## The Battle of Neighborhoods - Week 2

## **Problem Background:**

The City of New York, is the most populous city in the United States. It is diverse and is the financial capital of USA. It is multicultural. It provides lot of business oppourtunities and business friendly environment. It has attracted many different players into the market. It is a global hub of business and commerce. The city is a major center for banking and finance, retailing, world trade, transportation, tourism, real estate, new media, traditional media, advertising, legal services, accountancy, insurance, theater, fashion, and the arts in the United States.

This also means that the market is highly competitive. As it is highly developed city so cost of doing business is also one of the highest. Thus, any new business venture or expansion needs to be analysed carefully. The insights derived from analysis will give good understanding of the business environment which help in strategically targeting the market. This will help in reduction of risk. And the Return on Investment will be reasonable.

Your friend has spent many years working at various cafes and would like to check various options of setting up a cafe in the neaghborhood of the Manhattan or Bronx.

You want to team up with your friend to open up a cafe that serves you know will be successful IF you can get people in the door.

Humans are creatures of habit and you know that because there are many great coffee shops, you will have to open up your store near existing cafes. The reason why it has to be near an existing cafe is that it will reduce marketing costs - people will come to the area for coffee.

You are deciding whether to open up the cafe in Manhattan or in the Bronx. We explored Manhattan in module 3, this capstone will explore clusters in Bronx to see if Cafes are in the top categories of any clusters.

A restaurant is a business which prepares and serves food and drink to customers in return for money, either paid before the meal, after the meal, or with an open account. The City of New York is famous for its excelllent cuisine. It's food culture includes an array of international cuisines influenced by the city's immigrant history.

Central and Eastern European immigrants, especially Jewish immigrants - bagels, cheesecake, hot dogs, knishes, and delicatessens Italian immigrants - New York-style pizza and Italian cuisine Jewish immigrants and Irish immigrants - pastrami and corned beef Chinese and other Asian restaurants, sandwich joints, trattorias, diners, and coffeehouses are ubiquitous throughout the city mobile food vendors - Some 4,000 licensed by the city Middle Eastern foods such as falafel and kebabs examples of modern New York street food It is famous for not just Pizzerias, Cafe's but also for fine dining Michelin starred restaurants. The city is home to "nearly one thousand of the finest and most diverse haute cuisine restaurants in the world", according to Michelin. So it is evident that to survive in such competitive market it is very important to startegically plan. Various factors need to be studied inorder to decide on the Location such as:

New York Population New York City Demographics Are there any Farmers Markets, Wholesale markets etc nearby so that the ingredients can be purchased fresh to maintain quality and cost? Are there any venues like Gyms, Entertainmnet zones, Parks etc nearby where floating population is high etc Who are the competitors in that location? Cuisine served / Menu of the competitors Safest neoghborhood for individuals and family with kids Segmentation of the Borough Untapped markets Saturated markets etc

## Data requirement

In order to solve this problem, I will need a list of all neighbourhoods in NYC (from here https://geo.nyu.edu/catalog/nyu 2451 34572 (https://geo.nyu.edu/catalog/nyu 2451 34572)). I will need to build a data frame and find venues for each neighbourhood. Then find the coordinates and filter by just the venues in Bronx before using the k-means to clusters.

## **Target Audience:**

To recommend the correct location, "Coffee Cafe Company" has appointed me to lead of the Data Science team. The objective is to locate and recommend to the management which neighborhood of Newyork city will be best choice to start a restaurant. The Management also expects to understand the rationale of the recommendations made.

This would interest anyone who wants to start a new restaurant in Newyork city.

## **Success Criteria:**

The success criteria of the project will be a good recommendation of borough/Neighborhood choice to "Coffee Cafe Company" based on lack of such cafes in that location and nearest suppliers of ingredients.

### Week 2 - Data Analysis

# **Methodology and Exploratory Data Analysis**

The Data Science Workflow for parts 3 & 4 includes:

1.Data Analysis and Location Data:

Foursquare location data will be leveraged to explore or compare districts arou nd Paris.

Data manipulation and analysis to derive subsets of the initial data.

Identifying the high traffic areas using data visualisation and tatistical naly sis.

### 2. Visualization:

Analysis and plotting visualizations.

Data visualization using various mapping libraries.

#### 3.Discussion and Conclusions:

Recomendations and results based on the data analysis.

Discussion of any limitations and how the results can be used, and any conclusi ons that can be drawn.

```
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         import pandas as pd # library for data analsysis
         pd.set option('display.max columns', None)
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         import json # library to handle JSON files
         #!conda install -c conda-forge geopy --yes # uncomment this line if you have
         n't completed the Foursquare API lab
         from geopy.geocoders import Nominatim # convert an address into Latitude and L
         ongitude values
         import requests # library to handle requests
         from pandas.io.json import json normalize # tranform JSON file into a pandas d
         ataframe
         # Matplotlib and associated plotting modules
         import matplotlib.cm as cm
         import matplotlib.colors as colors
         # import k-means from clustering stage
         from sklearn.cluster import KMeans
         !conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you
          haven't completed the Foursquare API lab
         import folium # map rendering library
         print('Libraries imported.')
```

Solving environment: done

## Package Plan ##

environment location: /opt/conda/envs/Python36

added / updated specs:

- folium=0.5.0

The following packages will be downloaded:

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certifi-2020.4.5.1	py36h9f0ad1d_0	151 KB	conda-forge
openssl-1.1.1g	h516909a_0	2.1 MB	conda-forge
vincent-0.4.4	py_1	28 KB	conda-forge
folium-0.5.0	py_0	45 KB	conda-forge
branca-0.4.1	py_0	26 KB	conda-forge
altair-4.1.0	py_1	614 KB	conda-forge
ca-certificates-2020.4.5.1	hecc5488_0	146 KB	conda-forge
	Total:	3.1 MB	

The following NEW packages will be INSTALLED:

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branca:	0.4.1-py_0	conda-forge
folium:	0.5.0-py_0	conda-forge
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vincent:	0.4.4-pv 1	conda-forge

The following packages will be UPDATED:

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conda-forge

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d 0 conda-forge

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conda-forge

Downloading and Extracting Packages

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openssl-1.1.1g 0%	2.1 MB	#####################################	LØ
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altair-4.1.0	614 KB	#####################################	L0

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Data downloaded!

