



APPLIED DATA SCIENCE CAPSTONE

Final Assignment Report

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1. Introduction

Background

New York City (NYC) and Toronto are located in North America and are major financial hubs in the world. They are made up of different skyscrapers and business centers. Both are very cosmopolitan and have dynamic life style. Apart from the commercial perspective, they also build with many high-rise residential buildings. Many Global organization around the world have office located in these 2 countries. Many people often relocate from other countries to these 2 cities and working in the central business district (CBD) areas. They may not be aware of the similarities or differences in these 2 cities. One of the examples is related to the ethnic makeups in NYC and Toronto. NYC has a much larger Black and Latino population, whereas Toronto has proportionally more Asians and Indians. Hence the likelihood of NYC having more America or south America Restaurant than Toronto is higher.

The target audience for this project is the expatriate who will move to either cities and will work on the CBD areas. Hence the scopes will focus on the Manhattan New York and East, downtown, central and West Toronto areas

Problem and Interests

Given the diversity of the culture, this project will compare the following neighbourhoods of these two cities and determine how similar or dissimilar they are. In total,

- Manhattan consists of 40 neighbourhoods
- East, downtown, central and West Toronto consists of 39 neighbourhoods

It will focus on 3 topics

- Difference of the venue category between these 2 cities.
- Difference between the food culture based on the type of restaurant.
- Both cities will be independently split into clusters by neighbourhood. And then comparison between clusters will be done and identify similarity based on the venue category

It meant to provide the information for expatriates who plan to live in the neighbourhoods around the CBD areas so that they choose the neighbourhoods best suit to their life style and needs.

2. Data

Source of Data, Data Acquisition and Cleansing

Two data sets, one for Manhattan, one for Toronto, created from the previous labs or projects of the training course will be used as the source of data. These datasets have already populated with the information of the boroughs and neighbourhoods of NYC and Toronto as well as the respective latitudes and longitudes.

Before the data analysis, the neighbourhood candidates (NC) need to be filtered from the source of datasets. The outcome will have 2 datasets.

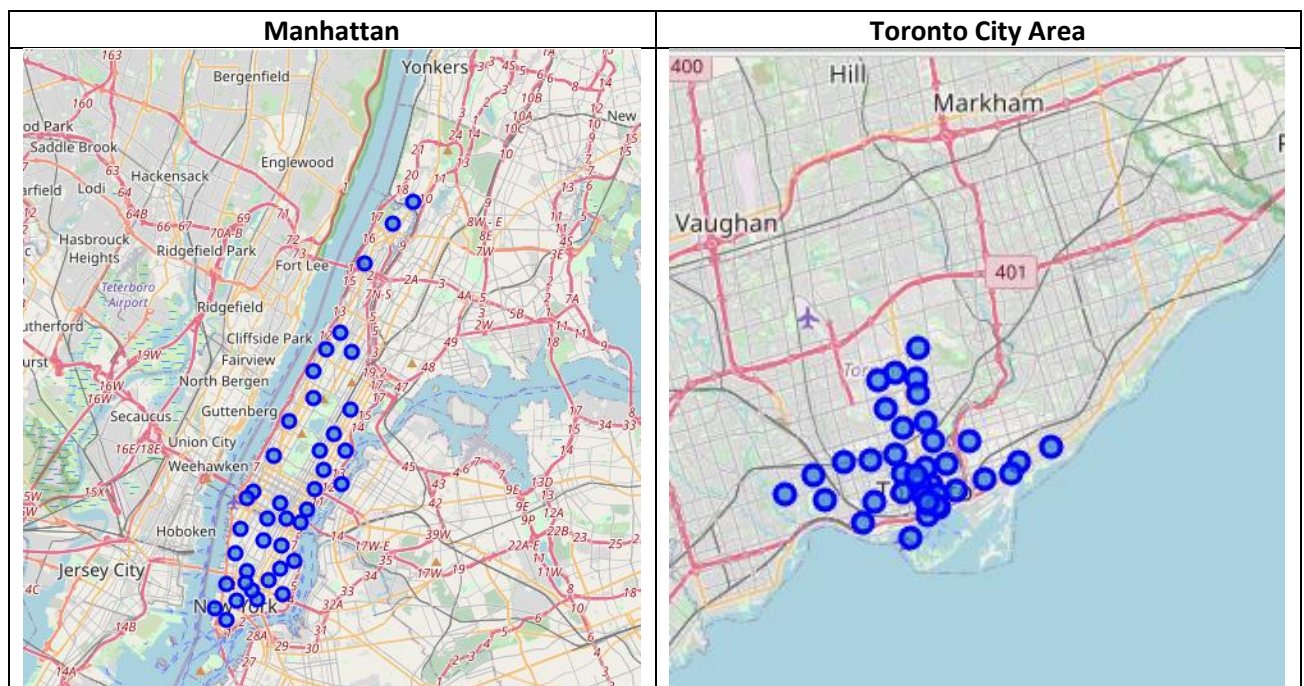
- Neighbourhood Candidates Set A - represent the 40 neighbourhoods of Manhattan. The sample data is as follows

