Comparative Analysis of two Finacials districts Neighboarhood (Dwontown Toronto/Canada and Manhattan/USA)

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1. Introduction: The Idea

In This project i will make a comparative analysis beetween two Financial Districts area in the world. The key question will be how are their Neighborhod are structured and diversified:

- **What Level of diversity?** Throught inertia of clusters and number of possible clusters we will analyse the 2 places Naighorhood.

- **What structure?** Throught the caracteristics of the cluster we could say how the Neighboardhoo is structured?

On a final i will discuss the result and open perspectives for other further analysis.

I choose Downtown toronto(Canada) and Manhattan (USA) for the study.

2. Data

a. Sources

For This study we will use New York and Toronto data, combine to Foursquare API data:

- **New York Data** : We will essentially need a dataset that contains boroughs and the neighborhoods that exist in each borough as well as the the latitude and logitude coordinates of each neighborhood. These information are in a dataset provided as json file. From this file will make a pandas dataframe and use it for the study.

- **Toronto Data** : We will need the same kind of informations as for New York city. For that perpose we will scrap the information from the web, more precisely from Wikipedia. We will transform this data into a Pandans dataframe and use it for the study.

- **Geospatial Cordinate** : The data from wikipedia have not geo information. We will use a file provide for the course. In this file we have some geo information that we are going to take to complete wikipedia informations through a join operation.

- **Foursquare** : For square API will provide the venues around the neighborhoods we will provide. The will merge those informations the NewYork and Toronto data for the study.

b. Data Cleaning and feature selection

For this study i clean the data as follow :

- Remove data with null Borough : Toronto dataset had null Borough and i choose to elinate the row rows as titi s no sens to use them. I could locate anything.

- Replace Null Neighborhood with the Borough : I assume that if a Bourough have no neighbourhood mentionned it is his own neighbord.

- Group data by PostalCode and Borough : in order to avoid any duplication i fi rst grouped Toronto data by postal code and Borough . I after make a join ge odata t find the coordinates and finally remove postal codes to have the sam e structure of dataframe for the two Finacial District.

- I choose to rename some venues categories to group them in more big comm on category. The objective was to give a more global sens to the place in the analysis as here i was analysising all venues.

    For feauture selection, i choose to focus on the 5th most common venue catego ries by Borough to focus on the main caracteristics of Boroughs.

3. Methodology

For this study K-Mean clustering will be our main tool and we will focus on the inertia of clusters and optimal clusters number to analyse the diversity.

I choose to focus on the 5th most common venue categories by Borough to focus on the main caracteristics of Boroughs. I will do them same process separately for each dataset financial district data.

To analyse the result i will use the intra-cluster inertia. I will calculate and plot them to determine a "elbow" point. I will then choose optimal cluster number for every financial district data. I will finally for each cluster identify the main caracterics that best describe
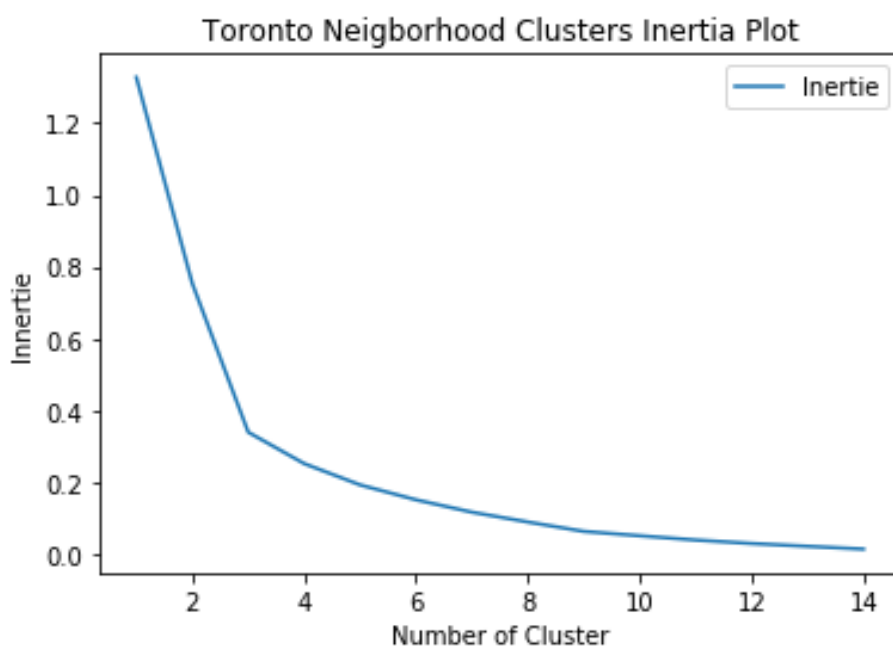
it. All this will help me to see what are the dynamics aroud the 2 places. I will try find venues that exist in manhattan but not in Toronto Downtow and vis versa.

