Neighborhood Analysis- Italian Restaurant in New York - Part 2

Introduction:

New York City's demographics show that it is a large and ethnically diverse metropolis. Nearly half of New York state's population lives in New York city. Hundreds of languages are spoken in the city and you will be surprised to know that in some areas English is spoken only by 25% of the people. The city is a major gateway for immigrants into the United States.

This ethnic diversity also brings cuisines from all over the world to this city including Italian which is one of my favorites. I would like to use the neighborhood information of New York to find a better place to open an Italian restaurant.

Data:

For this project we need the following data:

1. New York City data that contains Boroughs/Neighborhoods along with their latitude and longitude.
2. Italian restaurants in each borough and/or neighborhood of New York city with their Ratings, Tips and, Likes.

The project is trying to answer the following questions.:

1. What's the distribution of Italian restaurants in New York city by neighborhood/borough by numbers and visualization?
2. Which neighborhood has good potential for opening a new Italian restaurant ? What are the factors we shall consider ?
3. Which areas/neighborhoods lack Italian restaurants?
4. If you love Italian food, what are some of the best places to live in New York?

Approach:

1. Use New York city data from "https://cocl.us/new_york_dataset" to get the details of each Neighborhood in New York City along with latitude and longitude, and

borough.

```
In [21]: ny_data=get_ny_data()
```

```
In [22]: ny_data.head()
```

Out[22]:

	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 [23]: ny_data.shape
```

```
Out[23]: (306, 4)
```

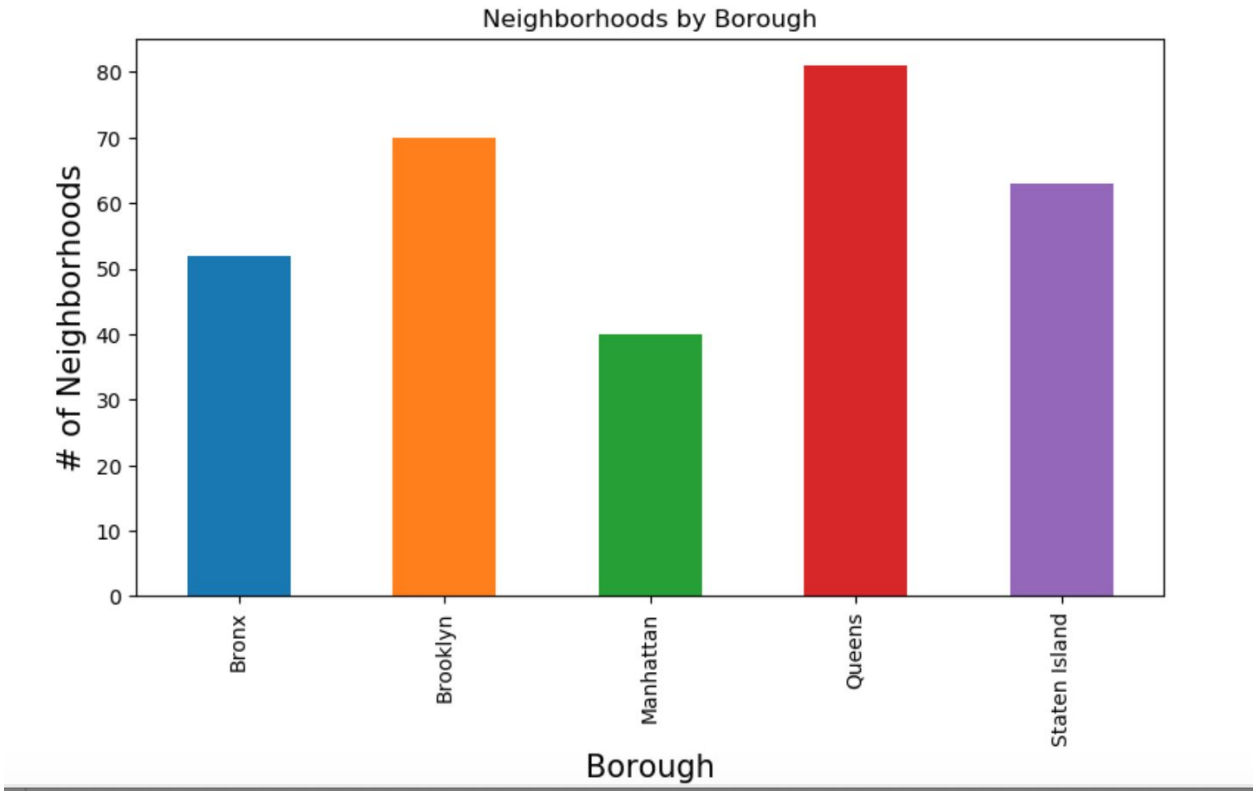
```
In [24]: ny_data.to_csv('ny_data.csv', index=False)
```

```
( 1 / 306 ) Italian Restaurants in Wakefield, Bronx:0
( 2 / 306 ) Italian Restaurants in Co-op City, Bronx:0
( 3 / 306 ) Italian Restaurants in Eastchester, Bronx:0
( 4 / 306 ) Italian Restaurants in Fieldston, Bronx:0
( 5 / 306 ) Italian Restaurants in Riverdale, Bronx:0
( 6 / 306 ) Italian Restaurants in Kingsbridge, Bronx:0
( 7 / 306 ) Italian Restaurants in Marble Hill, Manhattan:0
( 8 / 306 ) Italian Restaurants in Woodlawn, Bronx:1
( 9 / 306 ) Italian Restaurants in Norwood, Bronx:0
( 10 / 306 ) Italian Restaurants in Williamsbridge, Bronx:0
( 11 / 306 ) Italian Restaurants in Baychester, Bronx:0
( 12 / 306 ) Italian Restaurants in Pelham Parkway, Bronx:2
( 13 / 306 ) Italian Restaurants in City Island, Bronx:1
( 14 / 306 ) Italian Restaurants in Bedford Park, Bronx:0
( 15 / 306 ) Italian Restaurants in University Heights, Bronx:0
( 16 / 306 ) Italian Restaurants in Morris Heights, Bronx:0
( 17 / 306 ) Italian Restaurants in Fordham, Bronx:0
( 18 / 306 ) Italian Restaurants in East Tremont, Bronx:0
( 19 / 306 ) Italian Restaurants in West Farms, Bronx:0
( 20 / 306 ) Italian Restaurants in High  Bridge, Bronx:0
```

2. I used the Foursquare API to find top 50 businesses within 500 meter radius of each neighborhood's longitude and latitude.

In [18]:
```
def get_business(lat,lng):

