

# IBM Capstone project-The battle of Neighborhoods

SELECTING THE BEST LOCATION TO OPEN AN  
ITALIAN RESTAURANTS IN MANHATTAN,  
NEW YORK

# Introduction

The City of **New York** is famous for its excellent cuisine. It's food culture includes an array of international cuisines influenced by the city's immigrant history.

**ITALIAN RESTAURANTS** have become so popular in the United States now it seems that there is one on every corner, not only in major cities but also in smaller cities. Starting a Italian restaurant can be a great business opportunity, but you need to distinguish yourself from others to enjoy long-term success.

# Business Problem

My client wants to open his business in **Manhattan** area, so I focus on that borough during my analysis. We define potential neighborhood based on the number of Italian restaurant which are operating right in each neighborhood. Manhattan has full potential but also is a very challenging district to open a business because of high competition. New Italian restaurant should be open in an area that inadequate neighborhood in this way the Restaurant can attract more customers. Therefore, this analysis necessary to ensure that we have enough customers .

# Data Selection

- To identify the characteristics of our competitors' venues in Manhattan, we would first need to find out the number of Italian restaurants in Manhattan currently and their location.
- We then used Google Map API to find their geographic coordinates based on their postal code addresses.
- In Manhattan, there is 1763 Italian restaurants are currently operating.

```
newyork_venues_italian.shape
```

```
(1508, 7)
```

# Data Selection

Next, we also used Google Map API to find their geographic coordinates of the 5 locations shortlisted for our Italian restaurants:

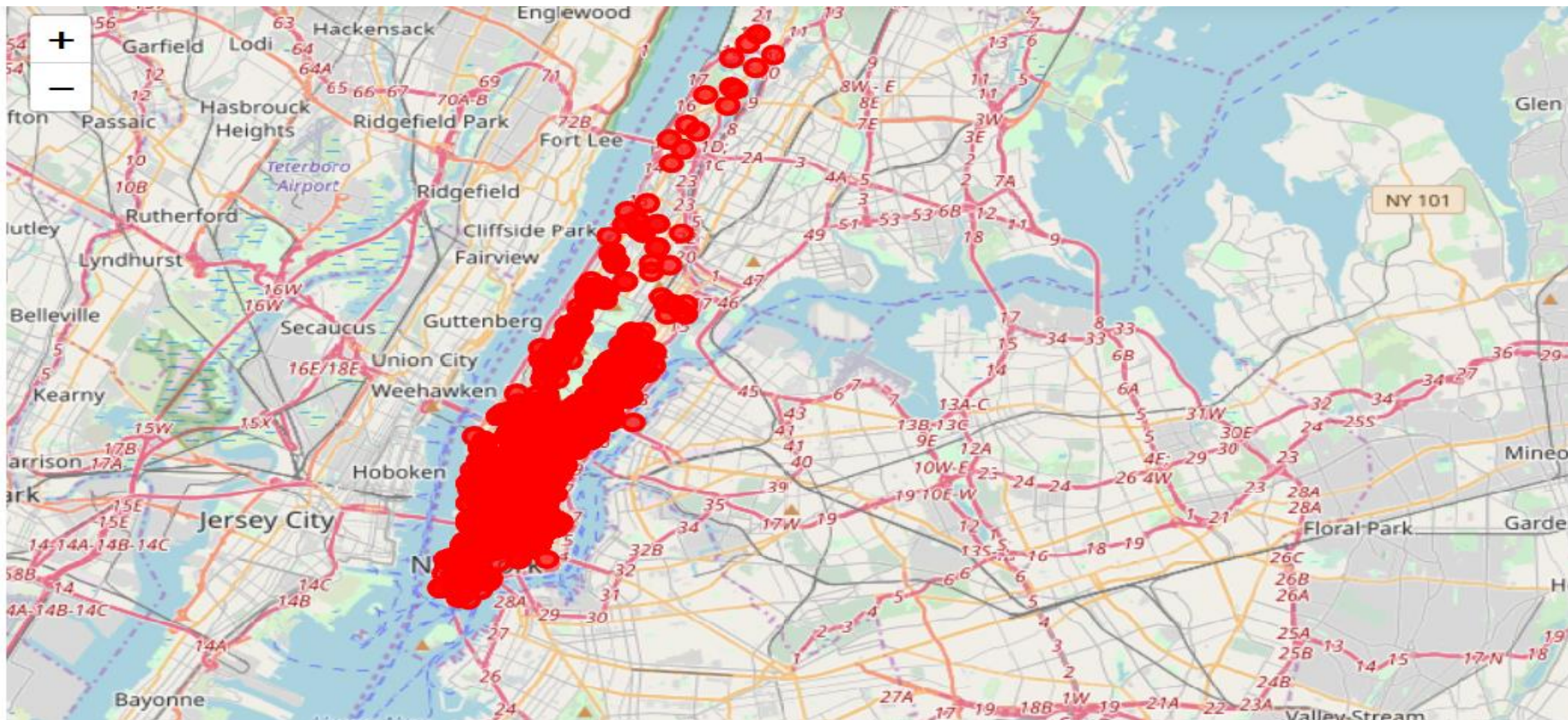
	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Marble Hill	40.876551	-73.91066	Arturo's	40.874412	-73.910271	Pizza Place
1	Marble Hill	40.876551	-73.91066	Broadway Pizza & Pasta	40.878822	-73.904494	Pizza Place
2	Marble Hill	40.876551	-73.91066	Patricia's of Tremont	40.882543	-73.913501	Italian Restaurant
3	Marble Hill	40.876551	-73.91066	pinochio pizza	40.877868	-73.918948	Italian Restaurant
4	Marble Hill	40.876551	-73.91066	Nonno Tony's	40.885288	-73.909588	Italian Restaurant

