

The Battle of Neighborhoods – Toronto vs. New York

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1. Introduction

1.1 Background

As data scientists, we solve real world problems by analyzing data, applying complex mathematical and problem-solving skills, and validating theories to address open-ended questions. New York City and Toronto are two large cities which are well-known and can be quite attractive to immigrants from many countries around the globe.

1.2 Problem

If one were thinking about migrating to either cities, which would be the better city to live in? New York City or Toronto in the past couple of decades are home to many immigrants around the world. Each of these two cities are unique to their own heritages.

1.3 Interest

Exploring and comparing these two cities can be quite easy to someone who would be migrating since most of the information such as ratings of restaurants, venue vicinities to a specified neighborhood, etc. are at our fingertips. With a wide range of data and tools to process and analyze them from our data science toolbox, we will be exploring how similar/dissimilar they are to one another with regards to common venues for food, tourist attractions, and more.

2. Data acquisition and cleaning

2.1 Data Sources

In answering the problem statement at hand, we will be pulling data from our previous course labs in order to get the dataset for the neighborhoods of both New York city and Toronto. We will process these into usable data frames as well as intend to leverage the Foursquare API to further explore the datasets for these two cities. The datasets will include information about their surrounding neighborhoods i.e hotels, cafes, coffee shops, restaurants, museums, theaters, etc.

2.2 Data Cleaning

To narrow down our search specifically which neighborhood would be appropriate to live in/migrate to, we will focus our analysis towards the island of Manhattan and Downtown Toronto to cluster and segmentize the neighborhoods. Based on the vicinity of common venues, we will compare each neighborhood in Manhattan and Downtown Toronto to help situate what would be the most ideal city to live in and ultimately, which neighborhood would be best in each city. Essentially, we will additionally be able to distinguish what the level of similarities there are between these two cities.

3. Methodology

Since this problem involves two cities, both exploration, analysis and visualization were conducted in a similar fashion, first for the city of Toronto and then New York.

3.1 Data Exploration

The neighborhood data was extracted from the Wikipedia page of the list of Toronto's neighborhoods. The data was manipulated into a dataframe by using Python pandas. Data wrangling steps such as removing erroneous data, combining neighborhoods which have same neighborhood coordinates for each borough, and removing "Not Assigned" neighborhoods were applied to the dataframe. In the next step, coordinates which were provided in a .csv file were added to the dataframe for each neighborhood. Similarly, data wrangling was applied to the New York dataset as well. The datasets comprised of postal code, boroughs, neighborhoods, latitude and longitudes and could be visualized with the table below.

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M3A	North York	Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636
3	M6A	North York	Lawrence Manor, Lawrence Heights	43.718518	-79.464763
4	M7A	Queen's Park	Ontario Provincial Government	43.662301	-79.389494

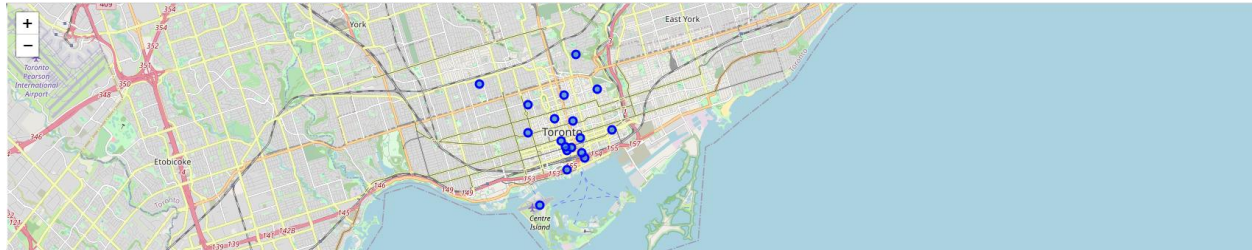
Table indicating first five rows of the Toronto dataset.

