Methodology

My master data has the main components Borough, Neighborhood, Latitude and Longitude informations of the Borough of Manhattan.

	Borough	Neighborhood	Latitude	Longitude
6	Manhattan	Marble Hill	40.876551	-73.910660
100	Manhattan	Chinatown	40.715618	-73.994279
101	Manhattan	Washington Heights	40.851903	-73.936900
102	Manhattan	Inwood	40.867684	-73.921210
103	Manhattan	Hamilton Heights	40.823604	-73.949688

I utilized the Foursquare API to explore the Neighborhood to get the location of hotels. I designed the limit 100 and radius 500 meter for each Neighborhood from their given latitude and longitude informations. Then extracted Venue Category of Hotel in order to make a list of hotel.

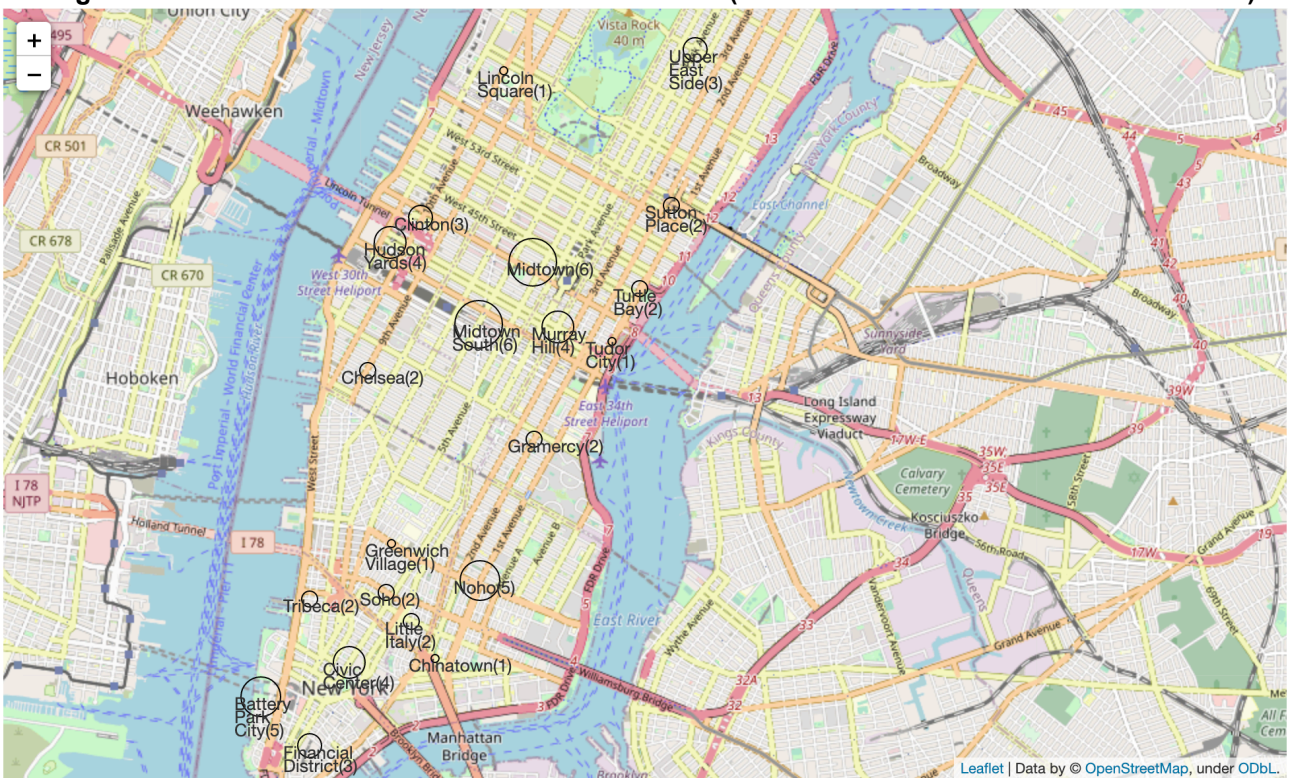
In summary of this data 63 hotels were returned by Foursquare. Here is a head of the list of Venues name (Hotel name), category (Hotel only), latitude and longitude informations from Forsquare API.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
23	Chinatown	40.715618	-73.994279	Hotel 50 Bowery	40.715936	-73.996789	Hotel
466	Upper East Side	40.775639	-73.960508	The Mark Hotel	40.775274	-73.963383	Hotel
469	Upper East Side	40.775639	-73.960508	The Carlyle	40.774413	-73.963301	Hotel
488	Upper East Side	40.775639	-73.960508	The Surrey	40.774415	-73.963889	Hotel
866	Upper West Side	40.787658	-73.977059	The Lucerne Hotel	40.783427	-73.978495	Hotel

1. Popular ares for a hotel location

I used the Folium library to visualize the neighborhoods where more than one hotel is located.

