Analysis of business sites in Brooklyn neighborhoods

Stalin Figueroa Álava

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1. Introduction

1.1 Background and business analysis

In this case study
a clearer vision will be given to enter a new business in the Brooklyn district.

To achieve the objective we will do an analysis
where all the commercial premises of all the neighborhoods of the Brooklyn district will be explored

We will explore their geographic locations, their types of businesses, the names of the businesses and the number of commercial places by category.

We will also analyze the most common commercial premises, and the less common ones.

With this analysis
interested persons or companies may have a clearer vision to enter a new business in the Brooklyn district.

2. Data acquisition and cleaning

2.1 Data source

To achieve the objective of analyzing all the commercial premises of all the neighborhoods of the

Brooklyn district, we began by downloading the data of the city of new york with its geographical

locations from the following link: Datos New York

With the help of the Foursquare API, we explore all the Brooklyn neighborhoods with their

commercial places and categories

2.2 Data Cleaning

Having obtained the data from the indicated sources, we move on to the next process of transforming the data into a pandas data frame to segment and group the data for the neighborhoods in the Brooklyn borough.

After creating the new panas data frame with the Brooklyn data, and obtaining the Brooklyn latitude and longitude values, then the Brooklyn map is created.

With the help of the Foursquare API, we scanned all the Brooklyn neighborhoods with their business locations and categories to generate the data frame, an image of which can be seen in the following figure 1.

In that data frame, we have all the neighborhoods in Brooklyn

with the 10 most common business locations for each neighborhood.

At the end of the case study, we will apply machine learning techniques to analyze all the information by clusters, and

to get responses to the following requests:

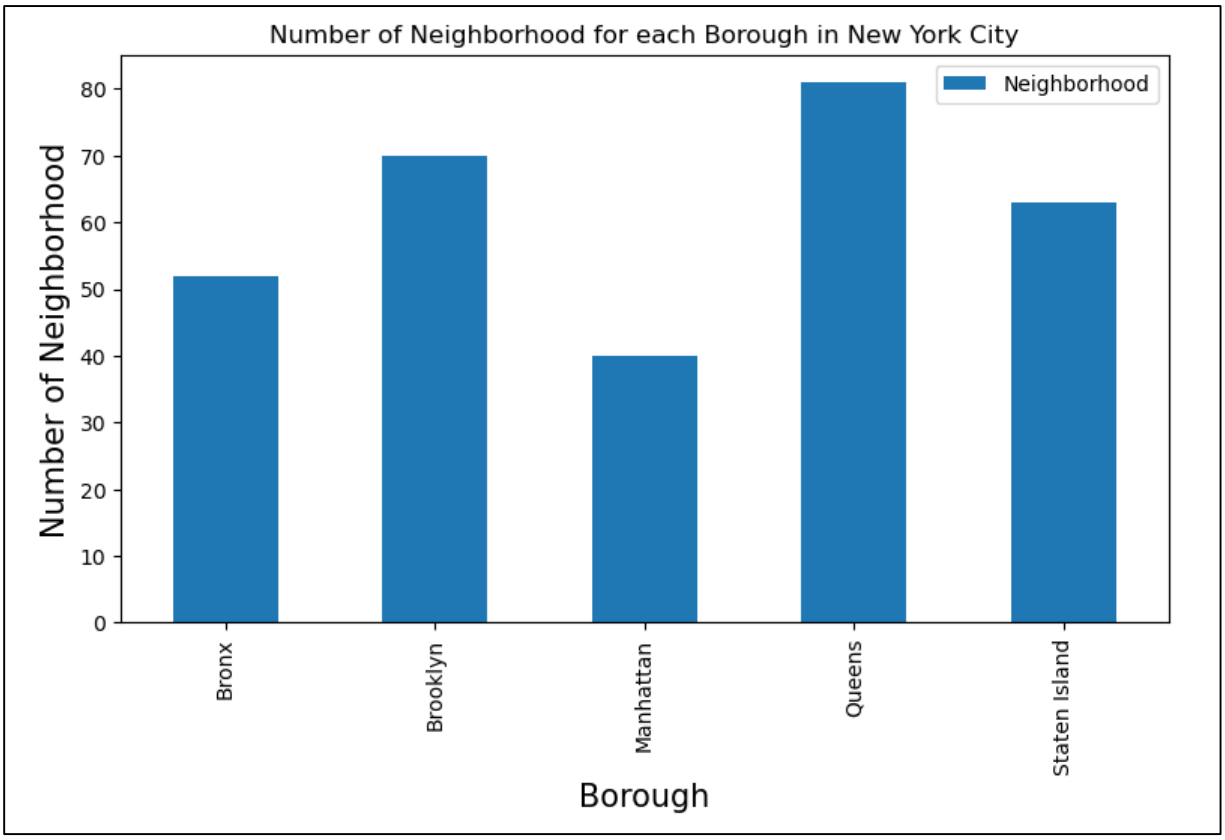
- Most common business types
- Less common business types
- Most common business names
- Less common business names
- How many more common business premises exist
- How many less common business premises exist

