# The Battle of Neighborhoods: Capstone Project

## Opening a bakery in a convenient neighborhood in

## New York City

## Introduction/Business Problem

Because New York City has been a major point of entry for immigrants in United States, is a metropolis with a large and ethnical diversity. With over 8.3 million people in 2019, and with a fast-growing population, it looks like a good place to open a business or buying a business already installed. Considering that "bread" is part of many cultures, bakery is a good option to open a business. There are two approach that will be considered to open or buying a bakery: In a business area, or close to a residential area. The main reason in a business area is giving more emphasis to provide other businesses like restaurants, cafes, sandwich places, etc., and the main reason close to a residential area is to provide services directly to people. In this case, it will be considered to open a bakery close to a residential area, because it would be a small family business.

Many questions come out about this business opening. For example: What is the best borough and neighborhood? What indicators determine a good borough and a good neighborhood? In this case, population, density, and the best Gross Domestic Product (GDP) will be considered as good indicator. A place with more people and more concentration of people implies more customers, and when GDP is growing, especially if inflation is not a problem, is better for workers and businesses.

# Data Section

I believe that the depth of a study, always depends on data available for analysis.

**1.- Dataset**

A dataset that contains Borough, Neighborhoods of New York City with their latitudes and longitudes will be use. The source of this dataset is https://cocl.us/new_york_dataset. This dataset will help to explore the neighborhoods and start to answer the question: What is the best neighborhood should be considered for a bakery.

The output of the exploring is:

First, latitude and longitude of every neighborhood.

```
[8]: df_ny.head()
```

[8]:

| | Borough | Neighborhood | Latitude | Longitude |
|---|---|---|---|---|
| 0 | Bronx | Wakefield | 40.894705 | -73.847201 |
| 1 | Bronx | Co-op City | 40.874294 | -73.829939 |
| 2 | Bronx | Eastchester | 40.887556 | -73.827806 |
| 3 | Bronx | Fieldston | 40.895437 | -73.905643 |
| 4 | Bronx | Riverdale | 40.890834 | -73.912585 |

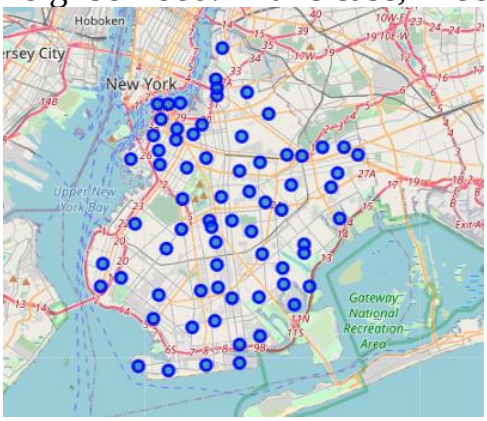
Second, the borough with more neighborhood.

Grouping by borough and counting neighborhoods in every borough

```
[10]: # We group by Borough and count the Neighborhoods in every one of them.
neighborhoods_in_boroughs = df_ny.groupby(['Borough'])['Neighborhood'].count()
neighborhoods_in_boroughs
```

```
[10]: Borough
Bronx            52
Brooklyn         70
Manhattan        40
Queens           81
Staten Island    63
Name: Neighborhood, dtype: int64
```

Third, The map-visualization of neighborhoods in the borough with more neighborhood. In this case, Brooklyn.



## 2.- Link

The link https://developer.foursquare.com/docs/resources/categories is a resource for developers with codes that helps to identify the type of business in venues when Foursquare API is used. So, it lets to filter the type of business. The code for bakeries is 4bf58dd8d48988d16a941735. There is a little issue with this code because it also includes a couple other type of business. Even though this additional businesses are related with bakeries, an additional filter is necessary to select only bakeries. The first filter gives 1180 business with code (4bf58dd8d48988d16a941735), but the real number of bakeries in Brooklyn is 945. The map shows 1180 business.