My analyse will also use the story of some place to justify why they are so.

4. Analyse

For this study i first choose to try to define a proper cluster size for each area and i got that results :

a. Clusters size

In Downtown Toronto Clustering the Elbow is more evident at glence that in Manhattan Clustering. I choose 3 for Toronto and 8 for Manhattan. Why not 5 for Manhattan? Because at 8 the inertia is close to Toronto Downtown. This is a choice to be approximatively on the same level of comparison.

Here we can clearly tell Manhattan Neigborhood is more diverse than Downtown Toronto. This maybe mean you have to go to some Specific Boroughs if you want to easyly find some venues.

Thge clusters :

b. Result and discussion

In this cluster analysis of Downtown Toronto and Manhattan Neighbordhood we have seen that Manhattan is more diverse than Downtown Toronto in the structure of their Neighborhood. Approximativement the same inertia Manhattan has more cluster than Downtown Toronto. In addition the elbow point for Downtown Toronto is easer to identify than for Manhathan. We choose 3 for Manhattan and 8 for Downtown Toronto.

Globaly these two Financial Districts Neighbordhood are structured as follow:

In Downtown Toronton the 3 clusters are airport area located in an island with airport comodities, quay and Museums; Rosedale an upscale Borough with park playground and Restaurant;and the others (Mainly Restaurant and shops).

In Manhattan the 8 clusters are have most thing in common than Downtown Toronton clusters. We have a first subcluster where venues are mosly Shops (1,2,4,8), a second subcluster where venues are mosly fifty fifty Restaurant and Shops (3,6,7) and a third subcluster where the main venue category are Bars:

Subcuster 1:

In the cluster 1 we have Soho and Marble Hill. In reality Soho refers to art and fashion and can see that in venues around. marbel Hill is the only Neighborhood of Manhattan that is not and Island. finally theseare two atypic places where u find venue that are not common + shops and restaurants.

In cluster 2 we only have shops Restaurant and Bar mostly. The Restaurant are mostly Asian.

In cluster 4 we only have plus shops and Restaurant Hotel, Parks, Schools, Coffee Shops. It is most diverse than the 2nd in term of venues category.

In cluster 8 is also diverse than the 2nd but with sport places, Park, Theater. It is where we found mostly sport place.

Subcuster 2: In cluster 3 we only mostly Asian/European Restaurant and Other food places/no one specialy very présent. There are also shops and Bars.

In cluster 6 we only mostly latin Restaurant.

In cluster 7 we only mostly Asian Restaurant and Shop mosly. Plus we have some european restaurant.

Subcuster 3:

This subcluster has only one Borough (Stuyvesant town in the east side)the main venue category are Bars boats.

Finally Manhattan clustering was the most ambigus as there is not real differences beetween clusters out of the order of the venue category counts. Sometime non common venues make the diffrence. My study is an overview and it remain global. It is possible to studies some specificities like focusing on food places with some additionnal information on their size, their menus... There was also not real informations about local food restaurant. above all it was a good exercise to have an idea of the two place.

Clearly Manhattan has most venue than Downtown toronto and that maybe explain his the diveristy. The number venue categories you can find in Manhattan neighborhood is also higher than that you can find in Downtown Toronto but not in Manhattan neighborhood. This fact explain also the number of clusters in Manhattan compare to Downtown Toronto.

5. Conclusion

The objective of this studies was to compare two financials district in the world and we choose Toronto and Manhattan. They appear very different in term of structure as Manhattan is more diverse. The most venues of theese place were shops restaurant, hotels...and it is very typical of bussiness areas. We also found some place near the water with boats... Something interestant was also that we found an aeroport in Downtown Toronto neighborhood but not in Manhathan Neighborhood.