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

- Neighbourhood Candidates Set B - represent the 39 neighbourhoods of East, downtown, central and West Toronto. The sample data is as follows

	number	Postal Code	Borough	Neighbourhood	Latitude	Longitude
	38	37.0	M4E	East Toronto	The Beaches	43.67635739999999 -79.2930312
	42	41.0	M4K	East Toronto	The Danforth West, Riverdale	43.6795571 -79.352188
	43	42.0	M4L	East Toronto	India Bazaar, The Beaches West	43.6689985 -79.31557159999998
	44	43.0	M4M	East Toronto	Studio District	43.6595255 -79.340923
	45	44.0	M4N	Central Toronto	Lawrence Park	43.7280205 -79.3887901

Then, the geographical locations of the neighbourhoods will be reviewed to ensure the neighbourhoods are next to each other to ensure they are not scattered too far apart.



Features selection

The venues and venue categories will be the key features for the analysis. Hence, Foursquare API will be used to extract the revenues and revenue categories of all the neighbourhoods for these 2 cities. These data will combine with the datasets Set A and Set B to create new datasets that have the neighbourhoods and the revenue categories.

3. Methodology

After the data source have been loaded into the data frame with data cleansing and filtering, Foursquare API will be used to collect the venues, latitudes, longitudes and venue categories for the neighbourhoods of Manhattan and Toronto City area.

To address the 1st audience interest, multiple datasets will be created to store venue categories followed by using "**SET**" operations to identify

- The common venue categories for both cities.
- The venue categories existed in Manhattan but not in Toronto City Area.
- The venue categories existed in Toronto City but not in Manhattan.

Difference between the food culture based on the type of restaurant will be the 2nd part of interest in this project. The "Restaurant" will be the key word to extract the records from the previous datasets and conduct an analysis or comparison.

Finally, the similarity of neighbourhood based on the venue category will be assessed. To do that, **one hot encoding** will be use to split the column which contains numerical categorical data to many columns depending on the number of categories present in that column. Both cities will be independently split into clusters by neighbourhood using cluster algorithm "**k-means**"; and the comparing the clusters and surface out the similarity based on the venue category

4. Analysis

To start the data exploratory analysis, I will explore the venues of Toronto City Center and Manhattan. The Foursquare API will be used to collect the information. To trigger the FourSquire API, the credentials and API parameters will be prepared.

As multiple invocations of FourSquare API are required to extract the complete information, a function called "getNearbyVenues" is defined to get near by venues, latitudes, longitudes and the venue categories. Then this function will be triggered separately to get the near by venues for Toronto City and Manhattan.

The followings show the neighbourhoods, near by venues, latitudes, longitudes and the venue categories for both Toronto City and Manhattan.