	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	Bath Beach	Bubble Tea Shop	Pharmacy	Italian Restaurant	Gas Station	Chinese Restaurant	Donut Shop	Dessert Shop	Fast Food Restaurant	Pizza Place	Cantonese Restaurant
1	Bay Ridge	Italian Restaurant	Spa	Pizza Place	Bar	American Restaurant	Greek Restaurant	Hookah Bar	Thai Restaurant	Bagel Shop	Pharmacy
2	Bedford Stuyvesant	Coffee Shop	Café	Pizza Place	Bar	Discount Store	Tiki Bar	Fried Chicken Joint	New American Restaurant	Boutique	Gift Shop
3	Bensonhurst	Chinese Restaurant	Italian Restaurant	Donut Shop	Sushi Restaurant	Park	Pizza Place	Ice Cream Shop	Smoke Shop	Bar	Noodle House
4	Bergen Beach	Harbor / Marina	Baseball Field	Hockey Field	Athletics & Sports	Playground	Park	Food	Flower Shop	Food & Drink Shop	Food Court
5	Boerum Hill	Coffee Shop	Dance Studio	Bar	Furniture / Home Store	Spa	Sandwich Place	Bakery	Arts & Crafts Store	French Restaurant	Yoga Studio
6	Borough Park	Bank	Pizza Place	Fast Food Restaurant	Café	Pharmacy	Eastern European Restaurant	Hotel	American Restaurant	Grocery Store	Deli / Bodega
7	Brighton Beach	Eastern European Restaurant	Restaurant	Russian Restaurant	Beach	Sushi Restaurant	Mobile Phone Shop	Pharmacy	Gourmet Shop	Playground	Korean Restaurant

Figura 1.

3. Exploratory Data Analysis

We pass the data of the neighborhoods of each district to a dataframe, and make a representative graph.



Then we segment and group only the neighborhoods in the borough of Brooklyn.

So we create a new data frame with the Brooklyn data.

```
Brooklyn_data = neighborhoods[neighborhoods['Borough'] == 'Brooklyn'].reset_index(drop=True)
Brooklyn_data.head()
```

	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

Next, we'll start using the Foursquare API to explore and segment Brooklyn neighborhood shopping venues.

```
CLIENT_ID = 'M1WY0AKBYIJ3Q2ROSKAUI2MAHI0ONKJE3S5Y3Q3CP4WWIIRL' # your Foursquare ID
CLIENT_SECRET = 'A5WEKR4PJR4MSIGA1TDR2H0WYRZSRD1ILWHKBU2U0HKVAYT0' # your Foursquare Secret
VERSION = '20180605' # Foursquare API version
LIMIT = 100 # A default Foursquare API limit value

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

Now we will explore all of brooklyn neighborhoods.

We created a feature to explore every neighborhood in Brooklyn

```
def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

        # create the API request URL
        url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&r
adius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

        # make the GET request
        results = requests.get(url).json()["response"]['groups'][0]['items']

        # return only relevant information for each nearby venue
        venues_list.append([(
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['categories'][0]['name']) for v in results])

    nearby_venues = pd.DataFrame([item for venue_list in venues_list for item in venue_list])
    nearby_venues.columns = ['Neighborhood',
                  'Neighborhood Latitude',
                  'Neighborhood Longitude',
                  'Venue',
                  'Venue Latitude',
                  'Venue Longitude',
                  'Venue Category']

    return(nearby_venues)
```

Now explore all commercial places in all brooklyn neighborhoods, with the following function

```
Brooklyn_venues = getNearbyVenues(names=Brooklyn_data['Neighborhood'],
                                  latitudes=Brooklyn_data['Latitude'],
                                  longitudes=Brooklyn_data['Longitude']
                                 )
```

Then we group the commercial sites by each brooklyn neighborhood

