Similarities Between Manhattan, New York, and Downtown, Toronto
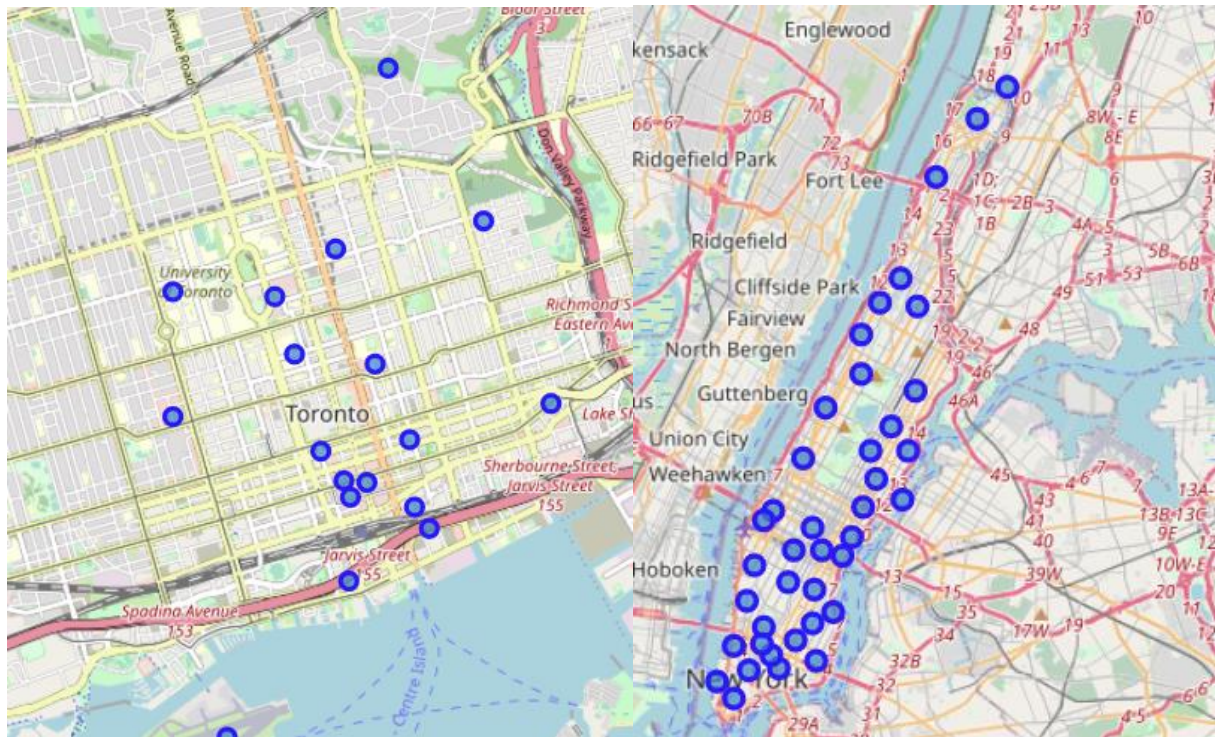

IBM Applied Data Science Capstone

The Battle of Neighborhoods

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1. Introduction

Tourism is a complex set of industries, including accommodation, recreation & entertainment, and food & beverage services. These days, people would like to visit different places like New York and Toronto to experience and explore their lives, heritage, and culture. Tourists need information regarding the nearby coffee shops, restaurants, hotels/accommodation, places to visit, and many more. Manhattan, New York, and downtown Toronto are very popular places people visit. This project aims to determine the similarity of these two cities are when it comes to tourism using data science. It will also assist tourists by providing them with the information needed to travel, comparing two places to make their decision depending on their choices.

The results of this project will guide then potential tourists who are planning a trip to visit Manhattan, New York, or downtown Toronto. A Data Scientist in this project would like to compare the similarities two places and identify tourist areas where to stay, popular places to visits etc.