    #set variables
    radius=500
    LIMIT=50
```




```
( 287 / 306 ) Italian Restaurants in Sandy Ground, Staten Island:0
( 288 / 306 ) Italian Restaurants in Egbertville, Staten Island:1
( 289 / 306 ) Italian Restaurants in Roxbury, Queens:0
( 290 / 306 ) Italian Restaurants in Homecrest, Brooklyn:0
( 291 / 306 ) Italian Restaurants in Middle Village, Queens:1
( 292 / 306 ) Italian Restaurants in Prince's Bay, Staten Island:1
( 293 / 306 ) Italian Restaurants in Lighthouse Hill, Staten Island:1
( 294 / 306 ) Italian Restaurants in Richmond Valley, Staten Island:0
( 295 / 306 ) Italian Restaurants in Malba, Queens:0
( 296 / 306 ) Italian Restaurants in Highland Park, Brooklyn:0
( 297 / 306 ) Italian Restaurants in Madison, Brooklyn:1
( 298 / 306 ) Italian Restaurants in Bronxdale, Bronx:1
( 299 / 306 ) Italian Restaurants in Allerton, Bronx:0
( 300 / 306 ) Italian Restaurants in Kingsbridge Heights, Bronx:0
( 301 / 306 ) Italian Restaurants in Erasmus, Brooklyn:0
( 302 / 306 ) Italian Restaurants in Hudson Yards, Manhattan:3
( 303 / 306 ) Italian Restaurants in Hammels, Queens:0
( 304 / 306 ) Italian Restaurants in Bayswater, Queens:0
( 305 / 306 ) Italian Restaurants in Queensbridge, Queens:0
( 306 / 306 ) Italian Restaurants in Fox Hills, Staten Island:0
```

3. Then filtered the dataset to find all Italian restaurant locations in each neighborhood

```
In [ ]: italian_rest_ny.to_csv('italianrestny_final2.csv', index=False)
```

```
In [45]: italian_rest_ny.head()
```

Out[45]:

	Borough	Neighborhood	ID	Name
0	Bronx	Woodlawn	511edb6de4b0d58346fd272d	Patrizia's Of Woodlawn
1	Bronx	Pelham Parkway	4bf96ae65317a593d837017f	Enzo's
2	Bronx	Pelham Parkway	4b47f069f964a5208c4426e3	Pasta Pasta
3	Bronx	City Island	4514ed4df964a520e5391fe3	Artie's Steak and Seafood
4	Bronx	Throgs Neck	4d4456d93616b60c953fe3c2	Tosca Marquee