Toronto City

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	The Beaches	43.67635739999999	-79.2930312	Glen Manor Ravine	43.676821	-79.293942	Trail
1	The Beaches	43.67635739999999	-79.2930312	The Big Carrot Natural Food Market	43.678879	-79.297734	Health Food Store
2	The Beaches	43.67635739999999	-79.2930312	Grover Pub and Grub	43.679181	-79.297215	Pub
3	The Beaches	43.67635739999999	-79.2930312	Upper Beaches	43.680563	-79.292869	Neighborhood
4	The Beaches	43.67635739999999	-79.2930312	Dip 'n Sip	43.678897	-79.297745	Coffee Shop

Manhattan							
	Neighbourhood	Neighbourhood Latitude	Neighbourhood 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	Bikram Yoga	40.876844	-73.906204	Yoga Studio
2	Marble Hill	40.876551	-73.91066	Tibbett Diner	40.880404	-73.908937	Diner
3	Marble Hill	40.876551	-73.91066	Starbucks	40.877531	-73.905582	Coffee Shop
4	Marble Hill	40.876551	-73.91066	Dunkin'	40.877136	-73.906666	Donut Shop

4.1. Difference of the venue category between these 2 cities

After the creation of the 2 data frames above, the extraction of the venue categories will be done followed by conversions of the columns to "SET" data type to analyse the similarity and the differences between the neighbourhoods in both cities. The followings show the

- common venue categories in both cities
- venue categories in Manhattan but not in Toronto
- venue categories in Toronto City but not in Manhattan

Common Venue Categories	venue categories in Manhattan but not in Toronto	venue categories in Toronto City but not in Manhattan
{'Adult Boutique', 'American Restaurant', 'Antique Shop', 'Art Gallery', 'Art Museum', 'Arts & Crafts Store', 'Asian Restaurant', 'Athletics & Sports', 'BBQ Joint', 'Baby Store', 'Bagel Shop', 'Bakery', 'Bank', 'Bar', 'Bed & Breakfast', 'Beer Bar', 'Beer Store', 'Bike Rental / Bike Share', 'Bistro', 'Boat or Ferry', 'Bookstore', 'Boutique', 'Brazilian Restaurant', 'Breakfast Spot', 'Bubble Tea Shop', 'Building', 'Burger Joint', 'Burrito Place', 'Bus Line', 'Butcher', 'Café', 'Cajun / Creole Restaurant',	{'Accessories Store', 'Afghan Restaurant', 'African Restaurant', 'Arepa Restaurant', 'Argentinian Restaurant', 'Auditorium', 'Australian Restaurant', 'Austrian Restaurant', 'Badminton Court', 'Baseball Field', 'Basketball Court', 'Beer Garden', 'Big Box Store', 'Bike Shop', 'Bike Trail', 'Board Shop', 'Boxing Gym', 'Bridal Shop', 'Bridge', 'Bus Station', 'Cafeteria', 'Camera Store', 'Cantonese Restaurant', 'Cha Chaa Teng', 'Christmas Market', 'Circus', 'Club House', 'College Academic Building', 'College Bookstore', 'College Theater', 'Comedy Club', 'Community Center',	'Airport', 'Airport Food Court', 'Airport Gate', 'Airport Lounge', 'Airport Service', 'Airport Terminal', 'Aquarium', 'Auto Workshop', 'Baseball Stadium', 'Basketball Stadium', 'Beach', 'Belgian Restaurant', 'Brewery', 'Church', 'College Auditorium', 'College Gym', 'College Rec Center', 'Colombian Restaurant', 'Comfort Food Restaurant', 'Comic Shop', 'Coworking Space', 'Distribution Center', 'Doner Restaurant', 'Fish & Chips Shop', 'Fruit & Vegetable Store', 'General Travel', 'Gluten-free Restaurant', 'Home Service', 'Hospital', 'IT Services', 'Lake', 'Lawyer',