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newyork_data
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    'annoangle': 0.0,
    'borough': 'Queens',
    'bbox': [-73.94563070334091,
     40.756091297094706,
     -73.94563070334091,
     40.756091297094706]}},
  { 'type': 'Feature',
   'id': 'nyu 2451 34572.306',
   'geometry': {'type': 'Point',
    'coordinates': [-74.08173992211962, 40.61731079252983]},
   'geometry name': 'geom',
   'properties': {'name': 'Fox Hills',
    'stacked': 2,
    'annoline1': 'Fox',
    'annoline2': 'Hills',
    'annoline3': None,
    'annoangle': 0.0,
    'borough': 'Staten Island',
    'bbox': [-74.08173992211962,
     40.61731079252983,
     -74.08173992211962,
     40.61731079252983]}}],
 'crs': {'type': 'name', 'properties': {'name': 'urn:ogc:def:crs:EPSG::432
6'}},
 'bbox': [-74.2492599487305,
 40.5033187866211,
```

```
-73.7061614990234,
40.9105606079102]}
```

```
In [13]: | neighborhoods_data = newyork_data['features']
          neighborhoods_data[0]
Out[13]: {'type': 'Feature',
           'id': 'nyu 2451 34572.1',
           'geometry': {'type': 'Point',
            'coordinates': [-73.84720052054902, 40.89470517661]},
           'geometry name': 'geom',
           'properties': {'name': 'Wakefield',
            'stacked': 1,
            'annoline1': 'Wakefield',
            'annoline2': None,
            'annoline3': None,
            'annoangle': 0.0,
            'borough': 'Bronx',
            'bbox': [-73.84720052054902,
            40.89470517661,
             -73.84720052054902,
             40.89470517661]}}
In [14]:
         # define the dataframe columns
          column_names = ['Borough', 'Neighborhood', 'Latitude', 'Longitude']
          # instantiate the dataframe
          neighborhoods = pd.DataFrame(columns=column_names)
In [15]:
         for data in neighborhoods data:
              borough = neighborhood_name = data['properties']['borough']
              neighborhood name = data['properties']['name']
              neighborhood latlon = data['geometry']['coordinates']
              neighborhood lat = neighborhood latlon[1]
              neighborhood lon = neighborhood latlon[0]
              neighborhoods = neighborhoods.append({'Borough': borough,
                                                      'Neighborhood': neighborhood name,
                                                      'Latitude': neighborhood lat,
                                                      'Longitude': neighborhood_lon}, igno
          re index=True)
In [16]: | neighborhoods.head()
Out[16]:
             Borough Neighborhood
                                   Latitude Longitude
          0
               Bronx
                         Wakefield 40.894705 -73.847201
          1
               Bronx
                         Co-op City 40.874294 -73.829939
```

-73.905643

Eastchester 40.887556 -73.827806

Riverdale 40.890834 -73.912585

Fieldston 40.895437

2

3

4

Bronx

Bronx

Bronx

```
In [17]: | address = 'New York City, NY'
         geolocator = Nominatim(user agent="ny explorer")
         location = geolocator.geocode(address)
         latitude = location.latitude
         longitude = location.longitude
         print('The geograpical coordinate of New York City are {}, {}.'.format(latitud
         e, longitude))
```

The geograpical coordinate of New York City are 40.7127281, -74.0060152.

```
# create map of New York using latitude and longitude values
In [18]:
         map newyork = folium.Map(location=[latitude, longitude], zoom start=10)
         # add markers to map
         for lat, lng, borough, neighborhood in zip(neighborhoods['Latitude'], neighbor
         hoods['Longitude'], neighborhoods['Borough'], neighborhoods['Neighborhood']):
             label = '{}, {}'.format(neighborhood, borough)
             label = folium.Popup(label, parse html=True)
             folium.CircleMarker(
                  [lat, lng],
                  radius=5,
                 popup=label,
                  color='blue',
                 fill=True,
                 fill color='#3186cc',
                 fill_opacity=0.7,
                 parse_html=False).add_to(map_newyork)
         map newyork
```

Out[18]: Make this Notebook Trusted to load map: File -> Trust Notebook

```
bronx_data = neighborhoods[neighborhoods['Borough'] == 'Bronx'].reset_index(dr
In [19]:
         op=True)
         bronx_data.head()
```

### Out[19]:

	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

```
In [20]: address = 'Bronx, NY'
         geolocator = Nominatim(user_agent="ny_explorer")
         location = geolocator.geocode(address)
         latitude = location.latitude
         longitude = location.longitude
         print('The geograpical coordinate of Brinx are {}, {}.'.format(latitude, longi
         tude))
```

The geograpical coordinate of Brinx are 40.8466508, -73.8785937.

```
In [21]: # create map of Bronx using latitude and Longitude values
         map bronx = folium.Map(location=[latitude, longitude], zoom start=11)
         # add markers to map
         for lat, lng, label in zip(bronx_data['Latitude'], bronx_data['Longitude'], br
         onx_data['Neighborhood']):
             label = folium.Popup(label, parse html=True)
             folium.CircleMarker(
                  [lat, lng],
                  radius=5,
                 popup=label,
                  color='blue',
                 fill=True,
                 fill color='#3186cc',
                 fill_opacity=0.7,
                 parse_html=False).add_to(map_bronx)
         map_bronx
```

Out[21]: Make this Notebook Trusted to load map: File -> Trust Notebook

```
In [ ]: CLIENT ID = 'MUPROOXCLBNNHBIYXOBGFKLGYVNE10AIIDDPWXCYFEYVKXWS' # your Foursqua
         CLIENT SECRET = 'IV2KZ5A2PSYAJDMIXJRD5V34PYLBGHYQEGSØUE5EDDKHBUQU' # your Four
         square Secret
         VERSION = '20190520' # Foursquare API version
         print('Your credentails:')
         print('CLIENT_ID: ' + CLIENT_ID)
         print('CLIENT_SECRET:' + CLIENT_SECRET)
In [22]: | bronx_data.loc[0, 'Neighborhood']
Out[22]: 'Wakefield'
```

```
In [23]: neighborhood latitude = bronx data.loc[0, 'Latitude'] # neighborhood latitude
          vaLue
         neighborhood longitude = bronx data.loc[0, 'Longitude'] # neighborhood longitu
         de value
         neighborhood_name = bronx_data.loc[0, 'Neighborhood'] # neighborhood name
         print('Latitude and longitude values of {} are {}, {}.'.format(neighborhood na
         me,
                                                                         neighborhood_la
         titude,
                                                                         neighborhood lo
         ngitude))
```

Latitude and longitude values of Wakefield are 40.89470517661, -73.8472005205 4902.