```
In [4]: italian_rest_ny_fromcsv_2=pd.read_csv('italianrestny_final2.csv')
```

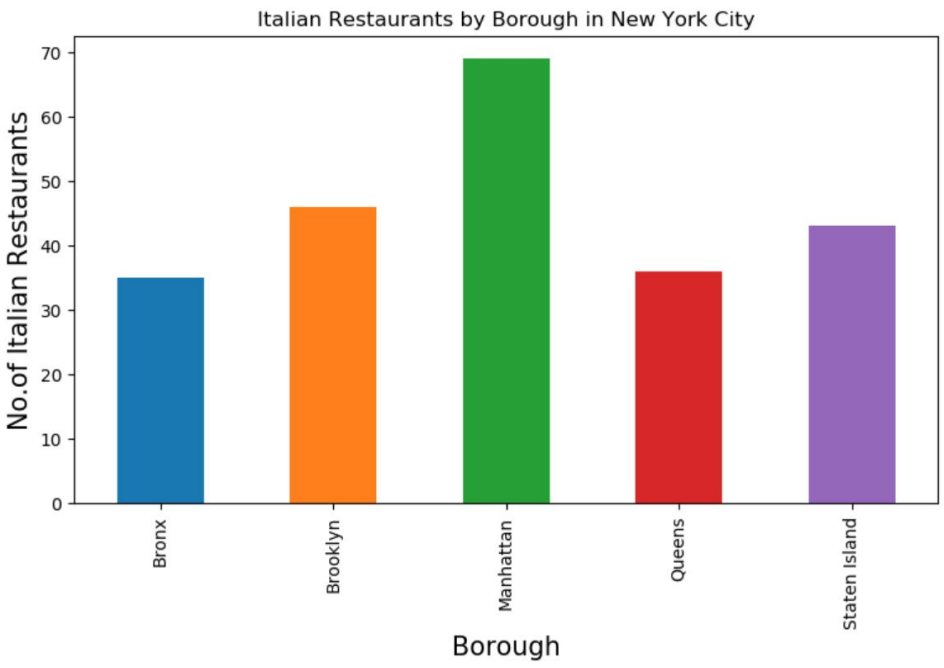
```
In [5]: italian_rest_ny_fromcsv_2.head()
```

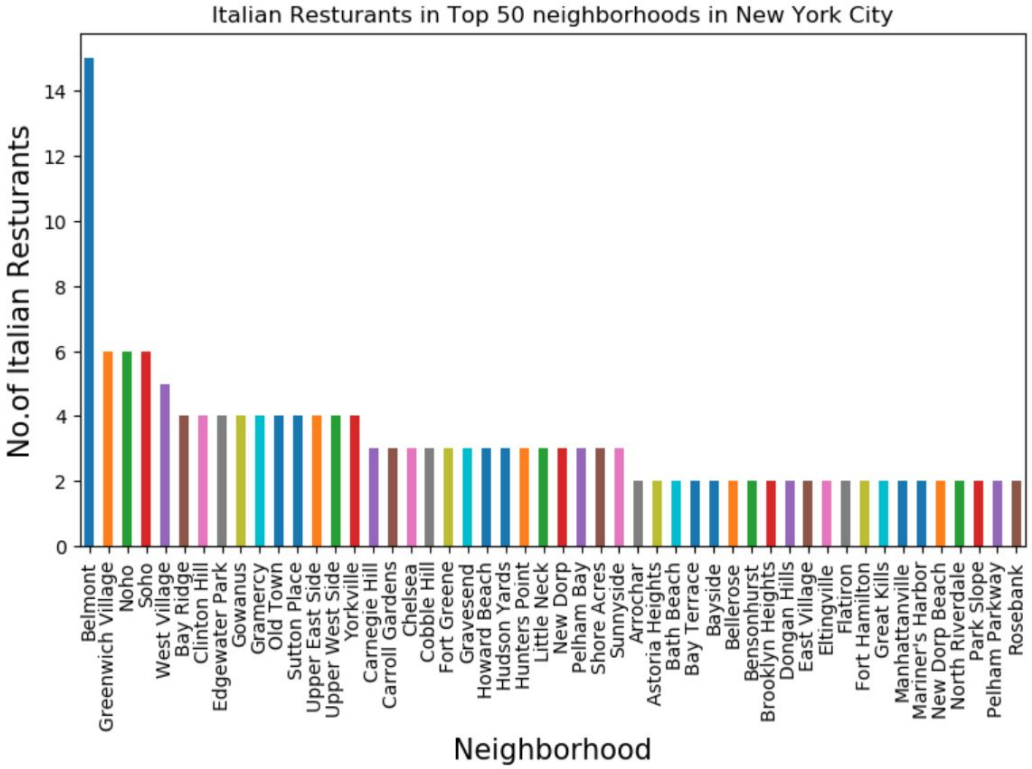
Out[5]:

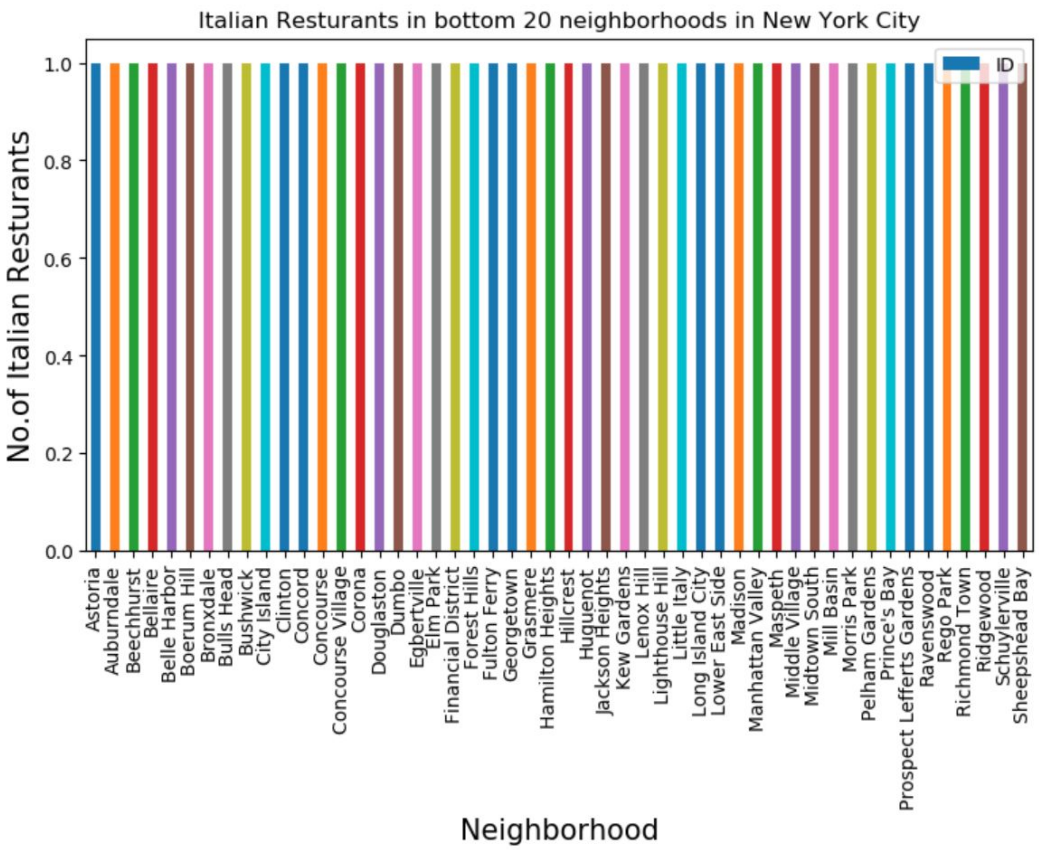
	Borough	Neighborhood	ID	Name
0	Bronx	Woodlawn	511edb6de4b0d58346fd272d	Patrizia's Of Woodlawn
1	Bronx	Pelham Parkway	4bf96ae65317a593d837017f	Enzo's
2	Bronx	Pelham Parkway	4b47f069f964a5208c4426e3	Pasta Pasta
3	Bronx	City Island	4514ed4df964a520e5391fe3	Artie's Steak and Seafood
4	Bronx	Throgs Neck	4d4456d93616b60c953fe3c2	Tosca Marquee