'Candy Store', 'Caribbean Restaurant', 'Cheese Shop', 'Chinese Restaurant', 'Chocolate Shop', 'Climbing Gym', 'Clothing Store', 'Cocktail Bar', 'Coffee Shop', 'College Arts Building', 'College Cafeteria', 'Concert Hall', 'Convenience Store', 'Cosmetics Shop', 'Creperie', 'Cuban Restaurant', 'Cupcake Shop', 'Dance Studio', 'Deli / Bodega', 'Department Store', 'Dessert Shop', 'Diner', 'Discount Store', 'Dog Run', 'Donut Shop', 'Dumpling Restaurant', 'Eastern European Restaurant', 'Electronics Store', 'Ethiopian Restaurant', 'Event Space', 'Falafel Restaurant', 'Farmers Market', 'Fast Food Restaurant', 'Filipino Restaurant', 'Fish Market', 'Flea Market', 'Flower Shop', 'Food & Drink Shop', 'Food Court', 'Food Truck', 'Fountain', 'French Restaurant', 'Fried Chicken Joint', 'Frozen Yogurt Shop', 'Furniture / Home Store', 'Gaming Cafe', 'Garden', 'Garden Center', 'Gas Station', 'Gastropub', 'Gay Bar', 'General Entertainment', 'German Restaurant', 'Gift Shop', 'Gourmet Shop', 'Greek Restaurant', 'Grocery Store', 'Gym', 'Gym / Fitness Center', 'Harbor / Marina', 'Health & Beauty Service', 'Health Food Store', 'Historic Site', 'History Museum', 'Hobby Shop', 'Hookah Bar', 'Hotel', 'Hotel Bar', 'Ice Cream Shop', 'Indian Restaurant', 'Indie Movie Theater',	'Cooking School', 'Cycle Studio', 'Czech Restaurant', 'Daycare', 'Dim Sum Restaurant', 'Dive Bar', 'Doctor's Office', 'Drugstore', 'Dry Cleaner', 'Duty-free Shop', 'Empanada Restaurant', 'English Restaurant', 'Exhibit', 'Eye Doctor', 'Food Stand', 'Golf Course', 'Gym Pool', 'Gymnastics Gym', 'Hardware Store', 'Hawaiian Restaurant', 'Helipoint', 'High School', 'Hill', 'Himalayan Restaurant', 'Hostel', 'Hot Dog Joint', 'Hotpot Restaurant', 'Indie Theater', 'Israeli Restaurant', 'Japanese Curry Restaurant', 'Jewish Restaurant', 'Karaoke Bar', 'Kebab Restaurant', 'Kids Store', 'Kitchen Supply Store', 'Kosher Restaurant', 'Laundry Service', 'Lebanese Restaurant', 'Library', 'Malay Restaurant', 'Massage Studio', 'Mattress Store', 'Medical Center', 'Memorial Site', 'Mini Golf', 'Mobile Phone Shop', 'Music School', 'Music Store', 'Nail Salon', 'Newsstand', 'Non-Profit', 'North Indian Restaurant', 'Outdoor Sculpture', 'Outdoors & Recreation', 'Paella Restaurant', 'Paper / Office Supplies Store', 'Pedestrian Plaza', 'Persian Restaurant', 'Peruvian Restaurant', 'Pet Café', 'Pet Service', 'Photography Studio', 'Physical Therapist', 'Pie Shop', 'Pier', 'Pilates Studio', 'Public Art', 'Residential Building (Apartment / Condo)', 'Resort', 'Rest Area',	'Light Rail Station', 'Neighborhood', 'Other Great Outdoors', 'Plane', 'Poutine Place', 'Sculpture Garden', 'Stadium', 'Stationery Store', 'Swim School', 'Tanning Salon', 'Theme Restaurant', 'Tibetan Restaurant'