```
In [24]:
         LIMIT = 100
         radius = 500
         url = 'https://api.foursquare.com/v2/venues/explore?&client id={}&client secre
         t={}&v={}&ll={},{}&radius={}&limit={}'.format(
              CLIENT ID,
              CLIENT SECRET,
              VERSION,
              neighborhood latitude,
              neighborhood longitude,
              radius,
              LIMIT)
         url
```

Out[24]: https://api.foursquare.com/v2/venues/explore?&client\_id=XVY0YGK3DX5QGHMN2TGS K2EWA55P3JNPIVC5QVW5SGIGUI2L&client secret=T53Z3HT4W5DVALRIPBK2DPD4NFOCISMUTM NBLNW13KEJTAIJ&v=20191101&ll=40.89470517661,-73.84720052054902&radius=500&lim it=100'

```
In [25]:
         results = requests.get(url).json()
```

```
In [26]: # function that extracts the category of the venue
         def get_category_type(row):
             try:
                  categories list = row['categories']
             except:
                  categories list = row['venue.categories']
             if len(categories list) == 0:
                  return None
             else:
                  return categories list[0]['name']
```

#### Out[27]:

	name	categories	lat	Ing
0	Lollipops Gelato	Dessert Shop	40.894123	-73.845892
1	Carvel Ice Cream	Ice Cream Shop	40.890487	-73.848568
2	Walgreens	Pharmacy	40.896528	-73.844700
3	Rite Aid	Pharmacy	40.896649	-73.844846
4	Dunkin'	Donut Shop	40.890459	-73.849089

```
In [28]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))
```

9 venues were returned by Foursquare.

```
In [29]: 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={}&clie
         nt secret={}&v={}&ll={},{}&radius={}&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)
```

```
In [30]: bronx_venues = getNearbyVenues(names=bronx_data['Neighborhood'],
                                             latitudes=bronx_data['Latitude'],
                                            longitudes=bronx_data['Longitude']
                                            )
```

Wakefield

Co-op City

Eastchester

Fieldston

Riverdale

Kingsbridge

Woodlawn

Norwood

Williamsbridge

Baychester

Pelham Parkway

City Island

Bedford Park

University Heights

Morris Heights

Fordham

East Tremont

West Farms

High Bridge

Melrose

Mott Haven

Port Morris

Longwood

**Hunts Point** 

Morrisania

Soundview

Clason Point

Throgs Neck

Country Club

Parkchester

Westchester Square

Van Nest

Morris Park

Belmont

Spuyten Duyvil

North Riverdale

Pelham Bay

Schuylerville

Edgewater Park

Castle Hill

Olinville

Pelham Gardens

Concourse

Unionport

Edenwald

Claremont Village

Concourse Village

Mount Eden

Mount Hope

Bronxdale

Allerton

Kingsbridge Heights

In [31]: print(bronx\_venues.shape) bronx\_venues.head()

(1203, 7)

# Out[31]:

	Neighborhood Neighborhood N Latitude		annormona o va		Venue Latitude	Venue Longitude	Venue Category
0	Wakefield	40.894705	-73.847201	Lollipops Gelato	40.894123	-73.845892	Dessert Shop
1	Wakefield	40.894705	-73.847201	Carvel Ice Cream	40.890487	-73.848568	Ice Cream Shop
2	Wakefield	40.894705	-73.847201	Walgreens	40.896528	-73.844700	Pharmacy
3	Wakefield	40.894705	-73.847201	Rite Aid	40.896649	-73.844846	Pharmacy
4	Wakefield	40.894705	-73.847201	Dunkin'	40.890459	-73.849089	Donut Shop

In [32]: bronx\_venues.groupby('Neighborhood').count()

# Out[32]:

	Neighborhood Neighborhood Latitude Longitude		Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Allerton	31	31	31	31	31	31
Baychester	21	21	21	21	21	21
Bedford Park	39	39	39	39	39	39
Belmont	99	99	99	99	99	99
Bronxdale	11	11	11	11	11	11
Castle Hill	9	9	9	9	9	9
City Island	27	27	27	27	27	27
Claremont Village	16	16	16	16	16	16
Clason Point	10	10	10	10	10	10
Co-op City	18	18	18	18	18	18
Concourse	23	23	23	23	23	23
Concourse Village	41	41	41	41	41	41
Country Club	5	5	5	5	5	5
East Tremont	17	17	17	17	17	17
Eastchester	18	18	18	18	18	18
Edenwald	5	5	5	5	5	5
Edgewater Park	22	22	22	22	22	22
Fieldston	4	4	4	4	4	4
Fordham	80	80	80	80	80	80
High Bridge	26	26	26	26	26	26
<b>Hunts Point</b>	13	13	13	13	13	13
Kingsbridge	71	71	71	71	71	71
Kingsbridge Heights	30	30	30	30	30	30
Longwood	7	7	7	7	7	7
Melrose	29	29	29	29	29	29
Morris Heights	9	9	9	9	9	9
Morris Park	22	22	22	22	22	22
Morrisania	26	26	26	26	26	26
Mott Haven	17	17	17	17	17	17
Mount Eden	34	34	34	34	34	34
Mount Hope	13	13	13	13	13	13

	The Ballio St. Weighbornesdo (West, 1)						
	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	
Neighborhood							
North Riverdale	22	22	22	22	22	22	
Norwood	33	33	33	33	33	33	
Olinville	8	8	8	8	8	8	
Parkchester	30	30	30	30	30	30	
Pelham Bay	40	40	40	40	40	40	
Pelham Gardens	22	22	22	22	22	22	
Pelham Parkway	21	21	21	21	21	21	
Port Morris	15	15	15	15	15	15	
Riverdale	10	10	10	10	10	10	
Schuylerville	17	17	17	17	17	17	
Soundview	16	16	16	16	16	16	
Spuyten Duyvil	9	9	9	9	9	9	
Throgs Neck	10	10	10	10	10	10	
Unionport	23	23	23	23	23	23	
University Heights	23	23	23	23	23	23	
Van Nest	18	18	18	18	18	18	
Wakefield	9	9	9	9	9	9	
West Farms	21	21	21	21	21	21	
Westchester Square	33	33	33	33	33	33	
Williamsbridge	4	4	4	4	4	4	
Woodlawn	26	26	26	26	26	26	