	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

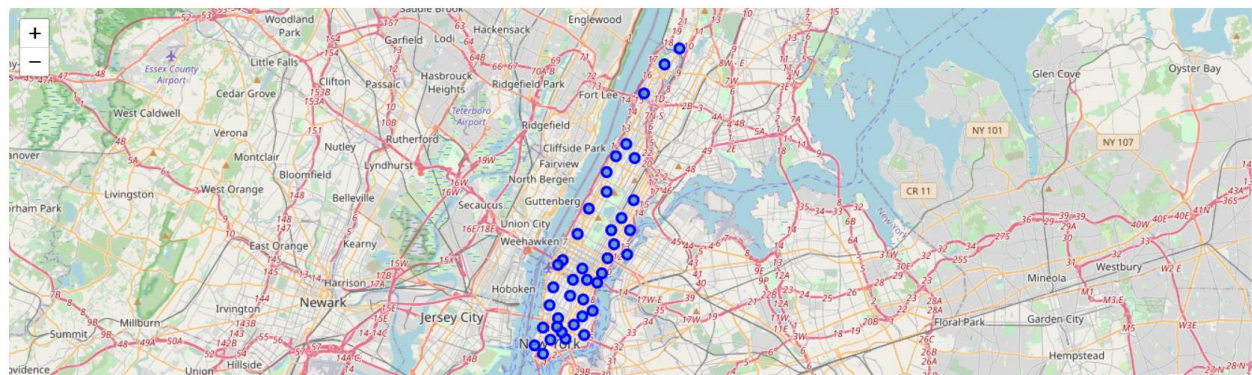
Table indicating first five rows of the New York dataset.

Preliminary calculations were made to ensure the accuracy of the steps to wrangle the data and were compared with the values achieved from the previous labs. For the Toronto dataset, using the .shape function from pandas, the dataframe comprised of 15 boroughs and 103 neighborhoods while for the New York dataset, the dataframe consisted of 5 boroughs and 306 neighborhoods.

The next steps were to get the geographical coordinates of each city by utilizing the geopy library and hence, the geocode function. With this, the geographical coordinates of Toronto and New York were determined to be 43.6534817, -79.383934 and 40.7127281, -74.0060152 respectively. To narrow our search, only Downtown Toronto and the island of Manhattan were focused in this analysis. Hence, the Toronto and New York dataset were sliced to only focus on boroughs with the word “Downtown Toronto” and “Manhattan” in them. The coordinates for each neighborhood in both cities were plotted as follows:



Map of Downtown Toronto indicating the location of each neighborhood.



Map of Manhattan indicating the location of each neighborhood.

3.2 Analysis

The dataset were analyzed separately. Starting with the Downtown Toronto dataset, the first neighborhood was explored and looked at. From the data, it was found that the first neighborhood was Regent Park, Harbourfront. The latitude and longitude values of this neighborhood was 43.6542599, -79.360635.

The next step was to utilize the Foursquare API to construct a function which would return the categories of the venues and then another function to get the nearby venues in all the neighborhoods of the dataset. Before constructing these functions, the radius and limit of parameter of was set to 500 and 100 for the GET request URL. The function is then ran on each neighborhood and a new dataframe called `toronto_venues` was created. By running these functions, 58 venues were returned by the Foursquare API and each venue was listed out.

Using one hot encoding, each neighborhood was analyzed. Whichever venue had popped up in the

neighborhood, a “1” would appear on the table. Afterwards, another dataset called `toronto_grouped` was created by grouping rows by neighborhood and by taking the mean of the frequency of occurrence of each category. The following indicates how the dataset looks:

	Neighborhood	Yoga Studio	Adult Boutique	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	Aquarium	Art Gallery	Arts & Crafts Store	Asian Restaurant	BBO Joint	Baby Store	Bagel Shop
0	Berczy Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.021277	0.000000	0.000000	0.000000	0.000000	0.021277
1	CN Tower, King and Spadina, Railway Lands, Har...	0.000000	0.000000	0.000000	0.071429	0.071429	0.071429	0.071429	0.214286	0.142857	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	Central Bay Street	0.015873	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.015873	0.000000	0.000000	0.000000	0.000000
3	Christie	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.071429	0.000000
4	Church and Wellesley	0.014706	0.014706	0.014706	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.014706	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5	Commerce Court, Victoria Hotel	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.020000	0.000000	0.00	0.010000	0.000000	0.030000	0.000000	0.000000	0.010000

Screenshot of the table indicating the first few rows of `toronto_grouped`.

Each neighborhood was printed along with the top 5 most common venues. A function called `return_most_common_venues` was created to sort the venues in descending order. A new dataframe called `neighborhoods_venues_sorted` was created by passing the function to return the top 10 venues for each neighborhood.