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'Intersection', 'Irish Pub', 'Italian Restaurant', 'Japanese Restaurant', 'Jazz Club', 'Jewelry Store', 'Juice Bar', 'Korean Restaurant', 'Latin American Restaurant', 'Lingerie Store', 'Liquor Store', 'Lounge', 'Market', 'Martial Arts School', 'Mediterranean Restaurant', 'Men's Store', 'Metro Station', 'Mexican Restaurant', 'Middle Eastern Restaurant', 'Miscellaneous Shop', 'Modern European Restaurant', 'Molecular Gastronomy Restaurant', 'Monument / Landmark', 'Moroccan Restaurant', 'Movie Theater', 'Museum', 'Music Venue', 'New American Restaurant', 'Nightclub', 'Noodle House', 'Office', 'Opera House', 'Optical Shop', 'Organic Grocery', 'Park', 'Performing Arts Venue', 'Pet Store', 'Pharmacy', 'Pizza Place', 'Playground', 'Plaza', 'Poke Place', 'Pool', 'Portuguese Restaurant', 'Post Office', 'Pub', 'Ramen Restaurant', 'Record Shop', 'Rental Car Location', 'Restaurant', 'Roof Deck', 'Sake Bar', 'Salad Place', 'Salon / Barbershop', 'Sandwich Place', 'Scenic Lookout', 'Seafood Restaurant', 'Shoe Store', 'Shopping Mall', 'Skate Park', 'Skating Rink', 'Smoke Shop', 'Smoothie Shop', 'Snack Place', 'Soup Place', 'Spa', 'Speakeasy', 'Sporting Goods Shop', 'Sports Bar', 'Steakhouse', 'Strip Club',	'River', 'Rock Climbing Spot', 'Rock Club', 'Scandinavian Restaurant', 'School', 'Shanghai Restaurant', 'Shipping Store', 'Shoe Repair', 'Soba Restaurant', 'Soccer Field', 'Social Club', 'South American Restaurant', 'South Indian Restaurant', 'Southern / Soul Food Restaurant', 'Spanish Restaurant', 'Spiritual Center', 'Sports Club', 'Stables', 'Street Art', 'Swiss Restaurant', 'Szechuan Restaurant', 'Tapas Restaurant', 'Tech Startup', 'Tennis Court', 'Tennis Stadium', 'Thrift / Vintage Store', 'Tiki Bar', 'Tourist Information Center', 'Turkish Restaurant', 'Udon Restaurant', 'Used Bookstore', 'Venezuelan Restaurant', 'Veterinarian', 'Video Store', 'Volleyball Court', 'Waterfront', 'Whisky Bar', 'Wings Joint', 'Women's Store'}	
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'Supermarket', 'Supplement Shop', 'Sushi Restaurant', 'Taco Place', 'Tailor Shop', 'Taiwanese Restaurant', 'Tea Room', 'Thai Restaurant', 'Theater', 'Toy / Game Store', 'Trail', 'Train Station', 'Vegetarian / Vegan Restaurant', 'Video Game Store', 'Vietnamese Restaurant', 'Wine Bar', 'Wine Shop', 'Yoga Studio'}		
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- The number of same venues categories for both Manhattan and Toronto is 192.
- Manhattan has 141 venues categories different from Toronto City.
- Toronto City has 44 venues categories different from Manhattan.

