

The Battle of Neighborhoods NYC

Introduction

- Number of people following special or restricted diet has been significantly increased
- New York City is considered to be one of the most visited cities in USA
- A travel agency in New York City needs help in creating travel plans for travelers following different diets

Objectives

- compare the following diets' restaurants in some areas in New York City
 - Vegetarian/Vegan
 - Halal
 - Kosher
 - Gluten Free
- Focus boroughs
 - Bronx
 - Manhattan

Data

- New York City Neighborhoods dataset. It includes NYC Borough, Neighborhood, Latitude, and Longitude
https://geo.nyu.edu/catalog/nyu_2451_34572
- Foursquare API search function. This is to get the number of restaurants for each diet in every neighborhood.

<https://developer.foursquare.com/docs/build-with-foursquare/categories/>

Methodology(1)

- Bronx and Manhattan neighborhoods

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

Manhattan_neigh.[head\(\)](#)

	Borough	Neighborhood	Latitude	Longitude
0	Manhattan	Marble Hill	40.876551	-73.910660
1	Manhattan	Chinatown	40.715618	-73.994279
2	Manhattan	Washington Heights	40.851903	-73.936900
3	Manhattan	Inwood	40.867684	-73.921210
4	Manhattan	Hamilton Heights	40.823604	-73.949688

Methodology(2)

- Geopy library for coordinates

```
[15]: address = 'New York City, NY'

geolocator = Nominatim(user_agent="foursquare_agent")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geographical coordinate of New York City are {}, {}'.format(latitude, longitude))

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

```
[16]: #Bronx
Bronx_address = 'Bronx, NY'
Bronx_location = geolocator.geocode(Bronx_address)
Bronx_latitude = Bronx_location.latitude
Bronx_longitude = Bronx_location.longitude
print('The geographical coordinate of Bronx are {}, {}'.format(Bronx_latitude, Bronx_longitude))

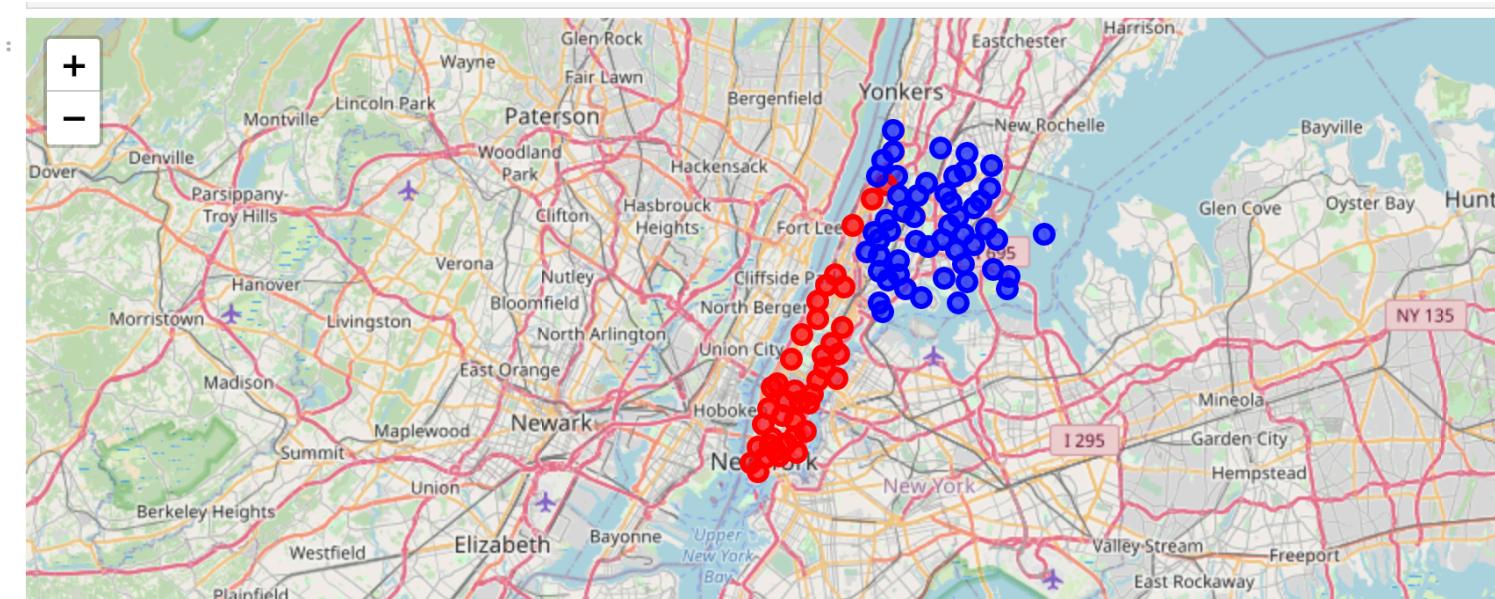
#Manhattan
Manhattan_address = 'Manhattan, NY'
Manhattan_location = geolocator.geocode(Manhattan_address)
Manhattan_latitude = Manhattan_location.latitude
Manhattan_longitude = Manhattan_location.longitude
print('The geographical coordinate of Manhattan are {}, {}'.format(Manhattan_latitude, Manhattan_longitude))