```
Brooklyn_venues.groupby('Neighborhood').count()
```

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Bath Beach	46	46	46	46	46	46
Bay Ridge	83	83	83	83	83	83
Bedford Stuyvesant	30	30	30	30	30	30
Bensonhurst	36	36	36	36	36	36
Bergen Beach	8	8	8	8	8	8
Boerum Hill	91	91	91	91	91	91
Borough Park	22	22	22	22	22	22
Brighton Beach	43	43	43	43	43	43
Broadway Junction	25	25	25	25	25	25
Brooklyn Heights	100	100	100	100	100	100
Brownsville	20	20	20	20	20	20
Bushwick	72	72	72	72	72	72
Canarsie	8	8	8	8	8	8
Carroll Gardens	100	100	100	100	100	100
City Line	38	38	38	38	38	38
Clinton Hill	95	95	95	95	95	95
Cobble Hill	89	89	89	89	89	89
Coney Island	19	19	19	19	19	19
Crown Heights	26	26	26	26	26	26
Cypress Hills	27	27	27	27	27	27

We analyze every neighborhood in Brooklyn

```
# one hot encoding
Brooklyn_onehot = pd.get_dummies(Brooklyn_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
Brooklyn_onehot['Neighborhood'] = Brooklyn_venues['Neighborhood']

# move neighborhood column to the first column
fixed_columns = [Brooklyn_onehot.columns[-1]] + list(Brooklyn_onehot.columns[:-1])
Brooklyn_onehot = Brooklyn_onehot[fixed_columns]

Brooklyn_onehot.head()
```

	Yoga Studio	Accessories Store	African Restaurant	American Restaurant	Antique Shop	Arepa Restaurant	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Arts & Entertainmen
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0

We group all the Brooklyn neighborhoods

```
Brooklyn_grouped = Brooklyn_onehot.groupby('Neighborhood').mean().reset_index()
Brooklyn_grouped
```

	Neighborhood	Yoga Studio	Accessories Store	African Restaurant	American Restaurant	Antique Shop	Arepa Restaurant	Argentinian Restaurant	Art Gallery	Art Museum
0	Bath Beach	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
1	Bay Ridge	0.012048	0.000000	0.000000	0.036145	0.000000	0.00	0.000000	0.000000	0.000000
2	Bedford Stuyvesant	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
3	Bensonhurst	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
4	Bergen Beach	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
5	Boerum Hill	0.021978	0.000000	0.000000	0.010989	0.010989	0.00	0.000000	0.010989	0.000000
6	Borough Park	0.000000	0.000000	0.000000	0.045455	0.000000	0.00	0.000000	0.000000	0.000000
7	Brighton Beach	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
8	Broadway Junction	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
9	Brooklyn Heights	0.040000	0.000000	0.000000	0.010000	0.000000	0.00	0.000000	0.000000	0.000000
10	Brownsville	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
11	Bushwick	0.000000	0.000000	0.000000	0.013889	0.000000	0.00	0.000000	0.013889	0.000000
12	Canarsie	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000
13	Carroll Gardens	0.000000	0.000000	0.000000	0.010000	0.000000	0.00	0.000000	0.000000	0.000000
14	City Line	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000

We get the Brooklyn neighborhoods with the 10 most common commercial places

```
neighborhoods_venues_sorted
```

	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
0	Bath Beach	Pharmacy	Chinese Restaurant	Fast Food Restaurant	Dessert Shop	Pizza Place	Cantonese Restaurant	Gas Station	Bubble Tea Shop
1	Bay Ridge	Italian Restaurant	Spa	Pizza Place	Bar	American Restaurant	Greek Restaurant	Café	Mexican Restaurant
2	Bedford Stuyvesant	Coffee Shop	Café	Pizza Place	Bar	Mexican Restaurant	Thrift / Vintage Store	Fried Chicken Joint	New American Restaurant
3	Bensonhurst	Chinese Restaurant	Italian Restaurant	Sushi Restaurant	Ice Cream Shop	Donut Shop	Pizza Place	Park	Bagel Shop
4	Bergen Beach	Harbor / Marina	Athletics & Sports	Baseball Field	Hockey Field	Playground	Park	Café	Women's Store
5	Boerum Hill	Coffee Shop	Dance Studio	Bar	Bakery	Furniture / Home Store	Sandwich Place	Spa	French Restaurant
6	Borough Park	Bank	Pizza Place	Café	Fast Food Restaurant	Pharmacy	Coffee Shop	Hotel	Chinese Restaurant
7	Brighton Beach	Restaurant	Russian Restaurant	Eastern European Restaurant	Gourmet Shop	Sushi Restaurant	Mobile Phone Shop	Pharmacy	Beach
8	Broadway Junction	Bar	Donut Shop	Diner	Burger Joint	Bus Stop	Business Service	Fried Chicken Joint	Breakfast Spot
9	Brooklyn Heights	Deli / Bodega	Yoga Studio	Park	Italian Restaurant	Gym	Cosmetics Shop	Pharmacy	Pet Store
10	Brownsville	Moving Target	Playground	Fried Chicken Joint	Spanish Restaurant	Restaurant	Chinese Restaurant	Park	Performing Arts Venue

4. Predictive Modeling

APPLY MACHINE LEARNING - Cluster Neighborhoods

Run K-MEANS to group the 70 neighborhood into 10 groups.

