The Battle of Neighborhoods

Venues comparision – financial hubs of Canada and New York Boroughs

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Coursera – Assignment – Capstone Project Week 4

Author Note

This is for the educational purpose and needing to submit to Coursera Data Science Certification Program.

Analyzing Venues of two boroughs of world financial hubs – Toronto Downtown and Manhattan for Immigrants, student and businessmen

Project Description:

Both the boroughs of Toronto and New York, Toronto Downtown and Manhattan respectively are very big financial hubs of their countries and also facinating to people from different countries outsides.

Students, immigrants, Businessmen from different countries have been targetting these regularly. This case study and Report is to provide the readers required information around the culture and venues which might help them prepare for their decision to persue career or start of a new life in. Having known to venue and traffic information will help make an informed decision in picking right place to travel, stay and begin a new life.

Foursquare API:

This project will use Four-square API as its prime data gathering source as it is one of the rich collection of location info provide for many fortune 500 companies world wide. it has a database of millions of places, especially their places API which provides the ability to perform location search, location sharing and details about a business.

Work Flows:

API data is used to analyze and cluster the venue info from Downtown Toronto and Manhattan broughs. Bascially, this includes -

- Data acquisition and cleansing
- Data preperation
- Feature selection and verification thru visualization
- Clustering

Data acquisition and wrangling –

For Downtown Toronto case, we have extracted table of Toronto's Borough from Wikipedia page. Then we arrange the data according to our requirements. In the arrangement phase, which applied multiple steps including but not limited to, eliminating "Not assigned" values, combine neighborhoods which have same geographical coordinates at each borough and sorted against the concerned borough. For data verification and further exploration, we use Foursquare API to get the coordinates of Downtown Toronto and explore its neighborhoods. The neighborhoods are further characterized as venues and venue categories.

We pulled Downtown Toronto data from the wiki page - https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M. And then added long and lattitude using Geospatial_Coordinates.csv. Data wrangling to - eliminate 'not assigned' and merging neighborhoods having same geo space and finally sort them according to their boroughs. used geocoders for long and lat computation for Downtown Toronto. Foursquare API data used for venue location data.

We pulled Manhattan detail using https://cocl.us/new_york_dataset which has all boroughs and then filtered for only Manhattan.

Data preperation–

Taken the venue information of 2 boroughs cities, explore the data, analyze them and visualize them in a seperate section. Then a final conclusion of data analysis in last sections.

Downtown Toronto data is pulled from wesite and has postal code, neighbourhood info. The Geospace info has been fed from the file. And then a data frame has been created for further processing of data. Manhattan data is used from file which is a straight forward radily available info.

Preparation of "Downtown Toronto" data

- Extract data from https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
- Add location data from Geospatial_Coordinates.csv
- Cleansing -
- Eliminate neighborhood column (Nan). Throughout the project, Neighbourhood used for clarity
- Drop the postal code column
- Filter for Downtown Toronto borough and set it as index

Preparation of "Manhattan" data

- Extract data from https://cocl.us/new_york_dataset

Geopy is used for location lattitude and longitude calculations for both Downtown toronto and Manhattan.

Feature selection and verification thru visualization –

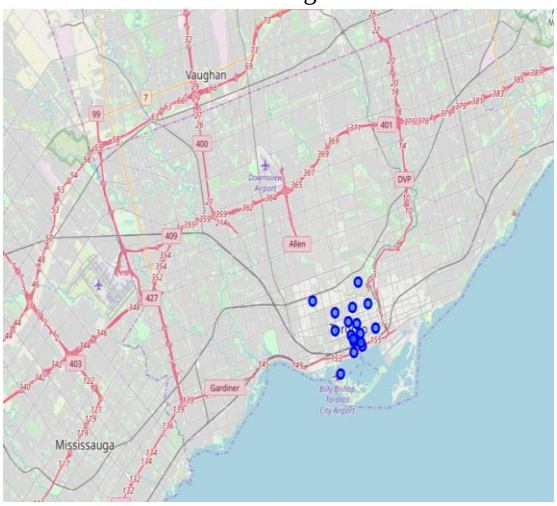
	Borough	Neighbourhood	Latitude	Longitude
0	Downtown Toronto	Harbourfront,Regent Park	43.654260	-79.360636
1	Downtown Toronto	Ryerson,Garden District	43.657162	-79.378937
2	Downtown Toronto	St. James Town	43.651494	-79.375418
3	Downtown Toronto	Berczy Park	43.644771	-79.373306
4	Downtown Toronto	Central Bay Street	43.657952	-79.387383