2. Data sources

The data used in this project is public domain. To solve the problem, we need the following data:

Toronto data: we web scraped data from https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

Manhattan, New York city data is available from https://geo.nyu.edu/catalog/nyu_2451_34572

Geospatial data is available from http://cocl.us/Geospatial_data

3. Methodology

 The data extracted from the above webpages will have neighborhood data of different places in Toronto and New York. This project focuses on Manhattan, New York, and Downtown Toronto using the Foursquare API services. Foursquare API will provide the nearest venue data including their name, location, and venue type. We will apply a K-means Clustering machine learning algorithm to compare the two places Manhattan, New York, and Downtown, Toronto, and find the similarities.

4. Data Processing

4.1 Downtown Toronto

• Extract Data of Toronto from the Wikipedia page.

• Eliminate "Not assigned" values.

• Combine neighborhoods that have the same geographical coordinates at each borough and sorted against the concerned borough.

• Use Foursquare API for data verification and to get the coordinates of Downtown Toronto and explore its neighborhoods.

• Characterize the neighborhoods as venues and venue categories.

```
The geograpical coordinate of Downtown Toronto are 43.6563221, -79.3809161.
```

```
In [9]: downtown_toronto_data = df_toronto[df_toronto['Borough'] == 'Downtown Toronto'].reset_index(drop=True)
        downtown_toronto_data.head()
```

Out[9]:

	Postal Code	Borough	Neighbourhood	Latitude	Longitude
0	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636
1	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
2	M5B	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937
3	M5C	Downtown Toronto	St. James Town	43.651494	-79.375418
4	M5E	Downtown Toronto	Berczy Park	43.644771	-79.373306

4.2 Manhattan, New York

• Extract Data of New York from the New York University webpage.

• Combine neighborhoods that have the same geographical coordinates at each borough and sorted against the concerned borough.

• Use Foursquare API for data verification and to get the coordinates of Downtown Toronto and explore its neighborhoods.