	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
0	Berczy Park	Cocktail Bar	Coffee Shop	Sandwich Place	Bakery	Farmers Market	Beer Bar	Seafood Restaurant	Vegetarian / Vegan Restaurant	Lounge	Bistro
1	CN Tower, King and Spadina, Railway Lands, Har...	Airport Service	Airport Terminal	Airport Lounge	Plane	Rental Car Location	Harbor / Marina	Boat or Ferry	Airport Gate	Airport Food Court	Airport
2	Central Bay Street	Coffee Shop	Sandwich Place	Sushi Restaurant	Café	Italian Restaurant	Japanese Restaurant	Pizza Place	Burger Joint	Bank	Salad Place
3	Christie	Grocery Store	Café	Park	Restaurant	Nightclub	Coffee Shop	Baby Store	Italian Restaurant	College Arts Building	Discount Store
4	Church and Wellesley	Japanese Restaurant	Sushi Restaurant	Gay Bar	Restaurant	Coffee Shop	Indian Restaurant	Pub	Fast Food Restaurant	Mediterranean Restaurant	Burrito Place

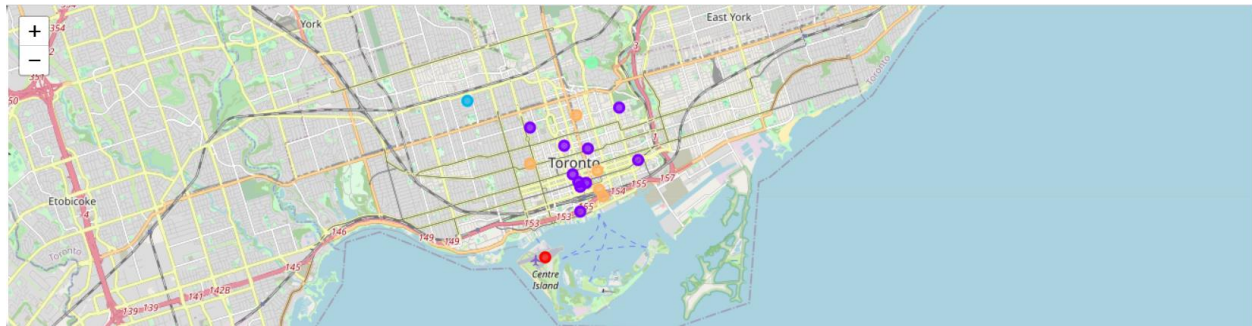
Screenshot of the table indicating the first 5 rows of `neighborhoods_venues_sorted` for Downtown Toronto.

After this, the clustering and segmentation of the neighborhoods was carried out. The k-means was designated to 5 to cluster the neighborhood. The k-means clustering algorithm was ran and the cluster labels were generated and checked for each row in the dataframe. A new dataframe called `toronto_merged` was created by merging, the downtown Toronto neighborhood dataset, cluster labels and the `neighborhoods_venue_sorted` dataset.

PostalCode	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	10th Most Common Venue
0	MSA	Downtown Toronto	Regent Park, Harbourfront	43.654260 -79.360636	1	Coffee Shop	Park	Pub	Bakery	Restaurant	Café	Historic Site	Chocolate Shop	Sandwich Place	Beer Store
1	MSB	Downtown Toronto	Garden District, Ryerson	43.657162 -79.378937	1	Coffee Shop	Clothing Store	Sandwich Place	Café	Japanese Restaurant	Pizza Place	Hotel	Cosmetics Shop	Bank	Middle Eastern Restaurant
2	MSC	Downtown Toronto	St James Town	43.651494 -79.375418	4	Coffee Shop	Café	Italian Restaurant	Cocktail Bar	Restaurant	Clothing Store	Gastropub	Farmers Market	Diner	Department Store
3	MSE	Downtown Toronto	Berczy Park	43.644771 -79.373306	4	Cocktail Bar	Coffee Shop	Sandwich Place	Bakery	Farmers Market	Beer Bar	Seafood Restaurant	Vegetarian / Vegan Restaurant	Lounge	Bistro
4	MSG	Downtown Toronto	Central Bay Street	43.657952 -79.387383	1	Coffee Shop	Sandwich Place	Sushi Restaurant	Café	Italian Restaurant	Japanese Restaurant	Pizza Place	Burger Joint	Bank	Salad Place

Screenshot of the table indicating the first 5 rows of `toronto_merged`.

The resulting clusters were visualized on a map.



Map of Downtown Toronto indicating the locations of each neighborhood cluster.

