Coursera Capstone Project – The Battle of Neighborhoods

1. Introduction/Problem Statement

According to the 2010 census, New York City has the largest population of African-born residents, with 233,000 people, mostly from Nigeria, Egypt, Ghana, Ethiopia, Morocco, Kenya, South Africa, Somalia, Sierra Leone, and Sudan. Besides these residents, thousands of tourists frequently visit New York City, prior COVID-19 (it is expected to continue at the same pace when things normalize). Although Africans love to cook in their homes and eat their local delicacies, they find it challenging to find restaurants where they can eat local foods when they go out, go to work, or on vacation. The purpose of this project is to visualize African restaurants in New York City to make it easy for both African residents and tourists to locate. Additionally, this project will provide information about (1) the best rated African restaurant(s) in New York City, (2) the areas with more concentration of African restaurants, and (3) the areas with a few or no African Restaurants.

2. Data

1. https://cocl.us/new_york_dataset: This is a data source from New York City containing the list of boroughs and neighborhoods with their latitudes and longitudes.
2. Foursquare API: The API will provide the location information of African restaurants
3. https://data.cityofnewyork.us/City-Government/Borough-Boundaries/tqmj-j8zm: The data source has the borough boundaries information, which is expected to provide visualization of these boundaries.

3. Methodology

The data sets were collected from the data sources mentioned above in the Data section. The data source from New York City contains the list of boroughs, neighborhoods, and their geographical coordinates – https://cocl.us/new_york_dataset. The locations of African restaurants using Foursquare API and the visualization of the borough boundaries using https://data.cityofnewyork.us/City-Government/Borough-Boundaries/tqmj-j8zm. The restaurants will be analyzed and sorted using their ratings and will be visualized and ranked based on these ratings. The visualization of the neighborhoods will be achieved using folium library with Python. The data analysis and results will be done with Python programming using the Jupyter Notebook platform.

4. Analysis and results

The full analysis used in this project using python codes is available in Github – https://github.com/Atolie/hello-world/blob/master/Capstone%20Project%20-%20The%20Battle%20of%20Neighborhoods-Final.ipynb. Some of the codes are shown in this section with relevant results.

```
# import libraries:

from bs4 import BeautifulSoup
import requests
import pandas as pd
import numpy as np
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)
import geocoder
import os
import folium # this will create the map of New York City
from geopy.geocoders import Nominatim

# import Matplotlib modules:

import matplotlib.pyplot as plt
import matplotlib.cm as cm
import matplotlib.colors as colors
%matplotlib inline
```

In [17]:
```
# get New York City data

new_york_data=get_new_york_data()
new_york_data.head()
```

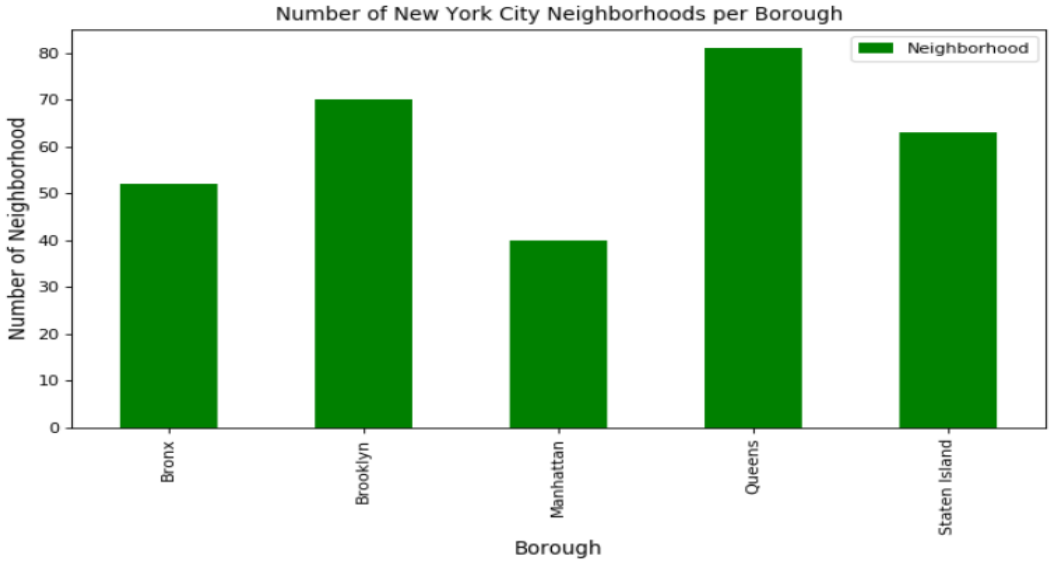
Out[17]:

	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 [19]:
```
# Plot of a bar chart to show the number of neighborhood per borough

plt.figure(figsize=(10,5), dpi = 80)
plt.title('Number of New York City Neighborhoods per Borough')
plt.xlabel('Borough', fontsize = 12)
plt.ylabel('Number of Neighborhood', fontsize=12)
new_york_data.groupby('Borough')['Neighborhood'].count().plot(kind='bar', color='green')
plt.legend()

plt.show()
```



In [21]:
```
# African restaurants' analysis

african_rest_ny.head()
```

Out[21]:

	Borough	Neighborhood	ID	Name
0	Bronx	University Heights	4c2f8b1b7cc0c9b6a1eaeb9a	Accra Resturant
1	Bronx	University Heights	4cb2beaadedbef3bca7c9d40	Papaye Restaurant
2	Bronx	Fordham	4cb2beaadedbef3bca7c9d40	Papaye Restaurant
3	Bronx	Belmont	4cb2beaadedbef3bca7c9d40	Papaye Restaurant
4	Brooklyn	Crown Heights	51d4d2cc454a777ed5a76c57	Cafe Rue Dix

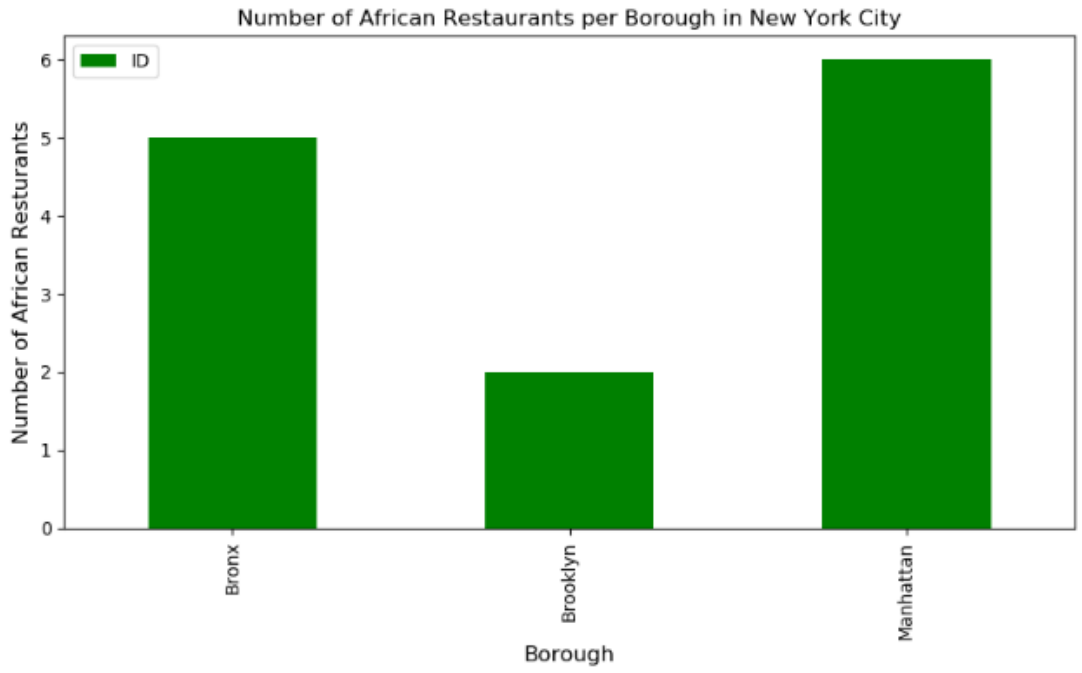
In [22]:
```
african_rest_ny.shape
```

Out[22]: (13, 4)

