	40.625801	-74.030621	5050 Skatepark	40.628053	-74.074548	Skate Park	2.314581
1	Bay Ridge	40.625801	-74.030621	Millennium Skate Park	40.640938	-74.030570	Skate Park	1.044472
2	Bay Ridge	40.625801	-74.030621	Fort Hamilton Roller Hockey	40.638216	-73.999462	Skate Park	1.848443
3	Bensonhurst	40.611009	-73.995180	Skate	40.607003	-73.959730	Skate Park	1.884572
4	Bensonhurst	40.611009	-73.995180	Fort Hamilton Roller Hockey	40.638216	-73.999462	Skate Park	1.890784

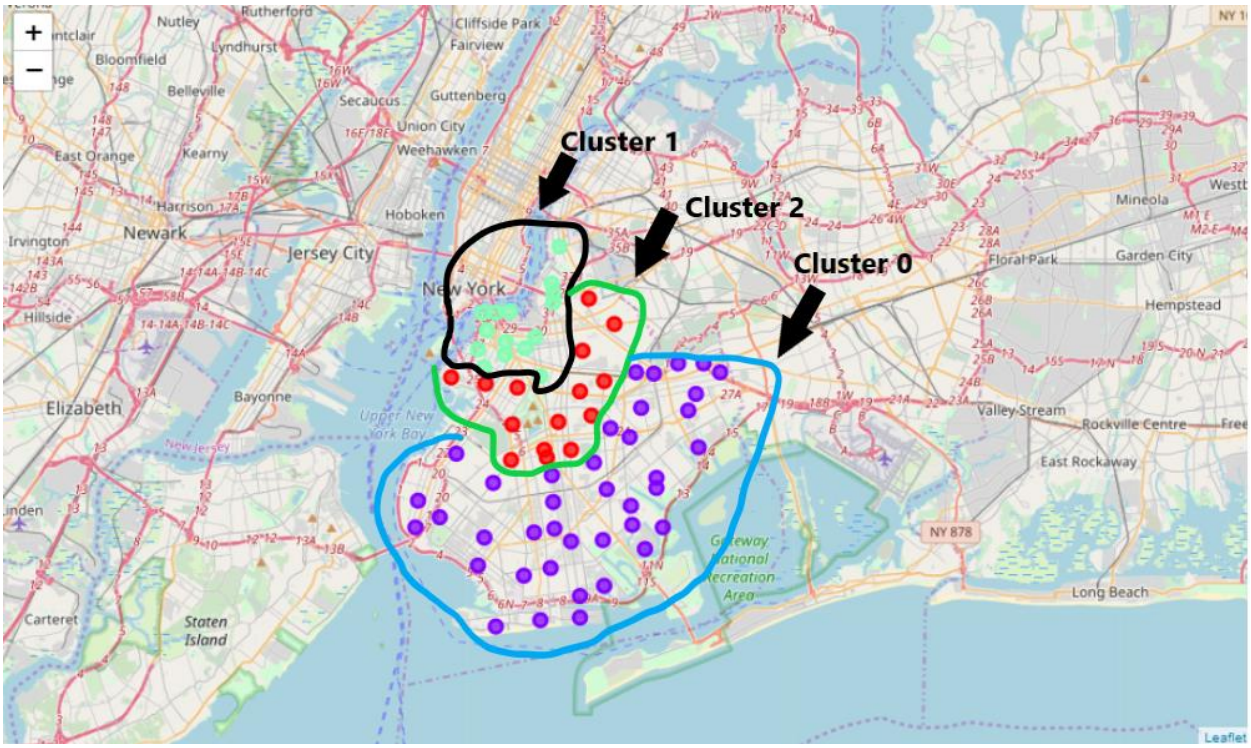
The decision to use the counts of each skate park within a 3 mile radius of each neighborhood was use.

	Neighborhood	Skate Park
0	Bath Beach	2
1	Bay Ridge	3
2	Bedford Stuyvesant	12
3	Bensonhurst	3
4	Bergen Beach	4
5	Boerum Hill	16

Afterwards, since the k for K-means clustering is unknown, **the Elbow method was utilized to determine the k**.



After the data was passed to the K-means clustering model, the results were plotted on a map to visualize the location of each cluster.



Finally, the neighborhoods of each cluster was listed to help discern which area should another skate park.