The same, was repeated for the Manhattan dataset. The Foursquare API was utilized again to run the function that was created previously to return the categories of the venues and then the next function to get the nearby venues in all the neighborhoods of the Manhattan dataset. Before running these functions, the radius and limit of parameter of was set to 500 and 100 for the GET request URL. The function was then ran on each neighborhood and a new dataframe called `manhattan_venues` was created. By running these functions, venues were returned by the Foursquare API and each venue was listed out.

Using one hot encoding, each neighborhood was analyzed. Whichever venue had popped up in the neighborhood, a “1” would appear on the table. Afterwards, another dataset called `manhattan_grouped` was created by grouping rows by neighborhood and by taking the mean of the frequency of occurrence of each category. The following indicates how the dataset looks:

	Neighborhood	Accessories Store	Adult Boutique	Afghan Restaurant	African Restaurant	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auditorium	Australian Restaurant	Austrian Restaurant	Auto Workshop	BBQ Joint
0	Battery Park City	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.015873	0.015873	0.000000	0.00	0.000	0.015873
1	Carnegie Hill	0.000000	0.000000	0.00	0.000000	0.013889	0.000000	0.000000	0.000000	0.027778	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000	0.000000
2	Central Harlem	0.000000	0.000000	0.00	0.076923	0.051282	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000	0.025641
3	Chelsea	0.000000	0.000000	0.00	0.000000	0.020000	0.000000	0.000000	0.080000	0.000000	0.000000	0.010000	0.000000	0.000000	0.000000	0.00	0.000	0.000000
4	Chinatown	0.000000	0.000000	0.00	0.000000	0.030000	0.000000	0.000000	0.010000	0.000000	0.000000	0.020000	0.000000	0.000000	0.010000	0.01	0.000	0.000000
5	Civic Center	0.000000	0.000000	0.00	0.000000	0.022989	0.011494	0.000000	0.022989	0.000000	0.000000	0.011494	0.000000	0.000000	0.011494	0.00	0.000	0.000000
6	Clinton	0.000000	0.000000	0.00	0.000000	0.050000	0.000000	0.000000	0.010000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000	0.000000
7	East Harlem	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000	0.000000

Screenshot of the table indicating the first few rows of `manhattan_grouped`.

Each neighborhood was printed along with the top 5 most common venues. The function called `return_most_common_venues` which was previously created, was used to sort the venues in descending order. A new dataframe called `neighborhoods_venues_sorted` was created by passing the function to return the top 10 venues for each neighborhood.

	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
0	Battery Park City	Park	Hotel	Pizza Place	Coffee Shop	Gym	Memorial Site	Food Court	Shopping Mall	Sandwich Place	Chinese Restaurant
1	Carnegie Hill	Wine Shop	Pizza Place	Cosmetics Shop	Coffee Shop	Gym	Café	Yoga Studio	Art Museum	Japanese Restaurant	Gym / Fitness Center
2	Central Harlem	African Restaurant	Bar	French Restaurant	American Restaurant	Sandwich Place	Gym / Fitness Center	Seafood Restaurant	Park	Library	Beer Bar
3	Chelsea	Art Gallery	Bakery	Coffee Shop	Italian Restaurant	Theater	Ice Cream Shop	French Restaurant	Bookstore	Tapas Restaurant	Cycle Studio
4	Chinatown	Bakery	Chinese Restaurant	Cocktail Bar	Dessert Shop	Salon / Barbershop	Noodle House	Ice Cream Shop	American Restaurant	Spa	Optical Shop

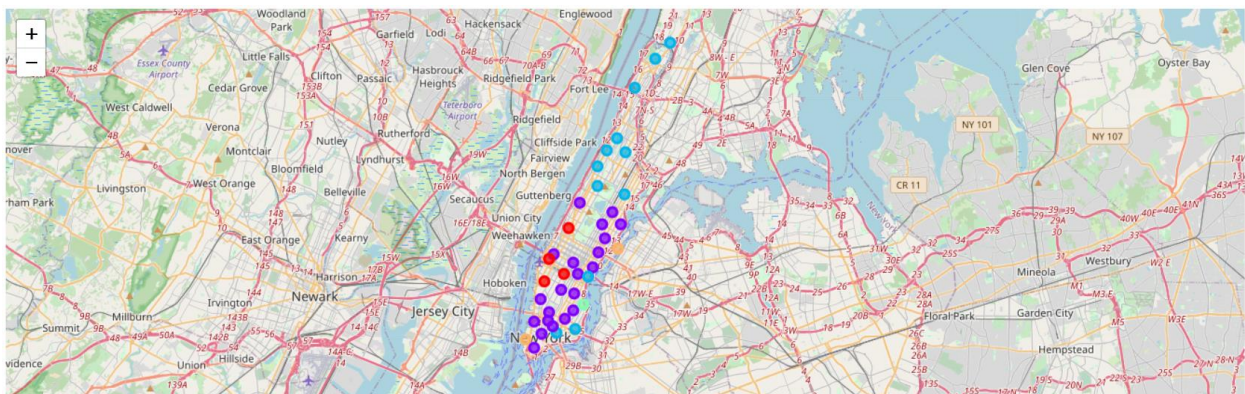
Screenshot of the table indicating the first 5 rows of neighborhoods_venue_sorted for Manhattan.