	Borough	Neighbourhood	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

Visualization –

Before clusterting to validate the data on graph for its appearance

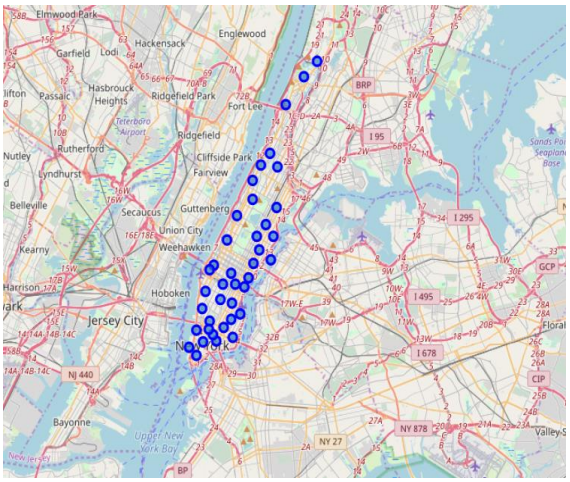
Downtown Toronto - Borough




```
#downtown_toronto_venues
```

```
1 Harbourfront,Regent Park
2 Ryerson,Garden District
3 St. James Town
4 Berczy Park
5 Central Bay Street
6 Christie
7 Adelaide,King,Richmond
8 Harbourfront East,Toronto Islands,Union Station
9 Design Exchange,Toronto Dominion Centre
10 Commerce Court,Victoria Hotel
11 Harbord,University of Toronto
12 Chinatown,Grange Park,Kensington Market
13 CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,Railway Lands,South Niagara
14 Rosedale
15 Stn A PO Boxes 25 The Esplanade
16 Cabbagetown,St. James Town
17 First Canadian Place,Underground city
18 Church and Wellesley
```

Manhattan – Borough




```
1 Marble Hill
2 Chinatown
3 Washington Heights
4 Inwood
5 Hamilton Heights
6 Manhattanville
7 Central Harlem
8 East Harlem
9 Upper East Side
10 Yorkville
11 Lenox Hill
12 Roosevelt Island
13 Upper West Side
14 Lincoln Square
15 Clinton
16 Midtown
17 Murray Hill
18 Chelsea
19 Greenwich Village
20 East Village
21 Lower East Side
22 Tribeca
23 Little Italy
24 Soho
25 West Village
26 Manhattan Valley
27 Morningside Heights
28 Gramercy
29 Battery Park City
30 Financial District
31 Carnegie Hill
32 Noho
33 Civic Center
34 Midtown South
35 Sutton Place
36 Turtle Bay
37 Tudor City
38 Stuyvesant Town
39 Flatiron
40 Hudson Yards
```

After clustering using KMeans to cluster and segment the neoghbourhoods

Downtown Toronto : cluster and segmentation

Cluster 1 - Airport Lounge, Coffee shops, Cafe, Restaurants & Grocery Store

```
downtown_toronto_merged.loc[downtown_toronto_merged['Cluster Labels'] == 0, downtown_toronto_merged.columns[[1] + list(range(5, downtown_toronto_merged.shape[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	10th Most Common Venue
0	Harbourfront,Regent Park	Coffee Shop	Park	Gym / Fitness Center	Breakfast Spot	Performing Arts Venue	Bakery	Chocolate Shop	Restaurant	Farmers Market	Historic Site
1	Ryerson,Garden District	Café	Movie Theater	Music Venue	Burrito Place	Burger Joint	Pizza Place	Clothing Store	Plaza	Coffee Shop	Ramen Restaurant
2	St. James Town	Gastropub	Restaurant	Japanese Restaurant	Coffee Shop	Church	BBQ Joint	Cosmetics Shop	Creperie	Middle Eastern Restaurant	Italian Restaurant
17	Church and Wellesley	Park	Hobby Shop	Mexican Restaurant	Burger Joint	Bubble Tea Shop	Pizza Place	Breakfast Spot	Juice Bar	Bookstore	Pub

Cluster 2 - Gastropubs