# Methodology

- Addresses are converted into their equivalent latitude and longitude values.
- Foursquare API is used to explore neighborhoods in Manhattan, New York.
- After that, explore function to get Italian restaurant categories in each neighborhood.

[illegible]





Italian restaurant in Manhattan

- Then using this feature to group the neighborhoods into clusters k-means clustering algorithm will be use to complete this task. And also, the folium library to visualize the neighborhoods in Manhattan and its emerging clusters.

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	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	Manhattan	Marble Hill	40.876551	-73.910660	0	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café
1	Manhattan	Chinatown	40.715618	-73.994279	1	Italian Restaurant	Pizza Place	Café	Gourmet Shop	Bakery	Fast Food Restaurant
2	Manhattan	Washington Heights	40.851903	-73.936900	2	Italian Restaurant	Swiss Restaurant	Asian Restaurant	Bakery	Café	Cocktail Bar
3	Manhattan	Inwood	40.867684	-73.921210	3	Italian Restaurant	Cocktail Bar	Swiss Restaurant	Asian Restaurant	Bakery	Café
4	Manhattan	Hamilton Heights	40.823604	-73.949688	4	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café



# Results

- Using K-mean to clustering data area with less number of Italian restaurant

## Cluster 0

	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	8th Most Common Venue	9th Most Common Venue
0	Marble Hill	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega
7	East Harlem	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega
11	Roosevelt Island	Italian Restaurant	Pizza Place	Sandwich Place	Wine Bar	Seafood Restaurant	Restaurant	Asian Restaurant	Bakery	Café
19	East Village	Italian Restaurant	Pizza Place	Wine Bar	American Restaurant	Café	Swiss Restaurant	Sandwich Place	Event Space	Asian Restaurant
27	Gramercy	Italian Restaurant	Pizza Place	Café	Gourmet Shop	Mediterranean Restaurant	New American Restaurant	Wine Bar	Pub	Sandwich Place
28	Battery Park City	Italian Restaurant	Pizza Place	Event Space	Gourmet Shop	Sandwich Place	Asian Restaurant	Bakery	Café	Cocktail Bar
29	Financial District	Italian Restaurant	Pizza Place	Event Space	Gourmet Shop	Sandwich Place	Asian Restaurant	Bakery	Café	Cocktail Bar
37	Stuyvesant Town	Italian Restaurant	Pizza Place	Asian Restaurant	Sandwich Place	Café	Gourmet Shop	Bakery	Cocktail Bar	Coffee Shop

