

The Battle of the Neighborhoods: Brooklyn Edition

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1. Introduction

1.1 Background

Your friend is considering opening a coffee shop in the Brooklyn borough of New York City, NY. Brooklyn is the up and coming borough of New York City and they are requesting help selecting a neighborhood to open their shop in to be successful. They have asked for your assistance with your expertise in data analytics with Python to help them select a location for an increased likelihood of success.

1.2 Problem

The problem you need to solve is to select a neighborhood to recommend your friend open the coffee shop in. You should employ data analytics with Python to select the optimal neighborhood for the coffee shop based on neighborhood segmenting and clustering as well as analysis of the types of venues in the neighborhood.

1.3 Interest

The target audience of this problem is your friend who is opening the coffee shop as well as any investors or stakeholders involved in the opening of the coffee shop. This presentation will provide a recommendation for the neighborhood to open the coffee shop in as well as provide the documentation of the data analysis performed to inform the recommendation. Your friend, investors, and stakeholders will care about the recommendations and the supporting analysis because it can make them confident that they are making a data informed decision optimizing their success.

2. Data Acquisition and Cleaning

2.1 Data Sources

For the data to solve this business problem, we will use the dataset of New York City neighborhoods and boroughs at the following link of data collected and stored as a shapefile by NYU.

https://geo.nyu.edu/catalog/nyu_2451_34572

2.2 Data Cleaning

The data is first extracted from the url and then looped to create a data frame from the features key filling in one row at a time ensuring that the data from all 5 boroughs and 306 neighborhoods is included. This transforms the data into a workable form for analysis in with Pandas in Python. Additionally, this problem requires the use of data only for the borough of Brooklyn. The data frame is sliced to create a new data frame only including Brooklyn's data. Then, Foursquare API is utilized to access venue data regarding the neighborhoods in Brooklyn. The original dataset is utilized to develop a json Folium map in combination with the Foursquare data to cluster the venues and determine the most common venue in each cluster.

2.3 Features Selection

This dataset consists of the 306 neighborhoods in New York City including the neighborhood name, borough, latitude, longitude, geometry type, and annotation. We can extract each neighborhood including the neighborhood name, borough, latitude, and longitude into a Pandas data frame. This data will allow for the neighborhoods to be plotted on the map and grouped by borough. Then, we will filter the dataset and data frame to only include the Brooklyn borough. This resultant dataset and data frame can be utilized with the Foursquare data of venues to analyze each neighborhood and make a recommendation.

3. Exploratory Data Analysis Methodology

Here is the link to the Jupyter notebook on Github containing the full data analysis

[https://github.com/kgunneson/Coursera_Capstone/blob/master/The%20Battle%20of%20the%20Neighborhoods%20\(5\).ipynb](https://github.com/kgunneson/Coursera_Capstone/blob/master/The%20Battle%20of%20the%20Neighborhoods%20(5).ipynb)

The following is an explanation of the methodology used in the data analysis.