```
# set number of clusters
kclusters = 10
Brooklyn_grouped_clustering = Brooklyn_grouped.drop('Neighborhood', 1)
Brooklyn_grouped_clustering
```

```
# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(Brooklyn_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
```

```
array([7, 7, 7, 7, 6, 7, 1, 7, 7, 7], dtype=int32)
```

```
Brooklyn_merged.sort_values('Cluster Labels', ascending=True)
```

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
67	Brooklyn	Highland Park	40.681999	-73.890346	0	Deli / Bodega	Moving Target	Grocery Store	Tennis Court	Park
43	Brooklyn	Ocean Hill	40.678403	-73.913068	0	Deli / Bodega	Bus Stop	Supermarket	Southern / Soul Food Restaurant	Grocery St
26	Brooklyn	East New York	40.669926	-73.880699	0	Deli / Bodega	Salon / Barbershop	Fried Chicken Joint	Child Care Service	Plaza
34	Brooklyn	Borough Park	40.633131	-73.990498	1	Bank	Pizza Place	Café	Fast Food Restaurant	Pharmacy
46	Brooklyn	Midwood	40.625596	-73.957595	1	Pizza Place	Ice Cream Shop	Video Game Store	Candy Store	Bakery
9	Brooklyn	Crown Heights	40.670829	-73.943291	1	Pizza Place	Museum	Café	Bakery	Racetrack
59	Brooklyn	Paerdegat Basin	40.631318	-73.902335	2	Auto Garage	Food	Asian Restaurant	Child Care Service	Women's Store
57	Brooklyn	Remsen Village	40.652117	-73.916653	3	Caribbean Restaurant	Fast Food Restaurant	Fried Chicken Joint	Coffee Shop	Breakfast Spot
56	Brooklyn	Rugby	40.655572	-73.926882	3	Caribbean Restaurant	Bank	Grocery Store	Salon / Barbershop	Fried Chicl Joint
29	Brooklyn	Flatlands	40.630446	-73.929113	3	Caribbean Restaurant	Pharmacy	Fried Chicken	Fast Food Restaurant	Nightclub

We examine the Clusters

Now, we can examine each cluster and determine the categories of discriminating commercial places that distinguish each cluster.

Cluster 1

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 0, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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
26	East New York	Deli / Bodega	Salon / Barbershop	Fried Chicken Joint	Child Care Service	Plaza	Fast Food Restaurant	Pizza Place	Event Service	Convenien Store
43	Ocean Hill	Deli / Bodega	Bus Stop	Supermarket	Southern / Soul Food Restaurant	Grocery Store	Park	Martial Arts School	Seafood Restaurant	Chinese Restaurant
67	Highland Park	Deli / Bodega	Moving Target	Grocery Store	Tennis Court	Park	Liquor Store	Spanish Restaurant	Caribbean Restaurant	Pizza Place

Cluster 2

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 1, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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	10t Co Ver
9	Crown Heights	Pizza Place	Museum	Café	Bakery	Racetrack	Bagel Shop	Fried Chicken Joint	Candy Store	Supermarket	Sus Res
34	Borough Park	Bank	Pizza Place	Café	Fast Food Restaurant	Pharmacy	Coffee Shop	Hotel	Chinese Restaurant	American Restaurant	Del Boc
46	Midwood	Pizza Place	Ice Cream Shop	Video Game Store	Candy Store	Bakery	Bagel Shop	Pharmacy	Field	Convenience Store	Hot

Cluster 3

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 2, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 Comm Venue
59	Paerdegat Basin	Auto Garage	Food	Asian Restaurant	Child Care Service	Women's Store	Fish & Chips Shop	Farm	Farmers Market	Fast Food Restaurant	Field

Cluster 4

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 3, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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
28	Canarsie	Caribbean Restaurant	Asian Restaurant	Gym	Grocery Store	Food	Cosmetics Shop	Thai Restaurant	Women's Store	Farmers Market
29	Flatlands	Caribbean Restaurant	Pharmacy	Fried Chicken Joint	Fast Food Restaurant	Nightclub	Bus Station	Lounge	Chinese Restaurant	Paper / Office Supplies Store
56	Rugby	Caribbean Restaurant	Bank	Grocery Store	Salon / Barbershop	Fried Chicken Joint	Mobile Phone Shop	Fast Food Restaurant	Supermarket	Farmers Market