# Results

## Cluster 1

	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	8th Most Common Venue	9th Most Common Venue
1	Chinatown	Italian Restaurant	Pizza Place	Café	Gourmet Shop	Bakery	Fast Food Restaurant	Asian Restaurant	Cocktail Bar	Coffee Shop
9	Yorkville	Italian Restaurant	Pizza Place	Wine Bar	Seafood Restaurant	Fast Food Restaurant	Asian Restaurant	Bakery	Café	Cocktail Bar
10	Lenox Hill	Italian Restaurant	Pizza Place	Café	Cocktail Bar	Mediterranean Restaurant	Wine Bar	American Restaurant	Pub	Restaurant
16	Murray Hill	Italian Restaurant	Pizza Place	American Restaurant	Gourmet Shop	Steakhouse	Mediterranean Restaurant	Deli / Bodega	Event Space	Asian Restaurant
20	Lower East Side	Italian Restaurant	Pizza Place	Fast Food Restaurant	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop
30	Carnegie Hill	Italian Restaurant	Pizza Place	Wine Bar	Restaurant	Seafood Restaurant	Fast Food Restaurant	Asian Restaurant	Bakery	Café
31	Noho	Italian Restaurant	Pizza Place	Café	Gourmet Shop	Wine Bar	Swiss Restaurant	Restaurant	Event Space	Asian Restaurant
33	Midtown South	Italian Restaurant	Pizza Place	Sandwich Place	Coffee Shop	New American Restaurant	Mediterranean Restaurant	Gourmet Shop	Event Space	Asian Restaurant
34	Sutton Place	Italian Restaurant	Pizza Place	Wine Bar	Café	Nightclub	Cocktail Bar	Mediterranean Restaurant	Sandwich Place	Seafood Restaurant
38	Flatiron	Italian Restaurant	Pizza Place	Sandwich Place	Pub	New American Restaurant	Mediterranean Restaurant	Gourmet Shop	Event Space	Asian Restaurant

# Results

## Cluster 2

	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	8th Most Common Venue	9th Most Common Venue
2	Washington Heights	Italian Restaurant	Swiss Restaurant	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega	Event Space
5	Manhattanville	Italian Restaurant	Swiss Restaurant	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega	Event Space
18	Greenwich Village	Italian Restaurant	Sandwich Place	Gourmet Shop	Pizza Place	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop
21	Tribeca	Italian Restaurant	Sandwich Place	Mediterranean Restaurant	Pizza Place	Wine Bar	Restaurant	Event Space	Asian Restaurant	Bakery
26	Morningside Heights	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega

# Results

## Cluster 3

	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	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
3	Inwood	Italian Restaurant	Cocktail Bar	Swiss Restaurant	Asian Restaurant	Bakery	Café	Coffee Shop	Deli / Bodega	Event Space	Fast Food Restaurant