• Characterize the neighborhoods as venues and venue categories. 6. Foursquare API Provide the Foursquare API credentials in the code to explore the neighborhoods in Downtown Toronto and Manhattan, New York.
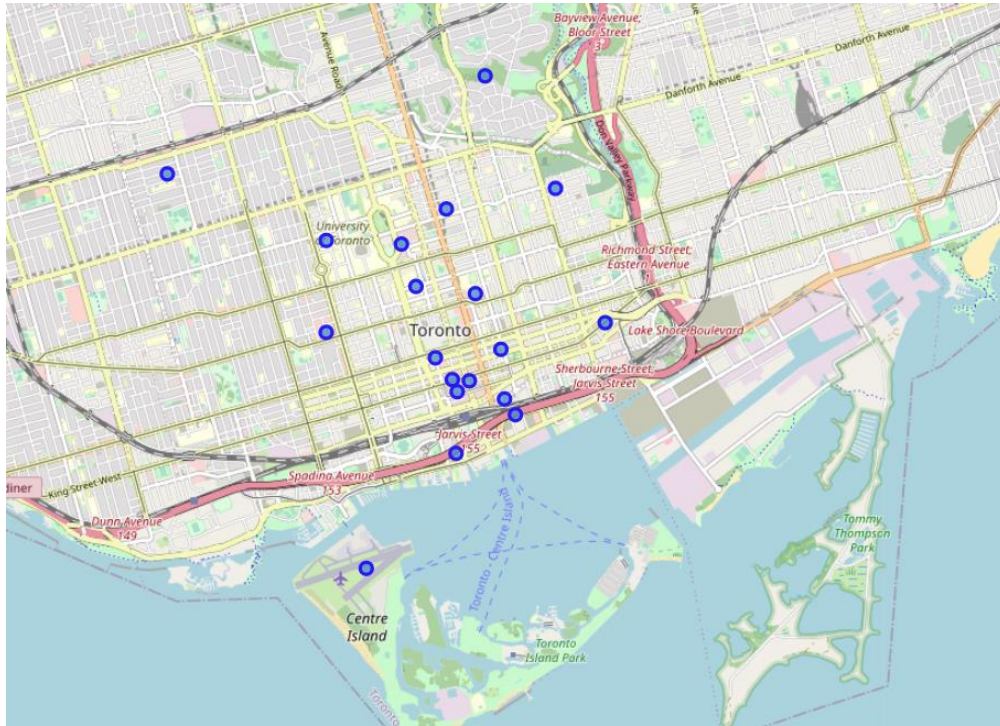
```
In [17]: manhattan_data = neighborhoods[neighborhoods['Borough'] == 'Manhattan'].reset_index(drop=True)
         manhattan_data.head()
```
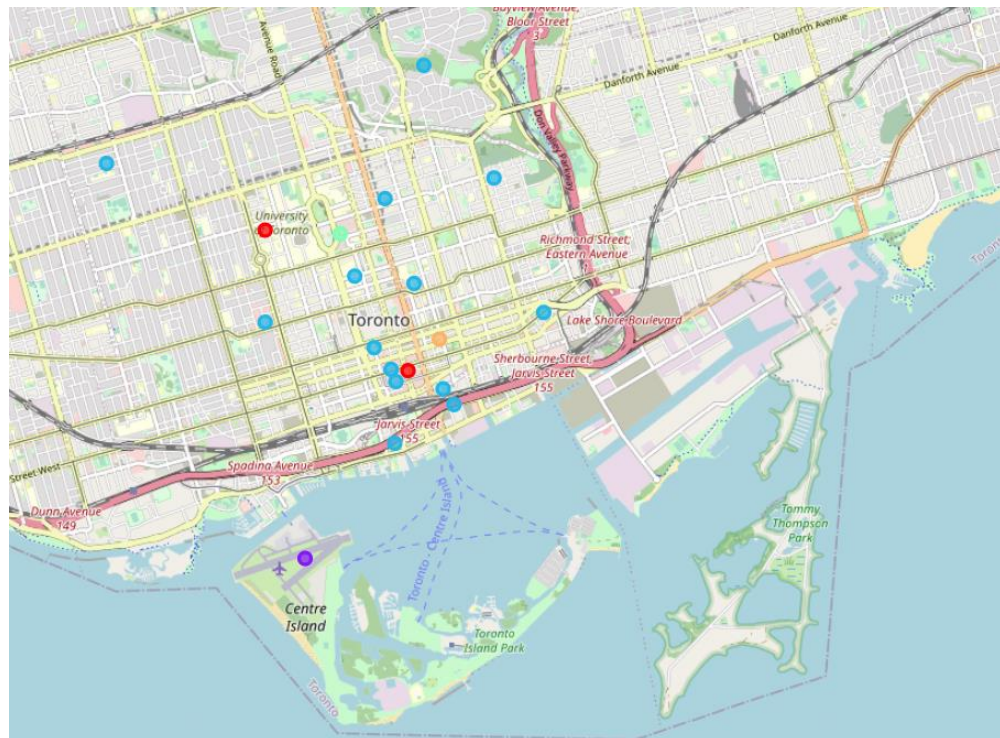
Out[17]:

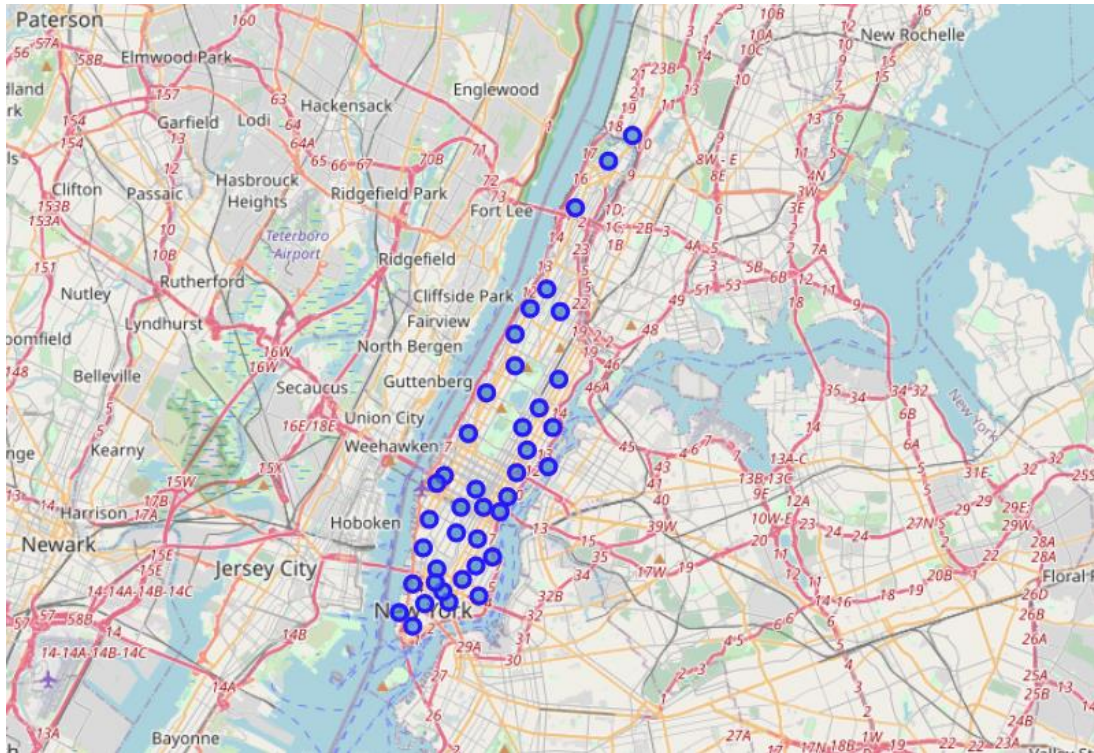|	Borough	Neighborhood	Latitude	Longitude
0	Manhattan	Marble Hill	40.876551	-73.910660
1	Manhattan	Chinatown	40.715618	-73.994279
2	Manhattan	Washington Heights	40.851903	-73.936900
3	Manhattan	Inwood	40.867684	-73.921210
4	Manhattan	Hamilton Heights	40.823604	-73.949688

5. Visualization

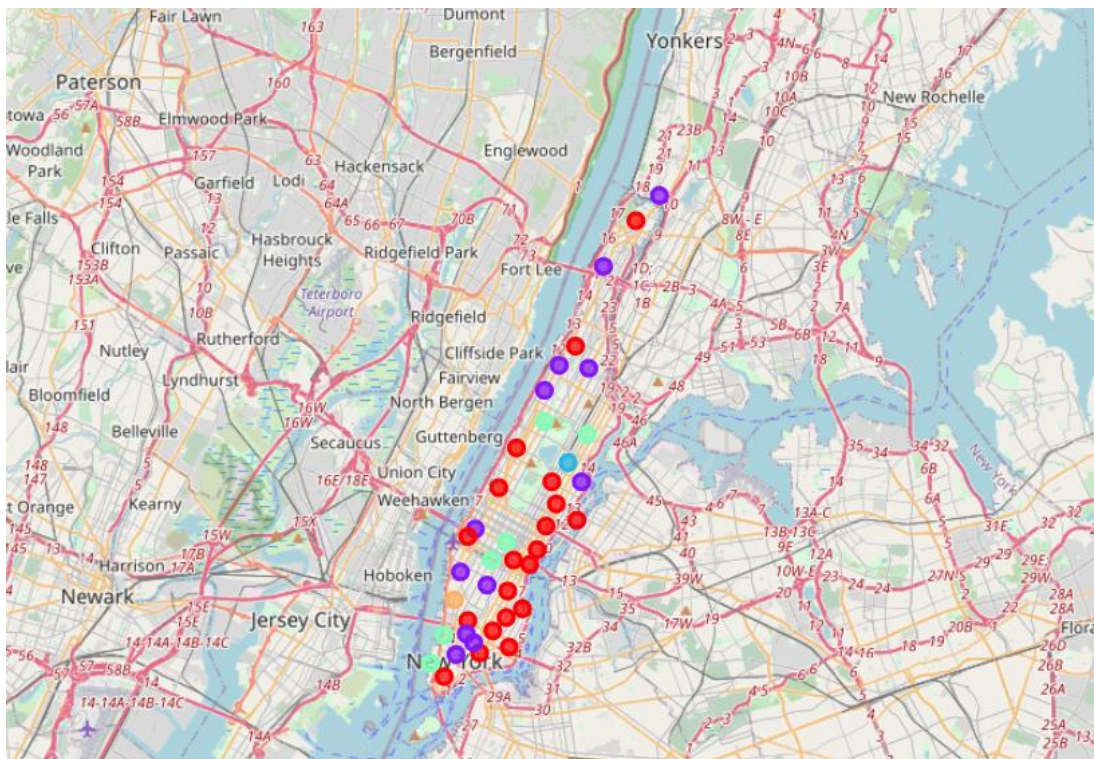### 5.1 Downtown Toronto Before Clustering

