

The Battle of the Neighborhoods -Final Project Report

1. Introduction & Business Problem:

New York is the most populous city of United States. It is diverse and also happens to be the financial capital of USA. It is multicultural and that brings in lot of business opportunities especially in the food and beverages sector to cater to diverse palates. Owing to its business-friendly environment it has attracted many different players into the market. It is a global hub of business and commerce. The city is a major centre for banking and finance, retailing, world trade, transportation, tourism, real-estate, media, advertising, legal services, accountancy, insurance, theatre, fashion, and arts. This also means that the market is highly competitive. Being a highly developed city the cost of doing business is also one of the highest. Thus, any new venture or expansion needs careful analysis. The insights derived from the analysis will give us a good understanding of the business environment which help in strategically targeting the market factors such as customers. This will help reduce the risk and improve the Return on Investment (RoI).

2. Business Problem:

The City of New York is famous for its excellent variety of cuisine. It includes a myriad of international cuisines influenced by the city's immigrant history. Sushi 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 towns. Starting a sushi restaurant can be a great business opportunity, but you need to distinguish yourself to enjoy long-term success.

If you plan a real restaurant that can demand higher prices for fresh fish, delivered daily from Japan, focus on neighbourhoods and outlets that already attract a sophisticated Japanese clientele. If you plan a cheap buffet restaurant, target the masses looking for affordable high-traffic locations with large shopping centres and other popular locations.

My client wants to open his business in Manhattan area; hence I focus on that borough in my analysis. We define potential neighbourhoods based on the number of sushi restaurants which are operating in each neighbourhood. Manhattan has huge potential but is also a very challenging district to start a new business venture because of the high volume of competition. New sushi restaurants must open in an area that have inadequate number already and in this way the restaurant will have less competition and will attract more clientele. Therefore, we shall be focussing on the analysis of the density of sushi places in an area to find an area with lesser competition.

3. Data:

Data 1: The Neighbourhood comprises a total of 5 boroughs and 306 neighbourhoods. In order to segment the neighbourhoods and explore them, we will essentially need a dataset that contains the 5 boroughs and the neighbourhoods that exist in each borough as well as the coordinates of each neighbourhood. This following dataset is available for free. Dataset link: https://geo.nyu.edu/catalog/nyu_2451_34572

Data2: New York City's geographical coordinates will be utilized as inputs for the Foursquare API, that will be used to provide us with venue information for each neighbourhood. The below is image of the Foursquare API data

	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 addition, Sushi category Id 4bf58dd8d48988d1d2941735 is used for retrieving data from Foursquare API.

3. Methodology

In this project, we shall use the methodology as taught in Week 3 lab.

