

# Capstone Project - The Battle of Neighborhoods

The City of New York, usually referred to as either New York City (NYC) or simply New York (NY), is the most populous city in the United States. With an estimated 2018 population of 8,398,748 distributed over a land area of about 302.6 square miles (784 km<sup>2</sup>), New York is also the most densely populated major city in the United States.

Located at the southern tip of the state of New York, the city is the center of the New York metropolitan area, the largest metropolitan area in the world by urban landmass and one of the world's most populous megacities, with an estimated 19,979,477 people in its 2018 Metropolitan Statistical Area and 22,679,948 residents in its Combined Statistical Area. A global power city, New York City has been described as the cultural, financial, and media capital of the world, and exerts a significant impact upon commerce, entertainment, research, technology, education, politics, tourism, art, fashion, and sports.

Situated on one of the world's largest natural harbors, New York City consists of five boroughs, each of which is a separate county of the State of New York. The five boroughs – Brooklyn, Queens, Manhattan, The Bronx, and Staten Island – were consolidated into a single city in 1898. The city and its metropolitan area constitute the premier gateway for legal immigration to the United States. As many as 800 languages are spoken in New York, making it the most linguistically diverse city in the world. New York City is home to more than 3.2 million residents born outside the United States, the largest foreign-born population of any city in the world. As of 2019, the New York metropolitan area is estimated to produce a gross metropolitan product (GMP) of US\$1.9 trillion. If greater New York City were a sovereign state, it would have the 12th highest GDP in the world. New York is home to the highest number of billionaires of any city in the world.

Indians in the New York City metropolitan region constitute one of the largest and fastest growing ethnicities in the New York City metropolitan area of the United States. The New York City region is home to the largest Indian American population among metropolitan areas by a significant margin, enumerating 711,174 uniraical individuals by the 2013-2017 U.S. Census American Community Survey estimates. The Asian Indian population also represents the second-largest metropolitan Asian national diaspora both outside of Asia and within the New York City metropolitan area.

Indian cuisine is very popular among Asian Indians in the United States. The growth in the New York City metropolitan region's Asian Indian populace has been accompanied by growth in the number of Indian restaurants, located both within and outside of traditional Indian enclaves, such that within New York City proper alone, there are hundreds of Indian restaurants. According to David Shaftel of The New York Times in December 2014, the food at New York City's many chain restaurants is worthy of their flagships in India; the Midtown Manhattan neighborhood south of Murray Hill, namely Rose Hill, has been nicknamed Curry Hill, and provides an abundance of multinational India-based chains specializing in South Indian cuisine.

With this various people in this city, people do have various cultural diversity and also the different type of food habit. People can fulfil their wishes of having their homely food as it has many restaurants over the city with different cuisines, such as Indian, Chinese etc.

In this capstone project we will explore the major part of the New York city with great Indian restaurants.

## **Data:**

To accomplish our task of exploring Indian restaurants in New York city, we need the datasets which covers the below:

- New York City data that contains list Boroughs, Neighborhoods along with their latitude and longitude.
  - Data Source: [https://cocl.us/new\\_york\\_dataset](https://cocl.us/new_york_dataset)
  - This data set contains the required information. And we will use this data set to explore various neighborhoods of New York city.
- Indian restaurants in each neighborhood of New York city.
  - Data source: Foursquare API
  - Description: By using this API we will get all the venues in each neighborhood. We can filter these venues to get only Indian restaurants.
- GeoSpace data
  - Data source: <https://data.cityofnewyork.us/City-Government/Borough-Boundaries/tqmj-j8zm>
  - Description: By using this geo space data we will get the New York Borough boundaries that will help us visualize choropleth map.