5.2 Downtown Toronto After Clustering

5.3 Manhattan Before Clustering

5.4 Manhattan After Clustering

6. Results and Analysis

Analyze both Downtown Toronto and Manhattan, New York neighborhoods with one-hot encoding, which gives a value '1' if a venue category is present and '0' if there is no venue category. With the help of this technique, we will calculate the mean of each neighborhood's frequency of occurrence. The top venues will show the foot traffic.

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	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	Aquarium	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	B Jc
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Dataset: one hot encoding

• Downtown Toronto and Manhattan, New York both the places have venues that tourists would be attracted to explore.

• The neighborhoods are similar to venues like Theaters, opera houses, food places, clubs, museums, parks, etc.

• The only dissimilarity is that their unique historical places and monuments. 9.2 Observations The following are the places that attract tourists

• Downtown Toronto has Historical places and Airport facilities, a harbor, a Sculpture garden, and ferry services.

• Manhattan has monument or landmark venues, Nightlife, Climbing gym, and Museums.

After the analysis, we recommend Downtown Toronto will be a tourist's priority to visit. This is because the airport facility is available in Downtown Toronto which saves time but also saves money.

	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	Coffee Shop	Restaurant	Cheese Shop	Seafood Restaurant	Farmers Market	Cocktail Bar	Beer Bar	Bakery	Hotel	Eastern European Restaurant
1	CN Tower, King and Spadina, Railway Lands, Har...	Airport Lounge	Airport Service	Boutique	Boat or Ferry	Plane	Rental Car Location	Sculpture Garden	Bar	Harbor / Marina	Coffee Shop
2	Central Bay Street	Coffee Shop	Café	Italian Restaurant	Sandwich Place	Japanese Restaurant	Thai Restaurant	Department Store	Burger Joint	Bubble Tea Shop	Salad Place
3	Christie	Grocery Store	Café	Park	Italian Restaurant	Nightclub	Coffee Shop	Athletics & Sports	Baby Store	Restaurant	Candy Store
4	Church and Wellesley	Coffee Shop	Japanese Restaurant	Gay Bar	Sushi Restaurant	Restaurant	Café	Pub	Hotel	Yoga Studio	Bubble Tea Shop
5	Commerce Court, Victoria Hotel	Coffee Shop	Restaurant	Café	Hotel	Gym	Italian Restaurant	Deli / Bodega	Japanese Restaurant	Seafood Restaurant	American Restaurant
6	First Canadian Place, Underground city	Coffee Shop	Café	Hotel	Gym	Restaurant	Japanese Restaurant	American Restaurant	Asian Restaurant	Salad Place	Seafood Restaurant
7	Garden District, Ryerson	Clothing Store	Coffee Shop	Café	Japanese Restaurant	Bubble Tea Shop	Cosmetics Shop	Italian Restaurant	Pizza Place	Lingerie Store	Diner
8	Harbourfront East, Union Station, Toronto Islands	Coffee Shop	Aquarium	Hotel	Café	Fried Chicken Joint	Restaurant	Pizza Place	Brewery	Scenic Lookout	Music Venue
9	Kensington Market, Chinatown, Grange Park	Coffee Shop	Bar	Mexican Restaurant	Vegetarian / Vegan Restaurant	Café	Vietnamese Restaurant	Burger Joint	Grocery Store	Bakery	Pizza Place
10	Queen's Park, Ontario Provincial Government	Coffee Shop	Gym	Diner	Restaurant	Portuguese Restaurant	Park	Music Venue	Mexican Restaurant	Italian Restaurant	Hobby Shop