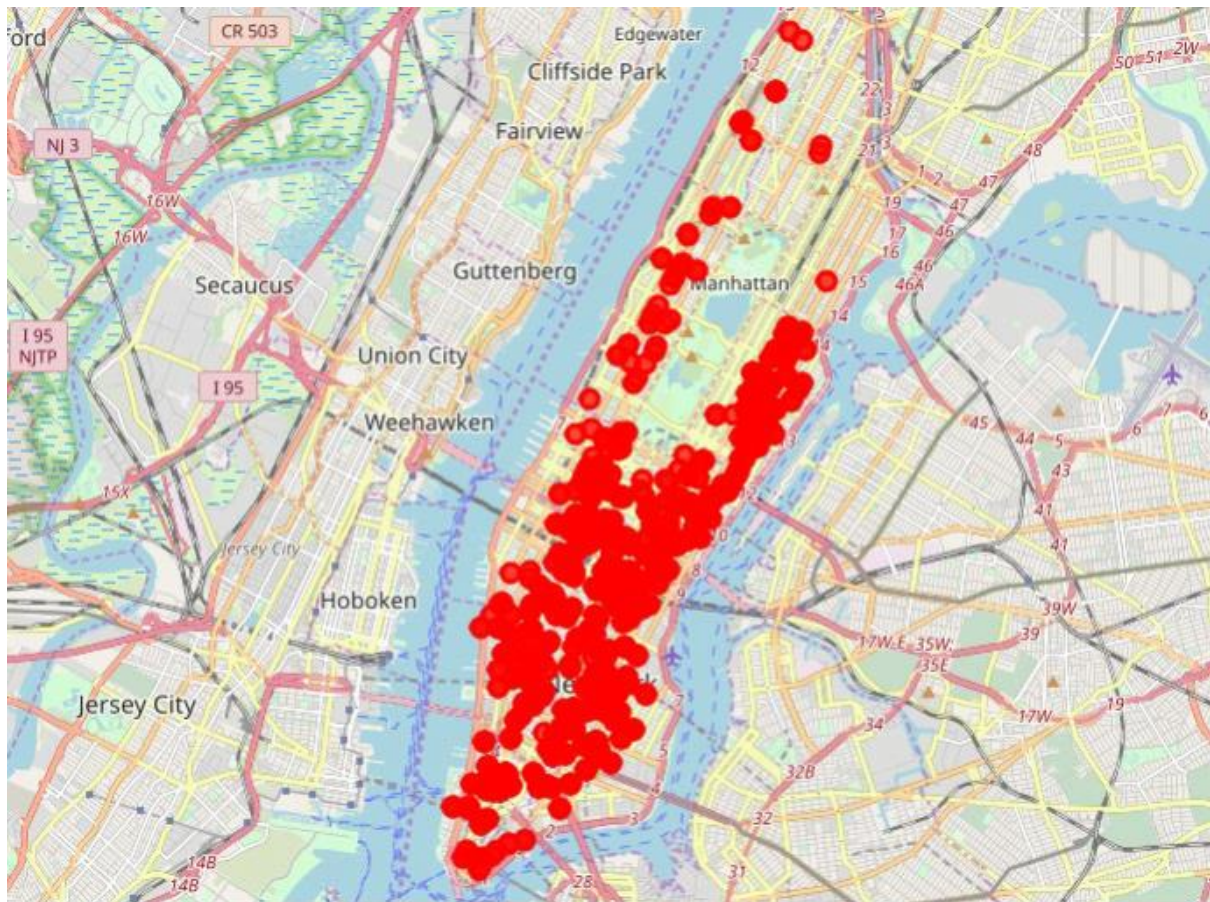
In the following image I have converted addresses into their equivalent coordinates. Then we will use the Foursquare API to explore neighbourhoods in Manhattan, New York. Thence we shall explore to get sushi restaurant categories in each neighbourhood.

	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

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Fieldston	40.895437	-73.905643	Asian Tokyo	40.890839	-73.898335	Sushi Restaurant
1	Fieldston	40.895437	-73.905643	Yokohama	40.887214	-73.904708	Sushi Restaurant
2	Riverdale	40.890834	-73.912585	Planet Tokyo	40.886158	-73.909615	Sushi Restaurant
3	Riverdale	40.890834	-73.912585	Yokohama	40.887214	-73.904708	Sushi Restaurant
4	Kingsbridge	40.881687	-73.902818	Yokohama	40.887214	-73.904708	Sushi Restaurant