After this, the clustering and segmentation of the neighborhoods was carried out. The k-means was designated to 5 to cluster the neighborhood. The k-means clustering algorithm was ran and the cluster labels were generated and checked for each row in the dataframe. A new dataframe called manhattan_merged was created by merging, the Manhattan neighborhood dataset, cluster labels and the neighborhoods_venues_sorted dataset.

	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	10th Most Common Venue
0	Manhattan	Marble Hill	40.876551	-73.910660	2	Sandwich Place	Yoga Studio	Diner	Supplement Shop	Storage Facility	Steakhouse	Clothing Store	Coffee Shop	Seafood Restaurant	Department Store
1	Manhattan	Chinatown	40.715618	-73.994279	2	Bakery	Chinese Restaurant	Cocktail Bar	Dessert Shop	Salon / Barbershop	Noodle House	Ice Cream Shop	American Restaurant	Spa	Optical Shop
2	Manhattan	Washington Heights	40.851903	-73.936900	2	Café	Pizza Place	Grocery Store	Mobile Phone Shop	Bank	Bakery	Chinese Restaurant	Supplement Shop	Tapas Restaurant	Coffee Shop
3	Manhattan	Inwood	40.867684	-73.921210	2	Mexican Restaurant	Lounge	Café	Deli / Bodega	Bakery	Bank	Park	Pizza Place	Chinese Restaurant	Caribbean Restaurant
4	Manhattan	Hamilton Heights	40.823604	-73.949688	2	Pizza Place	Café	Mexican Restaurant	Sandwich Place	Yoga Studio	Juice Bar	Cocktail Bar	Bakery	Latin American Restaurant	Park

Screenshot of the table indicating the first 5 rows of manhattan_merged.

The resulting clusters were visualized on a map.



Map of Manhattan indicating the locations of each neighborhood cluster.

4. Results

Both cities were segmented by 5 neighborhood clusters. Examining each cluster will allow for determination on distinctive venue categories that distinguish each cluster. Based on defining categories, each cluster is assigned a name. The clusters for Downtown Toronto are listed as follows:

Cluster 1

	Borough	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	10th Most Common Venue
12	Downtown Toronto	0	Airport Service	Airport Terminal	Airport Lounge	Plane	Rental Car Location	Harbor / Marina	Boat or Ferry	Airport Gate	Airport Food Court	Airport

Cluster 2

	Borough	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	10th Most Common Venue
0	Downtown Toronto	1	Coffee Shop	Park	Pub	Bakery	Restaurant	Café	Historic Site	Chocolate Shop	Sandwich Place	Beer Store
1	Downtown Toronto	1	Coffee Shop	Clothing Store	Sandwich Place	Café	Japanese Restaurant	Pizza Place	Hotel	Cosmetics Shop	Bank	Middle Eastern Restaurant
4	Downtown Toronto	1	Coffee Shop	Sandwich Place	Sushi Restaurant	Café	Italian Restaurant	Japanese Restaurant	Pizza Place	Burger Joint	Bank	Salad Place
6	Downtown Toronto	1	Coffee Shop	Café	Sandwich Place	Clothing Store	Gym	Sushi Restaurant	Restaurant	Deli / Bodega	Pizza Place	Burrito Place
7	Downtown Toronto	1	Coffee Shop	Café	Hotel	Aquarium	Scenic Lookout	Pizza Place	Steakhouse	Park	Bank	Brewery
8	Downtown Toronto	1	Coffee Shop	Café	Sandwich Place	Hotel	Asian Restaurant	Pharmacy	Restaurant	Salad Place	Deli / Bodega	Bakery
9	Downtown Toronto	1	Coffee Shop	Sandwich Place	Café	Hotel	Restaurant	Gym	Japanese Restaurant	Asian Restaurant	Bank	Deli / Bodega
10	Downtown Toronto	1	Café	Coffee Shop	Sandwich Place	Pub	Japanese Restaurant	Bar	Bakery	Gym	Comfort Food Restaurant	Beer Store
15	Downtown Toronto	1	Coffee Shop	Pub	Pizza Place	Restaurant	Italian Restaurant	Café	Bakery	Diner	Deli / Bodega	Beer Store
16	Downtown Toronto	1	Coffee Shop	Sandwich Place	Café	Hotel	Gym	Bank	Japanese Restaurant	Asian Restaurant	Deli / Bodega	Restaurant