The geographical coordinate of Bronx are 40.8466508, -73.8785937.
The geographical coordinate of Manhattan are 40.7896239, -73.9598939.
```

Support

Methodology(3)

- Folium library to visualize neighborhoods
 - Blue – Bronx
 - Red – Manhattan



Methodology(4)

- Parameters and URL to call foursquare API “search”

```
[8]: CLIENT_ID = 'YIPE0XDZX0RNL3XZYFBWVP20CNCBLMHXXZJWPNXRK5URKTN' # your Foursquare ID
CLIENT_SECRET = 'G4H5YBLNT531U4L2AYA0VD1CAGHUIPHLNASL30XPKUPZJBQ1' # your Foursquare Secret
VERSION = '20180604'
print('Your credentials:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)
LIMIT = 50 # limit of number of venues returned by Foursquare API
radius = 1000 # define radius of 1 KM
search_query = ''

Your credentials:
CLIENT_ID: YIPE0XDZX0RNL3XZYFBWVP20CNCBLMHXXZJWPNXRK5URKTN
CLIENT_SECRET: G4H5YBLNT531U4L2AYA0VD1CAGHUIPHLNASL30XPKUPZJBQ1
```

In[8]

```
# create the API request URL
url = 'https://api.foursquare.com/v2/venues/search?client_id={}&client_secret={}&v={}&ll={},{}&query={}&radius={}&limit={}&categoryId={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    latitude,
    longitude,
    search_query,
    radius,
    LIMIT,
    category)
```

Out[8]

Methodology(5)

- Merge foursquare venues with New York neighborhoods

```
: print(Bronx_venues.shape)
Bronx_venues.head(10)
```

(13, 9)

	Borough	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Category	Venue	Venue Latitude	Venue Longitude	Venue Category				
0	Bronx	Kingsbridge	40.881687	-73.902818	Vegetarian/Vegan	Kingsbridge-Riverdale Farmers' Market	40.879973	-73.907295	Vegetarian / Vegan Restaurant				
1	Bronx	Fordham	40.860997	-73.896427	Vegetarian/Vegan	Veggie Mart	40.861740	-73.890566	Vegetarian / Vegan Restaurant				
2	Bronx	Fordham	40.84	print(Manhattan_venues.shape) Manhattan_venues.head(10)									
3	Bronx	Country Club	40.84	(430, 9)	Borough Neighborhood Neighborhood Latitude Neighborhood Longitude Category Venue Venue Latitude Venue Longitude Venue Category	Venue	Venue Latitude	Venue Longitude	Venue Category				
4	Bronx	Parkchester	40.83	0	Manhattan	Marble Hill	40.876551	-73.910660	Vegetarian/Vegan	Kingsbridge-Riverdale Farmers' Market	40.879973	-73.907295	Vegetarian / Vegan Restaurant
5	Bronx	Belmont	40.83	1	Manhattan	Chinatown	40.715618	-73.994279	Vegetarian/Vegan	Jisu Vegetarian	40.716050	-73.995348	Vegetarian / Vegan Restaurant
				2	Manhattan	Chinatown	40.715618	-73.994279	Vegetarian/Vegan	Orchard Grocer	40.717847	-73.990358	Vegetarian / Vegan Restaurant
				3	Manhattan	Chinatown	40.715618	-73.994279	Vegetarian/Vegan	Petisco Vegano	40.714040	-73.988815	Vegetarian / Vegan Restaurant
				4	Manhattan	Chinatown	40.715618	-73.994279	Vegetarian/Vegan	Dirt Candy	40.717890	-73.991015	Vegetarian / Vegan Restaurant

Methodology(6)

- Breakdown of venues by category

Let's check how many venues were returned for each category