## **Approach of the Study:**

- Collect the New York city data from [https://cocl.us/new\\_york\\_dataset](https://cocl.us/new_york_dataset)
- Using FourSquare API we will find all venues for each neighborhood.
- Filter out all venues that are Indian Restaurants.
- Find ratings, tips and like count for each Indian Restaurants using FourSquare API.
- Using rating for each restaurant, we will sort that data.
- Visualize the Ranking of neighborhoods using folium library using python. (we will get the New York Borough boundaries that will help us visualize choropleth map and take proper decision for the entrepreneurs)

## **Business Problems:**

This will be applicable for the entrepreneurs who would like to set up an Indian restaurant in the New York city. They need to consider many aspects before they go for their set up, such as getting the suitable location based on the other restaurants exist with the neighbourhoods and their ratings/likes. And also, they need to see the distribution of the Indian restaurants across the locality. Mainly the below questions from an entrepreneur point of view should be considered.

### **Questions to answer from datasets:**

- What is best location in New York City for Indian Cuisine?
- Which areas have potential Indian Restaurant Market?
- Which all areas lack Indian Restaurants?
- Which is the best place to stay if I prefer Indian Cuisine?

### **Technical Dependencies for Analysis:**

- We will import the required libraries for Python.
- Pandas and NumPy for handling data.
- Request module for using FourSquare API for getting the details about restaurants.
- geopy to get co-ordinates of City of New York.
- folium to visualize the results on a map which will be easy for the entrepreneurs to see insights.

## Data Exploration:

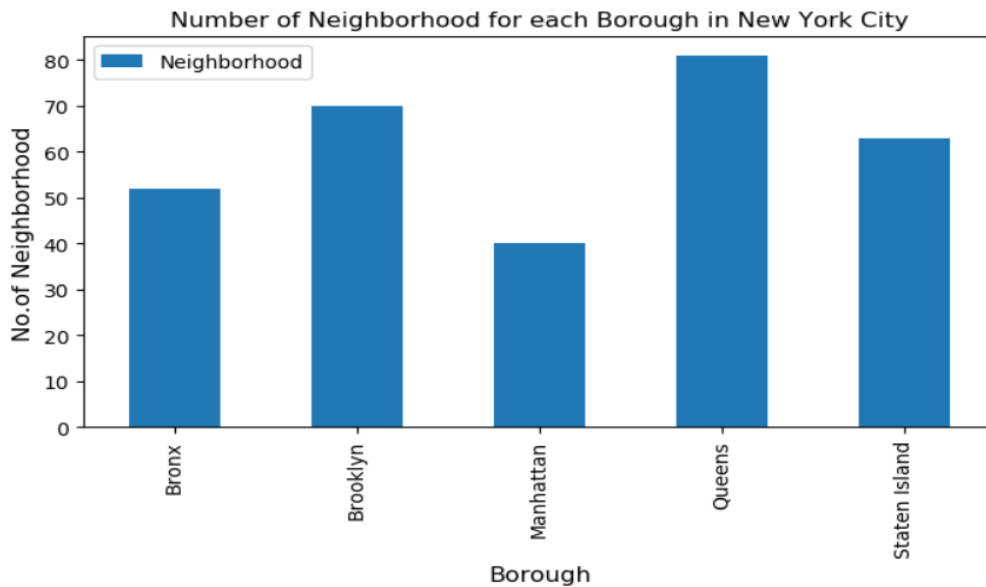
- **New York Location data:** (Data Source: [https://cocl.us/new\\_york\\_dataset](https://cocl.us/new_york_dataset)):
  - New York data set has the location information of New York Location. It has five Boroughs (*Bronx, Manhattan, Brooklyn, Queens and Staten Island*) along with their 306 Neighbourhoods with the Longitude and Latitude information.

```
# Display first 10 records  
new_york_data.head(10)
```

|   | 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 |
| 5 | Bronx     | Kingsbridge    | 40.881687 | -73.902818 |
| 6 | Manhattan | Marble Hill    | 40.876551 | -73.910660 |
| 7 | Bronx     | Woodlawn       | 40.898273 | -73.867315 |
| 8 | Bronx     | Norwood        | 40.877224 | -73.879391 |
| 9 | Bronx     | Williamsbridge | 40.881039 | -73.857446 |