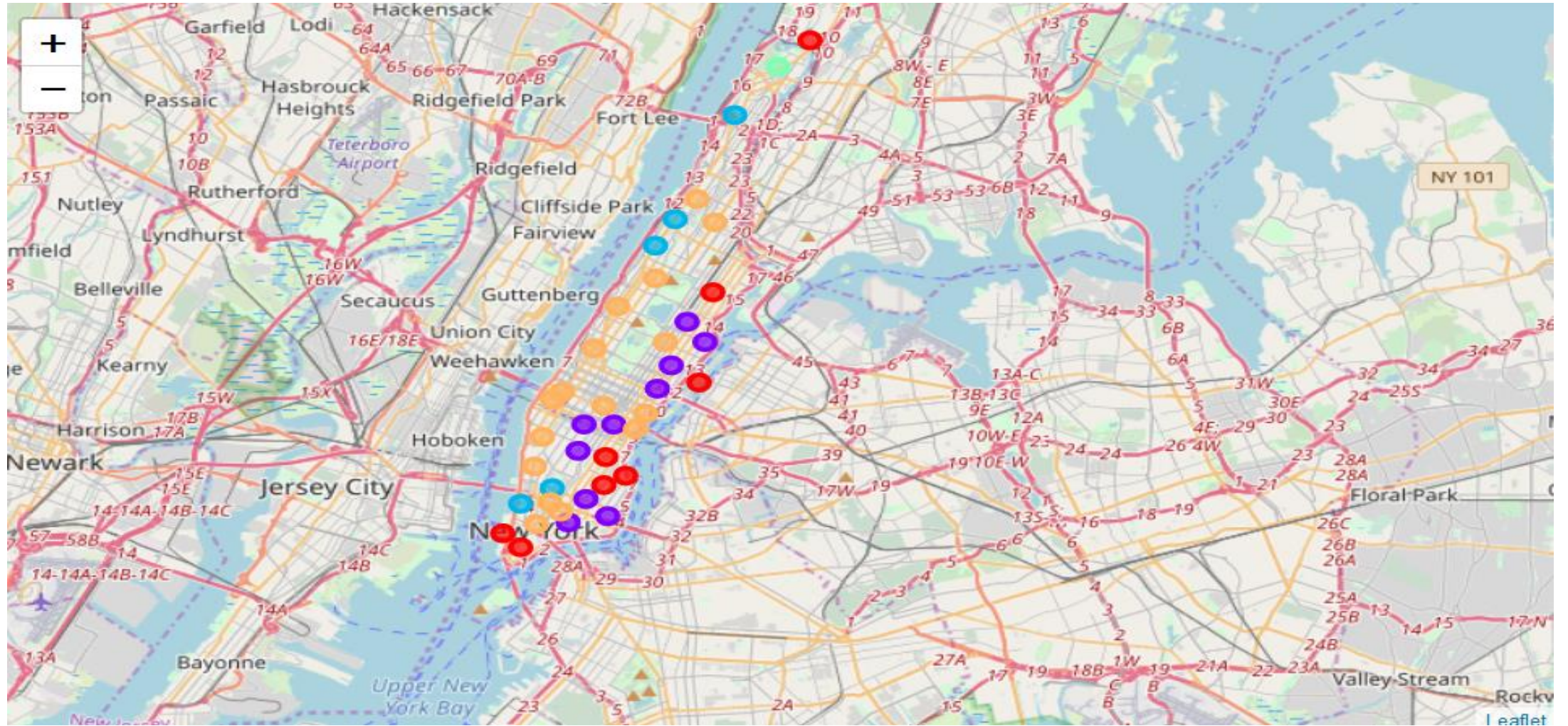
# Results

## Cluster 4

	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	8th Most Common Venue	9th Most Common Venue
4	Hamilton Heights	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega
6	Central Harlem	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega
8	Upper East Side	Italian Restaurant	Pizza Place	Café	American Restaurant	Sandwich Place	Restaurant	Asian Restaurant	Bakery	Steakhouse
12	Upper West Side	Italian Restaurant	Pizza Place	Wine Bar	Seafood Restaurant	Fast Food Restaurant	Asian Restaurant	Bakery	Café	Cocktail Bar
13	Lincoln Square	Italian Restaurant	Pizza Place	Seafood Restaurant	Deli / Bodega	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar
14	Clinton	Italian Restaurant	Pizza Place	Coffee Shop	Wine Bar	Seafood Restaurant	Sandwich Place	Event Space	Asian Restaurant	Bakery
15	Midtown	Italian Restaurant	Pizza Place	Coffee Shop	Deli / Bodega	Gourmet Shop	American Restaurant	Steakhouse	Pub	Restaurant
17	Chelsea	Italian Restaurant	Pizza Place	Wine Bar	Sandwich Place	Seafood Restaurant	Fast Food Restaurant	Asian Restaurant	Bakery	Café
22	Little Italy	Italian Restaurant	Pizza Place	Café	Gourmet Shop	Wine Bar	Sandwich Place	Restaurant	Event Space	Asian Restaurant
23	Soho	Italian Restaurant	Pizza Place	Gourmet Shop	Café	Wine Bar	Sandwich Place	Restaurant	Event Space	Asian Restaurant
24	West Village	Italian Restaurant	Pizza Place	Wine Bar	Mediterranean Restaurant	Sandwich Place	Seafood Restaurant	Event Space	Asian Restaurant	Bakery
25	Manhattan Valley	Italian Restaurant	Pizza Place	Gourmet Shop	Asian Restaurant	Bakery	Café	Cocktail Bar	Coffee Shop	Deli / Bodega
32	Civic Center	Italian Restaurant	Pizza Place	Gourmet Shop	Bakery	Wine Bar	Sandwich Place	Restaurant	Event Space	Asian Restaurant
35	Turtle Bay	Italian Restaurant	Pizza Place	Wine Bar	Gourmet Shop	Steakhouse	Sandwich Place	Event Space	Asian Restaurant	Bakery
36	Tudor City	Italian Restaurant	Pizza Place	Wine Bar	Gourmet Shop	Steakhouse	Fast Food Restaurant	Asian Restaurant	Bakery	Café
39	Hudson Yards	Italian Restaurant	Pizza Place	Sandwich Place	Coffee Shop	Wine Bar	Seafood Restaurant	Restaurant	Event Space	Asian Restaurant