```
Bronx_venues.groupby('Category')['Venue'].count().sort_values(ascending=False)
```

```
Category
Vegetarian/Vegan      8
Halal                  2
Gluten Free            2
Kosher                 1
Name: Venue, dtype: int64
```

```
Manhattan_venues.groupby('Category')['Venue'].count().sort_values(ascending=False)
```

```
Category
Vegetarian/Vegan     297
Halal                  51
Kosher                 43
Gluten Free            39
Name: Venue, dtype: int64
```

Methodology(7)

- One hot encoding

```
print(Bronx_restaurant_grouped.shape)  
Bronx_restaurant_grouped
```

(11, 5)

	Neighborhood	Gluten Free	Halal	Kosher	Vegetarian/Vegan
0	Bedford Park	0	1	0	0
1	Belmont	0	0	0	1
2	Bronxdale	0	0	0	1
3	Country Club	0	0	0	1
4	Fordham	0	0	0	2
5	Kingsbridge	0	0	0	1
6	North Riverdale	0	0	1	0
7	Olinville	0	0	0	1
8	Parkchester	1	0	0	1
9	Unionport	0	1	0	0
10	Van Nest	1	0	0	0

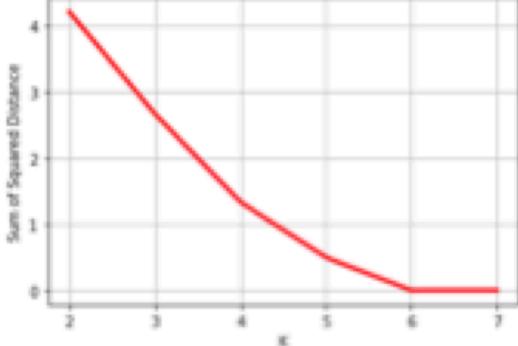
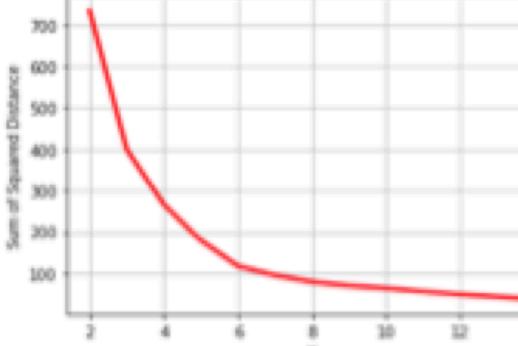
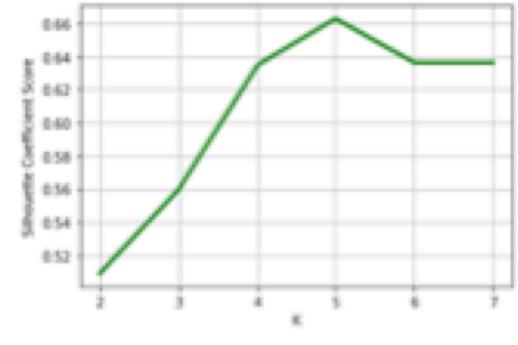
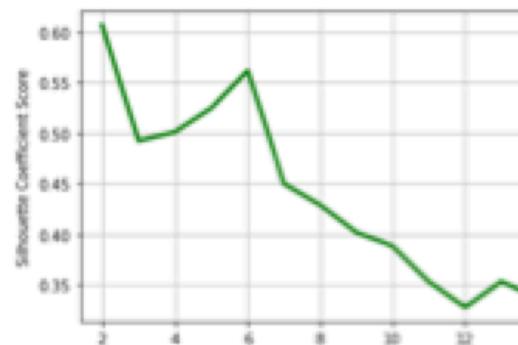
```
print(Manhattan_restaurant_grouped.shape)  
Manhattan_restaurant_grouped
```

(35, 5)

	Neighborhood	Gluten Free	Halal	Kosher	Vegetarian/Vegan
0	Battery Park City	0	0	0	1
1	Carnegie Hill	1	0	1	4
2	Central Harlem	0	3	0	1
3	Chelsea	1	2	0	7
4	Chinatown	0	1	0	16
5	Civic Center	1	2	1	6
6	Clinton	2	1	0	6
7	East Harlem	0	2	1	1
8	East Village	2	5	1	19
9	Financial District	1	3	1	9
10	Flatiron	4	2	1	24