```
In [6]: italian_rest_ny_fromcsv_2.shape
```

```
Out[6]: (229, 4)
```




Italian Resturants in Top 50 neighborhoods in New York City
No.of Italian Resturants
0
2
4
6
8
10
12
14
Belmont
Greenwich Village
Noho
Soho
West Village
Bay Ridge
Clinton Hill
Edgewater Park
Gowanus
Gramercy
Old Town
Sutton Place
Upper East Side
Upper West Side
Yorkville
Carnegie Hill
Carroll Gardens
Chelsea
Cobble Hill
Fort Greene
Gravesend
Howard Beach
Hudson Yards
Hunters Point
Little Neck
New Dorp
Pelham Bay
Shore Acres
Sunnyside
Arrochar
Astoria Heights
Bath Beach
Bay Terrace
Bayside
Bellerose
Bensonhurst
Brooklyn Heights
Dongan Hills
East Village
Eltingville
Flatiron
Fort Hamilton
Great Kills
Manhattanville
Mariner's Harbor
New Dorp Beach
North Riverdale
Park Slope
Pelham Parkway
Rosebank
Neighborhood



4. Get the ratings, tips, likes for each restaurant

Now, Merge the output of the all the stats files into one single csv file.

In [10]:
```
italianrest_stats_ny_final = pd.read_csv('italianrest_stats_ny_final2.csv')
```

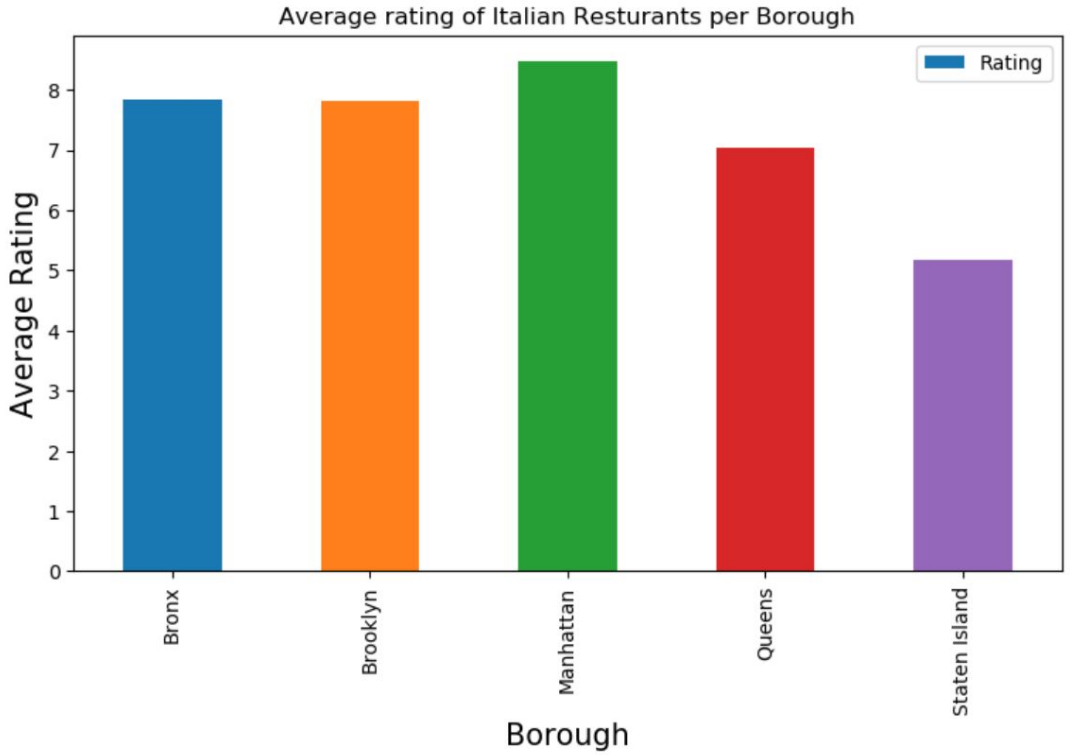
In [11]:
```
italianrest_stats_ny_final.shape
```

Out[11]:
```
(229, 7)
```

In [12]:
```
italianrest_stats_ny_final.head()
```

Out[12]:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
0	Bronx	Woodlawn	511edb6de4b0d58346fd272d	Patrizia's Of Woodlawn	18	8.3	14
1	Bronx	Pelham Parkway	4bf96ae65317a593d837017f	Enzo's	26	8.7	11
2	Bronx	Pelham Parkway	4b47f069f964a5208c4426e3	Pasta Pasta	9	6.4	8
3	Bronx	City Island	4514ed4df964a520e5391fe3	Artie's Steak and Seafood	44	8.3	27
4	Bronx	Throgs Neck	4d4456d93616b60c953fe3c2	Tosca Marquee	19	6.9	14


Average rating of Italian Resturants per Borough
Rating
Average Rating
0
1
2
3
4
5
6
7
8
Bronx
Brooklyn
Manhattan
Queens
Staten Island
Borough

5.

Convert datatype for Likes and Tips From String to Float

In [10]:
```
italianrest_stats_ny_final['Likes']=italianrest_stats_ny_final['Likes'].astype('float64')
italianrest_stats_ny_final['Tips']=italianrest_stats_ny_final['Tips'].astype('float64')
```

Now we will find the Italian restuarants with Maximum Likes, Maximum Ratings and Maximum Tips.

In [11]:
```
italianrest_stats_ny_final.iloc[italianrest_stats_ny_final['Likes'].idxmax()]
```

Out[11]:
```
Borough                       Manhattan
Neighborhood                       Soho
ID              4cc6222106c25481d7a4a047
Name                 Rubirosa Ristorante
Likes                                2491
Rating                                9.3
Tips                                  824
Name: 108, dtype: object
```

In [12]:
```
italianrest_stats_ny_final.iloc[italianrest_stats_ny_final['Rating'].idxmax()]
```

Out[12]:
```
Borough                         Brooklyn
Neighborhood                     Bushwick
ID              5a98aed16a59506d7a60d67c
Name                       Carmenta,Äôs
Likes                                56
Rating                              9.5
Tips                                 21
Name: 46, dtype: object
```

In [13]:
```
italianrest_stats_ny_final.iloc[italianrest_stats_ny_final['Tips'].idxmax()]
```

Out[13]:
```
Borough                   Staten Island
Neighborhood                West Brighton
ID              4b5b58dbf964a52088f628e3
Name                         Panini Grill
Likes                                  21
Rating                                8.6
Tips                                 1136
Name: 157, dtype: object
```

6. These are the top neighborhoods by average rating.