```
In [33]:
        # one hot encoding
         bronx_onehot = pd.get_dummies(bronx_venues[['Venue Category']], prefix="", pre
         fix_sep="")
         # add neighborhood column back to dataframe
         bronx_onehot['Neighborhood'] = bronx_venues['Neighborhood']
         # move neighborhood column to the first column
         fixed_columns = [bronx_onehot.columns[-1]] + list(bronx_onehot.columns[:-1])
         bronx_onehot = bronx_onehot[fixed_columns]
         bronx_onehot.head(3)
```

#### Out[33]:

	Neighborhood	Accessories Store	African Restaurant	American Restaurant	Arcade	Arepa Restaurant	Art Gallery	Art Museum	Rı
0	Wakefield	0	0	0	0	0	0	0	
1	Wakefield	0	0	0	0	0	0	0	
2	Wakefield	0	0	0	0	0	0	0	
4									•

```
bronx_grouped = bronx_onehot.groupby('Neighborhood').mean().reset_index()
bronx_grouped
```

### Out[34]:

	Neighborhood	Accessories Store	African Restaurant	American Restaurant	Arcade	Arepa Restaurant	Art Gallery	Aı Museur
0	Allerton	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
1	Baychester	0.000000	0.000000	0.000000	0.047619	0.000000	0.000000	0.00000
2	Bedford Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
3	Belmont	0.000000	0.000000	0.010101	0.000000	0.000000	0.000000	0.00000
4	Bronxdale	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
5	Castle Hill	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
6	City Island	0.000000	0.000000	0.037037	0.000000	0.000000	0.000000	0.00000
7	Claremont Village	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
8	Clason Point	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
9	Co-op City	0.055556	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
10	Concourse	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.04347
11	Concourse Village	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
12	Country Club	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
13	East Tremont	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
14	Eastchester	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
15	Edenwald	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
16	Edgewater Park	0.000000	0.000000	0.045455	0.000000	0.000000	0.000000	0.00000
17	Fieldston	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
18	Fordham	0.012500	0.012500	0.000000	0.000000	0.000000	0.000000	0.00000
19	High Bridge	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
20	Hunts Point	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
21	Kingsbridge	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
22	Kingsbridge Heights	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
23	Longwood	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
24	Melrose	0.000000	0.000000	0.000000	0.000000	0.000000	0.034483	0.00000
25	Morris Heights	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
26	Morris Park	0.000000	0.000000	0.000000	0.000000	0.045455	0.000000	0.00000
27	Morrisania	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
28	Mott Haven	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
29	Mount Eden	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
30	Mount Hope	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000

	Neighborhood	Accessories Store	African Restaurant	American Restaurant	Arcade	Arepa Restaurant	Art Gallery	Aı Museur
31	North Riverdale	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
32	Norwood	0.000000	0.000000	0.030303	0.000000	0.000000	0.000000	0.00000
33	Olinville	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
34	Parkchester	0.000000	0.000000	0.066667	0.000000	0.000000	0.000000	0.00000
35	Pelham Bay	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
36	Pelham Gardens	0.000000	0.000000	0.045455	0.000000	0.000000	0.000000	0.00000
37	Pelham Parkway	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
38	Port Morris	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
39	Riverdale	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
40	Schuylerville	0.000000	0.000000	0.058824	0.000000	0.000000	0.000000	0.00000
41	Soundview	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
42	Spuyten Duyvil	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
43	Throgs Neck	0.000000	0.000000	0.100000	0.000000	0.000000	0.000000	0.00000
44	Unionport	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
45	University Heights	0.000000	0.043478	0.000000	0.000000	0.000000	0.000000	0.00000
46	Van Nest	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
47	Wakefield	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
48	West Farms	0.000000	0.000000	0.000000	0.000000	0.000000	0.047619	0.00000
49	Westchester Square	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
50	Williamsbridge	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
51	Woodlawn	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
4								<b>•</b>

In [35]: bronx\_grouped.shape

Out[35]: (52, 169)

```
In [36]: | num_top_venues = 5
         for hood in bronx_grouped['Neighborhood']:
             print("----"+hood+"----")
             temp = bronx_grouped[bronx_grouped['Neighborhood'] == hood].T.reset_index
         ()
             temp.columns = ['venue','freq']
             temp = temp.iloc[1:]
             temp['freq'] = temp['freq'].astype(float)
             temp = temp.round({'freq': 2})
             print(temp.sort_values('freq', ascending=False).reset_index(drop=True).hea
         d(num_top_venues))
             print('\n')
```

```
----Allerton----
                venue freq
          Pizza Place 0.13
1
        Deli / Bodega
                       0.06
                       0.06
2
                  Spa
3
                       0.06
  Chinese Restaurant
4
               Bakery 0.06
----Baychester----
                  venue freq
0
             Donut Shop
                        0.10
1
     Mexican Restaurant
                         0.05
2
            Supermarket
                        0.05
3
          Shopping Mall
                         0.05
   Fast Food Restaurant
                         0.05
----Bedford Park----
                venue frea
   Chinese Restaurant 0.10
1
          Pizza Place 0.10
2
                Diner
                       0.10
3
  Mexican Restaurant 0.08
        Deli / Bodega
4
                       0.08
----Belmont----
                venue
                       frea
0
   Italian Restaurant 0.20
          Pizza Place 0.08
1
2
        Deli / Bodega 0.07
               Bakery
3
                       0.05
  Mexican Restaurant 0.04
----Bronxdale----
                           venue freq
                  Breakfast Spot
                                  0.09
1
              Italian Restaurant
                                  0.09
2
              Spanish Restaurant 0.09
3
                     Pizza Place 0.09
  Paper / Office Supplies Store 0.09
----Castle Hill----
                             venue freq
                    Baseball Field 0.11
0
1
                     Deli / Bodega
                                   0.11
2
                             Diner
                                   0.11
                       Pizza Place 0.11
3
   Southern / Soul Food Restaurant 0.11
----City Island----
                    venue freq
          Harbor / Marina 0.11
```

