A Recommadation System for a New Restaurant

Problem Description

One client wants to start a new business and open a new restaurant in Bronx. Since he does not have much experience, he wants to open his restaurant in a neighborhood that has the least number of restaurants. Because he doesn't want to face a competition. He wants to open an Italian or a Mexican type of restaurant and he wants me to analyze all Bronx to find what kind of restaurants are common. Considering the info that I will provide for him, he will decide to open either Italian or Mexican restaurant after seeing that which of them is uncommon.

Required Data

Since the client wants to build open his restaurant in Bronx, NY, I will need geo-locational information of Bronx and its neighborhood. For this part of the problem I will use postal code information provided by the NYU Spatial Data Repository.

Data resource: https://geo.nyu.edu/catalog/nyu_2451_34572 as JSON File

Required Data-2

By using this information, I will analyze the target area and then with the help of Foursquare I will find the most common restaurant types and total number of restaurants in each neighborhood. I will do this by getting data of location (latitude, longitude), distance to center, category and popularity that is provided by a typical request from Foursquare.

url ='https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format()

Required Data-2

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	name	categories	lat	lng
0	Lollipops Gelato	Dessert Shop	40.894123	-73.845892
1	Jackie's West Indian Bakery	Caribbean Restaurant	40.889283	-73.843310
2	Ripe Kitchen & Bar	Caribbean Restaurant	40.898152	-73.838875
3	Rite Aid	Pharmacy	40.896521	-73.844680
4	Ali's Roti Shop	Caribbean Restaurant	40.894036	-73.856935

Methodology

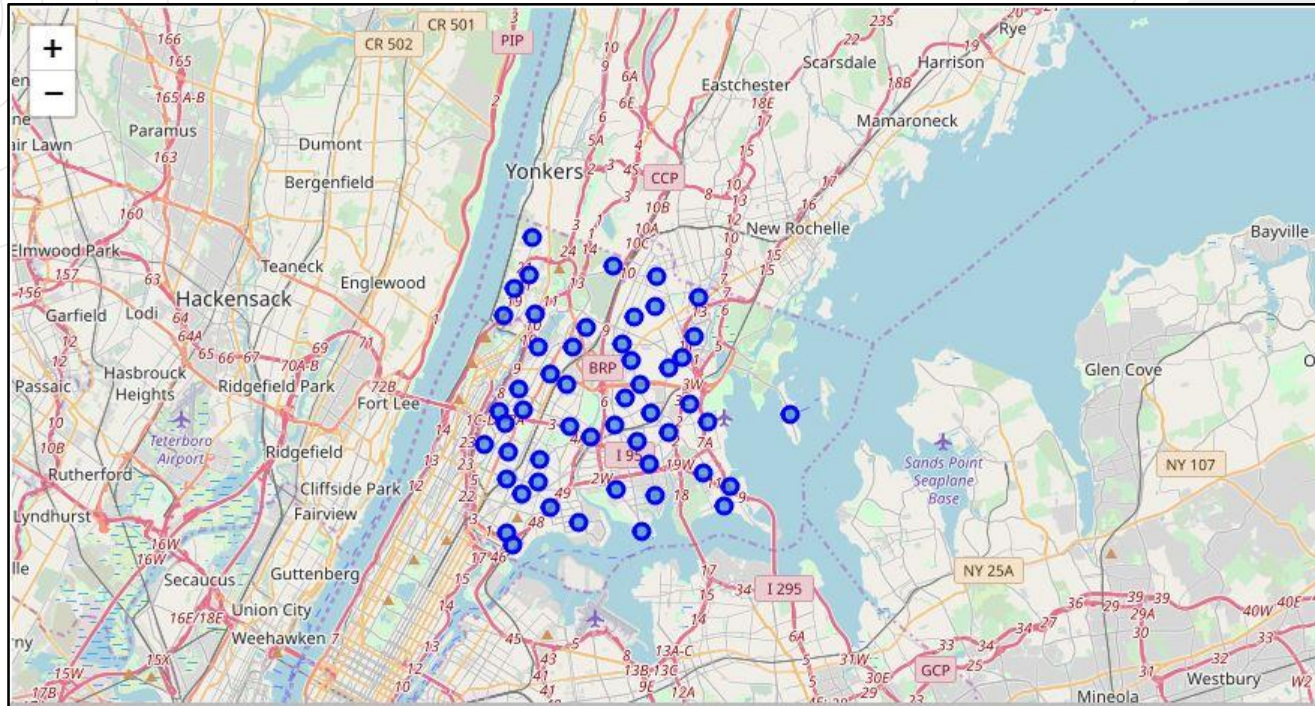## Step-1.1: Identifying Neighborhoods inside Bronx

```
neigh.head()
```