```
downtown_toronto_merged.loc[downtown_toronto_merged['Cluster Labels'] == 1, downtown_toronto_merged.columns[[1] + list(range(5, downtown_toronto_merged.shape[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	10th Most Common Venue
8	Design Exchange,Toronto Dominion Centre	Café	Coffee Shop	Deli / Bodega	Restaurant	Bakery	Gym	Gym / Fitness Center	Hotel	Japanese Restaurant	Gastropub
9	Commerce Court,Victoria Hotel	Café	Gastropub	Coffee Shop	Deli / Bodega	Bakery	Gym	Gym / Fitness Center	Beer Bar	American Restaurant	Museum
10	Harbord,University of Toronto	Bookstore	Bakery	Japanese Restaurant	Restaurant	Dessert Shop	Sandwich Place	Beer Bar	Chinese Restaurant	Italian Restaurant	Comfort Food Restaurant
16	First Canadian Place,Underground city	Café	Coffee Shop	Restaurant	Steakhouse	Gastropub	Pub	Deli / Bodega	Bakery	Pizza Place	Seafood Restaurant

Cluster 3 - Cafes

```
downtown_toronto_merged.loc[downtown_toronto_merged['Cluster Labels'] == 2, downtown_toronto_merged.columns[[1] + list(range(5, downtown_toronto_merged.shape[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	10th Most Common Venue
4	Central Bay Street	Coffee Shop	Italian Restaurant	Bubble Tea Shop	Park	Japanese Restaurant	Seafood Restaurant	Spa	Ramen Restaurant	Sushi Restaurant	Sandwich Place
13	Rosedale	Park	Trail	Playground	Building	Wine Bar	Convenience Store	Chinese Restaurant	Chocolate Shop	Church	Clothing Store

Cluster 4 - Coffee Shops, Cafe, Park & Japanese Restaurants

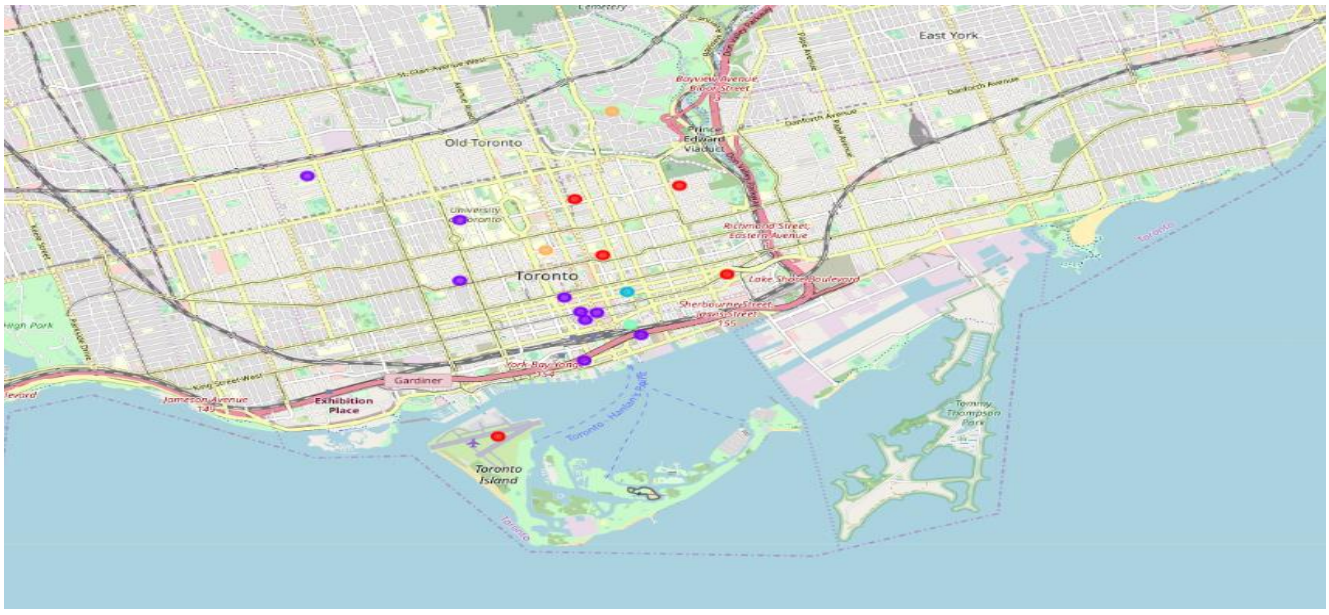
```
downtown_toronto_merged.loc[downtown_toronto_merged['Cluster Labels'] == 3, downtown_toronto_merged.columns[[1] + list(range(5, downtown_toronto_merged.shape[1]))]]
```

	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	10th Most Common Venue
14	Stn A PO Boxes 25 The Esplanade	Cocktail Bar	Beer Bar	Farmers Market	French Restaurant	Steakhouse	Park	Museum	Clothing Store	Jazz Club	Concert Hall

Cluster 5 - Seafood, steakhouse, Hotel & Cafe