4.2. difference between the food culture based on the type of restaurant

In order to compare the food culture based on the type of restaurant, the “Sets” created in section 4.1. will be converted back to data frames and filter all rows with “Restaurant” in the venue categories. The outcome is as follows

List of common Restaurants	List of Restaurants in Manhattan but not in Toronto City area	List of Restaurants in Toronto City area but not in Manhattan
Fast Food Restaurant Latin American Restaurant Molecular Gastronomy Restaurant Modern European Restaurant Korean Restaurant Ramen Restaurant Middle Eastern Restaurant Mexican Restaurant Vietnamese Restaurant Chinese Restaurant Mediterranean Restaurant Taiwanese Restaurant Falafel Restaurant Filipino Restaurant Portuguese Restaurant Greek Restaurant Vegetarian / Vegan Restaurant Indian Restaurant Japanese Restaurant Dumpling Restaurant Seafood Restaurant German Restaurant Thai Restaurant Cajun / Creole Restaurant Eastern European Restaurant Cuban Restaurant Caribbean Restaurant Restaurant Brazilian Restaurant Moroccan Restaurant French Restaurant Sushi Restaurant	Swiss Restaurant African Restaurant Malay Restaurant Scandinavian Restaurant Jewish Restaurant Cantonese Restaurant Spanish Restaurant Czech Restaurant Japanese Curry Restaurant Kebab Restaurant Dim Sum Restaurant Shanghai Restaurant Lebanese Restaurant Szechuan Restaurant Hotpot Restaurant Arepa Restaurant Afghan Restaurant Empanada Restaurant Paella Restaurant Hawaiian Restaurant Turkish Restaurant South Indian Restaurant Tapas Restaurant Austrian Restaurant Persian Restaurant Soba Restaurant English Restaurant Israeli Restaurant Australian Restaurant South American Restaurant Himalayan Restaurant Southern / Soul Food Restaurant	Comfort Food Restaurant Theme Restaurant Gluten-free Restaurant Belgian Restaurant Doner Restaurant Tibetan Restaurant Colombian Restaurant

American Restaurant Asian Restaurant New American Restaurant Ethiopian Restaurant Italian Restaurant	North Indian Restaurant Argentinian Restaurant Kosher Restaurant Peruvian Restaurant Udon Restaurant Venezuelan Restaurant	
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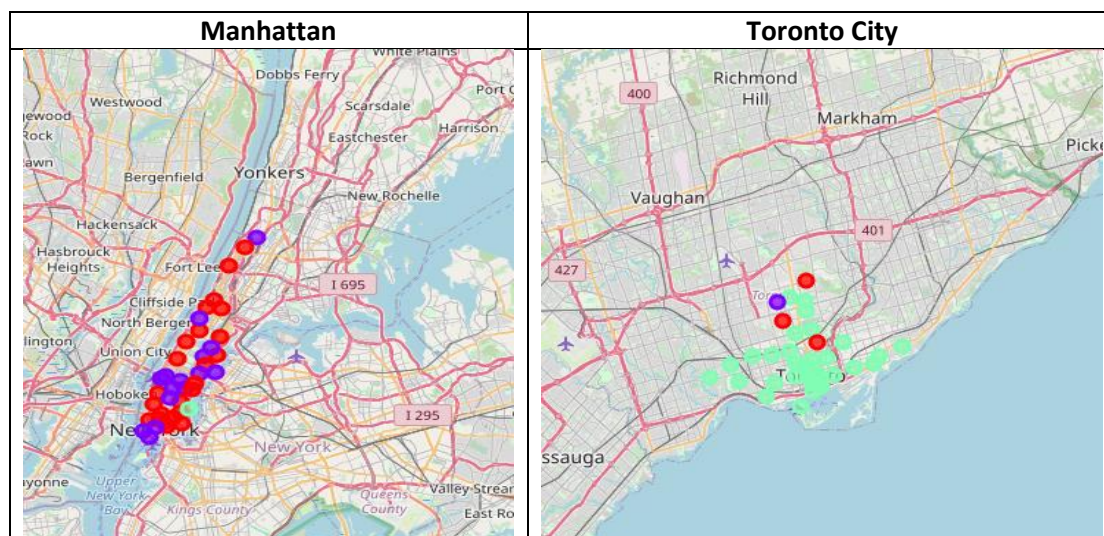
4.3. Both cities will be independently split into clusters by neighbourhood. And then comparison between clusters will be done and identify similarity based on the venue category