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newyork_venues_sushi.shape
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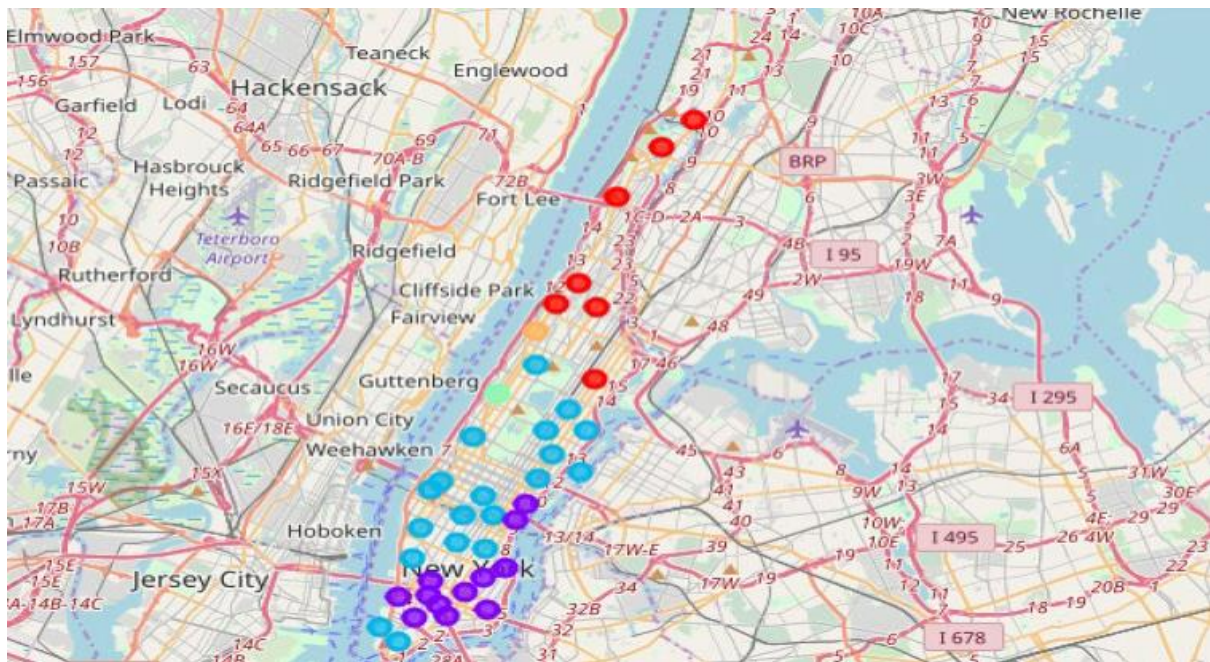


Sushi bars in Manhattan

	Neighborhood	Asian Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant	Japanese Restaurant	Noodle House	Poke Place	Ramen Restaurant	Restaurant	Sake Bar	Sandwich Place	Rest
0	Marble Hill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Chinatown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Chinatown	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
3	Chinatown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Chinatown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Then we shall convert the restaurants' categorical data into dummy variables using OneHotEncoding feature and then use K-means clustering algorithm to cluster the restaurants into different categories based on restaurant density in a neighbourhood. We shall also use the Folium library to visualize the neighborhoods in Manhattan and its emerging clusters.

	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	Annadale	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
1	Arden Heights	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
2	Astoria	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant
3	Astoria Heights	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
4	Auburndale	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar



4. Results:

K-mean Clustering: Using K-means clustering to cluster the area with less number of sushi bars.

Cluster 0

	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	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue
0	Manhattan	Marble Hill	40.876551	-73.910660	0	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
1	Manhattan	Chinatown	40.715618	-73.994279	0	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant
2	Manhattan	Washington Heights	40.851903	-73.936900	0	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
3	Manhattan	Inwood	40.867684	-73.921210	0	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar
4	Manhattan	Hamilton Heights	40.823604	-73.949688	0	Sushi Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop	Burger Joint	Café	Chinese Restaurant	Cocktail Bar

Cluster 1

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manhattan_merged.loc[manhattan_merged['Cluster_Labels'] == 1, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
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	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
1	Chinatown	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
18	Greenwich Village	Sushi Restaurant	Japanese Restaurant	Sake Bar	Grocery Store	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega
19	East Village	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
20	Lower East Side	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
21	Tribeca	Sushi Restaurant	Noodle House	Japanese Restaurant	Theme Restaurant	Vegetarian / Vegan Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
22	Little Italy	Sushi Restaurant	Japanese Restaurant	Noodle House	Vegetarian / Vegan Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
23	Soho	Sushi Restaurant	Japanese Restaurant	Noodle House	Theme Restaurant	Vegetarian / Vegan Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
31	NoHo	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
32	Civic Center	Sushi Restaurant	Japanese Restaurant	Noodle House	Theme Restaurant	Vegetarian / Vegan Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
35	Turtle Bay	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Steakhouse	Seafood Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
36	Tudor City	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Steakhouse	Smoothie Shop	Seafood Restaurant	Sandwich Place	Sake Bar	Restaurant
37	Stuyvesant Town	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant

Cluster 2

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manhattan_merged.loc[manhattan_merged['Cluster_Labels'] == 2, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
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	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
8	Upper East Side	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Grocery Store	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Hawaiian Restaurant
9	Yorkville	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Chinese Restaurant	Noodle House	Bakery	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
10	Lenox Hill	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Grocery Store	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Hawaiian Restaurant
11	Roosevelt Island	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
13	Lincoln Square	Sushi Restaurant	Japanese Restaurant	Smoothie Shop	Chinese Restaurant	Grocery Store	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Cocktail Bar	Deli / Bodega
14	Clinton	Sushi Restaurant	Japanese Restaurant	Poke Place	Chinese Restaurant	Cocktail Bar	Asian Restaurant	Seafood Restaurant	Sandwich Place	Sake Bar	Restaurant
15	Midtown	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Seafood Restaurant	Ramen Restaurant	Bakery	Vegetarian / Vegan Restaurant	Sandwich Place	Sake Bar	Restaurant
16	Murray Hill	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Restaurant	Bakery	Chinese Restaurant	Ramen Restaurant	Vegetarian / Vegan Restaurant	Sake Bar	Sandwich Place
17	Chelsea	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Vegetarian / Vegan Restaurant	Smoothie Shop	Seafood Restaurant	Sandwich Place	Sake Bar	Restaurant	Ramen Restaurant
24	West Village	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Sake Bar	Grocery Store	Asian Restaurant	Sandwich Place	Seafood Restaurant	Restaurant	Ramen Restaurant
25	Manhattan Valley	Sushi Restaurant	Hawaiian Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
27	Gramercy	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Chinese Restaurant	Noodle House	Bakery	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
28	Battery Park City	Sushi Restaurant	Japanese Restaurant	Noodle House	Theme Restaurant	Vegetarian / Vegan Restaurant	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store
29	Financial District	Sushi Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
30	Carnegie Hill	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Chinese Restaurant	Noodle House	Bakery	Cocktail Bar	Deli / Bodega	Grocery Store	Hawaiian Restaurant
33	Midtown South	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Restaurant	Bakery	Chinese Restaurant	Ramen Restaurant	Vegetarian / Vegan Restaurant	Sake Bar	Sandwich Place
34	Sutton Place	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Steakhouse	Seafood Restaurant	Deli / Bodega	Bakery	Chinese Restaurant	Cocktail Bar	Grocery Store