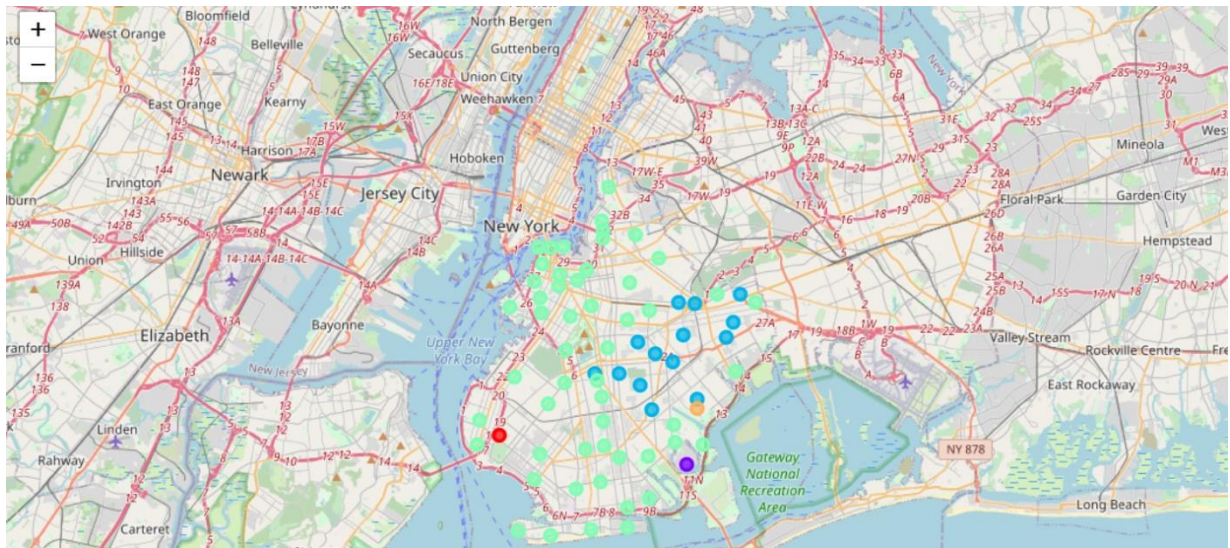
3.1 Foursquare Venue Data

After the data imported, cleaned, and the maps are created, then you are ready to begin data analysis. First, the Foursquare data of the venues in Brooklyn can be imported and analyzed to determine the number of unique venues in the borough. Then, the groupby method can be applied to determine the frequency of the occurrence of each type of venue in each neighborhood. This allows you to determine the top five and ten most frequently

occurring venue types for each neighborhood. With this, you can determine the most frequent types of venues in each neighborhood and begin to gain perspective regarding the characteristics of the neighborhood.

3.2 K-Means Clustering Map

Next, k-means clustering is utilized to cluster the neighborhoods in Brooklyn into five groups. Then, the clustered neighborhoods are color coded on the map below with the colors light green, red, blue, orange, and purple.



Cluster 1 is represented by the red dot. Cluster 2 is represented by the purple dot. Cluster 3 is represented by the blue dots. Cluster 4 is represented by the green dots. Cluster 5 is represented by the orange dot.

3.3 Top 10 Venues for Each Cluster

Then, data frames were constructed for each neighborhood cluster regarding the top ten most frequent venue types in each cluster. This will allow for the revelation of the trends in the neighborhood to determine where a coffee shop will likely do well.

4. Results

The following page of results contains a summary of the neighborhoods and the top ten venue types in each neighborhood for each cluster. These resultant data frames can be utilized to observe commonalities in the clusters to determine the optimal neighborhood to open a coffee shop in Brooklyn.

Neighborhood Dyker Heights	1st Most Common	Venue Park	2nd Most Common	Venue Golf Course	3rd Most Common	Venue Bagel Shop	4th Most Common	Venue Cosmetics Shop	5th Most Common	Venue Burger Joint	6th Most Common	Venue Food Truck	7th Most Common	Venue Food Stand	8th Most Common	Venue Food Court	9th Most Common	Venue Food & Drink Shop	10th Most Common	Venue Food
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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
Mill Island	Pool	Women's Store	Flea Market	Field	Filipino Restaurant	Fish & Chips Shop	Fish Market	Fishing Spot	Fishing Store	Flower Shop