	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

Methodology

Step-1.2 : Visualizing Neighborhoods inside Bronx

Methodology

Step-2: Connecting to Foursquare and Retrieving Locational Data for Each Venue in Every Neighborhood

'https://api.foursquare.com/v2/venues/explore?&client_id=C0VJET0NBDTYHKE30JU1BE42KF0MHEJSYWKM4KNVLUZDQ4DG&client_secret=HAQX5G43GGY0GTAMSL1ACMVASKWZLGMWCPKZISOL4KZR3X2S&v=20180605&ll=40.89470517661,-73.84720052054902&radius=1000&limit=200'

Parameters:
limit=200,
Radius=1000

8

Methodology

Step-3.1: Processing the Retrieved Data and Creating a Data Frame for All the Venues inside the Bronx.

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

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Allerton	100	100	100	100	100	100
Baychester	100	100	100	100	100	100
Bedford Park	100	100	100	100	100	100
Belmont	100	100	100	100	100	100
Bronxdale	100	100	100	100	100	100
Castle Hill	100	100	100	100	100	100

Methodology

Step-3.2: Manually Selecting Required Category Types (Restaurants)

```
bronx_onehot = bronx_onehot[important_list_of_features]

bronx_onehot.head()
```

	Neighborhood	Caribbean Restaurant	Burger Joint	Italian Restaurant	Diner	Fast Food Restaurant	Brazilian Restaurant	Dumpling Restaurant	Mexican Restaurant	Asian Restaurant	American Restaurant	Cajun / Creole Restaurant
0	Wakefield	0	0	0	0	0	0	0	0	0	0	0
1	Wakefield	1	0	0	0	0	0	0	0	0	0	0
2	Wakefield	1	0	0	0	0	0	0	0	0	0	0
3	Wakefield	0	0	0	0	0	0	0	0	0	0	0
4	Wakefield	1	0	0	0	0	0	0	0	0	0	0

Methodology

Step-4.1: Applying one of Machine Learning Techniques (K-Means Clustering)

```
]:   kclusters = 5
     bronx_grouped_clustering = bronx_grouped.drop('Neighborhood', 1)

     kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(bronx_grouped_clustering)

     kmeans.labels_[0:10]
```

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Common Restaurant/Diner	2nd Common Restaurant/Diner	3rd Common Restaurant/Diner	4th Common Restaurant/Diner	5th Commo Restaurant/Dine
0	Bronx	Wakefield	40.894705	-73.847201	1	Caribbean Restaurant	Burger Joint	Italian Restaurant	Fast Food Restaurant	Dine
1	Bronx	Co-op City	40.874294	-73.829939	2	Caribbean Restaurant	Italian Restaurant	Mexican Restaurant	Fast Food Restaurant	Dine
2	Bronx	Eastchester	40.887556	-73.827806	1	Caribbean Restaurant	Italian Restaurant	Fast Food Restaurant	Burger Joint	Dine
3	Bronx	Fieldston	40.895437	-73.905643	1	Mexican Restaurant	Diner	Burger Joint	Latin American Restaurant	Italian Restaurar
4	Bronx	Riverdale	40.890834	-73.912585	1	Mexican Restaurant	Diner	Latin American Restaurant	Burger Joint	Japanes Restaurar

Methodology

Step-4.1: Calculating the Total Number of Restaurant in Each Neighborhood

```
final = bronx_onehot [['Neighborhood','Total']].groupby('Neighborhood').sum()
final.head()
```

Neighborhood	Total
Allerton	42
Baychester	60
Bedford Park	54
Belmont	52
Bronxdale	56

Decision making

We had two criteria:

Finding a neighborhood that has the least number of restaurants.

Finding the least common restaurant type in this neighborhood.

So according to first criterion Allerton and Port Morris have the least number of restaurants.

```
[54]: final = final.sort_values(['Total'], ascending=[True])
      final.head()
```

[54]:	Total
Neighborhood	
Allerton	42
Port Morris	42
Morris Heights	44
Mount Eden	46
Edenwald	46

Decision making

And according to second criterion;
In Allerton most common restaurants are: Italian Restaurant, Caribbean Restaurant, Mexican Restaurant, Spanish Restaurant Diner.
In Port Morris most common restaurants are: Italian Restaurant, Greek Restaurant, American Restaurant, Mexican Restaurant Ramen Restaurant.

21	Port Morris	Italian Restaurant	Greek Restaurant	American Restaurant	Mexican Restaurant	Ramen Restaurant

50	Allerton	Italian Restaurant	Caribbean Restaurant	Mexican Restaurant	Spanish Restaurant	Diner

Result

Based on this analysis, the client should open his Mexican Restaurant in Port Morris.

21	Port Morris	Italian Restaurant	Greek Restaurant	American Restaurant	Mexican Restaurant	Ramen Restaurant

Thanks!