```
1
   Thrift / Vintage Store 0.07
2
            Boat or Ferry
                           0.07
3
       Seafood Restaurant
                           0.07
4
           Baseball Field
                           0.04
----Claremont Village----
                venue freq
        Grocery Store 0.19
0
1
               Bakery 0.12
2
          Bus Station 0.12
3
  Chinese Restaurant 0.12
          Pizza Place 0.06
----Clason Point----
                              freq
                       venue
                               0.4
0
                        Park
1
                               0.1
                        Pool
2
               Moving Target
                               0.1
3
               Boat or Ferry
                               0.1
   South American Restaurant
                               0.1
----Co-op City----
                  venue
                        freq
   Fast Food Restaurant
                        0.11
1
            Bus Station
                         0.11
2
         Mattress Store
                        0.06
3
     Chinese Restaurant
                         0.06
       Basketball Court
4
                        0.06
----Concourse----
                 venue freq
0
         Grocery Store 0.17
         Deli / Bodega
1
                        0.09
2
           Bus Station 0.09
                Bakery 0.04
3
  Fried Chicken Joint 0.04
----Concourse Village----
                  venue freq
0
         Sandwich Place 0.07
1
          Deli / Bodega
                         0.07
2
            Bus Station
                         0.07
3
  Fast Food Restaurant
                        0.07
     Mexican Restaurant 0.07
----Country Club----
                venue freq
0
       Sandwich Place
                        0.4
           Playground
                        0.2
1
2
  Athletics & Sports
                        0.2
```

0.2

Chinese Restaurant

Accessories Store 0.0

```
----East Tremont----
            venue freq
0
      Pizza Place
                  0.18
1
                   0.06
       Restaurant
2
             Bank
                  0.06
3
  Discount Store 0.06
4
       Donut Shop 0.06
----Eastchester----
                  venue freq
   Caribbean Restaurant
                         0.17
1
                  Diner
                         0.11
2
          Deli / Bodega
                         0.11
3
            Bus Station
                         0.11
4
     Seafood Restaurant 0.06
----Edenwald----
                        venue
                              freq
0
                  Supermarket
                                0.2
1
  Construction & Landscaping
                                0.2
2
                  Fish Market
                                0.2
3
                  Gas Station
                                0.2
4
                Grocery Store
                                0.2
----Edgewater Park----
                venue freq
   Italian Restaurant 0.18
1
        Deli / Bodega 0.14
2
          Coffee Shop
                       0.09
3
          Pizza Place 0.09
4
                  Pub 0.05
----Fieldston----
               venue freq
               Plaza 0.25
0
1
           Wine Shop
                      0.25
2
               River
                      0.25
         Bus Station
                     0.25
   Accessories Store 0.00
----Fordham----
               venue freq
  Mobile Phone Shop
                      0.06
1
          Shoe Store
                      0.05
2
                Bank 0.05
          Donut Shop
3
                      0.05
         Pizza Place 0.05
```

```
----High Bridge----
                       venue freq
                    Pharmacy 0.15
1
                 Pizza Place 0.12
2
                 Bus Station 0.12
3
                 Supermarket
                              0.08
  Latin American Restaurant 0.08
----Hunts Point----
            venue freq
  Waste Facility
0
                   0.15
                   0.08
1
       Juice Bar
2
       BBQ Joint 0.08
3
    Gourmet Shop 0.08
4
    Grocery Store 0.08
----Kingsbridge----
                       venue freq
                 Pizza Place 0.08
1
                              0.06
                         Bar
2
                 Supermarket 0.04
3
         Mexican Restaurant 0.04
   Latin American Restaurant 0.04
----Kingsbridge Heights----
               venue freq
0
          Pizza Place 0.13
1
          Bus Station 0.10
2
          Food Truck 0.10
3
  Chinese Restaurant 0.07
          Coffee Shop 0.07
----Longwood----
                  venue freq
0
                         0.14
          Deli / Bodega
1
                  Diner
                         0.14
2
  Fast Food Restaurant 0.14
3
         Grocery Store
                        0.14
4
         Sandwich Place 0.14
----Melrose----
            venue freq
0
     Pizza Place 0.10
1
         Pharmacy
                   0.10
2
   Grocery Store
                  0.07
   Sandwich Place
                  0.07
  Discount Store
                  0.07
----Morris Heights----
                venue freq
```

0 Spanish Restaurant 0.22

```
1
    Recreation Center 0.11
2
                 Bank 0.11
3
       Deli / Bodega 0.11
4
          Supermarket 0.11
----Morris Park----
            venue freq
0
      Pizza Place 0.18
1
           Bakery 0.09
2
   Deli / Bodega 0.09
    Burger Joint 0.09
3
  Sandwich Place 0.05
----Morrisania----
                  venue freq
0
         Discount Store 0.15
            Bus Station
1
                        0.12
2
          Grocery Store
                         0.08
             Donut Shop
                         0.08
  Fast Food Restaurant
                        0.08
----Mott Haven----
                venue frea
   Spanish Restaurant 0.12
1
          Pizza Place 0.12
2
           Donut Shop 0.12
3
    Storage Facility 0.06
4
               Bakery 0.06
----Mount Eden----
                  venue freq
               Pharmacy
                        0.12
  Fast Food Restaurant
1
                         0.09
2
            Supermarket
                        0.09
3
     Spanish Restaurant
                         0.06
4
                    Bar
                         0.06
----Mount Hope----
                venue freq
0
        Grocery Store 0.15
1
          Pizza Place 0.15
2
  Spanish Restaurant 0.08
3
       Moving Target 0.08
       Ice Cream Shop 0.08
----North Riverdale----
                venue freq
          Pizza Place 0.14
                 Bank 0.09
1
2
  Italian Restaurant
                       0.09
```

Pool 0.05

3