Cluster 3

	Borough	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	10th Most Common Venue
8	Downtown Toronto	2	Grocery Store	Café	Park	Restaurant	Nightclub	Coffee Shop	Baby Store	Italian Restaurant	College Arts Building	Discount Store

Cluster 4

	Borough	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	10th Most Common Venue
13	Downtown Toronto	3	Park	Playground	Trail	Concert Hall	Discount Store	Diner	Dessert Shop	Department Store	Deli / Bodega	Dance Studio

Cluster 5

	Borough	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	10th Most Common Venue
2	Downtown Toronto	4	Coffee Shop	Café	Italian Restaurant	Cocktail Bar	Restaurant	Clothing Store	Gastropub	Farmers Market	Diner	Department Store
3	Downtown Toronto	4	Cocktail Bar	Coffee Shop	Sandwich Place	Bakery	Farmers Market	Beer Bar	Seafood Restaurant	Vegetarian / Vegan Restaurant	Lounge	Bistro
11	Downtown Toronto	4	Café	Vegetarian / Vegan Restaurant	Coffee Shop	Gaming Cafe	Bar	Bakery	Arts & Crafts Store	Burger Joint	Mexican Restaurant	Vietnamese Restaurant
14	Downtown Toronto Stn A	4	Sandwich Place	Coffee Shop	Cocktail Bar	Italian Restaurant	Bank	Bakery	Café	Japanese Restaurant	Beer Bar	Hotel
17	Downtown Toronto	4	Japanese Restaurant	Sushi Restaurant	Gay Bar	Restaurant	Coffee Shop	Indian Restaurant	Pub	Fast Food Restaurant	Mediterranean Restaurant	Burrito Place

First, looking at cluster 1, it can be observed that the common venues were those of airport relation. This meant that this single borough was likely to be in proximity with the airport. In cluster 2, it seemed that the most common venue was coffee shops, parks, sandwich places or cafes for 10 boroughs. Clusters 3 and 4 have both single boroughs in them. In cluster 3, the first 3 common venues are those like cluster 2, however, in cluster 4, the top 3 common venues were park, playground and trail. Cluster 5 comprised of 5 boroughs in which, have a diverse set of venues ranging from coffee shops, to cocktail bars, to restaurants of diverse ethnic cuisines.

The clusters of Manhattan are as follows:

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Hareen Subramaniam

Coursera Capstone Final Project

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	10th Most Common Venue
13	Lincoln Square	Concert Hall	Café	Plaza	Theater	Performing Arts Venue	Indie Movie Theater	Bakery	Gym / Fitness Center	Coffee Shop	Hotel
17	Chelsea	Art Gallery	Bakery	Coffee Shop	Italian Restaurant	Theater	Ice Cream Shop	French Restaurant	Bookstore	Tapas Restaurant	Cycle Studio
33	Midtown South	Korean Restaurant	Hotel	Hotel Bar	Bakery	Gym / Fitness Center	Café	Coffee Shop	Salad Place	Cosmetics Shop	Dessert Shop
39	Hudson Yards	American Restaurant	Gym / Fitness Center	Park	Restaurant	Gym	Hotel	Italian Restaurant	Coffee Shop	Clothing Store	Music School