```
In [16]: ny_neighborhood_stats.sort_values(['Average Rating'],ascending=False).head(25)
```

Out[16]:

	Neighborhood	Average Rating
18	Bushwick	9.500000
14	Boerum Hill	9.100000
51	Hamilton Heights	9.000000
101	Tribeca	8.900000
50	Greenwich Village	8.866667
93	Soho	8.866667
110	Windsor Terrace	8.800000
15	Bronxdale	8.800000
24	Clinton Hill	8.750000
44	Georgetown	8.700000
29	Corona	8.700000
61	Little Italy	8.700000
72	Mill Basin	8.700000
76	Noho	8.650000
16	Brooklyn Heights	8.650000
73	Morris Park	8.600000
57	Jackson Heights	8.600000
9	Bellaire	8.600000
108	West Village	8.520000
39	Flatiron	8.500000
81	Pelham Gardens	8.500000
106	Washington Heights	8.500000
64	Lower East Side	8.500000
71	Midtown South	8.500000
86	Rego Park	8.500000

7. Rank all the restaurants based on the Ratings by Borough. We can see Manhattan, Bronx, and Brooklyn are the top 3 followed by Queens and Staten Island.

Similarly we will find the average rating of Italian Resturants for each Borough.

```
In [17]: ny_borough_stats=italianrest_stats_ny_final.groupby('Borough',as_index=False).mean()[['Borough','Rating']]
         ny_borough_stats.columns=['Borough','Average Rating']
```

```
In [18]: ny_borough_stats.sort_values(['Average Rating'],ascending=False).head()
```

Out[18]:

	Borough	Average Rating
2	Manhattan	8.476812
0	Bronx	7.828571
1	Brooklyn	7.804348
3	Queens	7.041667
4	Staten Island	5.176744

8. Rank all the restaurants based on the Ratings by Neighborhood. We can see that there are more neighborhoods in Brooklyn and Manhattan with an average rating > 8.5.

```
In [21]: ny_neighborhood_stats=ny_neighborhood_stats[ny_neighborhood_stats['Average Rating']>=8.5]

In [22]: ny_neighborhood_stats.shape
Out[22]: (26, 2)