```
4
        Burger Joint 0.05
```

```
---Norwood----
                venue freq
          Pizza Place
                       0.15
1
                 Park 0.09
2
                 Bank 0.09
3
  Mexican Restaurant
                       0.06
4
          Bus Station 0.06
----Olinville----
                  venue
                       freq
   Caribbean Restaurant
                         0.25
1
    Fried Chicken Joint
                         0.12
2
           Liquor Store
                        0.12
3
            Supermarket
                        0.12
4
                   Food
                        0.12
----Parkchester----
                 venue freq
0
           Supermarket 0.13
1
           Pizza Place 0.10
2
   American Restaurant 0.07
3
            Kids Store 0.07
4
                  Bank 0.07
----Pelham Bay----
                  venue
                        freq
   Fast Food Restaurant
                         0.08
1
     Italian Restaurant
                         0.08
2
                   Bank
                        0.08
3
      Convenience Store
                        0.05
4
             Donut Shop
                         0.05
----Pelham Gardens----
                venue freq
0
          Bus Station 0.09
1
           Donut Shop 0.09
2
             Pharmacy
                       0.09
          Pizza Place
                       0.05
   Spanish Restaurant 0.05
----Pelham Parkway----
                venue freq
   Italian Restaurant 0.10
1
          Pizza Place 0.10
2
  Mexican Restaurant 0.05
3
                 Bank 0.05
4
           Smoke Shop 0.05
```

```
----Port Morris----
                       venue
                              freq
   Latin American Restaurant
                              0.13
1
      Furniture / Home Store
                              0.13
2
                Cupcake Shop
                              0.07
3
                 Music Venue
                               0.07
4
                  Restaurant 0.07
----Riverdale----
         venue freq
0
          Park
                 0.2
                 0.1
1
    Food Truck
2
         Plaza
                 0.1
3
    Playground
                 0.1
   Bus Station
                 0.1
----Schuylerville----
                venue
                       freq
                Diner
                       0.12
1
  Mexican Restaurant
                       0.12
2
             Pharmacy
                       0.12
3
          Pizza Place 0.12
4
           Hookah Bar 0.06
----Soundview----
                 venue
                       freq
0
    Chinese Restaurant 0.19
1
                        0.06
              Pharmacy
2
  Fried Chicken Joint
                        0.06
3
        Discount Store 0.06
4
           Bus Station 0.06
----Spuyten Duyvil----
                  venue freq
           Intersection
                         0.11
1
        Thai Restaurant
                         0.11
2
               Pharmacy
                         0.11
                         0.11
3
         Scenic Lookout
  Fast Food Restaurant
                         0.11
----Throgs Neck----
                 venue freq
0
           Coffee Shop
                         0.1
1
           Pizza Place
                         0.1
2
   American Restaurant
                         0.1
3
        Baseball Field
                         0.1
4
    Italian Restaurant
                         0.1
----Unionport----
                              freq
                       venue
```

0 Latin American Restaurant 0.09

https://eu-gb.dataplatform.cloud.ibm.com/data/jupyter2/runtimeenv2/v1/wdpx/service/notebook/conda2py36c0f064ce62174be1847d5d39a2ad78b... 118/129

```
1
                  Donut Shop 0.09
2
              Ice Cream Shop
                              0.09
3
               Deli / Bodega
                              0.04
4
           Mobile Phone Shop 0.04
----University Heights----
                venue freq
0
          Pizza Place 0.09
1
  Chinese Restaurant 0.09
2
               Bakery 0.09
3
           Donut Shop 0.04
4
           Shoe Store 0.04
----Van Nest----
                       venue freq
0
                 Pizza Place 0.22
               Deli / Bodega 0.11
1
2
  Middle Eastern Restaurant 0.06
3
                 Coffee Shop 0.06
4
                 Bus Station 0.06
----Wakefield----
            venue freq
         Pharmacy 0.22
1
  Ice Cream Shop
                  0.11
2
      Gas Station
                  0.11
3
       Donut Shop 0.11
   Sandwich Place 0.11
----West Farms----
            venue freq
0
      Bus Station 0.24
                  0.10
1
             Park
2
     Intersection
                  0.05
3
                  0.05
             Bank
  Sandwich Place 0.05
----Westchester Square----
                  venue freq
   Fast Food Restaurant 0.09
1
               Pharmacy
                         0.06
2
             Donut Shop
                         0.06
         Sandwich Place 0.06
3
            Pizza Place 0.06
----Williamsbridge----
                        freq
                  venue
   Caribbean Restaurant
                         0.25
1
                         0.25
                    Bar
2
             Soup Place
                         0.25
```

0.25

Nightclub

3

```
4
            Playground 0.00
```

```
----Woodlawn----
              venue freq
      Deli / Bodega 0.15
1
                Pub 0.08
2
  Food & Drink Shop 0.08
         Playground 0.08
        Pizza Place 0.08
4
```

```
In [37]: def return_most_common_venues(row, num_top_venues):
             row_categories = row.iloc[1:]
             row_categories_sorted = row_categories.sort_values(ascending=False)
             return row_categories_sorted.index.values[0:num_top_venues]
```

```
In [38]: | num_top_venues = 10
         indicators = ['st', 'nd', 'rd']
         # create columns according to number of top venues
         columns = ['Neighborhood']
         for ind in np.arange(num_top_venues):
             try:
                  columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind
         ]))
             except:
                  columns.append('{}th Most Common Venue'.format(ind+1))
         # create a new dataframe
         neighborhoods venues sorted = pd.DataFrame(columns=columns)
         neighborhoods_venues_sorted['Neighborhood'] = bronx_grouped['Neighborhood']
         for ind in np.arange(bronx_grouped.shape[0]):
             neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(bron
         x grouped.iloc[ind, :], num top venues)
         neighborhoods_venues_sorted.head()
```

#### Out[38]:

	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 M Comn Vei
0	Allerton	Pizza Place	Spa	Deli / Bodega	Chinese Restaurant	Bakery	Supermarket	Sm S
1	Baychester	Donut Shop	Spanish Restaurant	Supermarket	Pizza Place	Pet Store	Rental Car Location	Disco St
2	Bedford Park	Chinese Restaurant	Diner	Pizza Place	Deli / Bodega	Mexican Restaurant	Spanish Restaurant	Sandv Pl
3	Belmont	Italian Restaurant	Pizza Place	Deli / Bodega	Bakery	Mexican Restaurant	Grocery Store	Des S
4	Bronxdale	Mexican Restaurant	Gym	Performing Arts Venue	Chinese Restaurant	Paper / Office Supplies Store	Eastern European Restaurant	Spar Restau

```
In [39]: # set number of clusters
kclusters = 5

bronx_grouped_clustering = bronx_grouped.drop('Neighborhood', 1)

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

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

Out[39]: array([0, 4, 0, 0, 0, 0, 0, 3, 0], dtype=int32)

# # add clustering labels neighborhoods\_venues\_sorted.insert(0, 'Cluster Labels', kmeans.labels\_) bronx merged = bronx data # merge toronto\_grouped with toronto\_data to add latitude/longitude for each n eighborhood bronx\_merged = bronx\_merged.join(neighborhoods\_venues\_sorted.set\_index('Neighb orhood'), on='Neighborhood') bronx\_merged.head() # check the last columns!