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
East Flatbush	Moving Target	Supermarket	Fast Food Restaurant	Caribbean Restaurant	Pharmacy	Chinese Restaurant	Chinese Restaurant	Liquor Store	Food & Drink Shop	Department Store
Brownsville	Restaurant	Fried Chicken Joint	Pool	Spanish Restaurant	Farmers Market	Chinese Restaurant	Chinese Restaurant	Performing Arts Venue	Convenience Store	Convenience Store
Cypress Hills	Latin American Restaurant	Fast Food Restaurant	Spanish Restaurant	Ice Cream Shop	Fried Chicken Joint	Donut Shop	Gas Station	Baseball Field	Seafood Restaurant	Bank
East New York	Fast Food Restaurant	Spanish Restaurant	Bus Stop	Caribbean Restaurant	Music Venue	Salon / Barbershop	Gym	Metro Station	Event Service	Chinese Restaurant
Canarsie	Chinese Restaurant	Gym	Grocery Store	Deli / Bodega	Food	Caribbean Restaurant	Thai Restaurant	Asian Restaurant	Fishing Shop	Filipino Restaurant
Flatlands	Pharmacy	Fried Chicken Joint	Fast Food Restaurant	Caribbean Restaurant	Nightclub	Paper / Office Supplies Store	Bar	Park	Lounge	Video Store
Ocean Hill	Deli / Bodega	Fried Chicken Joint	Southern / Soul Food Restaurant	Bakery	Playground	Pizza Place	Donut Shop	Pharmacy	Coffee Shop	Cocktail Bar
Prospect Park South	Caribbean Restaurant	Pizza Place	Grocery Store	Mobile Phone Shop	Fast Food Restaurant	Latin American Restaurant	Donut Shop	Clothing Store	Kids Store	Fried Chicken Joint
Wingate	Fried Chicken Joint	Donut Shop	Bakery	Caribbean Restaurant	Other Great Outdoors	Fish & Chips Shop	Field	Fast Food Restaurant	Liquor Store	Bus Station
Rugby	Grocery Store	Deli / Bodega	Bank	Caribbean Restaurant	Fried Chicken Joint	Mobile Phone Shop	Salon / Barbershop	Chinese Restaurant	Seafood Restaurant	Gas Station
Remsen Village	Caribbean Restaurant	Fast Food Restaurant	Deli / Bodega	Gym	Donut Shop	Rental Service	Salad Place	Chinese Restaurant	Sandwich Place	Fish Market
New Lots	Fried Chicken Joint	Pizza Place	Bus Stop	Breakfast Spot	Chinese Restaurant	Salon / Barbershop	Grocery Store	Metro Station	Bank	Bank
Broadway Junction	Fried Chicken Joint	Donut Shop	Diner	Bakery	Recording Studio	Sandwich Place	Caribbean Restaurant	Nightclub	Burger Joint	Sandwich Place
Erasmus	Caribbean Restaurant	Yoga Studio	Convenience Store	Bus Line	Food Truck	Mobile Phone Shop	Furniture / Home Store	Chinese Restaurant	School	