6. Annexe :

a. Clusters
Downtown Toronto neighborhood

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Cabbagetown, St. James Town	Shop/Store	European Restaurant	Asian Restaurant	Other Food Place	Bakery
2	Church and Wellesley	Shop/Store	Asian Restaurant	Other Food Place	Gay Bar	European Restaurant
3	Harbourfront, Regent Park	Shop/Store	Bakery	Coffee Shop	European Restaurant	Park
4	Ryerson, Garden District	Shop/Store	Other Food Place	Asian Restaurant	Bar	European Restaurant
5	St. James Town	Shop/Store	European Restaurant	Other Food Place	Coffee Shop	Asian Restaurant
6	Berczy Park	Shop/Store	Bar	Other Food Place	European Restaurant	Market
7	Central Bay Street	Shop/Store	Asian Restaurant	Other Food Place	European Restaurant	Bar
8	Adelaide, King, Richmond	Shop/Store	Other Food Place	Asian Restaurant	Bar	European Restaurant
9	Harbourfront East, Toronto Islands, Union Station	Shop/Store	Other Food Place	European Restaurant	Hotel	Art/Museum
10	Design Exchange, Toronto Dominion Centre	Shop/Store	Other Food Place	European Restaurant	Hotel	Coffee Shop
11	Commerce Court, Victoria Hotel	Shop/Store	Other Food Place	European Restaurant	Bar	Hotel
12	Harbord, University of Toronto	Shop/Store	Coffee Shop	Bar	European Restaurant	Asian Restaurant
13	Chinatown, Grange Park, Kensington Market	Asian Restaurant	Shop/Store	Other Food Place	Bar	Coffee Shop
15	Stn A PO Boxes 25 The Esplanade	Shop/Store	Other Food Place	Bar	European Restaurant	Hotel
16	First Canadian Place, Underground city	Other Food Place	Shop/Store	Bar	Hotel	Asian Restaurant

1 (cluster label)

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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
0	Rosedale	Park	Trail	Playground	European Restaurant	Caribbean Restaurant

2 (cluster label)

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
14	CN Tower, Bathurst Quay, Island airport, Harbo...	Airport	Harbor / Marina	Plane	Art/Museum	Boat or Ferry

3 (cluster label)

Manhattan

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Marble Hill	Shop/Store	Other Food Place	Yoga Studio	Bank	American Restaurant
23	Soho					

1 (cluster label)

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
2	Washington Heights	Shop/Store	Other Food Place	Asian Restaurant	Latin American Restaurant	Coffee Shop
8	Upper East Side	Shop/Store	European Restaurant	Other Food Place	Exhibit	Art/Museum
9	Yorkville	Shop/Store	Asian Restaurant	Other Food Place	Sport place	Bar
10	Lenox Hill	Shop/Store	European Restaurant	Other Food Place	Asian Restaurant	Sport place
12	Upper West Side	Shop/Store	Asian Restaurant	European Restaurant	Other Food Place	Bar
17	Chelsea	Shop/Store	European Restaurant	Other Food Place	Asian Restaurant	Bar
18	Greenwich Village	Shop/Store	European Restaurant	Asian Restaurant	Other Food Place	Bar
19	East Village	Shop/Store	Asian Restaurant	Bar	Other Food Place	European Restaurant
24	West Village	Shop/Store	European Restaurant	Bar	American Restaurant	Asian Restaurant
27	Gramercy	Shop/Store	Other Food Place	Bar	Asian Restaurant	European Restaurant
30	Carnegie Hill	Shop/Store	Asian Restaurant	Other Food Place	Bar	European Restaurant
31	Noho	Shop/Store	European Restaurant	Other Food Place	Asian Restaurant	Bar
34	Sutton Place	Shop/Store	European Restaurant	Asian Restaurant	Sport place	Bar
38	Flatiron	Shop/Store	Sport place	Asian Restaurant	American Restaurant	Other Food Place

2 (cluster label)