Toronto Downtown venues

	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	Gym	Coffee Shop	Memorial Site	Shopping Mall	Plaza	Burger Joint	Gourmet Shop	Playground
1	Carnegie Hill	Coffee Shop	Café	Bookstore	Italian Restaurant	Gym / Fitness Center	Gym	French Restaurant	Yoga Studio	Wine Shop	Vietnamese Restaurant
2	Central Harlem	African Restaurant	Chinese Restaurant	Bar	Seafood Restaurant	American Restaurant	French Restaurant	Cosmetics Shop	Caribbean Restaurant	Fried Chicken Joint	Café
3	Chelsea	Coffee Shop	Art Gallery	Bakery	American Restaurant	Café	Italian Restaurant	Ice Cream Shop	Park	Cycle Studio	Cupcake Shop
4	Chinatown	Chinese Restaurant	Cocktail Bar	Bakery	Dessert Shop	American Restaurant	Hotpot Restaurant	Optical Shop	Noodle House	Salon / Barbershop	Spa
5	Civic Center	Coffee Shop	Gym / Fitness Center	Spa	Cocktail Bar	Hotel	French Restaurant	Yoga Studio	Sushi Restaurant	Sandwich Place	Park
6	Clinton	Theater	American Restaurant	Gym / Fitness Center	Gym	Sandwich Place	Coffee Shop	Italian Restaurant	Spa	Hotel	Cocktail Bar
7	East Harlem	Mexican Restaurant	Bakery	Thai Restaurant	Deli / Bodega	Latin American Restaurant	Sandwich Place	Spa	Liquor Store	Taco Place	Gas Station
8	East Village	Bar	Ice Cream Shop	Mexican Restaurant	Pizza Place	Wine Bar	Coffee Shop	Korean Restaurant	Speakeasy	Vietnamese Restaurant	Italian Restaurant
9	Financial District	Coffee Shop	Pizza Place	Bar	Cocktail Bar	Café	Gym	Park	Steakhouse	Salad Place	Sandwich Place
10	Flatiron	Italian Restaurant	Japanese Restaurant	New American Restaurant	Cycle Studio	Gym	Gym / Fitness Center	Mediterranean Restaurant	Sporting Goods Shop	Spa	American Restaurant

Manhattan, New York venues

7. Discussion and Conclusion

Downtown Toronto and Manhattan, New York both the places have venues that tourists would be attracted to explore. Both neighborhoods have similar venues like Theaters, opera houses, food places,

clubs, museums, parks, etc. The only dissimilarity is that their unique historical places and Monuments. Downtown Toronto has Historical places and Airport facilities, a harbor, a Sculpture garden, and ferry services. Manhattan has monument or landmark venues, Nightlife, Climbing gym, and Museums

Downtown Toronto and Manhattan neighborhoods have similar venues. These neighborhoods are unique in their way. Hence, we suggest if money is a concern, a person should travel to Downtown Toronto.

The purpose of this project was to do what a data scientist does every day in real job. The project gives enough opportunity to learn and exercise exciting new things though this project is. I want to thank IBM and Coursera to bring such a good course for learning data science.