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
Bay Ridge	Italian Restaurant	Pizza Place	Spa	Bagel Shop	American Restaurant	Greek Restaurant	Chinese Restaurant	Chinese Restaurant	Sandwich Place	
Bensonhurst	Donut Shop	Ice Cream Shop	Pizza Place	Park	Chinese Restaurant	Italian Restaurant	Sushi Restaurant	Grocery Store	Cosmetics Shop	Coffee Shop
Sunset Park	Pizza Place	Bank	Latin American Restaurant	Mexican Restaurant	Mobile Phone Shop	Bakery	Fried Chicken Joint	Pharmacy	Gym	Sandwich Place
Greenpoint	Bar	Pizza Place	Coffee Shop	Cocktail Yoga Studio	Yoga Studio	Mexican Restaurant	French Restaurant	Sushi Restaurant	Bakery	Furniture / Home Store
Grauseland	Bakery	Metro Station	Lounge	Pizza Place	Italian Restaurant	Pharmacy	Bar	Mobile Phone Shop	Cosmetics Shop	Martial Arts School
Brighton Beach	Russian Restaurant	Eastern European Restaurant	Restaurant	Beach	Gourmet Shop	Sushi Restaurant	Bank	Convenience Store	Non-Profit	Mediterranean Restaurant
Sheepshead Bay	Dessert Shop	Turkish Restaurant	Harbor / Marina	Sandwich Place	Yoga Studio	Playground	Chinese Restaurant	Steakhouse	Restaurant	Cosmetics Shop
Manhattan Terrace	Ice Cream Shop	Pizza Place	Grocery Store	Donut Shop	Bagel Shop	Bus Station	Coffee Shop	Bagel Shop	Convenience Store	Sandwich Place
Flatbush	Chinese Restaurant	Deli / Bodega	Mexican Restaurant	Caribbean Restaurant	Juice Bar	Deli / Bodega	Bakery	Bank	Middle Eastern Restaurant	Salon / Barbershop
Crown Heights	Pizza Place	Café	Museum	Bagel Shop	Fried Chicken Joint	Pizza Place	Deli / Bodega	Pharmacy	Coffee Shop	Spa
Kensington	Grocery Store	Thai Restaurant	Restaurant	Ice Cream Shop	Sandwich Place	Mobile Phone Shop	Middle Eastern Restaurant	Mexican Restaurant	Nail Salon	Bookstore
Windsor Terrace	Café	Pizza	Grocery Store	Diner	Thai Restaurant	Restaurant	Tapas Restaurant	Bagel Shop	Chinese Restaurant	Beer Bar
Prospect Heights	Bar	Mexican Restaurant	Deli Shop	Bakery	Breakfast Spot	Cocktail Bar	Latin American Restaurant	Ice Cream Shop	Coffee Shop	Vegetarian / Vegan Restaurant
Williamsburg	Pizza Place	Bar	Coffee Shop	Bagel Shop	Discount Store	Breakfast Spot	Gift Shop	Taco Place	Liquor Store	French Restaurant
Bushwick	Bar	Deli / Bodega	Mexican Restaurant	Coffee Shop	Delhi / Bodega	Bar	Gift Shop	Café	Pizza Place	Park
Bedford Stuyvesant	Coffee Shop	Café	Pizza Place	Bar	Coffee Shop	Gym	Gourmet Shop	Grocery Store	Boutique	
Brooklyn Heights	Yoga Studio	Deli / Bodega	Park	Pizza Place	Bar	Cocktail Bar	Italian Restaurant	Cosmetics Shop	Bakery	Middle Eastern Restaurant
Cobble Hill	Cocktail Bar	Coffee Shop	Playground	Pizza Place	Spa	Deli / Bodega	Yoga Studio	Italian Restaurant	Ice Cream Shop	Thai Restaurant
Carroll Gardens	Italian Restaurant	Coffee Shop	Bakery	Pizza Place	Wine Shop	American Restaurant	Wine Shop	Bar	Grocery Store	Thai Restaurant
Red Hook	Art Gallery	Seafood Restaurant	Park	Pizza Place	Wine Shop	Playground	Chinese Restaurant	Gym / Fitness Center	Farm	Art Gallery
Gowanus	Italian Restaurant	Italian Restaurant	Furniture / Home Store	Pizza Place	Playground	French Restaurant	Cocktail Bar	Coffee Shop	Coffee Shop	Opera House
Fort Greene	Flower Shop	Wine Shop	Italian Restaurant	Pizza Place	Pub	Spa	Supermarket	Beach	Theater	Mexican Restaurant
Park Slope	Coffee Shop	Burger Joint	Bagel Shop	Pizza Place	Bookstore	River	Ice Cream Shop	Bakery	Pet Store	Music Venue