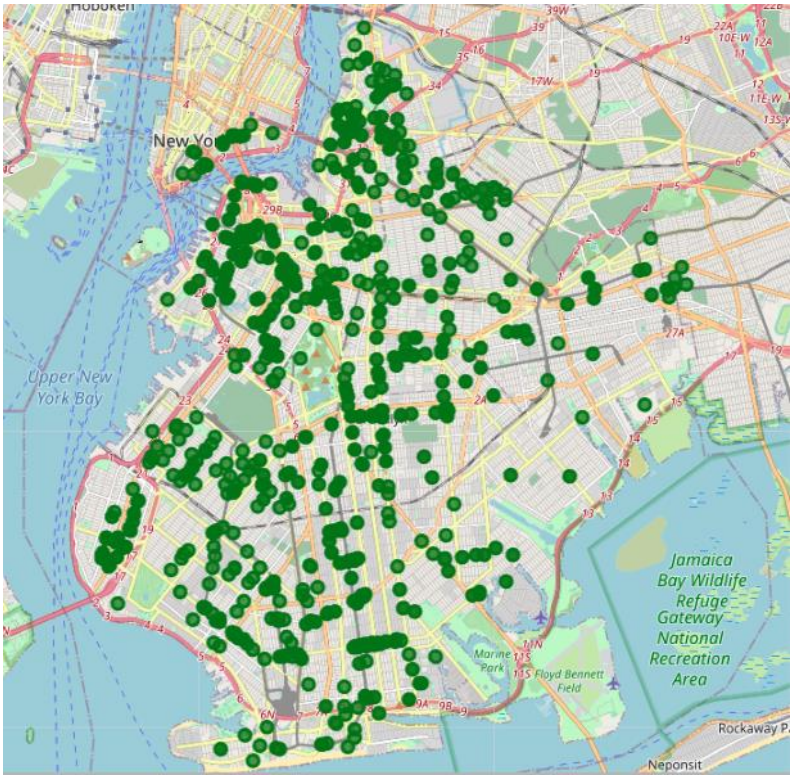
[46]:
```
#https://developer.foursquare.com/docs/resources/categories # lets to find the code for bakeries
#Bakery 4bf58dd8d48988d16a941735
#Creates a dataframe with businesses whose category is 4bf58dd8d48988d16a941735

bakery_brooklyn_venues = getNearbyVenues(names=df_brooklyn['Neighborhood'], \
    latitudes=df_brooklyn['Latitude'], longitudes=df_brooklyn['Longitude'], \
    radius=1000, categoryIds='4bf58dd8d48988d16a941735')
print(bakery_brooklyn_venues.shape)
bakery_brooklyn_venues.head()
```

```
(1181, 7)
```

[46]:

| | Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 0 | Bay Ridge | 40.625801 | -74.030621 | Cinnabon | 40.623156 | -74.031459 | Sandwich Place |
| 1 | Bay Ridge | 40.625801 | -74.030621 | Bay Ridge Diner | 40.625304 | -74.024340 | American Restaurant |
| 2 | Bay Ridge | 40.625801 | -74.030621 | Little Cupcake Bakeshop | 40.620021 | -74.032567 | Cupcake Shop |
| 3 | Bay Ridge | 40.625801 | -74.030621 | Paneantico | 40.619368 | -74.032814 | Bakery |
| 4 | Bay Ridge | 40.625801 | -74.030621 | Leske's Bakery | 40.628456 | -74.023100 | Bakery |



# Analysis

We already can make an analysis with this information. Brooklyn has the highest number of neighborhoods, so is a good borough to analyze
Grouping the businesses by venue, we can get the number of related businesses in every venue in Brooklyn.
Identifying the number of bakeries in every venue we can get the average of bakeries. The venue with the smallest average could be a good choice for a bakery. Or a venue with small average with venues around that have small average.
Under this criteria Coney Island could be a good choice.

[23]:
```
# Only bakeries
brooklyn_just_bakeries = pd.get_dummies(bakery_brooklyn_venues[['Venue Category']], prefix="", prefix_sep="")
brooklyn_just_bakeries['Neighborhood'] = bakery_brooklyn_venues['Neighborhood']
brooklyn_just_bakeries = brooklyn_just_bakeries[['Neighborhood', 'Bakery']]
brooklyn_just_bakeries[brooklyn_just_bakeries['Neighborhood'] == 'Coney Island']
# Shows the number of bakeries in the vanue selected indicated by the number 1
```

[23]:

| | Neighborhood | Bakery |
|---|---|---|
| 556 | Coney Island | 0 |
| 557 | Coney Island | 0 |
| 558 | Coney Island | 0 |
| 559 | Coney Island | 0 |
| 560 | Coney Island | 0 |
| 561 | Coney Island | 1 |
| 562 | Coney Island | 1 |