In [23]: ny_neighborhood_stats.head()
```

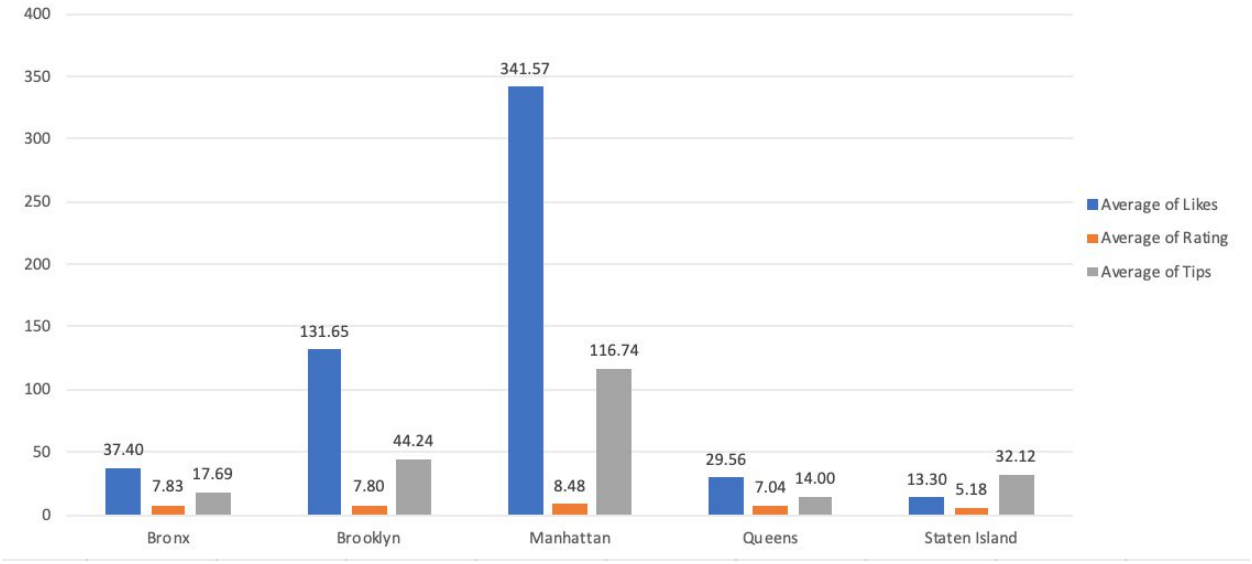
Out[23]:

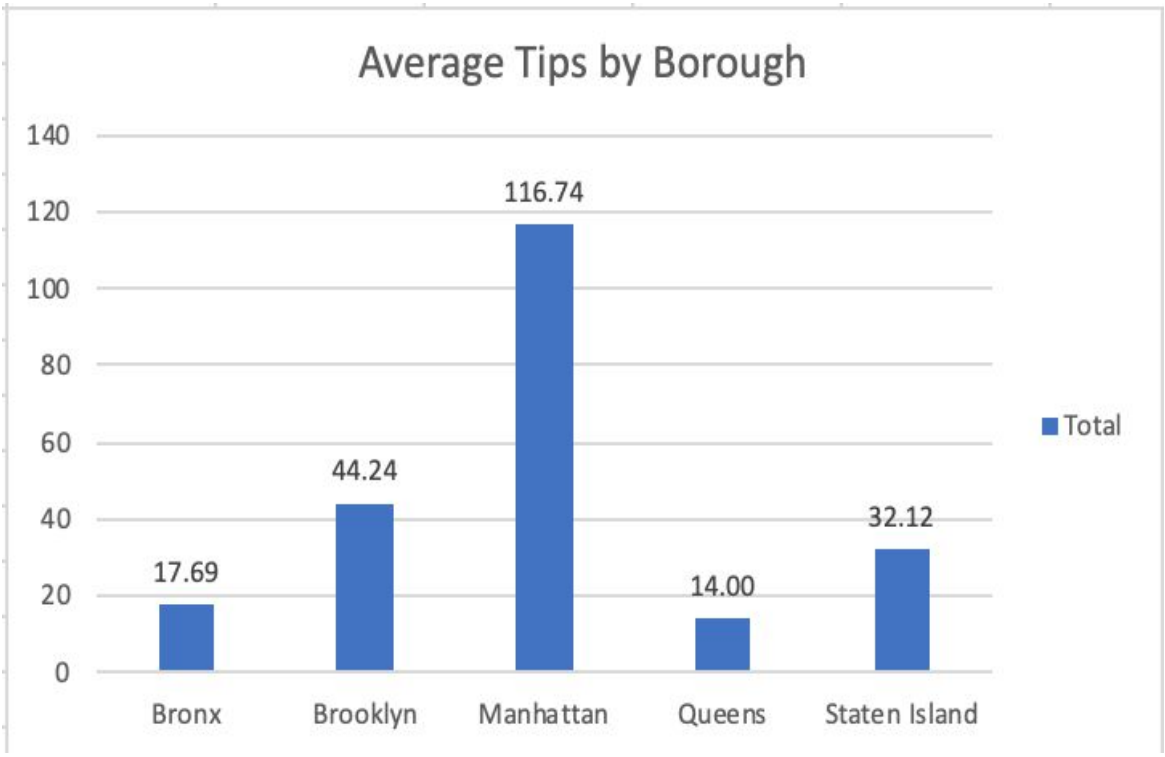
	Neighborhood	Average Rating
9	Bellaire	8.60
14	Boerum Hill	9.10
15	Bronxdale	8.80
16	Brooklyn Heights	8.65
18	Bushwick	9.50

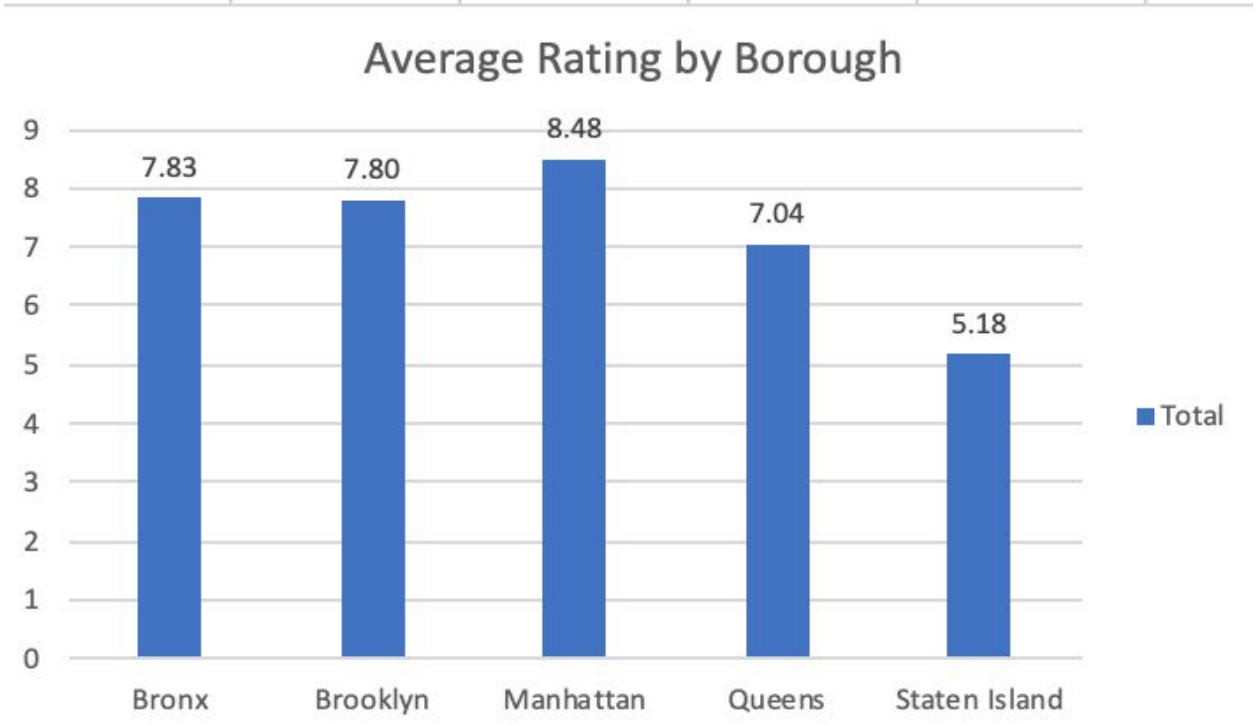
```
In [24]: print(ny_neighborhood_stats)
```

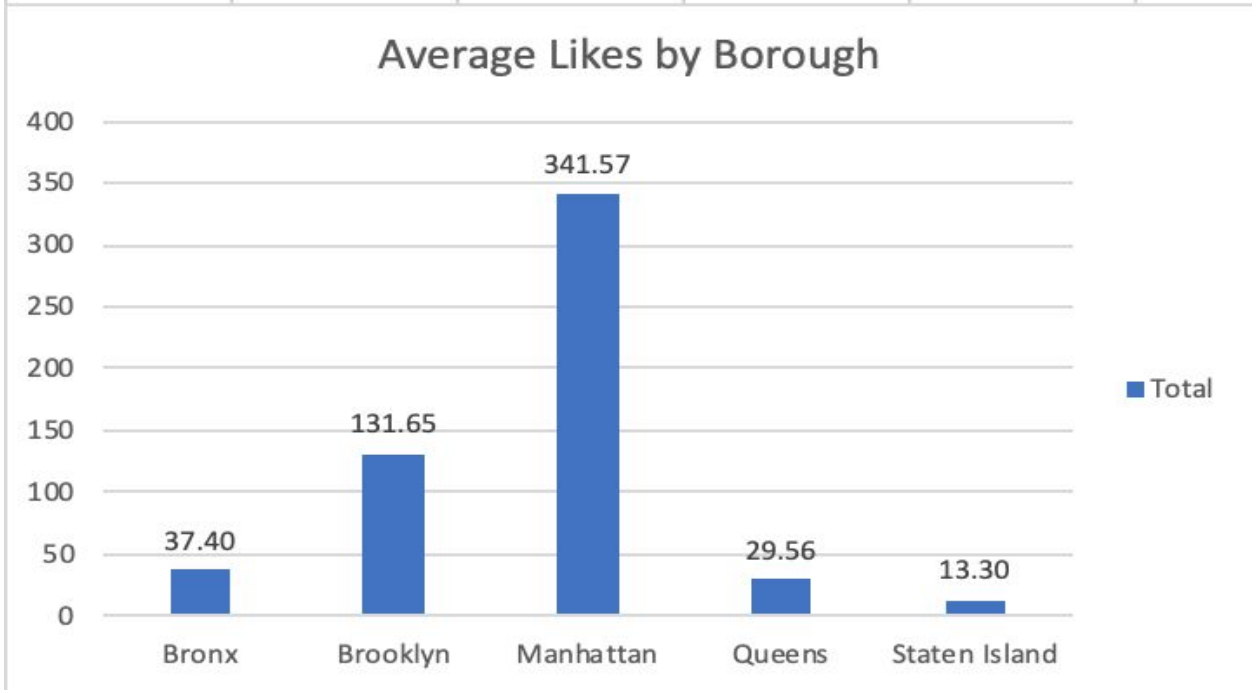
```
                    Neighborhood  Average Rating
9                       Bellaire       8.600000
14                   Boerum Hill       9.100000
15                     Bronxdale       8.800000
16               Brooklyn Heights       8.650000
18                      Bushwick       9.500000
24                   Clinton Hill       8.750000
29                         Corona       8.700000
39                       Flatiron       8.500000
44                     Georgetown       8.700000
50              Greenwich Village       8.866667
51               Hamilton Heights       9.000000
57                Jackson Heights       8.600000
61                   Little Italy       8.700000
64                Lower East Side       8.500000
71                  Midtown South       8.500000
72                     Mill Basin       8.700000
73                    Morris Park       8.600000
76                           Noho       8.650000
81                 Pelham Gardens       8.500000
84   Prospect Lefferts Gardens       8.500000
86                     Rego Park       8.500000
93                           Soho       8.866667
101                       Tribeca       8.900000
106          Washington Heights       8.500000
108                 West Village       8.520000
110              Windsor Terrace       8.800000
```

9. Now let's get the average of Likes and Tips by Borough and visualize it individually and also as a combination of these attributes.






Average Rating by Borough
9
8
7
6
5
4
3
2
1
0
7.83
7.80
8.48
7.04
5.18
Bronx
Brooklyn
Manhattan
Queens
Staten Island
Total


Average Likes by Borough
400
350
300
250
200
150
100
50
0
37.40
131.65
341.57
29.56
13.30
Bronx
Brooklyn
Manhattan
Queens
Staten Island
Total

10. Visualize neighborhood with a rating of > 8.5 using Folium with the circle markers and popup displaying neighborhood and rating of each marker.