Cluster 0

	Neighborhood	Cluster Labels	Skate Park
32	Coney Island	0	1
28	Canarsie	0	1
33	Bath Beach	0	2
27	Starrett City	0	2
4	Gravesend	0	2
59	Paerdegat Basin	0	2
53	Fort Hamilton	0	3
66	Homecrest	0	3
35	Dyker Heights	0	3
52	Ocean Parkway	0	3
1	Bensonhurst	0	3
0	Bay Ridge	0	3
58	New Lots	0	3
30	Mill Island	0	4
60	Mill Basin	0	4
10	East Flatbush	0	4
7	Manhattan Terrace	0	4
31	Manhattan Beach	0	4
68	Madison	0	4
57	Remsen Village	0	4
6	Sheepshead Bay	0	4
48	Georgetown	0	4
26	East New York	0	4
37	Marine Park	0	4
36	Gerritsen Beach	0	4
45	Bergen Beach	0	4
25	Cypress Hills	0	4
5	Brighton Beach	0	4
44	City Line	0	4
14	Brownsville	0	5
8	Flatbush	0	5
29	Flatlands	0	5
43	Ocean Hill	0	5
64	Broadway Junction	0	5
46	Midwood	0	5
67	Highland Park	0	5
2	Sunset Park	0	6
56	Rugby	0	6
34	Borough Park	0	6

Cluster 1

	Neighborhood	Cluster Labels	Skate Park
13	Prospect Heights	1	13
20	Carroll Gardens	1	14
19	Cobble Hill	1	14
3	Greenpoint	1	15
50	North Side	1	16
41	Boerum Hill	1	16
51	South Side	1	16
61	Fulton Ferry	1	17
65	Dumbo	1	17
15	Williamsburg	1	17
62	Vinegar Hill	1	18
18	Brooklyn Heights	1	18
40	Downtown	1	19
23	Fort Greene	1	20
38	Clinton Hill	1	20

Cluster 2

	Neighborhood	Cluster Labels	Skate Park
47	Prospect Park South	2	7
55	Wingate	2	7
69	Erasmus	2	7
54	Ditmas Park	2	7
63	Weeksville	2	8
16	Bushwick	2	8
11	Kensington	2	8
42	Prospect Lefferts Gardens	2	9
12	Windsor Terrace	2	9
21	Red Hook	2	10
9	Crown Heights	2	10
24	Park Slope	2	11
17	Bedford Stuyvesant	2	12
49	East Williamsburg	2	12
22	Gowanus	2	12

4 Results and Discussion

The borough of Brooklyn has a total of **70 neighborhoods**. Based on the population data that was collected, as of January 30, 2019 there is a total of **1,941,652 people** that live across each neighborhood. The **New York Department of Parks and Recreation** provided its residents with **36 outdoor and indoor skate parks** throughout the boroughs.

The **largest number of skate parks (21)** are located in the **northern portion of Brooklyn** and are north of Eastern Parkway (a main road that runs east – west through a portion of Brooklyn**). 9 out of the 21 skate parks** for this northern section are in the borough of Manhattan. There are a total of **11 skate parks in the southern portion of Brooklyn. 1 skate park is located** in the borough of Staten Island.

The below neighborhoods are fortunate enough to have 3 – 5 parks within a 1.5 miles radius:

Bedford Stuyvesant	Boerum Hill	Brooklyn Heights
Bushwick	Carroll Gardens	Clinton Hill
Cobble Hill	Downtown	Dumbo
East Williamsburg	Fort Greene	Fulton Ferry
Gerritsen Beach	Gowanus	Greenpoint
North Side	Park Slope	Prospect Heights
Prospect Lefferts Gardens	Red Hook	Sheepshead Bay
South Side	Vinegar Hill	Williamsburg
Windsor Terrace	Wingate	

The below neighborhoods have 10 or more skate parks within a 3 miles radius:

Bedford Stuyvesant - 12	Boerum Hill - 16	Brooklyn Heights - 18
Carroll Gardens - 14	Clinton Hill - 20	Cobble Hill - 14
Crown Heights - 10	Downtown - 19	Dumbo - 17
Park Slope - 11	Prospect Heights - 13	Red Hook - 10
South Side - 16	Vinegar Hill - 18	Williamsburg - 17

Looking at the results from pass**ing** the data through the K-means Clustering model and using 3 for “k”, the model’s results clustered the number of skate parks as follows:

Cluster Label	Cluster Range
Cluster 0	1 - 6
Cluster 1	13 - 20
Cluster 2	7 - 12

5 Conclusion

The neighborhoods that would benefit from additional skate parks would be the ones that full within Cluster 0. The recommendation would be to start to look at placing new parks in the Coney Island, Canarsie, Bath Beach, Gravesend, and Paerdegat Basin neighborhoods because the skaters and riders have a maximum of 1 - 2 parks to skate/ride.

In order to keep costs down, a single skate park should be built between Coney Island Canarsie.