- **Neighbourhoods Distribution across the NY Boroughs:**
  - The Borough Queens is having highest number of neighborhoods in New York
  - Below are the map of the NY boroughs and their neighbourhoods.
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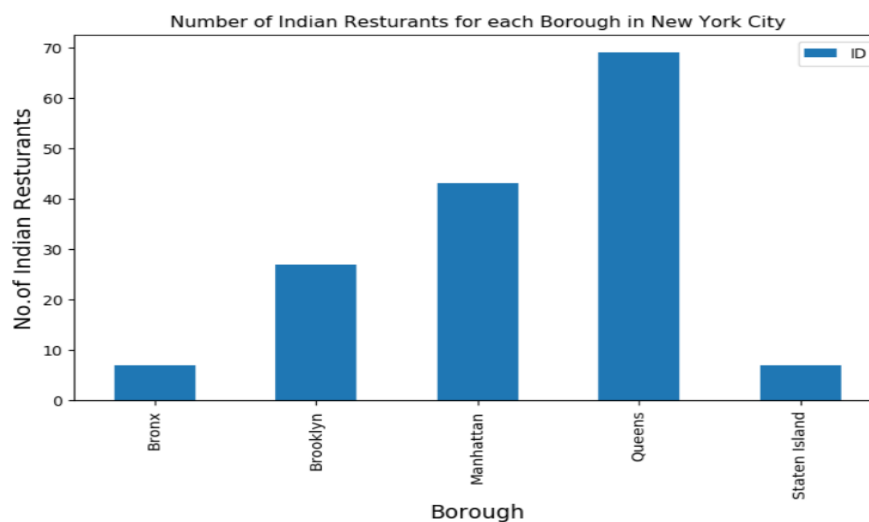


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- **Indian Restaurants in New York:**
  - Using FourSquare API we extracted the Indian restaurant from all the above neighborhoods. (Top 100 venues within a radius of 1000 metres for a given latitude and longitude – with setting radius=1000 and LIMIT=100 in API setting)
  - We found 153 Indian restaurants from the API.

```
#Display first 5 records
indian_rest_ny.head()
```

|   | Borough | Neighborhood   | ID                       | Name                        |
|---|---------|----------------|--------------------------|-----------------------------|
| 0 | Bronx   | Woodlawn       | 4c0448d9310fc9b6bf1dc761 | Curry Spot                  |
| 1 | Bronx   | Parkchester    | 4c194631838020a13e78e561 | Melanies Roti Bar And Grill |
| 2 | Bronx   | Parkchester    | 55dfa36a498e164ef19bef7b | Premium Sweets & Restaurant |
| 3 | Bronx   | Spuyten Duyvil | 4c04544df423a593ac83d116 | Cumin Indian Cuisine        |
| 4 | Bronx   | Concourse      | 551b7f75498e86c00a0ed2e1 | Hungry Bird                 |

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- **Indian Restaurants across Boroughs:**
  - We could notice Queens has the largest number of Indian restaurants



- **Indian Restaurants across Neighborhoods:**
  - We could notice Floral Park has the largest number of Indian restaurants (11)



- **Ranking of NY Indian Restaurants:**

- Using the FourSquare API we have extracted the rating related information for all mentioned Indian restaurant information in New York. Raring. The fields we got are Likes, Ratings (of Scale 10) and Tips.

```
indian_rest_stats_ny.head()
```

| Unnamed: 0 | Borough | Neighborhood | ID             | dd                       | Name | Likes                       | Rating | Tips |      |
|------------|---------|--------------|----------------|--------------------------|------|-----------------------------|--------|------|------|
| 0          | 0       | Bronx        | Woodlawn       | 4c0448d9310fc9b6bf1dc761 | 1    | Curry Spot                  | 5.0    | 8.0  | 11.0 |
| 1          | 1       | Bronx        | Parkchester    | 4c194631838020a13e78e561 | 2    | Melanies Roti Bar And Grill | 3.0    | 5.9  | 2.0  |
| 2          | 2       | Bronx        | Parkchester    | 55dfa36a498e164ef19bef7b | 1    | Premium Sweets & Restaurant | 18.0   | 7.4  | 5.0  |
| 3          | 3       | Bronx        | Spuyten Duyvil | 4c04544df423a593ac83d116 | 1    | Cumin Indian Cuisine        | 13.0   | 6.0  | 9.0  |
| 4          | 4       | Bronx        | Concourse      | 551b7f75498e86c00a0ed2e1 | 2    | Hungry Bird                 | 8.0    | 6.9  | 3.0  |

## Analysis & Results:

As we have gathered all the required information for our analysis like, let's visualize the analysis.