Cluster 3

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manhattan_merged.loc[manhattan_merged['Cluster_Labels'] == 3, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
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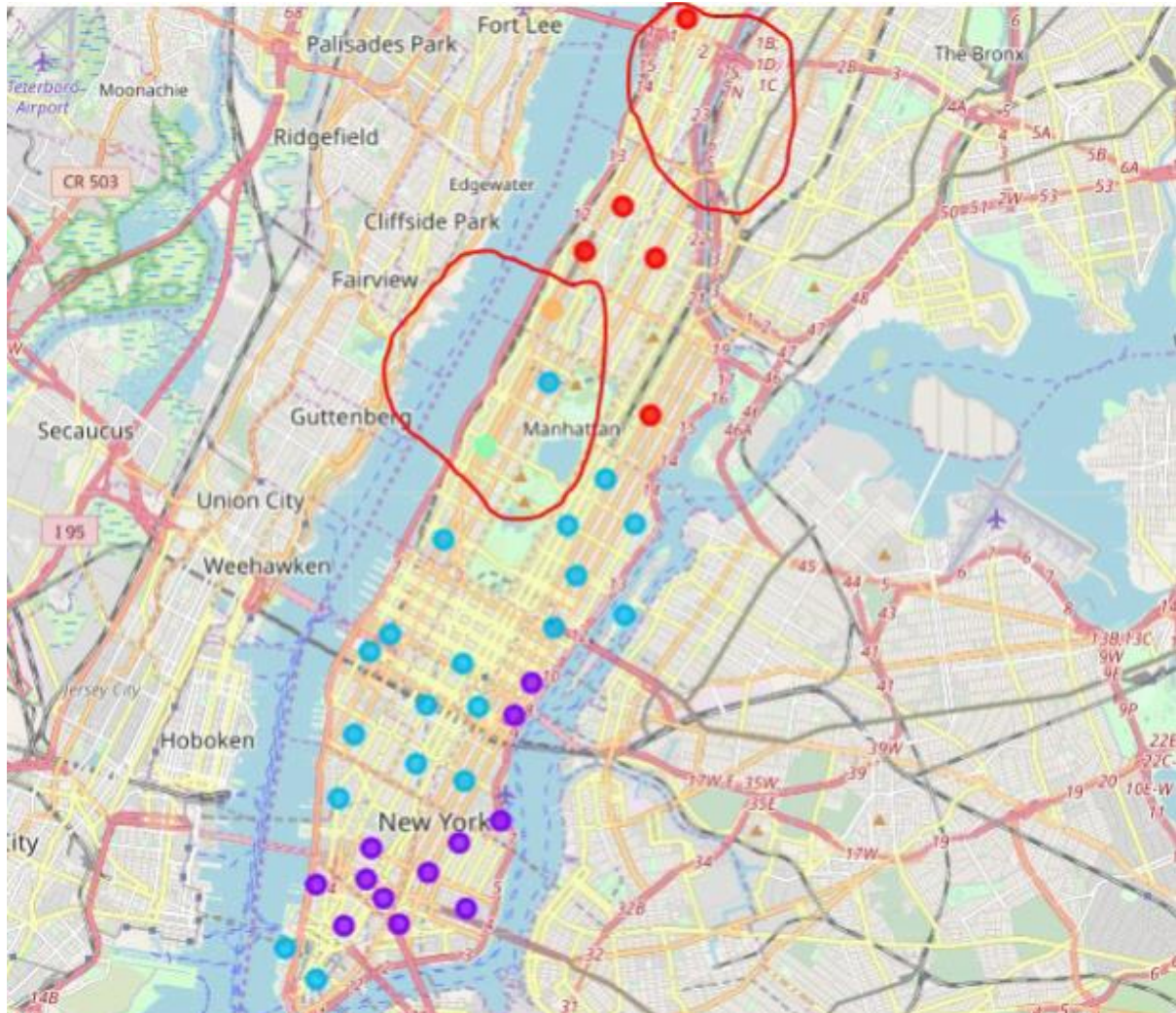
	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
12	Upper West Side	Sushi Restaurant	Japanese Restaurant	Asian Restaurant	Grocery Store	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Hawaiian Restaurant

Cluster 4

```
manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 4, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
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	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
26	Morningside Heights	Sushi Restaurant	Hawaiian Restaurant	Vegetarian / Vegan Restaurant	Noodle House	Bakery	Chinese Restaurant	Cocktail Bar	Deli / Bodega	Grocery Store	Japanese Restaurant

Based on the data frame analysis above Cluster 3 (Upper West Side) and Cluster 4 (Morningside Heights) areas are the best places to open a new sushi bar business.



5. Discussion:

In this section, I would be discussing my observations and my recommendation based on the results.

This analysis is performed on limited dataset. This may be right or wrong. But if adequate data is available, there is huge scope to arrive at more accurate results.

- There is lots of competition in Midtown and Soho, so it is very risky to start a business in these areas.
- Central Harlem has also potential which is closest to Morningside Heights area.

- A more detailed analysis can be done by adding other factors such as transportation, demographics of inhabitants, etc.

Finally, foursquare proved to be a good source of data but at the same time it has also been frustrating during some instances. Despite having a Developer account, I regularly exceeded my hourly limit locking me out for the day and thus it was an extremely painstaking process.

6. Conclusion:

Although all goals of this project were met there is definitely much room for further improvement as noted below. However, the goals of the project were accomplished and, with some more work, it could easily be developed into a full-fledged application to provide recommendations to support new business ventures by providing them a suitable location to invest and get established in.

As per the neighbourhood or restaurant type mentioned such as Sushi restaurants, the analysis can be performed in a deeper manner with more data available at our disposal. Upon careful analysis, an optimal venue can be suggested.