```
downtown_toronto_merged.loc[downtown_toronto_merged['Cluster Labels'] == 4, downtown_toronto_merged.columns[[1] + list(range(5, downtown_toronto_merged.shape[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	10th Most Common Venue
3	Berczy Park	Seafood Restaurant	Farmers Market	Steakhouse	Museum	Park	Cocktail Bar	Liquor Store	Coffee Shop	Bistro	Beer Bar
5	Christie	Grocery Store	Café	Park	Coffee Shop	Baby Store	Italian Restaurant	Athletics & Sports	Restaurant	Diner	Nightclub
6	Adelaide,King,Richmond	Asian Restaurant	Coffee Shop	Steakhouse	Seafood Restaurant	Lounge	Pizza Place	Plaza	Concert Hall	Bar	Hotel
7	Harbourfront East,Toronto Islands,Union Station	Park	Plaza	Café	Sporting Goods Shop	New American Restaurant	Performing Arts Venue	Bubble Tea Shop	Lake	Salad Place	Italian Restaurant
11	Chinatown,Grange Park,Kensington Market	Café	Caribbean Restaurant	Vietnamese Restaurant	Mexican Restaurant	Bakery	Farmers Market	Dessert Shop	Coffee Shop	Cocktail Bar	Organic Grocery
12	CN Tower,Bathurst Quay,Island airport,Harbourf...	Airport Lounge	Airport Service	Airport	Airport Food Court	Airport Gate	Airport Terminal	Boat or Ferry	Coffee Shop	Sculpture Garden	Harbor / Marina
15	Cabbagetown,St. James Town	Café	Restaurant	Park	Bakery	Caribbean Restaurant	Butcher	Pet Store	Pub	Jewelry Store	Italian Restaurant



Manhaatan : cluster and segmentation

Cluster 1 - Residential

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[62]: manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 0, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
```

[62]:

	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	10th Most Common Venue
1	Chinatown	Chinese Restaurant	Noodle House	Sandwich Place	Spa	Greek Restaurant	Museum	English Restaurant	Bike Shop	Garden Center	Salon / Barbershop
8	Upper East Side	Hotel	Jazz Club	Optical Shop	Coffee Shop	Chocolate Shop	French Restaurant	Burrito Place	Spa	Bookstore	Gym / Fitness Center
9	Yorkville	Wine Shop	Coffee Shop	Hobby Shop	Beer Store	Sandwich Place	Liquor Store	Dog Run	Bagel Shop	Pub	Asian Restaurant
11	Roosevelt Island	Sandwich Place	Coffee Shop	Farmers Market	Gym	Scenic Lookout	Baseball Field	Residential Building (Apartment / Condo)	School	Greek Restaurant	Japanese Restaurant
22	Little Italy	Café	Wine Bar	Sandwich Place	Snack Place	Salon / Barbershop	Newsstand	Clothing Store	Gourmet Shop	Coffee Shop	Bakery
39	Hudson Yards	American Restaurant	Hotel	Gym / Fitness Center	Music School	Furniture / Home Store	Supermarket	Cocktail Bar	Residential Building (Apartment / Condo)	Greek Restaurant	Theater

Cluster 2 -Commercial Places