#### Out[40]:

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	C
0	Bronx	Wakefield	40.894705	-73.847201	0	Pharmacy	Ice Cream Shop	Gas Station	
1	Bronx	Co-op City	40.874294	-73.829939	0	Fast Food Restaurant	Bus Station	Accessories Store	
2	Bronx	Eastchester	40.887556	-73.827806	0	Caribbean Restaurant	Deli / Bodega	Diner	
3	Bronx	Fieldston	40.895437	-73.905643	3	Plaza	Wine Shop	River	
4	Bronx	Riverdale	40.890834	-73.912585	3	Park	Playground	Bank	
4									•

```
In [41]: # create map
         map clusters = folium.Map(location=[latitude, longitude], zoom start=11)
         # set color scheme for the clusters
         x = np.arange(kclusters)
         ys = [i + x + (i*x)**2  for i in range(kclusters)]
         colors array = cm.rainbow(np.linspace(0, 1, len(ys)))
         rainbow = [colors.rgb2hex(i) for i in colors array]
         # add markers to the map
         markers colors = []
         for lat, lon, poi, cluster in zip(bronx_merged['Latitude'], bronx_merged['Long
         itude'], bronx_merged['Neighborhood'], bronx_merged['Cluster Labels']):
             label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=Tru
         e)
             folium.CircleMarker(
                  [lat, lon],
                 radius=5,
                 popup=label,
                  color=rainbow[cluster-1],
                 fill=True,
                 fill_color=rainbow[cluster-1],
                 fill_opacity=0.7).add_to(map_clusters)
         map_clusters
```

Out[41]: Make this Notebook Trusted to load map: File -> Trust Notebook

### Out[42]:

	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	
0	Wakefield	Pharmacy	Ice Cream Shop	Gas Station	Deli / Bodega	Sandwich Place	Dessert Shop	
1	Co-op City	Fast Food Restaurant	Bus Station	Accessories Store	Baseball Field	Grocery Store	Liquor Store	
2	Eastchester	Caribbean Restaurant	Deli / Bodega	Diner	Bus Station	Bowling Alley	Food & Drink Shop	С
5	Kingsbridge	Pizza Place	Bar	Supermarket	Latin American Restaurant	Sandwich Place	Mexican Restaurant	
6	Woodlawn	Deli / Bodega	Pizza Place	Food & Drink Shop	Playground	Pub	Convenience Store	
7	Norwood	Pizza Place	Park	Bank	Pharmacy	Mexican Restaurant	Bus Station	
10	Pelham Parkway	Pizza Place	Italian Restaurant	Frozen Yogurt Shop	Deli / Bodega	Performing Arts Venue	Coffee Shop	
11	City Island	Harbor / Marina	Seafood Restaurant	Thrift / Vintage Store	Boat or Ferry	History Museum	Tapas Restaurant	
12	Bedford Park	Chinese Restaurant	Diner	Pizza Place	Deli / Bodega	Mexican Restaurant	Spanish Restaurant	
13	University Heights	Bakery	Pizza Place	Chinese Restaurant	Laundromat	Burrito Place	Shoe Store	
14	Morris Heights	Spanish Restaurant	Pizza Place	Recreation Center	Pharmacy	Deli / Bodega	Grocery Store	S
18	High Bridge	Pharmacy	Pizza Place	Bus Station	Supermarket	Latin American Restaurant	Seafood Restaurant	
19	Melrose	Pizza Place	Pharmacy	Gym / Fitness Center	Sandwich Place	Discount Store	Grocery Store	
20	Mott Haven	Pizza Place	Spanish Restaurant	Donut Shop	Latin American Restaurant	Burger Joint	Storage Facility	
21	Port Morris	Latin American Restaurant	Furniture / Home Store	Cupcake Shop	Music Venue	Storage Facility	Food Truck	
22	Longwood	Fast Food Restaurant	Deli / Bodega	Sandwich Place	Latin American Restaurant	Diner	Donut Shop	
24	Morrisania	Discount Store	Bus Station	Fast Food Restaurant	Donut Shop	Grocery Store	Sandwich Place	F
25	Soundview	Chinese Restaurant	Deli / Bodega	Latin American Restaurant	Breakfast Spot	Bus Station	Bus Stop	
27	Throgs Neck	Pizza Place	Sports Bar	Bar	Chinese Restaurant	Coffee Shop	Asian Restaurant	

	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	
30	Westchester Square	Fast Food Restaurant	Donut Shop	Pharmacy	Pizza Place	Sandwich Place	Indie Theater	
31	Van Nest	Pizza Place	Deli / Bodega	Middle Eastern Restaurant	Food Truck	Coffee Shop	Donut Shop	
32	Morris Park	Pizza Place	Burger Joint	Deli / Bodega	Bakery	Coffee Shop	Buffet	
33	Belmont	Italian Restaurant	Pizza Place	Deli / Bodega	Bakery	Mexican Restaurant	Grocery Store	
35	North Riverdale	Pizza Place	Bank	Italian Restaurant	Bar	Burger Joint	Mexican Restaurant	
37	Schuylerville	Mexican Restaurant	Diner	Pharmacy	Pizza Place	Convenience Store	Bank	
38	Edgewater Park	Italian Restaurant	Deli / Bodega	Coffee Shop	Pizza Place	Pub	Bar	
39	Castle Hill	Bank	Pizza Place	Deli / Bodega	Pharmacy	Southern / Soul Food Restaurant	Diner	
41	Pelham Gardens	Pharmacy	Donut Shop	Bus Station	Liquor Store	Deli / Bodega	Pizza Place	
42	Concourse	Grocery Store	Deli / Bodega	Bus Station	Ice Cream Shop	Liquor Store	Pharmacy	С
43	Unionport	Latin American Restaurant	Ice Cream Shop	Donut Shop	Plaza	Spanish Restaurant	Pizza Place	
45	Claremont Village	Grocery Store	Chinese Restaurant	Bus Station	Bakery	Caribbean Restaurant	Liquor Store	
46	Concourse Village	Sandwich Place	Bus Station	Fast Food Restaurant	Mexican Restaurant	Deli / Bodega	Pharmacy	
47	Mount Eden	Pharmacy	Fast Food Restaurant	Supermarket	Spanish Restaurant	Bar	Grocery Store	
48	Mount Hope	Pizza Place	Grocery Store	Deli / Bodega	Moving Target	Supermarket	Donut Shop	
49	Bronxdale	Mexican Restaurant	Gym	Performing Arts Venue	Chinese Restaurant	Paper / Office Supplies Store	Eastern European Restaurant	
50	Allerton	Pizza Place	Spa	Deli / Bodega	Chinese Restaurant	Bakery	Supermarket	S
51	Kingsbridge Heights	Pizza Place	Bus Station	Food Truck	Coffee Shop	Chinese Restaurant	Pharmacy	