[24]:
```
#brooklyn_grouped_mean = brooklyn_grouped.groupby('Neighborhood').mean().reset_index()
brooklyn_grouped_mean = brooklyn_just_bakeries.groupby('Neighborhood').mean().reset_index()
brooklyn_grouped_mean.sort_values(by = 'Bakery').head()
```

[24]:

| | Neighborhood | Bakery |
|---|---|---|
| 59 | Sea Gate | 0.000000 |
| 16 | Coney Island | 0.285714 |
| 28 | Flatlands | 0.400000 |
| 62 | Starrett City | 0.500000 |
| 51 | Paerdegat Basin | 0.500000 |


There are few numbers of bakeries in a broad area.

# Additional data for and additional analysis.

Other dataset that could be explored is one that helps to analyze the population, the Gross Domestic Product, and the density of people in every borough. It is supposed that a borough with more population, a higher GDP, and a higher density is a good option to open the business.

The source of this dataset is
https://en.wikipedia.org/wiki/Demographics_of_New_York_City

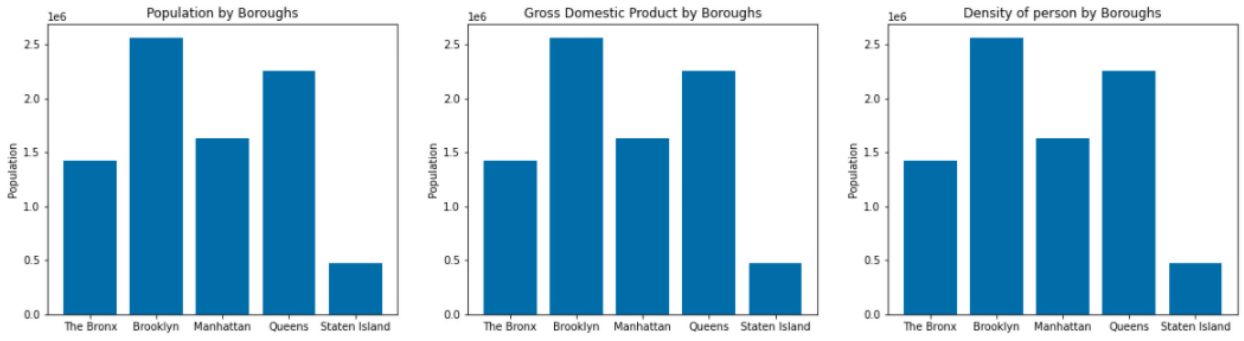
| New York City's five boroughs | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jurisdiction | | Population | GDP | Land area | | Density | |
| *Borough* | *County* | *Estimate (2019)* | *billions (2012 US$)* | *square miles* | *square km* | *persons / mi²* | *persons / km²* |
| The Bronx | Bronx | 1,418,207 | 42.695 | 42.10 | 109.04 | 33,867 | 13,006 |
| Brooklyn | Kings | 2,559,903 | 91.559 | 70.82 | 183.42 | 36,147 | 13,957 |
| Manhattan | New York | 1,628,706 | 600.244 | 22.83 | 59.13 | 71,341 | 27,544 |
| Queens | Queens | 2,253,858 | 93.310 | 108.53 | 281.09 | 20,767 | 8,018 |
| Staten Island | Richmond | 476,143 | 14.514 | 58.37 | 151.18 | 8,157 | 3,150 |
| **City of New York** | | **8,336,817** | **842.343** | **302.64** | **783.83** | **27,547** | **10,636** |
| State of New York | | 19,453,561 | 1,731.910 | 47,126.40 | 122,056.82 | 412 | 159 |
| *Sources:*[12][13][14] *and see individual borough articles* | | | | | | | |

The output of the exploring is: Population, GDP, and density of every borough in New York City.

```
[49]: # Data cleaning: Eliminates the extra information in columns and eliminates columns not useful.
df_ny_demography.columns = ['Borough','c','Population','GDP','c','c','Density','c','c'] # Renames columns
df_ny_demography.drop(columns=['c'],inplace=True)  # Drops columns we are not use them
df_ny_demography.drop(df_ny_demography.index[5:8],inplace=True)  #Drosp rows we are not use them
df_ny_demography
```

[49]:

| | Borough | Population | GDP | Density |
|---|---|---|---|---|
| 0 | The Bronx | 1418207 | 42.695 | 33867 |
| 1 | Brooklyn | 2559903 | 91.559 | 36147 |
| 2 | Manhattan | 1628706 | 600.244 | 71341 |
| 3 | Queens | 2253858 | 93.310 | 20767 |
| 4 | Staten Island | 476143 | 14.514 | 8157 |



# Analysis

Population, density and GDP also show that Brooklyn is a good choice to be explored as the analysis before showed.