```
[63]: manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 1, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
```

[63]:

	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	10th Most Common Venue
3	Inwood	Café	Park	Wine Bar	Yoga Studio	Bakery	Deli / Bodega	Diner	Farmers Market	Mexican Restaurant	Spanish Restaurant
4	Hamilton Heights	Yoga Studio	Caribbean Restaurant	Cocktail Bar	Mexican Restaurant	Historic Site	Pub	Café	Wine Bar	Mediterranean Restaurant	Coffee Shop
19	East Village	Pizza Place	Bagel Shop	Park	Coffee Shop	Ramen Restaurant	Dog Run	Moroccan Restaurant	Scandinavian Restaurant	Korean Restaurant	Beer Store
26	Morningside Heights	American Restaurant	Bookstore	Food Truck	Park	Farmers Market	Coffee Shop	Sandwich Place	Salad Place	Greek Restaurant	Café
27	Gramercy	Pizza Place	Coffee Shop	Yoga Studio	Beer Bar	Ice Cream Shop	Italian Restaurant	Gourmet Shop	Liquor Store	Mexican Restaurant	Food Truck
28	Battery Park City	Park	Food Court	Memorial Site	Smoke Shop	Scenic Lookout	Coffee Shop	BBQ Joint	Shopping Mall	Sandwich Place	Gym
34	Sutton Place	Gym	Indian Restaurant	Grocery Store	Steakhouse	Adult Boutique	American Restaurant	Beer Garden	Beer Store	Dessert Shop	Gym / Fitness Center
35	Turtle Bay	Karaoke Bar	Sushi Restaurant	Greek Restaurant	Museum	Lounge	Residential Building (Apartment / Condo)	Tennis Court	Farmers Market	Gift Shop	Duty-free Shop
38	Flatiron	Japanese Restaurant	Gym	Cycle Studio	Furniture / Home Store	Donut Shop	Spa	Bookstore	Sports Club	Café	Cheese Shop

Cluster 3- Tourist Areas & Hubs