Methodology(8)

- Determining K value

	Bronx	Manhattan
Elbow Method		
Silhouette score		
Best K value	5	6

Results(1)

- Clusters

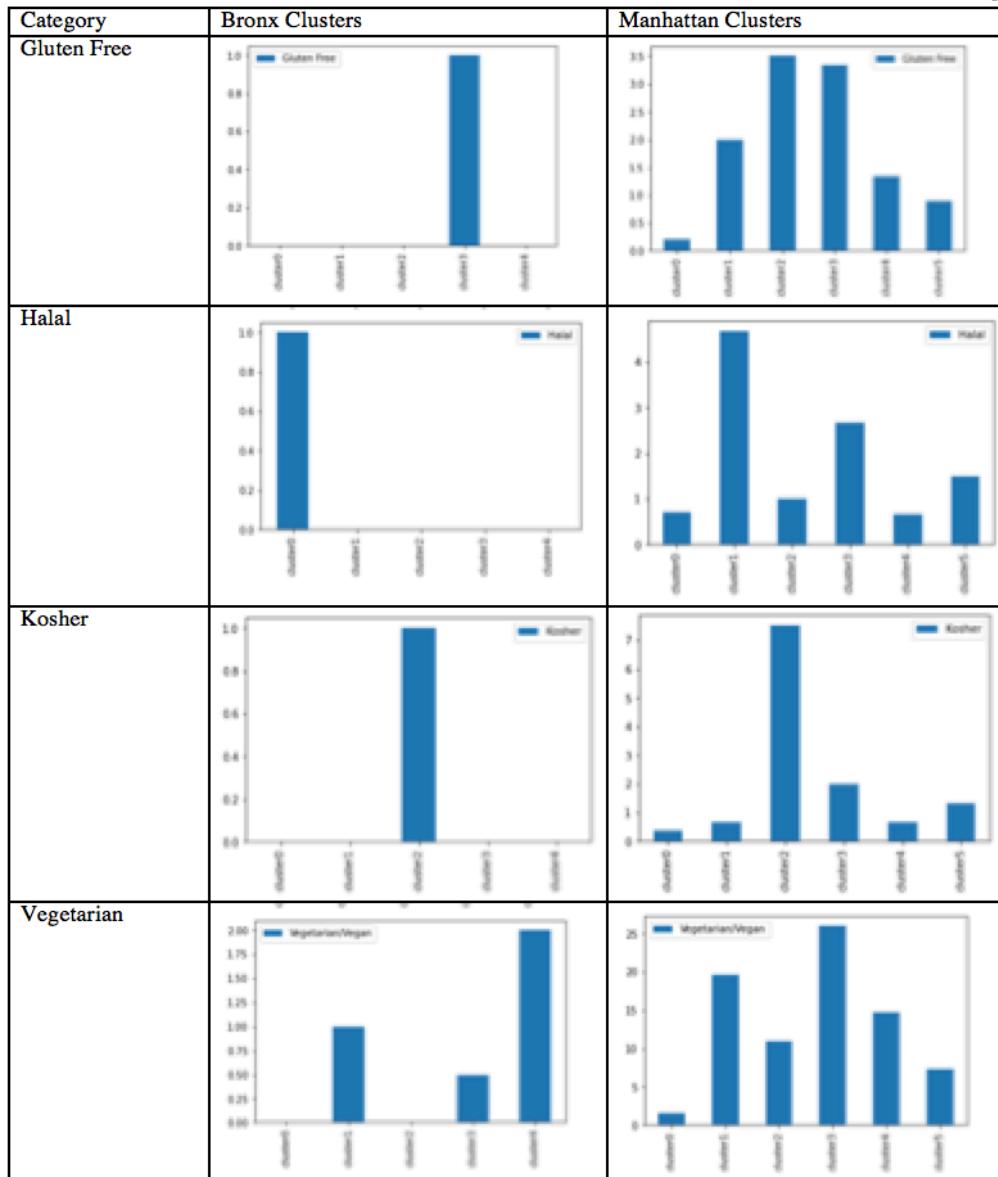
Bronx

- Cluster 0 - best for Halal Restaurants
- Cluster 1 - best for Vegan/Vegetarian Restaurants
- Cluster 2 - best for Kosher
- Cluster 3 - best for Gluten Free
- Cluster 4 - best for Vegan/Vegetarian Restaurants

Manhattan

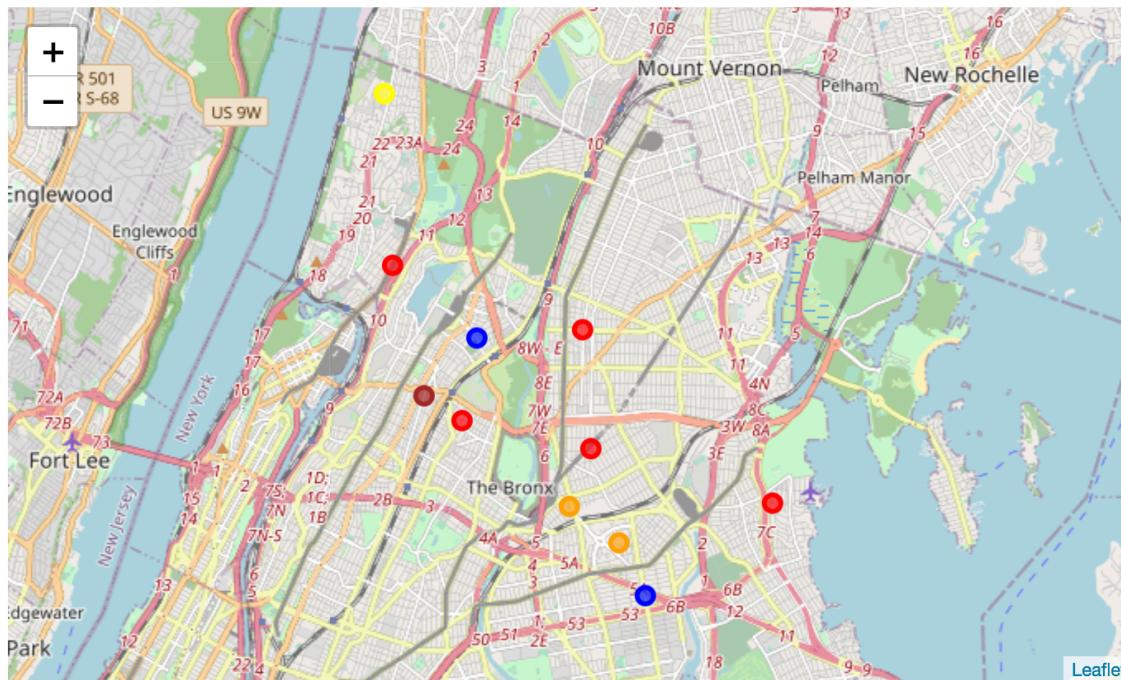
- Cluster 0 - not recommended for selected diets
- Cluster 1 - best for Vegan/Vegetarian and Halal Restaurants
- Cluster 2 - best for Gluten Free and Kosher
- Cluster 3 - good for all four diets but best for Vegan/Vegetarian
- Cluster 4 - good for Vegan/Vegetarian