In [23]:
```
# Plot of a bar chart to show the number of African Restaurants per Borough

plt.figure(figsize=(10,5), dpi = 100)
plt.title('Number of African Restaurants per Borough in New York City')
plt.xlabel('Borough', fontsize = 12)
plt.ylabel('Number of African Resturants', fontsize=12)
african_rest_ny.groupby('Borough')['ID'].count().plot(kind='bar', color = 'green')
plt.legend()

plt.show()
```



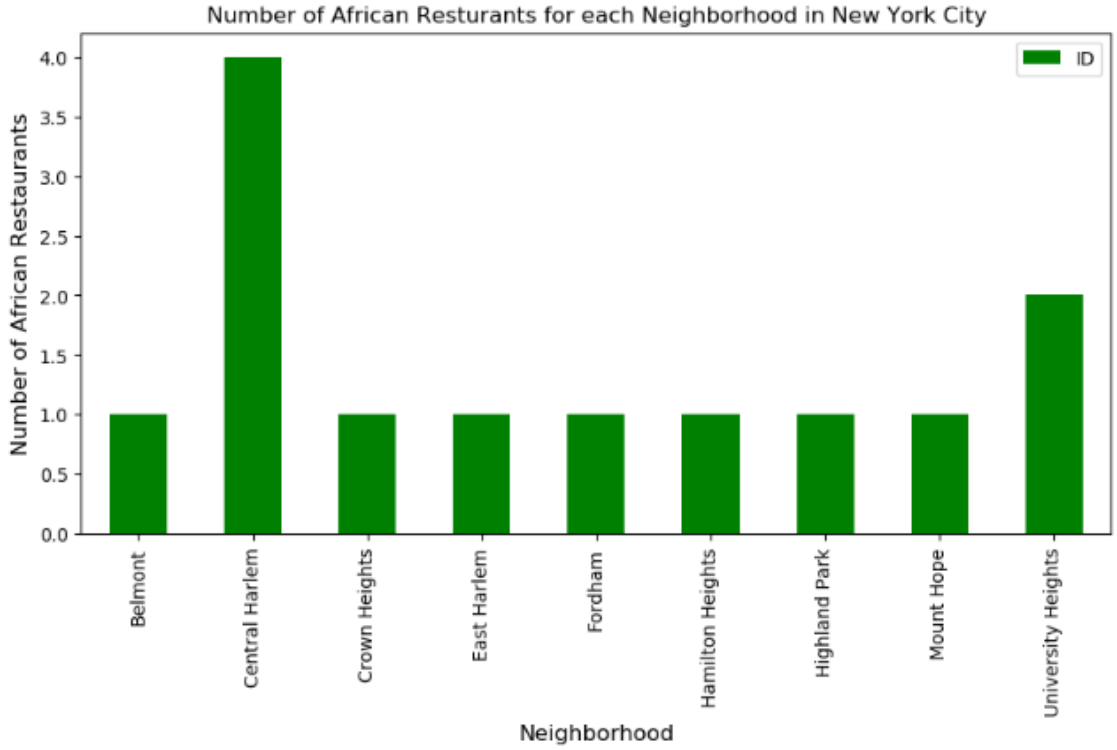
The above result shows that:

1. Manhattan has the largest number of African restaurant, with a total of six (6) restaurants,
2. Bronx has the 2nd largest number of African restaurant, with a total of five (5) restaurants,
3. Brookly has only 2 African restaurants, and
4. Queens and Staten Island has no African Restaurants.

In [24]:
```
# Plot of a bar chart to show the number of African Restaurants per Neighborhood

plt.figure(figsize=(10,5), dpi = 100)
plt.title('Number of African Resturants for each Neighborhood in New York City')
plt.xlabel('Neighborhood', fontsize = 12)
plt.ylabel('Number of African Restaurants', fontsize=12)
african_rest_ny.groupby('Neighborhood')['ID'].count().plot(kind='bar', color = 'green')
plt.legend()

plt.show()
```



The above result shows that:

1. Only nine out of 306 neighborhoods in New York City has African Restaurants,
2. Central Harlem has the largest number of African restaurant, with a total of six (4) restaurants