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	10th Most Common Venue
8	Upper East Side	Italian Restaurant	Exhibit	Spa	Bakery	Coffee Shop	Juice Bar	Yoga Studio	American Restaurant	Hotel	Wine Shop
9	Yorkville	Italian Restaurant	Coffee Shop	Sushi Restaurant	Japanese Restaurant	Gym	Wine Shop	Deli / Bodega	Diner	Cosmetics Shop	Bar
10	Lenox Hill	Italian Restaurant	Café	Pizza Place	Bank	Gym	Burger Joint	Sushi Restaurant	Gym / Fitness Center	Cocktail Bar	Coffee Shop
12	Upper West Side	Italian Restaurant	Bakery	Café	Coffee Shop	Wine Bar	Vegetarian / Vegan Restaurant	Seafood Restaurant	Middle Eastern Restaurant	Cosmetics Shop	Mediterranean Restaurant
14	Clinton	Theater	Coffee Shop	Italian Restaurant	Sandwich Place	American Restaurant	Gym	Gym / Fitness Center	Spa	Pizza Place	Juice Bar
15	Midtown	Clothing Store	Hotel	Coffee Shop	Spa	Theater	Bakery	Food Truck	Bookstore	Sushi Restaurant	Sandwich Place
16	Murray Hill	Coffee Shop	American Restaurant	Japanese Restaurant	Gym / Fitness Center	Spa	Sandwich Place	Pizza Place	Sushi Restaurant	Taco Place	Hotel
18	Greenwich Village	Italian Restaurant	Dessert Shop	Sushi Restaurant	Clothing Store	Coffee Shop	Café	Indian Restaurant	Oummet Shop	Spa	Japanese Restaurant
19	East Village	Bar	Vegetarian / Vegan Restaurant	Pizza Place	Wine Bar	Ice Cream Shop	Vietnamese Restaurant	Coffee Shop	Korean Restaurant	Mexican Restaurant	Dessert Shop
21	Tribeca	Spa	Park	Italian Restaurant	Café	Greek Restaurant	Skate Park	Cocktail Bar	Scenic Lookout	Coffee Shop	Basketball Court
22	Little Italy	Bakery	Italian Restaurant	Café	Clothing Store	Hotel	Ice Cream Shop	Sandwich Place	Pizza Place	Spa	Salon / Barbershop
23	Soho	Clothing Store	Italian Restaurant	Shoe Store	Bakery	Boutique	Salon / Barbershop	Café	Women's Store	Coffee Shop	Dessert Shop
24	West Village	Italian Restaurant	Cocktail Bar	Park	New American Restaurant	Coffee Shop	Wine Bar	American Restaurant	Jazz Club	Seafood Restaurant	Theater
27	Gramercy	Italian Restaurant	Pizza Place	Coffee Shop	Sandwich Place	Spa	Mexican Restaurant	Taco Place	Bagel Shop	Ice Cream Shop	Park
29	Financial District	Coffee Shop	Pizza Place	American Restaurant	Gym / Fitness Center	Falafel Restaurant	Wine Shop	Cocktail Bar	Steakhouse	Italian Restaurant	Mexican Restaurant
30	Carnegie Hill	Wine Shop	Pizza Place	Cosmetics Shop	Coffee Shop	Gym	Café	Yoga Studio	Art Museum	Japanese Restaurant	Gym / Fitness Center
31	NoHo	Italian Restaurant	Cocktail Bar	Pizza Place	Bookstore	Japanese Restaurant	Coffee Shop	Art Gallery	Grocery Store	Wine Bar	Hotel
32	Civic Center	Coffee Shop	Spa	Gym / Fitness Center	French Restaurant	Cocktail Bar	Hotel	Yoga Studio	Falafel Restaurant	Bakery	Café
34	Sutton Place	Italian Restaurant	Hotel	Pizza Place	Spa	Gym / Fitness Center	Mexican Restaurant	Park	Steakhouse	Mediterranean Restaurant	Bar
35	Turtle Bay	Italian Restaurant	Park	Deli / Bodega	Steakhouse	Coffee Shop	French Restaurant	Sushi Restaurant	Seafood Restaurant	Plaza	Café
38	Flatiron	Italian Restaurant	American Restaurant	Spa	Japanese Restaurant	New American Restaurant	Mediterranean Restaurant	Wine Shop	Gym / Fitness Center	Coffee Shop	Yoga Studio