Further analyse the neighbourhood of Manhattan & Toronto City is required. To recreate the clusters of neighbourhoods for both cities, **One hot encoding** will be used to split the column which contains numerical categorical data to many columns depending on the number of categories present in that column. In this case, the categorical data of venue categories will split to multiple columns. The clustering labels will be added. The sample data is as follows

Manhattan													
	Neighbourhood	Accessories Store	Adult Boutique	Afghan Restaurant	African Restaurant	American Restaurant	Antique Shop	Arepa Restaurant	Argentinian Restaurant	Art Gallery	...	Video Store	Vietnamese Restaurant
0	Battery Park City	0.0	0.0	0.0	0.000000	0.000000	0.0	0.0	0.000000	0.000000	...	0.0	0.0
1	Carnegie Hill	0.0	0.0	0.0	0.000000	0.011364	0.0	0.0	0.011364	0.000000	...	0.0	0.0
2	Central Harlem	0.0	0.0	0.0	0.065217	0.043478	0.0	0.0	0.000000	0.043478	...	0.0	0.0
3	Chelsea	0.0	0.0	0.0	0.000000	0.030000	0.0	0.0	0.000000	0.060000	...	0.0	0.0
4	Chinatown	0.0	0.0	0.0	0.000000	0.030000	0.0	0.0	0.000000	0.000000	...	0.0	0.0

Toronto City													
	Neighbourhood	Adult Boutique	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	...	Tibetan Restaurant	Toy / Game Store
0	Berczy Park	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0	0.0	...	0.0	0.0
1	Brockton, Parkdale Village, Exhibition Place	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0	0.0	...	0.0	0.0
2	Business reply mail Processing Centre, South C...	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0	0.0	...	0.0	0.0
3	CN Tower, King and Spadina, Railway Lands, Har...	0.0	0.055556	0.055556	0.055556	0.111111	0.166667	0.111111	0.0	0.0	...	0.0	0.0
4	Central Bay Street	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0	0.0	...	0.0	0.0

Once the data frames are ready, K-means clustering machine learning algorithm will be applied to cluster the neighbourhoods for both cities. Folium maps will be prepared to show the clusters for both cities.



Finally, new data frames will be built with the top 10 most common venue categories, which will provide the better understanding about the facilities available in each neighbourhood. This can provide better ways to do the comparison. The clusters are as follows

Manhattan Clusters

Manhattan Cluster 0										
	Neighbourhood	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
100	Chinatown	Chinese Restaurant	Bakery	Cocktail Bar	Bubble Tea Shop	Ice Cream Shop	Hotpot Restaurant	Salon / Barbershop	Optical Shop	Dessert Shop
101	Washington Heights	Café	Bakery	Grocery Store	Deli / Bodega	Chinese Restaurant	Mobile Phone Shop	New American Restaurant	Latin American Restaurant	Park
102	Inwood	Mexican Restaurant	Lounge	Restaurant	Café	Bakery	Spanish Restaurant	Frozen Yogurt Shop	Caribbean Restaurant	Chinese Restaurant
103	Hamilton Heights	Pizza Place	Coffee Shop	Café	Mexican Restaurant	Deli / Bodega	Cocktail Bar	Latin American Restaurant	Sushi Restaurant	Park
104	Manhattanville	Seafood Restaurant	Coffee Shop	Italian Restaurant	Mexican Restaurant	Chinese Restaurant	Deli / Bodega	Sushi Restaurant	Climbing Gym	Supermarket
105	Central Harlem	African Restaurant	Cosmetics Shop	French Restaurant	American Restaurant	Bar	Chinese Restaurant	Art Gallery	Seafood Restaurant	Spa
106	East Harlem	Mexican Restaurant	Bakery	Thai Restaurant	Deli / Bodega	Spa	Latin American Restaurant	Sandwich Place	Taco Place	Gym
108	Yorkville	Italian Restaurant	Gym	Coffee Shop	Deli / Bodega	Sushi Restaurant	Bar	Wine Shop	Diner	Japanese Restaurant
109	Lenox Hill	Italian Restaurant	Sushi Restaurant	Coffee Shop	Cocktail Bar	Pizza Place	Café	Gym / Fitness Center	Gym	Burger Joint
111	Upper West Side	Wine Bar	Bakery	Bar	Italian Restaurant	Indian Restaurant	Café	Coffee Shop	Pizza Place	Ice Cream Shop
112	Lincoln Square	Café	Plaza	Italian Restaurant	Gym / Fitness Center	Theater	Concert Hall	Performing Arts Venue	Indie Movie Theater	Gym
Manhattan Cluster 1										