- **Get the Restaurant with Maximum Likes:**

The Restaurant "*The Kati Roll Company*" has the highest number of likes which is located in Midtown of Manhattan borough.

```
# Resturant with maximum Likes
indian_rest_stats_ny.iloc[indian_rest_stats_ny['Likes'].idxmax()]

Unnamed: 0                                41
Borough                                Manhattan
Neighborhood                            Midtown
ID                                49d91c12f964a520015e1fe3
dd                                    2
Name                                The Kati Roll Company
Likes                                836
Rating                                8.7
Tips                                259
Name: 41, dtype: object
```

- **Get the Restaurant with Highest Ratings:**

The Restaurant “Seva Indian Cuisine” has the highest rating which is located in Astoria of Queens borough.

```
# Resturant with maximum Rating
indian_rest_stats_ny.iloc[indian_rest_stats_ny['Rating'].idxmax()]

Unnamed: 0                                56
Borough                                Queens
Neighborhood                            Astoria
ID                                4aa56c81f964a5204e4820e3
dd                                    1
Name                                Seva Indian Cuisine
Likes                                231
Rating                                9.2
Tips                                126
Name: 56, dtype: object
```

- **Get the Restaurant with Maximum Tips:**

The Restaurant “The Kati Roll Company” has the highest number of Tips which is located in Midtown of Manhattan borough.

```
# Resturant with maximum Tips
indian_rest_stats_ny.iloc[indian_rest_stats_ny['Tips'].idxmax()] ]

Unnamed: 0                                41
Borough                                Manhattan
Neighborhood                            Midtown
ID                                49d91c12f964a520015e1fe3
dd                                    2
Name                                The Kati Roll Company
Likes                                836
Rating                                8.7
Tips                                259
Name: 41, dtype: object
```

- **Top neighborhoods with top average rating of Indian Restaurants:**

These are top 10 neighbour which has the most average ratings of the Indian restaurants in New York. The neighbours like Astoria, Blissville and Sunnyside are having good rated Indian restaurants.

```
ny_neighborhood_stats.sort_values(['Average Rating'],ascending=False).head(10)
```

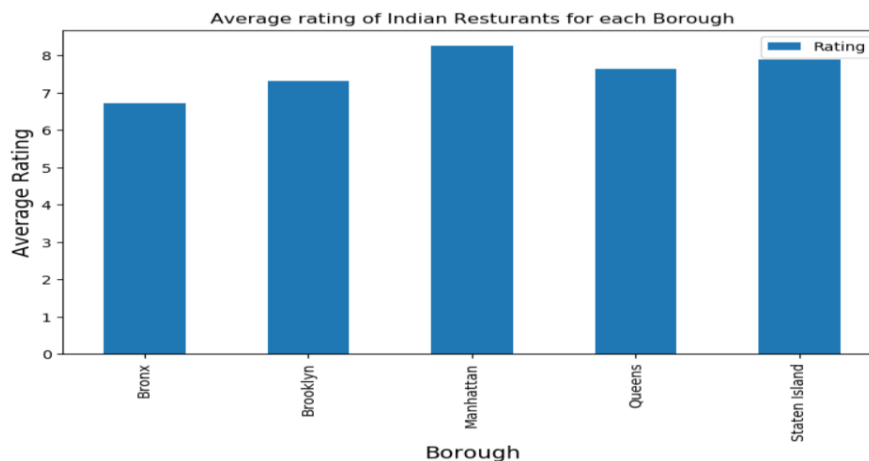
|    | Neighborhood      | Average Rating |
|----|-------------------|----------------|
| 0  | Astoria           | 9.200000       |
| 6  | Blissville        | 9.200000       |
| 64 | Sunnyside         | 9.200000       |
| 68 | Tribeca           | 9.000000       |
| 12 | Civic Center      | 9.000000       |
| 30 | Greenwich Village | 8.900000       |
| 28 | Gramercy          | 8.866667       |
| 74 | West Village      | 8.850000       |
| 13 | Clinton Hill      | 8.700000       |
| 42 | Midtown           | 8.700000       |

- **Average rating of Indian Restaurants across NY Boroughs:**

Manhattan borough has the highest average rating of Indian restaurants. It tells that this borough has good India restaurants in terms of user ratings.