Starrrett City	Shopping Mall	Shopping Mall	Pharmacy	Caribbean Restaurant </td <td>Gym Pool</td> <td>Ice Cream Shop</td> <td>Skating Rink</td> <td>Chinese Restaurant</td> <td>Bus Stop</td> <td>Food Stand</td>	Gym Pool	Ice Cream Shop	Skating Rink	Chinese Restaurant	Bus Stop	Food Stand
Manhattan Beach	Café	Bus Stop	Playground	Sandwich Place	Food	Donut Shop	Sushi Restaurant	Fast Food Restaurant	Food Court	Burger Joint
Coney Island	Baseball Stadium	Cosmetics Shop	Monument / Landmark	Brewery	Food Court	Bakery	Chinese Restaurant	Beach	Theme Park Ride / Attraction	Coffee Shop
Bath Beach	Italian Restaurant	Gas Station	Pharmacy	Bubble Tea Shop	Cantonese Restaurant	Delhi / Bodega	Gas Station	Fast Food Restaurant	Chinese Restaurant	Restaurant
Borough Park	Bank	Pizza Place	Fast Food Restaurant	Pharmacy	Harbor / Marina	Grocery Store	Japanese Restaurant	Event Space	Deli / Bodega	Yoga Studio
Gerritsen Beach	Pizza Place	Bar	Department Store	Chinese Restaurant	Gym	Baseball Field	Fishing Store	Basketball Court	Pizza Place	Fishing Store
Marine Park	Ice Cream Shop	Athletics & Sports	Soccer Field	Wine Shop	Mexican Restaurant	Delhi / Bodega	Fish & Chips Shop	Restaurant	Indian Restaurant	Food Stand
Clinton Hill	Italian Restaurant	Pizza Place	Thai Restaurant	Bus Station	Flower Shop	Filipino Restaurant	Grocery Store	Fish Market	Fishing Spot	Grocery Store
Sea Gate	Spa	Beach	American Restaurant	Chinese Restaurant	Bar	Sandwich Place	Arts & Crafts Store	Cocktail Bar	Cocktail Bar	Discount Store
Downtown	Burger Joint	Coffee Shop	Bar	Bakery	Furniture / Home Store	French Restaurant	Arts & Crafts Store	Sandwich Place	Gym / Fitness Center	Bus Line
Boerum Hill	Dance Studio	Coffee Shop	Pizza Place	Pizza Place	Caribbean Restaurant	Ice Cream Shop	Chinese Restaurant	Sushi Restaurant	Indian Restaurant	Fish Market
Prospect Lefferts Gardens	Café	Bakery	Deli / Bodega	Grocery Store	Bakery	Sandwich Place	Spanish Restaurant	Fried Chicken Joint	South American Restaurant	Fish Market
City Line	Donut Shop	Pizza Place	Liquor Store	Grocery Store						Shopping Mall
Bergen Beach	Harbor / Marina	Athletics & Sports	Baseball Field	Playground	Hockey Field	Women's Store	Field	Filipino Restaurant	Fish & Chips Shop	Gym / Fitness Center
Midwood	Pizza Place	Ice Cream Shop	Convenience Store	Bank	Sandwich Place	Video Game Store	Pharmacy	Filipino Restaurant	Fish & Chips Shop	French Restaurant
Georgetown	Bank	Pharmacy	Breakfast Spot	Bakery	Donut Shop	Shipping Store	Frozen Yogurt Shop	Mexican Restaurant	Burger Joint	South American Restaurant
East Williamsburg	Bar	Deli / Bodega	Bakery	Cocktail Bar	Coffee Shop	Concert Hall	Mexican Restaurant	Juice Bar	Café	Liquor Store
North Side	Coffee Shop	Pizza Place	Wine Bar	Yoga Studio	Bar	American Restaurant	Bakery	Breakfast Spot	Sushi Restaurant	Pharmacy
South Side	Coffee Shop	Bar	Playground	Bakery	Food	Chinese Restaurant	Yoga Studio	Sake Bar	Steakhouse	Japanese Restaurant
Ocean Parkway Place	Pizza Place	Sushi Restaurant	Playground	Chinese Restaurant	Sandwich Place	Steakhouse	General Entertainment	Donut Shop	Health Food Store	Liquor Store
Fort Hamilton	Deli / Bodega	Pizza Place	Italian Restaurant	Burger Joint	Pizza Place	Bus Stop	Gym / Fitness Center	Donut Shop	Gift Shop	Bakery
Ditmas Park	Chinese Restaurant	Deli / Bodega	Food Truck	Chinese Restaurant	Kids Store	Frozen Yogurt Shop	Caribbean Restaurant	Sushi Restaurant	Gift Shop	Scenic Lookout
Mill Basin	Chinese Restaurant	Japanese Restaurant	Pizza Place	Bank	Bagel Shop	Café	Breakfast Spot	Pizza Place	Roof Deck	Liquor Store
Fulton Ferry	Park	American Restaurant	Scenic Lookout	Coffee Shop						