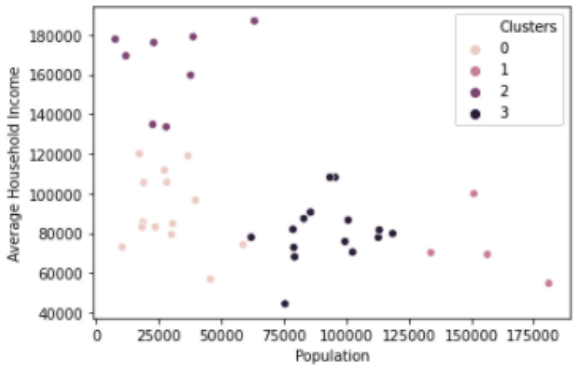
**Dataset**
A final dataset used for analysis is an excel worksheet built using information extracted from the web site www.point2homes.com.
Example: www.point2homes.com/US/Neighborhood/NY/Brooklyn/Brooklyn-Height-Demographics.html.
This dataset contains the "Population" and "Average Household Income" (AHI) of venues in Brooklyn that also are good indicators for analysis. Populated neighborhood with a high household income is a good choice too.

# Analysis

Clustering shows us venues with high AHI and low population, venues with high population and low AHI, and those that are more balanced.
Because bread is not an expensive product and could be a daily necessity, population should have more weight than income. So, the venues under these criteria can be found in cluster 2, with population between 75,000 and 125,000, and AHI between 70,000 and 110,000.

```
[44]: sns.scatterplot(x="Population", y="Average Household Income",hue = "Clusters", data=brooklyn_neigbor)
```

```
[44]: <AxesSubplot:xlabel='Population', ylabel='Average Household Income'>
```



```
[45]: venues_option = brooklyn_neigbor[brooklyn_neigbor['Population'].between(75000, 125000) \
                    & brooklyn_neigbor['Average Household Income'].between(70000, 110000) ]
venues_option
```

[45]:

| | Neighborhood | Population | Average Household Income | Clusters |
|---|---|---|---|---|
| 1 | Bay Ridge | 85791.0 | 90550.57 | 3 |
| 6 | Brighton Beach | 78775.0 | 81900.00 | 3 |
| 10 | Bushwick | 102607.0 | 70401.52 | 3 |
| 11 | Canarsie | 100844.0 | 86568.00 | 3 |
| 17 | Crown Heights | 118623.0 | 79791.13 | 3 |
| 27 | Flatbush | 99558.0 | 75780.00 | 3 |
| 32 | Georgetown | 95666.0 | 108156.00 | 3 |
| 33 | Gerritsen Beach | 83119.0 | 87360.00 | 3 |
| 35 | Gravesend | 112900.0 | 77822.67 | 3 |
| 41 | Manhattan Beach | 78775.0 | 81900.00 | 3 |
| 44 | Midwood | 113280.0 | 81581.01 | 3 |
| 45 | Mill Basin | 93534.0 | 108156.00 | 3 |
| 63 | Sunset Park | 79113.0 | 72787.62 | 3 |

Although, Coney Island is not in the range of this dataframe, still is an acceptable option under these last criteria.

| | | | | |
|---|---|---|---|---|
| 16 | Coney Island | 45795.0 | 56700.00 | 1 |

# Conclusion

Here are the analysis criteria and the different options resulting.
Even though data used in this case help to make good decisions, more data could be necessary to make a deeper analysis and answer questions like; what is the income of bakeries around the selected areas? or what is the rate of crimes in that areas? etc. that could affect the business.
How many variables should be considered for an analysis? Depend on how deep is necessary going is to satisfy the stakeholders requirements.