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
0	Marble Hill	Sandwich Place	Yoga Studio	Diner	Supplement Shop	Storage Facility	Steakhouse	Clothing Store	Coffee Shop	Seafood Restaurant	Department Store
1	Chinatown	Bakery	Chinese Restaurant	Cocktail Bar	Dessert Shop	Salon / Barbershop	Noodle House	Ice Cream Shop	American Restaurant	Spa	Optical Shop
2	Washington Heights	Café	Pizza Place	Grocery Store	Mobile Phone Shop	Bank	Bakery	Chinese Restaurant	Supplement Shop	Tapas Restaurant	Coffee Shop
3	Inwood	Mexican Restaurant	Lounge	Café	Deli / Bodega	Bakery	Bank	Park	Pizza Place	Chinese Restaurant	Caribbean Restaurant
4	Hamilton Heights	Pizza Place	Café	Mexican Restaurant	Sandwich Place	Yoga Studio	Juice Bar	Cocktail Bar	Bakery	Latin American Restaurant	Park
5	Manhattanville	Sushi Restaurant	Bank	Italian Restaurant	Coffee Shop	Deli / Bodega	Mexican Restaurant	Seafood Restaurant	Lounge	Thrift / Vintage Store	Cuban Restaurant
6	Central Harlem	African Restaurant	Bar	French Restaurant	American Restaurant	Sandwich Place	Gym / Fitness Center	Seafood Restaurant	Park	Library	Beer Bar
7	East Harlem	Bakery	Mexican Restaurant	Pizza Place	Bank	Deli / Bodega	Sandwich Place	Steakhouse	Café	French Restaurant	Beer Bar
20	Lower East Side	Café	Pizza Place	Bakery	Pharmacy	Sandwich Place	Art Gallery	Chinese Restaurant	Cocktail Bar	Tailor Shop	Mexican Restaurant
25	Manhattan Valley	Yoga Studio	Bar	Coffee Shop	Vietnamese Restaurant	Playground	Pizza Place	Park	Bubble Tea Shop	Café	Caribbean Restaurant
26	Morningside Heights	Café	Bookstore	Deli / Bodega	Burger Joint	Coffee Shop	Sandwich Place	Park	American Restaurant	Supermarket	Supplement Shop
36	Tudor City	Park	Café	Deli / Bodega	Mexican Restaurant	Bank	Restaurant	Thai Restaurant	Gym / Fitness Center	Pizza Place	Greek Restaurant

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	10th Most Common Venue
37	Stuyvesant Town	Boat or Ferry	Park	Yoga Studio	Farmers Market	Fountain	Bistro	Harbor / Marina	Cocktail Bar	Coffee Shop	Heliport

Cluster 5

	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
11	Roosevelt Island	Park	Coffee Shop	Deli / Bodega	Supermarket	Bubble Tea Shop	Soccer Field	Farmers Market	Outdoors & Recreation	Food & Drink Shop	Sandwich Place
28	Battery Park City	Park	Hotel	Pizza Place	Coffee Shop	Gym	Memorial Site	Food Court	Shopping Mall	Sandwich Place	Chinese Restaurant

Considering clusters 1, 2 & 3, they both have many neighborhoods in within their vicinities. A plethora of places such as concert halls, art galleries, diverse restaurants can be found. However, looking at clusters 4 and 5, these are clusters wherein there are only 1 or 2 neighborhoods. In cluster 4, the common venues are boat related which suggests that this neighborhood is near to the pier. In cluster 5, this

neighborhood is close to the park as the 1st most common venue in both neighborhoods were denoted as parks.

5. Observations & Recommendations

When comparing both cities, they are both unique and diverse in their own ways. Toronto seems to be a quieter and calmer city compared to New York city. They both have pretty similar venues but it does seem that there are far more tourist attractions in the city of New York than in Toronto. For someone who loves the hustle and bustle lifestyle or would love to open a restaurant for the purposes of immigrating, the city of New York would seem more appropriate to be the recommendation to migrate to. Specifically, clusters 2 or 3 as they seem to be the best amongst the five clusters that were analyzed due to the proximities of many common venues to those neighborhoods.

However, for someone who loves city lifestyle but rather not so “on-the-go”, Toronto would be more suitable. Cluster 1 would not be highly recommended as it is close by the airport which results in a lot of traffic noises which could be quite distracting and annoying. The best clusters would be cluster 2 as there are coffee shops, parks, sandwich places or cafes for over 10 boroughs.

6. Conclusion

In this study, the relationship between the clusters of each neighborhood and their performance was for each city was analyzed and reviewed. Both cities have their similarities as well as their dissimilarities. From one aspect, in terms of common venues, both cities have cafes, parks, coffee shops, gyms, shops, restaurants, etc. However, the difference lies were in historical landmarks and tourist attractions. From the maps, we can see that the island of Manhattan has a lot of venues for a smaller land area compared to Downtown Toronto.

Both areas focused on this study are unique in their own ways. In terms of migration, if migrating to settle down in a quieter neighborhood, Toronto would be a more suitable city to do so. However, for the purposes of migrating in opening a restaurant, museum, etc. both cities are appropriate.