Neighborhoods in Manhattan where hotels are located (Size of circle indicates number of hotels)



Neighborhoods that have more than 3 hotels are listed here:

	Neighborhood	No Hotels	Borough	Latitude	Longitude
12	Midtown	6	Manhattan	40.754691	-73.981669
13	Midtown South	6	Manhattan	40.748510	-73.988713
0	Battery Park City	5	Manhattan	40.711932	-74.016869
15	Noho	5	Manhattan	40.723259	-73.988434
14	Murray Hill	4	Manhattan	40.748303	-73.978332
4	Civic Center	4	Manhattan	40.715229	-74.005415
9	Hudson Yards	4	Manhattan	40.756658	-74.000111
21	Upper East Side	3	Manhattan	40.775639	-73.960508
5	Clinton	3	Manhattan	40.759101	-73.996119
6	Financial District	3	Manhattan	40.707107	-74.010665

2. The most common venue categories near each hotel

I used Forsquare API explore function to get the most common venue categories near each hotel.
I utilized the Foursquare API to explore each Hotel to get the most common venue categories near each hotel. I designed the limit 100 and radius 500 meter for each Hotel from their given latitude and longitude informations.

In summary of this data 6068 venues were returned by Foursquare. Here is a head of the list of Neighborhood (Name of Hotel), Venues name, category, latitude and longitude informations from Forsquare API.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Hotel 50 Bowery	40.715936	-73.996789	Zu Yuan Spa	40.715469	-73.998627	Spa
1	Hotel 50 Bowery	40.715936	-73.996789	Hotel 50 Bowery	40.715936	-73.996789	Hotel
2	Hotel 50 Bowery	40.715936	-73.996789	The Original Chinatown Ice Cream Factory	40.715521	-73.998145	Ice Cream Shop
3	Hotel 50 Bowery	40.715936	-73.996789	Xi'an Famous Foods	40.715232	-73.997263	Chinese Restaurant
4	Hotel 50 Bowery	40.715936	-73.996789	Alimama	40.715854	-73.999139	Dessert Shop

I created a dataframe that contains top 10 most common venues near the each hotel for K-means clustering.

	Hotel	Yoga Studio	Accessories Store	Adult Boutique	American Restaurant	Animal Shelter	Antique Shop	Arepa Restaurant	Argentinian Restaurant	Art Gallery	...	Video Game Store	Video Store	Vietnamese Restaurant	Volleyball Court	Watch Shop	V
0	AKA Sutton Place	0.00	0.0	0.01	0.03	0.0	0.0	0.0	0.0	0.00	...	0.0	0.0	0.00	0.0	0.0	
1	AKA Wall Street	0.01	0.0	0.00	0.04	0.0	0.0	0.0	0.0	0.00	...	0.0	0.0	0.00	0.0	0.0	
2	Ace Hotel New York	0.01	0.0	0.00	0.01	0.0	0.0	0.0	0.0	0.00	...	0.0	0.0	0.00	0.0	0.0	
3	Andaz 5th Avenue - a concept by Hyatt	0.00	0.0	0.00	0.02	0.0	0.0	0.0	0.0	0.01	...	0.0	0.0	0.01	0.0	0.0	
4	Andaz Wall Street - a concept by Hyatt	0.00	0.0	0.00	0.04	0.0	0.0	0.0	0.0	0.00	...	0.0	0.0	0.00	0.0	0.0	

I also created a dataframe that contains top 10 most common venues near the each hotel for discussion.