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

|   | Borough       | Average Rating |
|---|---------------|----------------|
| 2 | Manhattan     | 8.264286       |
| 4 | Staten Island | 7.900000       |
| 3 | Queens        | 7.644068       |
| 1 | Brooklyn      | 7.318519       |
| 0 | Bronx         | 6.714286       |



- **Filtering the neighborhoods which are having a good average rating (more than 8.5)**

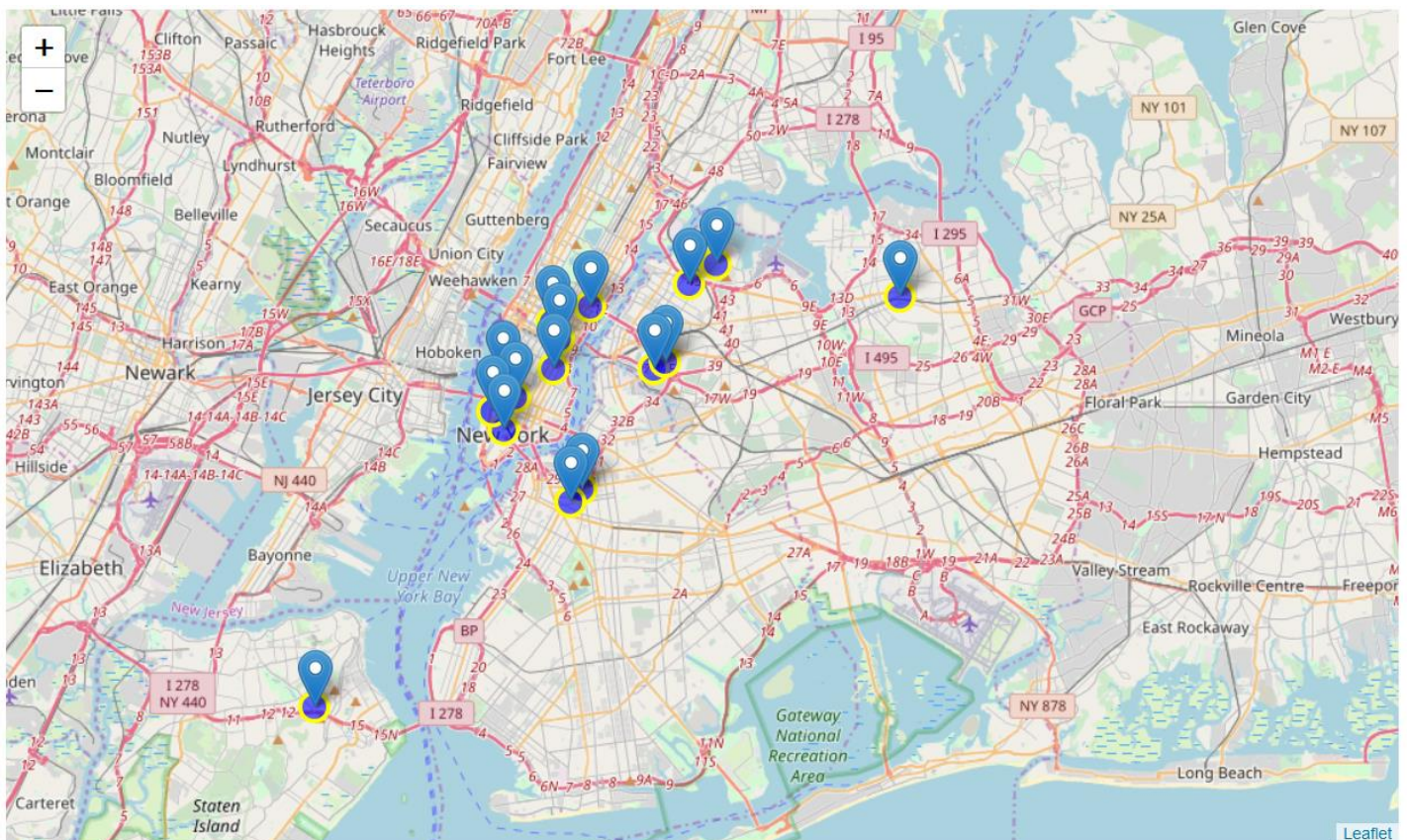
We got 16 neighborhoods which are having a good rating that is more than 8.5 in average.