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Paardegat Basin	Food	Asian Restaurant	Deli / Bodega	Business Service	Filipino Restaurant	Fish & Chips Shop	Fish Market	Fishing Spot	Fishing Store	Flea Market

5. Discussion

5.1 Observations

Based on the analysis of the above results, you can observe trends in the types of venues that are successful in each cluster. The number of neighborhoods contained in each cluster as well as the most common venues are listed in the table below.

Cluster #	Number of Neighborhoods Included	Most Common Venue Types
Cluster 1	1 neighborhood	Park
Cluster 2	1 neighborhood	Pool
Cluster 3	14 neighborhoods	Various types of restaurants including Latin American, fast food, Chinese, Fried Chicken, and a Caribbean restaurant.
Cluster 4	53 neighborhoods	Various restaurants including Italian restaurants, pizza places, Chinese restaurants, cafes, delis/bodegas, and a few coffee shops
Cluster 5	1 neighborhood	Food

Cluster 1, 2, and 5 include only one neighborhood and thus do not allow us to develop strong observations.

Cluster 3 consists of 14 neighborhoods. The most common venue type in these neighborhoods are various types of restaurants including Latin American, fast food, Chinese, Fried Chicken, and a Caribbean restaurant. While restaurants have proven to be successful in these neighborhoods, the types of restaurants that are not similar to a coffee shop. Lastly, cluster 4 consists of 53 neighborhoods. The most common venue type in these neighborhoods are various types of restaurants including Italian restaurants, pizza places, Chinese restaurants, cafes, delis/bodegas, and a few coffee shops. This demonstrates that restaurants of varying levels of scale and price have been successful in these neighborhoods. Additionally, coffee shops are the most common venue in some clusters, but the majority of neighborhoods are not overrun with coffee shops illustrating room for development.

5.2 Recommendations

Based on these observations, I would recommend that the coffee shop be opened in one of the Brooklyn neighborhoods in cluster 4 where coffee shops are not one of the most common venues. These neighborhoods include Bay Ridge, Sunset Park, Gravesend, Brighton Beach, Sheephead Bay, Kensington, Winsor Terrace, Prospect Heights, Red Hook, Starrett City, Manhattan Beach, Coney Island, Bath Beach, Gerritsen Beach, Marine Park, Clinton Hill, Sea Gate, Prospect Lefferts Gardens, City Line, Bergen Beach, Midwood, Georgetown, Ocean Parkway, Fort Hamilton, Ditmas Park, Mill Basin, Weeksville, Dumbo, Homecrest, Highland Park, and Madison. These neighborhoods are included in the cluster where restaurants of various scales and price values have been successful and are not overly populated by coffee shops providing the opportunity for success.

6. Conclusions

In this study, I have analyzed data regarding the venues in each neighborhood in Brooklyn as well as their geographic location to determine the optimal neighborhood to open a coffee shop in. The neighborhoods were clustered based on their geographic location and the venue data was analyzed to reveal trends in the types of venues that are successful in each cluster of neighborhoods. Based on this analysis, I recommend that the coffee shop be opened in one of the neighborhoods in cluster 4 where coffee shops are not already one of the most common venues. These neighborhoods include Bay Ridge, Sunset Park, Gravesend, Brighton Beach, Sheephead Bay, Kensington, Winsor Terrace, Prospect Heights, Red Hook, Starrett City, Manhattan Beach, Coney Island, Bath Beach, Gerritsen Beach, Marine Park, Clinton Hill, Sea Gate, Prospect Lefferts Gardens, City Line, Bergen Beach, Midwood, Georgetown, Ocean Parkway, Fort Hamilton, Ditmas Park, Mill Basin, Weeksville, Dumbo, Homecrest, Highland Park, and Madison.

7. Future Direction

Future study and closer analysis can be performed on the neighborhoods within cluster 4 to determine the single optimal neighborhood to open the coffee shop in.