- Cluster 5 - low availability of restaurants in all categories

Results(2)



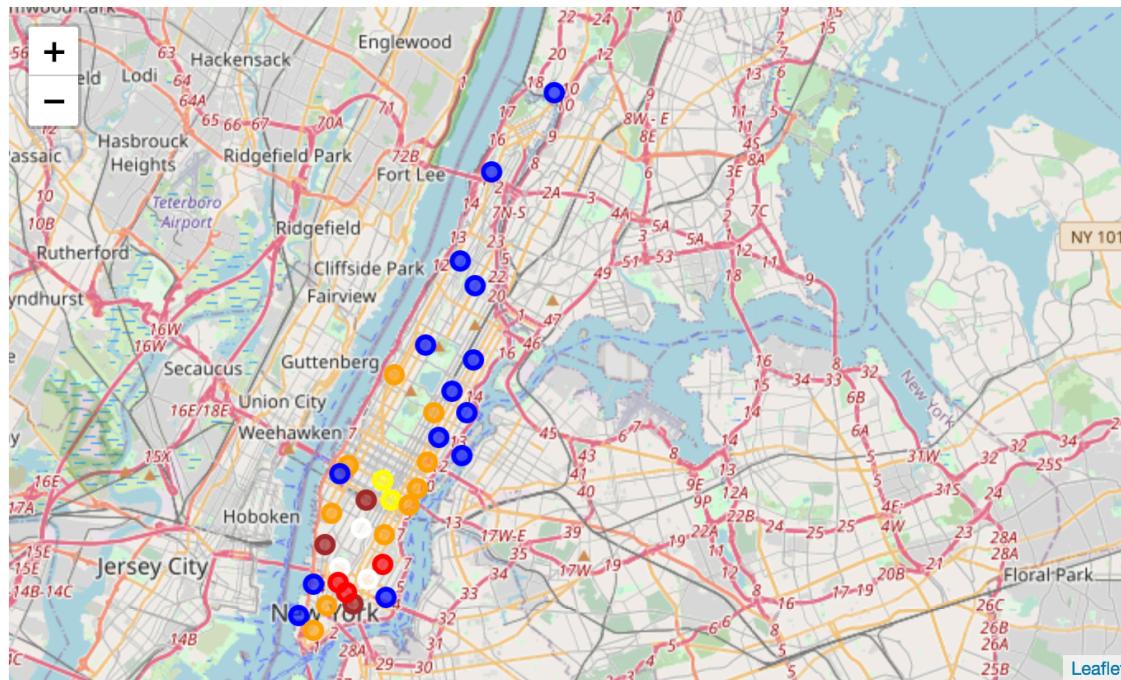
Results(3)

- Bronx



Results(4)

- Manhattan



Discussion

- Limitations of restaurants of selected categories in Bronx. However, there are much more varieties in Manhattan.
- In both Bronx and Manhattan, there are more neighborhoods serving vegetarian and vegan food compared to other categories.
- In Bronx, there is only one neighborhood, which has kosher restaurants.
- In Manhattan, there are 14 neighborhoods with significantly limited selection of restaurants and 10 neighborhoods with low availability of selections.
- Gluten free and kosher restaurants are low in numbers in both boroughs