ny\_neighborhood\_stats

|    | Borough       | Neighborhood      | Latitude  | Longitude  | Average Rating | Label                                      |
|----|---------------|-------------------|-----------|------------|----------------|--|
| 0  | Queens        | Astoria           | 40.768509 | -73.915654 | 9.200000       | Astoria, Queens(9.2)                       |
| 1  | Queens        | Blissville        | 40.737251 | -73.932442 | 9.200000       | Blissville, Queens(9.2)                    |
| 2  | Manhattan     | Civic Center      | 40.715229 | -74.005415 | 9.000000       | Civic Center, Manhattan(9.0)               |
| 3  | Brooklyn      | Clinton Hill      | 40.693229 | -73.967843 | 8.700000       | Clinton Hill, Brooklyn(8.7)                |
| 4  | Brooklyn      | Fort Greene       | 40.688527 | -73.972906 | 8.700000       | Fort Greene, Brooklyn(8.7)                 |
| 5  | Manhattan     | Gramercy          | 40.737210 | -73.981376 | 8.866667       | Gramercy, Manhattan(8.866666666666667)     |
| 6  | Manhattan     | Greenwich Village | 40.726933 | -73.999914 | 8.900000       | Greenwich Village, Manhattan(8.9)          |
| 7  | Manhattan     | Midtown           | 40.754691 | -73.981669 | 8.700000       | Midtown, Manhattan(8.7)                    |
| 8  | Manhattan     | Murray Hill       | 40.748303 | -73.978332 | 8.600000       | Murray Hill, Manhattan(8.6)                |
| 9  | Queens        | Murray Hill       | 40.764126 | -73.812763 | 8.600000       | Murray Hill, Queens(8.6)                   |
| 10 | Queens        | Steinway          | 40.775923 | -73.902290 | 8.600000       | Steinway, Queens(8.6)                      |
| 11 | Queens        | Sunnyside         | 40.740176 | -73.926916 | 9.200000       | Sunnyside, Queens(9.2)                     |
| 12 | Staten Island | Sunnyside         | 40.612760 | -74.097126 | 9.200000       | Sunnyside, Staten Island(9.2)              |
| 13 | Manhattan     | Sutton Place      | 40.760280 | -73.963556 | 8.533333       | Sutton Place, Manhattan(8.533333333333333) |
| 14 | Manhattan     | Tribeca           | 40.721522 | -74.010683 | 9.000000       | Tribeca, Manhattan(9.0)                    |
| 15 | Manhattan     | West Village      | 40.734434 | -74.006180 | 8.850000       | West Village, Manhattan(8.850000000000001) |