57	Remsen Village	Caribbean Restaurant	Fast Food Restaurant	Fried Chicken Joint	Coffee Shop	Breakfast Spot	Fish Market	Supermarket	Gas Station	Café
69	Erasmus	Caribbean Restaurant	Grocery Store	Bar	Yoga Studio	Cocktail Bar	Food Truck	Fried Chicken Joint	Mobile Phone Shop	Furniture / Home Store

Cluster 5

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 4, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 Comm Venue
30	Mill Island	Pool	Women's Store	Flea Market	Farm	Farmers Market	Fast Food Restaurant	Field	Filipino Restaurant	Fish & Chips Shop	Fish Market

Cluster 6

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 5, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 M Comm Venue
35	Dyker Heights	Playground	Grocery Store	Burger Joint	Bagel Shop	Golf Course	Women's Store	Fish Market	Fast Food Restaurant	Field	Filipino Restau

Cluster 7

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 6, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 Comm Venue
31	Manhattan Beach	Playground	Café	Ice Cream Shop	Food	Bus Stop	Beach	Sandwich Place	Harbor / Marina	Food Truck	Dog Ru
45	Bergen Beach	Harbor / Marina	Athletics & Sports	Baseball Field	Hockey Field	Playground	Park	Café	Women's Store	Farm	Farmer Market

Cluster 8

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 7, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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
0	Bay Ridge	Italian Restaurant	Spa	Pizza Place	Bar	American Restaurant	Greek Restaurant	Café	Mexican Restaurant
1	Bensonhurst	Chinese Restaurant	Italian Restaurant	Sushi Restaurant	Ice Cream Shop	Donut Shop	Pizza Place	Park	Bagel Shop
2	Sunset Park	Pizza Place	Mexican Restaurant	Latin American Restaurant	Bank	Bakery	Ice Cream Shop	Deli / Bodega	Gym
3	Greenpoint	Bar	Pizza Place	Coffee Shop	Cocktail Bar	Record Shop	Yoga Studio	Mexican Restaurant	French Restaurant
4	Gravesend	Lounge	Pizza Place	Bakery	Gym	Chinese Restaurant	Italian Restaurant	Bar	Pharmacy
5	Brighton Beach	Restaurant	Russian Restaurant	Eastern European Restaurant	Gourmet Shop	Sushi Restaurant	Mobile Phone Shop	Pharmacy	Beach
6	Sheepshead Bay	Dessert Shop	Turkish Restaurant	Sandwich Place	Hotel	Creperie	Restaurant	Russian Restaurant	Outlet Store
7	Manhattan Terrace	Ice Cream Shop	Pizza Place	Donut Shop	Chinese Restaurant	Japanese Restaurant	Jazz Club	Grocery Store	Liquor Store
8	Flatbush	Caribbean Restaurant	Deli / Bodega	Mexican Restaurant	Bank	Coffee Shop	Pharmacy	Lounge	Gastropub
10	East Flatbush	Caribbean Restaurant	Chinese Restaurant	Bar	Cosmetics Shop	Liquor Store	Park	Fast Food Restaurant	Pharmacy

Cluster 9

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 8, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 Comm Venue
39	Sea Gate	Beach	Bus Station	Spa	American Restaurant	Lighthouse	Sports Club	Home Service	Dog Run	Bus Line	Flea Market

Cluster 10

```
Clust_Brooklyn2.loc[Clust_Brooklyn2['Cluster Labels'] == 9, Clust_Brooklyn2.columns[[1] + list(range(5, Cl
ust_Brooklyn2.shape[1]))]]
```

	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 Mos Commor Venue
68	Madison	Bagel Shop	Pilates Studio	Deli / Bodega	Dessert Shop	Candy Store	Italian Restaurant	Spa	Hobby Shop	Pizza Place	Restaura

5. Conclusions

Upon completion of the exploratory study and cluster analysis of all commercial locations in all neighborhoods in the brooklyn district, we can conclude the following:

In cluster 1 the most common commercial places are warehouses

In group 2, they are pizzerias

In group 3, they are car garage

In group 4, are the Caribbean Restaurants

In cluster 5, they are the pools

In group 6, they are the Grocery Store and Burger

In group 7, they are the Playground, Harbor / Marina, Athletics and Sports, Baseball Field and Hockey Field

In group 8, are the restaurants, Italian restaurants, Chinese, Latin, Russian and American restaurants

In cluster 9, they are the bus stations and Spa

In group 10 are the Bagel Shop