	Neighbourhood	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
38	The Beaches	Coffee Shop	Health Food Store	Neighborhood	Trail	Pub	Yoga Studio	Dog Run	Diner	Discount Store
42	The Danforth West, Riverdale	Greek Restaurant	Coffee Shop	Italian Restaurant	Ice Cream Shop	Furniture / Home Store	Liquor Store	Indian Restaurant	Spa	Bookstore
43	India Bazaar, The Beaches West	Sandwich Place	Park	Fast Food Restaurant	Coffee Shop	Food & Drink Shop	Light Rail Station	Restaurant	Italian Restaurant	Fish & Chips Shop
44	Studio District	Coffee Shop	American Restaurant	Bakery	Brewery	Café	Gastropub	Yoga Studio	Fish Market	Pet Store
46	Davisville North	Gym / Fitness Center	Hotel	Breakfast Spot	Food & Drink Shop	Sandwich Place	Department Store	Park	Convenience Store	Distribution Center
47	North Toronto West, Lawrence Park	Clothing Store	Coffee Shop	Yoga Studio	Fast Food Restaurant	Italian Restaurant	Café	Mexican Restaurant	Salon / Barbershop	Metro Station
48	Davisville	Sandwich Place	Dessert Shop	Pizza Place	Coffee Shop	Sushi Restaurant	Café	Italian Restaurant	Gym	Gas Station
49	Moore Park, Summerhill East	Lawyer	Restaurant	Yoga Studio	Dessert Shop	Event Space	Ethiopian Restaurant	Electronics Store	Eastern European Restaurant	Dumpling Restaurant
50	Summerhill West, Rathnelly, South Hill, Forest...	Coffee Shop	American Restaurant	Liquor Store	Restaurant	Bank	Bagel Shop	Supermarket	Sushi Restaurant	Fried Chicken Joint
52	St. James Town, Cabbagetown	Coffee Shop	Café	Pizza Place	Restaurant	Italian Restaurant	Bakery	Pub	Beer Store	Chinese Restaurant

5. Results & Discussion

It is interesting to see the different shapes of the 2 cities; Manhattan is rectangular shaped while Toronto City Area is more squarish shaped.

The number of same venues categories for both Manhattan and Toronto is 192. Manhattan has 141 venues categories different from Toronto City. Toronto City has 44 venues categories different from Manhattan.

The food culture for both cities covered almost all regions: Asia, LATAM, European, Australia, Africa, North and South America. Manhattan has many restaurants, which are related to different provinces of different countries. Toronto City area has some interesting theme restaurants, which not exist in Manhattan.

The neighbourhood of cluster 0 and 1 of Manhattan are similar to cluster 2 of Toronto City, given that these clusters have good mix of venues and facilities such as cafe / coffeeshop, Gym, Spa, restaurants, Part and Hotel.

Cluster 0 of Toronto City has more parks, trails, playgrounds, restaurants, shops that seem to be more suitable for family living.

Both cluster 2 of Manhattan and cluster 0 of Toronto City have only 1 neighbourhood, the comparison is inconclusive, given that the venues are quite different.

6. Conclusion

Although some differences have been surfaced out from this study, the majority of venue categories are similar. Expatriates stayed in either one of the cities should have no problem to adapt on the other.