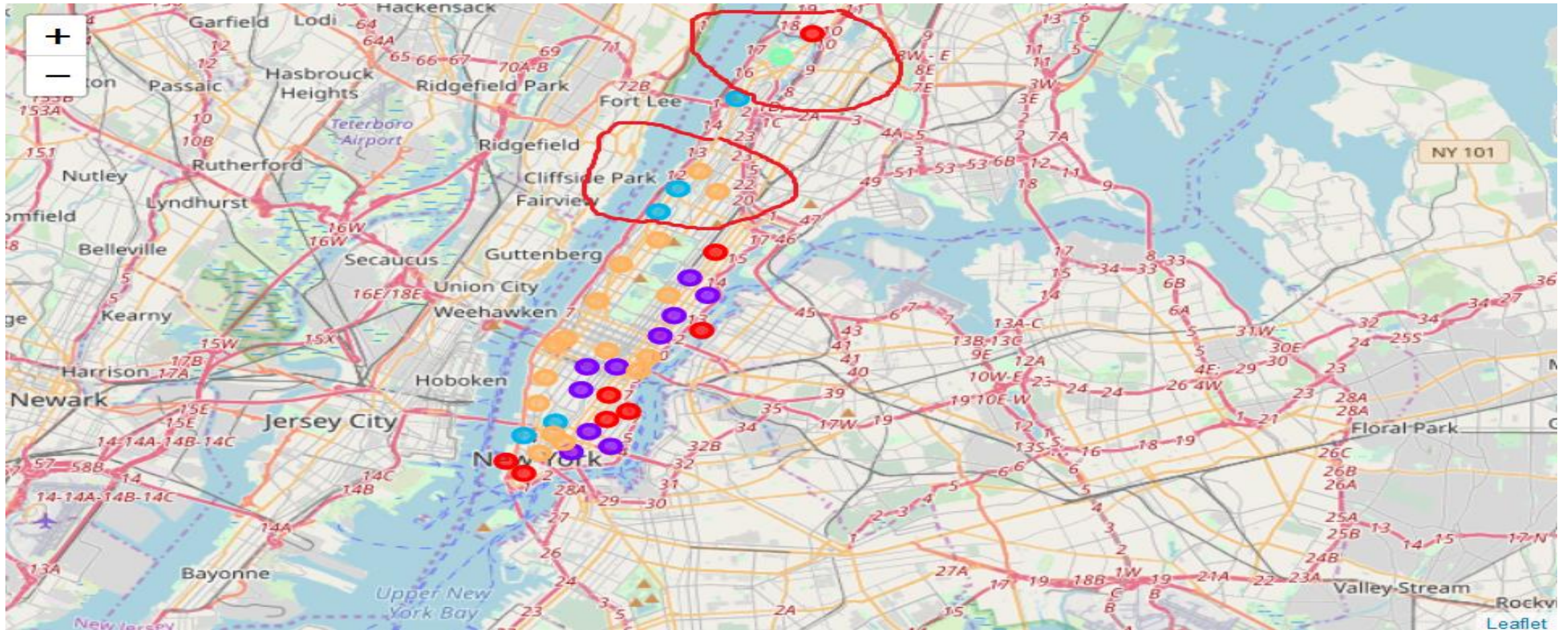


# Results





# Results



- Based on data frame analysis above Cluster 3 ( Inwood Side ) and Cluster 2 (Washington Heights) areas are the best places to open a new Italian Restaurant business.

# Discussion

- This analysis is performed on limited data. This may be right or may be wrong. But if good amount of data is available there is scope to come up with better results.
- There is high competition in Noho and Hamilton Heights so it is very risky to open business in these areas.
- Central Harlem has also potential where closes to Morningside Heights area.
- It can be done more detailed analysis by adding other factors such as transportation, demographics of inhabitants.

# Conclusion

Although all of the goals of this project were met there is definitely room for further improvement and development as noted below. However, the goals of the project were met and, with some more work, could easily be developed into a fully pledged application that could support the opening a business idea in an unknown location.