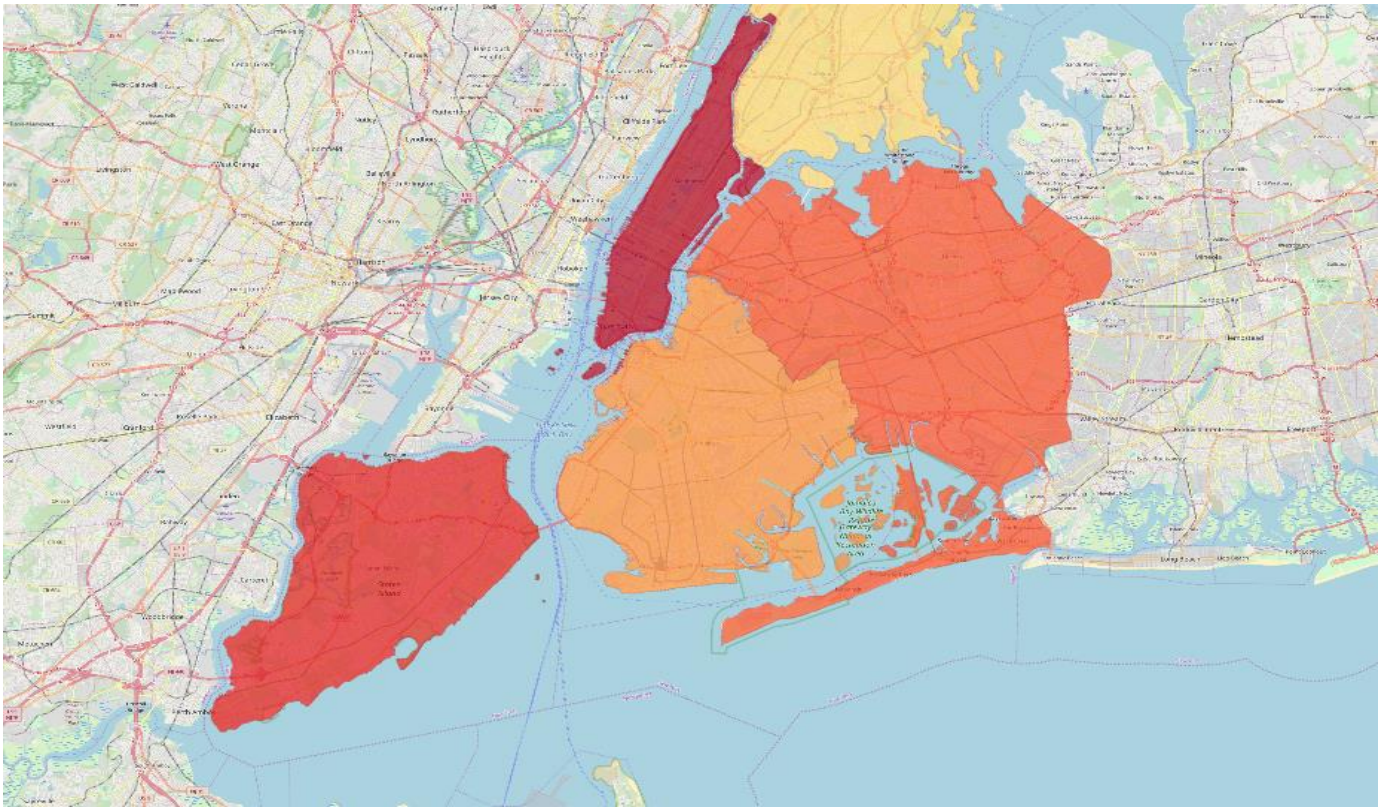
- Plotting the restaurants over neighborhoods which are having a good average rating (more than 8.5)





- **Identification of Borough based on their average ratings (more than 8.5 ratings restaurants)**

Manhattan (highlighted in deep red) has many good restaurants and Bronx (in yellow) lacks the same



## Conclusion:

The above insights and analysis on Indian restaurants in the different boroughs in New York will be helpful for an entrepreneur who wish to keep a good Indian restaurant in the New York. He/she can identify the most demanding borough to set up an Indian restaurant and which area has a great scope.

Even the users' point of view, they can identify the best place to live in the New York city if they prefer Indian cuisine.

The below few points from our analysis we can note which will be useful for entrepreneurs and/or users.

- Manhattan has many good Indian restaurants. It is the best place to stay if you prefer an Indian restaurant.
- Staten Island ranks lowest average ratings of Indian restaurants.
- Bronx is not having an Indian restaurant which is having more than 8.5 average rating.
- Manhattan have potential Indian Restaurant Market.
- Queens, Staten Island and Bronx lack of good Indian restaurants.
- Investors/entrepreneurs can look into the above areas for setting up Indian restaurants.

## Limitations:

- The ranking is purely on basis of rating of restaurants
- The accuracy of data depends purely depends on the data provided by FourSquare