In [27]:
```
african_rest_stats_ny.head()
```

Out[27]:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
0	Bronx	University Heights	4c2f8b1b7cc0c9b8a1eaeb9a	Accra Resturant	9	7.3	3
1	Bronx	University Heights	4cb2beaadedbef3bca7c9d40	Papaye Restaurant	11	7.5	3
2	Bronx	Fordham	4cb2beaadedbef3bca7c9d40	Papaye Restaurant	11	7.5	3
3	Bronx	Belmont	4cb2beaadedbef3bca7c9d40	Papaye Restaurant	11	7.5	3
4	Brooklyn	Crown Heights	51d4d2cc454a777ed5a76c57	Cafe Rue Dix	201	8.4	59

In [28]:
```
african_rest_stats_ny.shape
```

Out[28]: (13, 7)

In [37]:
```
# Restaurant with maximum Likes

african_rest_stats_ny.iloc[african_rest_stats_ny['Likes'].idxmax()]
```

Out[37]:
```
Borough                       Brooklyn
Neighborhood             Crown Heights
ID              51d4d2cc454a777ed5a76c57
Name                       Cafe Rue Dix
Likes                               201
Rating                              8.4
Tips                                 59
Name: 4, dtype: object
```

In [38]:
```
# Restaurant with minimum Likes

african_rest_stats_ny.iloc[african_rest_stats_ny['Likes'].idxmin()]
```

Out[38]:
```
Borough                           Bronx
Neighborhood          University Heights
ID              4c2f8b1b7cc0c9b6a1eaeb9a
Name                     Accra Resturant
Likes                                  9
Rating                               7.3
Tips                                   3
Name: 0, dtype: object
```

In [39]:
```
# Restaurant with maximum Rating

african_rest_stats_ny.iloc[african_rest_stats_ny['Rating'].idxmax()]
```

Out[39]:
```
Borough                       Manhattan
Neighborhood            Hamilton Heights
ID              53e01975498e78c0915599bf
Name                 Ponty Bistro Harlem
Likes                                105
Rating                               8.6
Tips                                  30
Name: 5, dtype: object
```

In [40]:
```
# Restaurant with minimum Rating

african_rest_stats_ny.iloc[african_rest_stats_ny['Rating'].idxmin()]
```

Out[40]:
```
Borough                       Brooklyn
Neighborhood             Highland Park
ID              4b1eefb3f964a520c72124e3
Name                       Festac Grill
Likes                                  9
Rating                                 6
Tips                                  11
Name: 12, dtype: object
```

In [51]:
```
ny_neighborhood_stats=ny_neighborhood_stats[['Borough','Neighborhood','Latitude','Longitude','Average Rating']]
```

In [52]:
```
ny_neighborhood_stats
```

Out[52]:

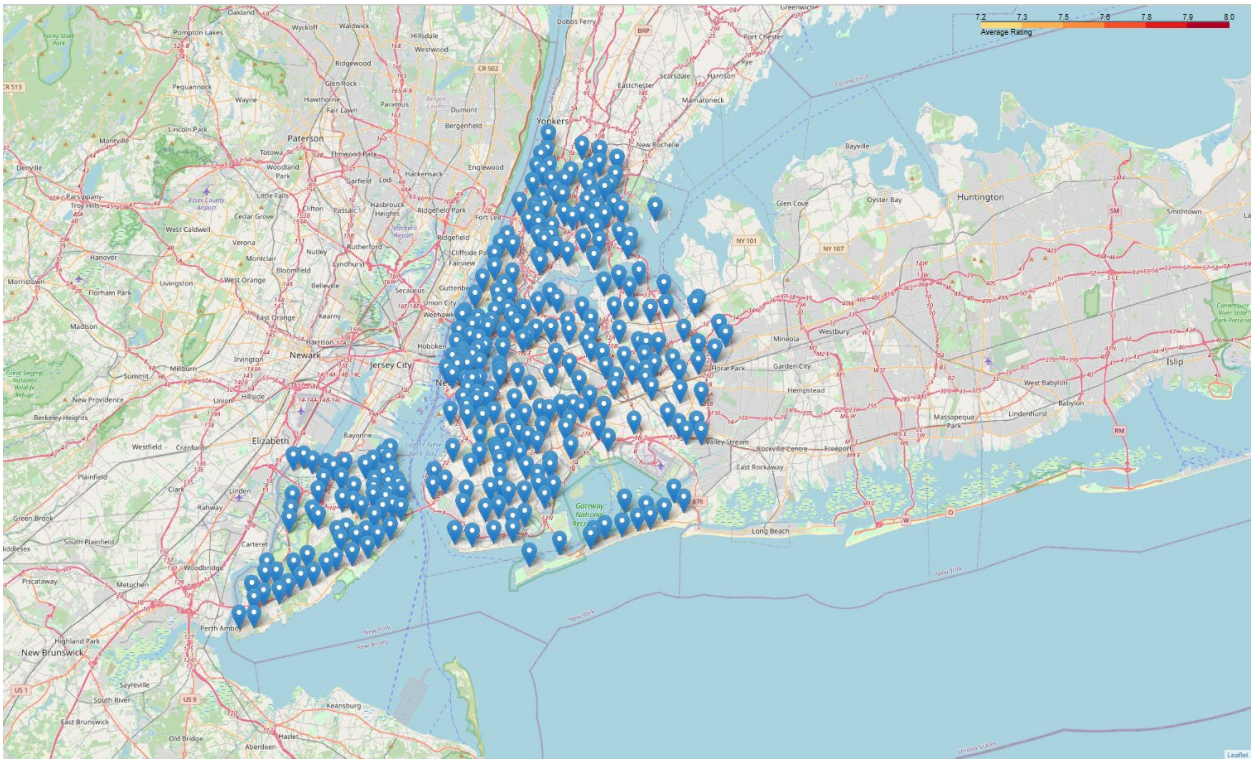
	Borough	Neighborhood	Latitude	Longitude	Average Rating
0	Bronx	Belmont	40.857277	-73.888452	7.50
1	Manhattan	Central Harlem	40.815976	-73.943211	7.75
2	Brooklyn	Crown Heights	40.670829	-73.943291	8.40
3	Manhattan	East Harlem	40.792249	-73.944182	8.60
4	Bronx	Fordham	40.860997	-73.896427	7.50
5	Manhattan	Hamilton Heights	40.823604	-73.949688	8.60
6	Bronx	Mount Hope	40.848842	-73.908299	7.30
7	Bronx	University Heights	40.855727	-73.910416	7.40

```
In [62]: # New York Map

ny_map = folium.Map(location=geo_location('New York'), zoom_start=12)
ny_geo = r'C:/nyu_2451_34572-geojson.json'

ny_map.choropleth(
    geo_data=ny_geo,
    data=ny_borough_stats,
    columns=['Borough', 'Average Rating'],
    key_on='feature.properties.boro_name',
    fill_color='YlOrRd',
    fill_opacity=0.6,
    line_opacity=0.2,
    legend_name='Average Rating'
)

ny_map.save('borough_rating.html')
```



5. Summary and conclusion

The objectives of the projects include the visualization African restaurants in New York City to make it easy for both African residents and tourists to locate, information about the best rated African restaurant(s) in New York City, information about the the areas with more concentration of African restaurants, and information about the areas with a few or no African Restaurants. The above analyses presented us with enough information to meet these objectives. From the results, it is surprising to see that only 13 African restaurants were captured in New York City. Another surprise is that Queens Borough that has 80 Neighborhoods did not have an African Restaurant.

A major limitation of this project is that data to obtain African restaurant information was sourced only from Foursquare. However, the process used for this study offer a coordinated approach to solve data-driven business problems. Therefore, African restaurants that are not on the radar needs to make their data available to promote their businesses and help customers locate their venues. Furthermore, this project discovered that:

- Manhattan has the largest number of African restaurant, with a total of six (6) restaurants,
- Bronx has the 2nd largest number of African restaurant, with a total of five (5) restaurants,
- Brookly has only 2 African restaurants,
- Queens and Staten Island has no African Restaurants,
- Only nine out of 306 neighborhoods in New York City has African Restaurants,
- Central Harlem has the largest number of African restaurant, with a total of six (4) restaurants, and
- The restaurant with the most "likes" is Café Rue Dix – located in Crown Heights Neighborhood on Brooklyn.

It will be interesting to explore this in the future to compare the currents findings and see if there is any improvement in the numbers of restaurants and other factors.