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
14	Clinton	Other Food Place	Shop/Store	Theater	Bar	European Restaurant
16	Murray Hill	Other Food Place	Asian Restaurant	Shop/Store	European Restaurant	Bar
21	Tribeca	Shop/Store	European Restaurant	Bar	Other Food Place	Asian Restaurant
35	Turtle Bay	Asian Restaurant	European Restaurant	Other Food Place	Shop/Store	Bar
36	Tudor City	Asian Restaurant	Other Food Place	European Restaurant	Shop/Store	Latin American Restaurant
39	Hudson Yards	Shop/Store	European Restaurant	Other Food Place	Hotel	Sport place

3 (cluster label)

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
6	Central Harlem	Shop/Store	African Restaurant	Other Food Place	American Restaurant	Art/Museum
11	Roosevelt Island	Shop/Store	Other Food Place	Park	Sport place	Playground
15	Midtown	Shop/Store	Other Food Place	Asian Restaurant	Hotel	Bar
22	Little Italy	Shop/Store	Other Food Place	Asian Restaurant	Bakery	European Restaurant
26	Morningside Heights	Shop/Store	Other Food Place	American Restaurant	Park	School/Education
28	Battery Park City	Shop/Store	Other Food Place	Art/Museum	Park	Hotel
29	Financial District	Shop/Store	Other Food Place	Sport place	European Restaurant	Bar

4 (cluster label)

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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
37	Stuyvesant Town	Bar	Boat or Ferry	Park	Playground	Sport place

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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
3	Inwood	Shop/Store	Other Food Place	Latin American Restaurant	Coffee Shop	European Restaurant
4	Hamilton Heights	Other Food Place	Shop/Store	Asian Restaurant	Latin American Restaurant	Bar
7	East Harlem	Latin American Restaurant	Other Food Place	Shop/Store	Bakery	Deli / Bodega

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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
1	Chinatown	Asian Restaurant	Shop/Store	Other Food Place	Bar	European Restaurant
5	Manhattanville	Asian Restaurant	Shop/Store	Other Food Place	European Restaurant	Latin American Restaurant
20	Lower East Side	Shop/Store	Asian Restaurant	Other Food Place	Art/Museum	Latin American Restaurant
25	Manhattan Valley	Asian Restaurant	Shop/Store	Other Food Place	Latin American Restaurant	European Restaurant
33	Midtown South	Shop/Store	Asian Restaurant	Hotel	Other Food Place	European Restaurant

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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
13	Lincoln Square	Shop/Store	European Restaurant	Sport place	Theater	Other Food Place
32	Civic Center	Shop/Store	European Restaurant	Sport place	Bakery	Other Food Place

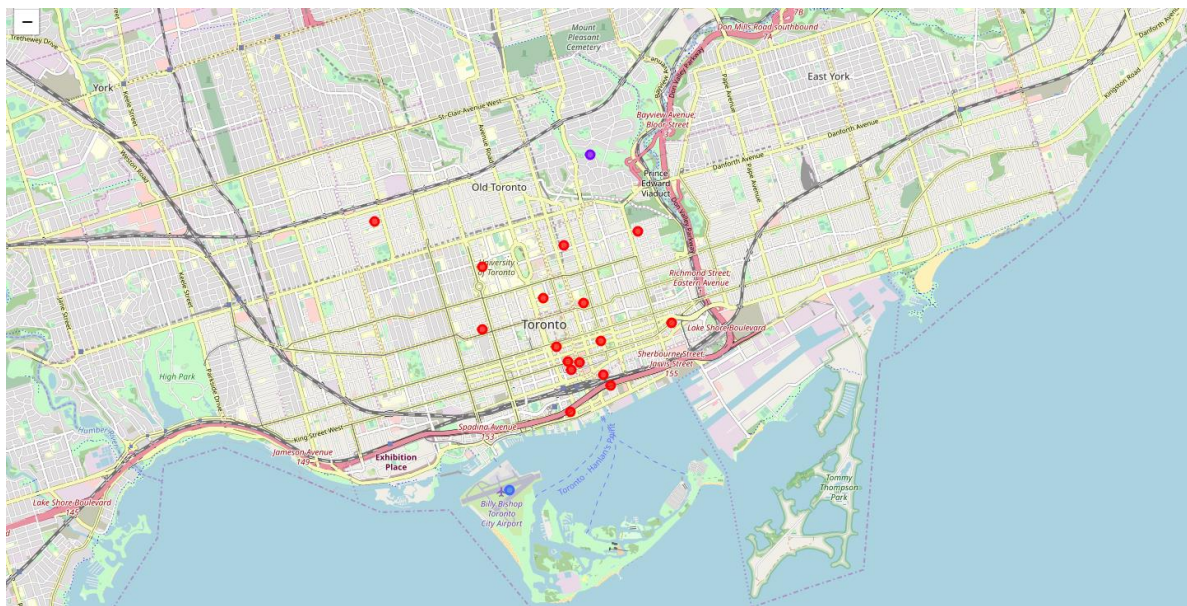## b. List of venues that are in Manhattan but not in Downtown Toronto