In [43]: | bronx\_merged.loc[bronx\_merged['Cluster Labels'] == 1, bronx\_merged.columns[[1] + list(range(5, bronx\_merged.shape[1]))]]

#### Out[43]:

	Neighborhood	1st Most Common Venue	Most Common Venue	3rd Most Common Venue	4th Most Common Venue		6th Most Common Venue		8th Con V
8	Williamsbridge	Nightclub	Soup Place	Bar	Caribbean Restaurant	Women's Store	Donut Shop	Film Studio	Fast Resta
4									

In [44]: bronx\_merged.loc[bronx\_merged['Cluster Labels'] == 2, bronx\_merged.columns[[1] + list(range(5, bronx\_merged.shape[1]))]]

#### Out[44]:

	Neighborhood	Common Venue	Common Venue	Common Venue	Common Venue			Common Venue	(
28	Country Club	Sandwich Place	Playground	Chinese Restaurant	Athletics & Sports	Dive Bar	Film Studio	Fast Food Restaurant	

In [45]: bronx\_merged.loc[bronx\_merged['Cluster Labels'] == 3, bronx\_merged.columns[[1] + list(range(5, bronx\_merged.shape[1]))]]

#### Out[45]:

	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
3	Fieldston	Plaza	Wine Shop	River	Bus Station	Dive Bar	Film Studio	Fast Food Restaurant
4	Riverdale	Park	Playground	Bank	Home Service	Plaza	Food Truck	Bus Station
17	West Farms	Bus Station	Park	Metro Station	Latin American Restaurant	Playground	Diner	Coffee Shop
26	Clason Point	Park	Pool	Bus Stop	Moving Target	Boat or Ferry	South American Restaurant	Grocery Store

С

```
bronx merged.loc[bronx merged['Cluster Labels'] == 4, bronx merged.columns[[1]
+ list(range(5, bronx_merged.shape[1]))]]
```

Out[46]:

	6th Most Common Venue	5th Most Common Venue	4th Most Common Venue	3rd Most Common Venue	2nd Most Common Venue	1st Most Common Venue	Neighborhood	
	Rental Car Location	Pet Store	Pizza Place	Supermarket	Spanish Restaurant	Donut Shop	Baychester	9
	Supplement Shop	Bank	Pizza Place	Shoe Store	Donut Shop	Mobile Phone Shop	Fordham	15
	Shoe Store	Supermarket	Breakfast Spot	Fast Food Restaurant	Café	Pizza Place	East Tremont	16
	Farmers Market	Café	Restaurant	Grocery Store	Food	Waste Facility	Hunts Point	23
	Women's Store	Kids Store	Bank	American Restaurant	Pizza Place	Supermarket	Parkchester	29
	Tennis Stadium	Tennis Court	Scenic Lookout	Bank	Park	Thai Restaurant	Spuyten Duyvil	34
С	Donut Shop	Sandwich Place	Gym / Fitness Center	Italian Restaurant	Bank	Fast Food Restaurant	Pelham Bay	36
	Liquor Store	Fried Chicken Joint	Supermarket	Southern / Soul Food Restaurant	Food	Caribbean Restaurant	Olinville	40
	Department Store	Grocery Store	Gas Station	Supermarket	Fish Market	Construction & Landscaping	Edenwald	44
•								4

## Results

First and second cluster contains majority of the neibourhood, based on common venues. Cluster 3-5 contain 1-2 venues per cluster.

Few observations/insights from the results:

Most neibourhoods are similar in terms of the types/categories of venues which could mean few things The population in Bronx is similar (i.e. age, occupation, etc.) across neibourhood While NYC is considered an international city, Bronx might be more American due to similar venues Only one of the neibourhood, East Tremont, where Cafe is in top 5 frequency which would indicate that it is more of a bedroom community - people go to work in other cities The final recommendation/conclusion that can be drawn from this is that you and your friend should open up a cafe in Manhattan as the first and the second clusters (Red and Purple) had cafe in the top 10 most common types of venues.

## **Observations**

I guess it's not a surprise that these districts are all very centrally located in Newyork City. Locations fitting the criteria for popular venues would normally be in central locations in many cities of the world.

From this visualisation it is clear that on a practical level, with no data to base decisions on, the circle of all the neighborhood is very large, and researching and then visiting them all would be a daunting and time consuming task. We have narrowed the search area down significantly to get the result.

### Inferences

We have made inferences from the data in making the location recommendations, but that is exactly the point. There is no right or wrong answer or conclusion for the task at hand. The job of data analysis here is to steer a course for the location selection of new stores (i) to meet the criteria of being in neighbourhoods that are lively with abundant leisure venues, and (ii) to narrow the search down to just a few of the main areas that are best suited to match the criteria.

## **Conclusions**

There are many ways this analysis could have been performed based on different methodolgy and perhaps different data sources. The method selected is a straight forward way to narrow down the options, not complicating what is actually simple in many ways - meeting the the critera for the surrounding venues. The analysis and results are not an end point, but rather a starting point that will guide the next part of the process to find specific store locations. The next part will involve domain knowledge of the industry, and perhaps, of the city itself. But the data analysis and resulting recommendations have greatly narrowed down the best neighborhood options based on data and what we can infer from it.

With Data science methodology, we can narrow down to best option for starting a cafe based on different data points and provide better startup strategy.

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