```
ny_neighborhood_stats=pd.merge(ny_neighborhood_stats,ny_data, on='Neighborhood')
```

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

```
ny_neighborhood_stats
```

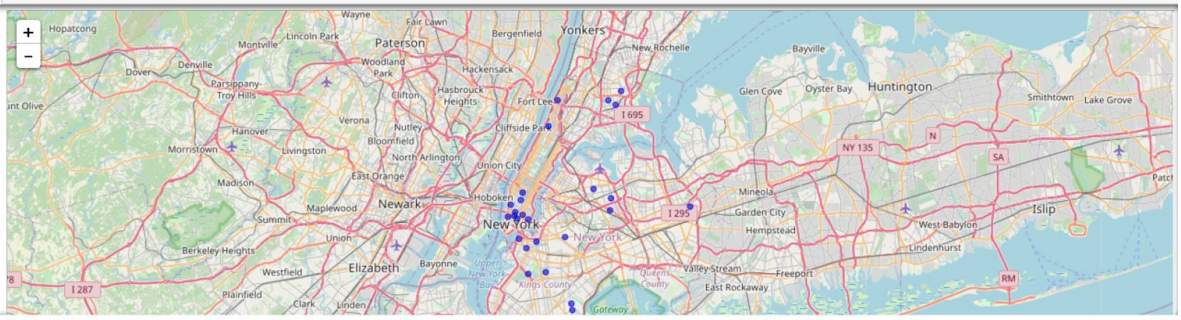
	Borough	Neighborhood	Latitude	Longitude	Average Rating
0	Queens	Bellaire	40.733014	-73.738892	8.600000
1	Brooklyn	Boerum Hill	40.685683	-73.983748	9.100000
2	Brooklyn	Brooklyn Heights	40.695864	-73.993782	8.650000
3	Brooklyn	Bushwick	40.698116	-73.925258	9.500000
4	Manhattan	Chelsea	40.744035	-74.003116	8.600000
5	Staten Island	Chelsea	40.594726	-74.189560	8.600000
6	Brooklyn	Clinton Hill	40.693229	-73.967843	8.750000
7	Queens	Corona	40.742382	-73.856825	8.700000
8	Brooklyn	Georgetown	40.623845	-73.916075	8.700000
9	Manhattan	Greenwich Village	40.726933	-73.999914	9.100000
10	Manhattan	Hamilton Heights	40.823604	-73.949688	9.000000
11	Queens	Jackson Heights	40.751981	-73.882821	8.600000
12	Manhattan	Little Italy	40.719324	-73.997305	9.000000
13	Manhattan	Lower East Side	40.717807	-73.980890	8.500000
14	Bronx	Morris Park	40.847549	-73.850402	8.600000
15	Bronx	Pelham Gardens	40.862966	-73.841612	8.500000
16	Brooklyn	Prospect Lefferts Gardens	40.658420	-73.954899	8.500000
17	Queens	Rego Park	40.728974	-73.857827	8.500000
18	Manhattan	Soho	40.722184	-74.000657	8.866667
19	Manhattan	Tribeca	40.721522	-74.010683	8.900000
20	Manhattan	Upper West Side	40.787658	-73.977059	8.500000
21	Manhattan	Washington Heights	40.851903	-73.936900	8.500000
22	Brooklyn	Windsor Terrace	40.656946	-73.980073	8.800000

In [40]:
```
# instantiate a feature group
incidents = folium.FeatureGroup(name="My Map")

# loop through the neighborhood and each location to the feature group and then add the feature group to the map.
for lat, lng, neighborhood, borough, avgrating in ny_neighborhood_stats[['Latitude','Longitude','Borough','Neighborhood','Average Rating']].valu
    incidents.add_child(folium.CircleMarker(location=[lat, lng], radius = 100,color='blue', popup=neighborhood+' '+borough +'  ' + str(avgrating

ny_map.add_child(incidents)
```

Out[40]:



```
In [40]: # instantiate a feature group
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for lat, lng, neighborhood, borough, avgrating in ny_neighborhood_stats[['Latitude','Longitude','Borough','Neighborhood','Average Rating']].valu
    incidents.add_child(folium.CircleMarker(location=[lat, lng], radius = 100,color='blue', popup=neighborhood+' '+borough +'   ' + str(avgrating

ny_map.add_child(incidents)
```
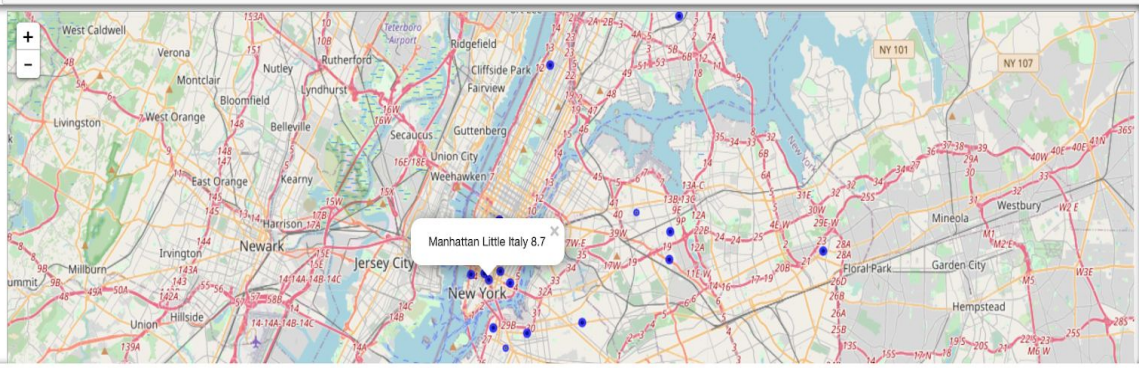

Out[40]:



11. **Summary**:

Let's see if we were able to answer the questions we started with.

a. What's the distribution of Italian restaurants in New York city by neighborhood/borough?
    i. Manhattan, Brooklyn are the top two boroughs for the Italian restaurants, though the number of neighborhoods in Brooklyn are higher than Manhattan.
b. Which neighborhood/borough has good potential for opening a new Italian restaurant ?
    i. Manhattan is on top in all these categories of Likes, Ratings and Tips for Italian restaurants. There will be a lot of competition for a new restaurant though it will be rewarding.
    ii. Brooklyn is the second in Tips and Likes, but significantly less number of italian restaurants though it has more neighborhoods than Manhattan. Bronx is slightly higher than Brooklyn in Ratings.
    iii. Based on these findings, I would recommend opening an Italian restaurant in Brooklyn.
c. Which areas/neighborhoods lack Italian restaurants?

    i. Queens and Bronx have less italian restaurants compared to other boroughs.
    ii. The ratings of italian restaurants in the Bronx(#2) are very close to that of Brooklyn(#3). Manhattan is #1. Queens is ranked #4.
    iii. Bronx is a good place to add an Italian restaurant based on the ratings and less competition than Brooklyn.
d. If you love Italian Food, what are some of the best places to live in New York?
    i. Manhattan and Brooklyn will be the best places to live and enjoy high quality Italian food based on the ratings and likes.