Arepa Restaurant	Basketball Court	Music School
Argentinian Restaurant	Big Box Store	Music Store
Austrian Restaurant	Bike Rental / Bike Share	Nail Salon
Auto Workshop	Bike Shop	Newsstand
Baseball Field	Bike Trail	Non-Profit
Beer Garden	Boutique	Outdoor Sculpture
Board Shop	Bridal Shop	Outdoors & Recreation
Boxing Gym	Bridge	Paella Restaurant
Bus Stop	Bus Line	Pakistani Restaurant
Business Service	Bus Station	Pet Café
Caucasian Restaurant	Cafeteria	Pet Service
Club House	Cambodian Restaurant	Piano Bar
College Cafeteria	Candy Store	Pilates Studio
Cultural Center	Circus	Pool
Cupcake Shop	Climbing Gym	Public Art
Czech Restaurant	College Academic Building	Rental Car Location
Design Studio	College Bookstore	Resort
Eastern European Restaurant	College Theater	Rest Area
English Restaurant	Comedy Club	River
Exhibit	Community Center	Rock Climbing Spot
Frozen Yogurt Shop	Cuban Restaurant	Roof Deck
General College & University	Cycle Studio	Russian Restaurant
Golf Course	Daycare	School
High School	Dive Bar	Shanghai Restaurant
Himalayan Restaurant	Drugstore	Shipping Store
Hotpot Restaurant	Dry Cleaner	Soba Restaurant
Indie Movie Theater	Duty-free Shop	Social Club
Intersection	Flea Market	South American Restaurant
Library	Flower Shop	South Indian Restaurant
Memorial Site	Garden	Spanish Restaurant
Moroccan Restaurant	Garden Center	Street Art
North Indian Restaurant	Gas Station	Supplement Shop
Other Nightlife	Gymnastics Gym	Swiss Restaurant
Paper / Office Supplies Store	Hardware Store	Tapas Restaurant
Peruvian Restaurant	Hawaiian Restaurant	Tattoo Parlor
Photography Studio	Heliport	Tech Startup
Pie Shop	Herbs & Spices Store	Tennis Court
Residential Building (Apartment / Condo)	Hot Dog Joint	Theme Park Ride / Attraction
Rock Club	Indie Theater	Tiki Bar
Skate Park	Israeli Restaurant	Track
Southern / Soul Food Restaurant	Japanese Curry Restaurant	Tree
Spiritual Center	Jewish Restaurant	Turkish Restaurant
Sports Club	Karaoke Bar	Udon Restaurant
Szechuan Restaurant	Kids Store	Veterinarian
Tourist Information Center	Kosher Restaurant	Video Store
Used Bookstore	Laundry Service	Volleyball Court
Venezuelan Restaurant	Leather Goods Store	Watch Shop
Womens Store	Lebanese Restaurant	Waterfront
African Restaurant	Malay Restaurant	Whisky Bar
Arcade	Medical Center	Wine Shop
Auditorium	Mini Golf	Tennis Stadium
Australian Restaurant	Mobile Phone Shop	

c. List of venues that are in Downtown Toronto but not in Manhattan

Airport Gate	Airport Service	Hospital
Airport Lounge	Airport Terminal	Lake
Aquarium	Baseball Stadium	Neighborhood
Basketball Stadium	Beach	Other Great Outdoors
College Arts Building	Belgian Restaurant	Plane
College Rec Center	Brewery	Skating Rink
Colombian Restaurant	Church	Smoothie Shop
Comfort Food Restaurant	Comic Shop	Tanning Salon
Poutine Place	Doner Restaurant	Train Station
Airport	General Travel	Theme Restaurant
Airport Food Court	Gluten-free Restaurant	

d. Clusters in the map

Downtown Toronto

Manhattan