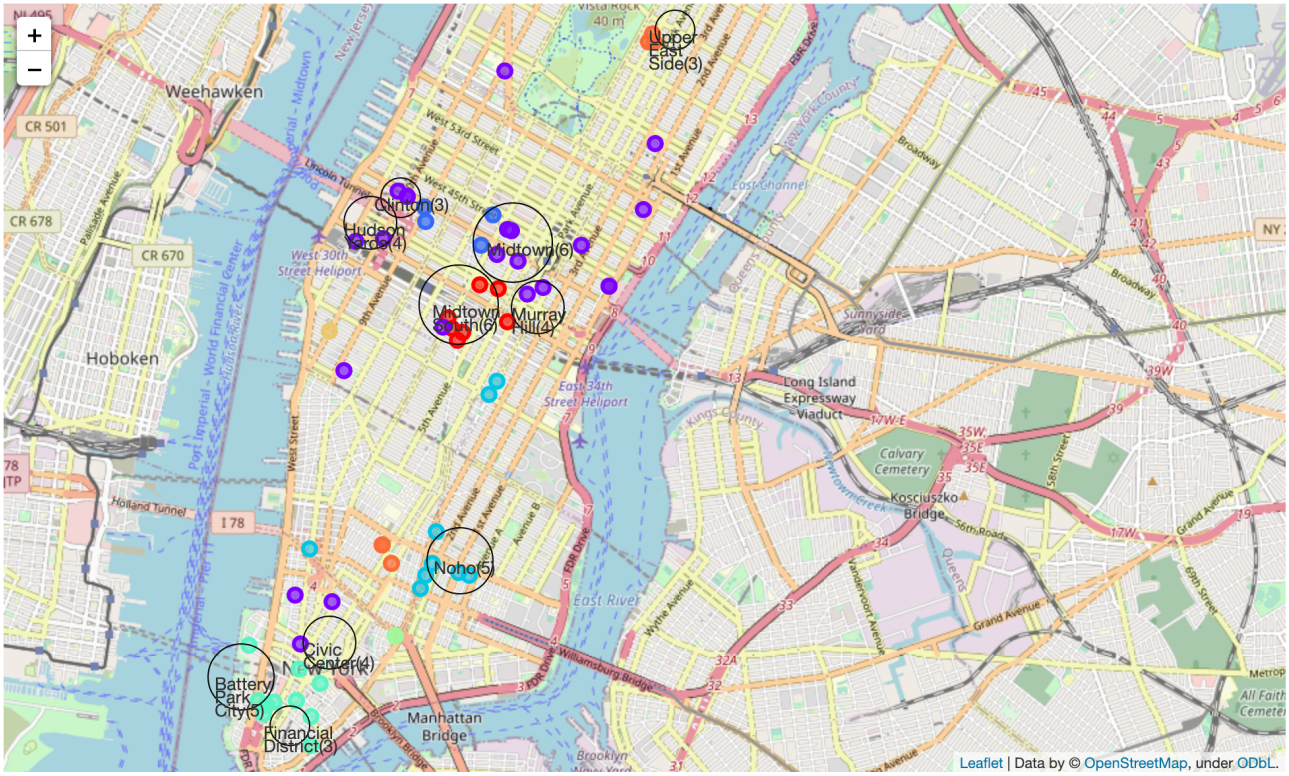
	Neighborhood	No Hotels	Venue	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	
0	Midtown	6	Sofitel New York	1	Theater	Clothing Store	Bakery	Steakhouse	Sushi Restaurant	Plaza	Sporting Goods Shop	Bookstore	American Restaurant	C
1	Midtown	6	Andaz 5th Avenue - a concept by Hyatt	1	Bakery	Coffee Shop	Clothing Store	Sporting Goods Shop	Mediterranean Restaurant	Grocery Store	Steakhouse	Bookstore	Sushi Restaurant	
2	Midtown	6	The Algonquin Hotel, Autograph Collection	1	Theater	Clothing Store	Bakery	Sporting Goods Shop	Bookstore	Steakhouse	American Restaurant	Plaza	Coffee Shop	
3	Midtown	6	Bryant Park Hotel	1	Bakery	Clothing Store	Sandwich Place	Café	Theater	American Restaurant	Gym / Fitness Center	Coffee Shop	Steakhouse	Me
4	Midtown	6	Hyatt Centric Times Square New York	2	Theater	Cosmetics Shop	Bookstore	Cuban Restaurant	Italian Restaurant	Sushi Restaurant	Plaza	Steakhouse	Bakery	

3. Neighborhoods analysis of each hotel in the popular areas

I used K-means clustering algorithm in order to analyze the most common venue categories found near each hotel. Then examined cluster and determine the discriminating venue categories that distinguish each cluster.

First, I run K-Means to cluster the boroughs into 8 clusters because when I analyze the K-Means with elbow method I didn't observe that the "elbow" up 40 so I selected 8 to make the analysis clear with maximum optimal result.

I used the Folium library to visualize the neighborhoods where more than one hotel is located.


Weehawken
CR 501
CR 678
CR 670
Hoboken
Upper East Side(3)
Clinton(3)
Hudson Yards(4)
Midtown(6)
Midtown South(6)
Murray Hill(4)
Noho(5)
Civic Center(4)
Battery Park City(5)
Financial District(3)
Manhattan Bridge
Long Island Expressway Viaduct
Calvary Cemetery
Kosciuszko Bridge
Queens
East River
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