```
[64]: manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 2, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
```

[64]:

	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	10th Most Common Venue
2	Washington Heights	Wine Shop	Park	Café	Frozen Yogurt Shop	Pool	Tapas Restaurant	Market	Restaurant	Burger Joint	Ramen Restaurant
12	Upper West Side	Italian Restaurant	Bar	Bagel Shop	Southern / Soul Food Restaurant	Peruvian Restaurant	Bookstore	Movie Theater	Chinese Restaurant	Gift Shop	Juice Bar
13	Lincoln Square	Theater	Concert Hall	Indie Movie Theater	Performing Arts Venue	Opera House	School	Library	Gift Shop	Park	Fountain
14	Clinton	Theater	Gym / Fitness Center	Pizza Place	Pie Shop	Peruvian Restaurant	Comedy Club	Café	Movie Theater	Building	Sporting Goods Shop
15	Midtown	Hotel	Cuban Restaurant	Bakery	Miscellaneous Shop	Spa	Sporting Goods Shop	Mediterranean Restaurant	Steakhouse	French Restaurant	Salad Place
18	Greenwich Village	Café	French Restaurant	Italian Restaurant	Yoga Studio	Optical Shop	Caribbean Restaurant	Sushi Restaurant	Beer Bar	Gourmet Shop	Clothing Store
20	Lower East Side	Coffee Shop	Art Gallery	Japanese Restaurant	Yoga Studio	Community Center	French Restaurant	Filipino Restaurant	Café	Mediterranean Restaurant	Chinese Restaurant
21	Tribeca	Wine Shop	Park	Yoga Studio	Salad Place	Sushi Restaurant	Dog Run	Café	Poke Place	Coffee Shop	Italian Restaurant
25	Manhattan Valley	Bar	Deli / Bodega	Yoga Studio	Italian Restaurant	Hawaiian Restaurant	Grocery Store	Korean Restaurant	Mexican Restaurant	Fried Chicken Joint	Ethiopian Restaurant
30	Carnegie Hill	Gym	Italian Restaurant	Coffee Shop	Gym / Fitness Center	Spa	Pizza Place	Community Center	Café	Wine Shop	Bagel Shop
33	Midtown South	Korean Restaurant	Cosmetics Shop	Coffee Shop	Lingerie Store	Food Truck	Boutique	Golf Course	Clothing Store	Grocery Store	Hotel
36	Tudor City	Park	Yoga Studio	Asian Restaurant	Convenience Store	Pizza Place	Deli / Bodega	Café	Bridge	Spanish Restaurant	Sushi Restaurant
37	Stuyvesant Town	Bar	Playground	Boat or Ferry	Park	Coffee Shop	Farmers Market	Bistro	Gas Station	German Restaurant	Basketball Court

Cluster 4 - Center Activity

```
[65]: manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 3, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
```

[65]:

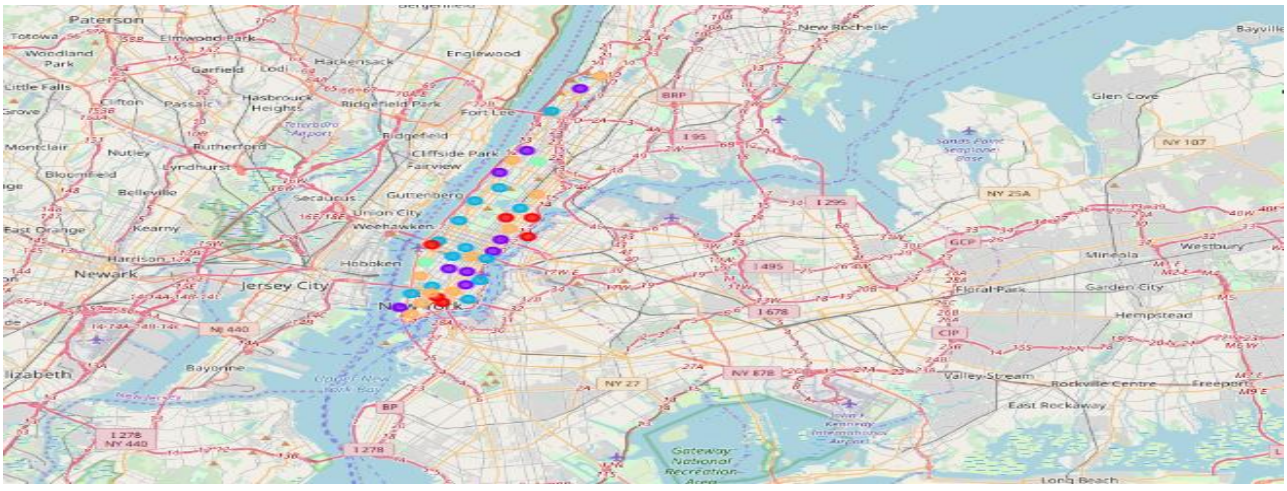
	Neighbourhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
6	Central Harlem	African Restaurant	American Restaurant	Boutique	Bagel Shop	Ethiopian Restaurant	Library	Beer Bar	French Restaurant	Bar	Juice Bar
17	Chelsea	Theater	Italian Restaurant	Nightclub	Indian Restaurant	Ice Cream Shop	French Restaurant	Cupcake Shop	Coffee Shop	Chinese Restaurant	Café

Cluster 5- Cultural & Going Out Places

```
[66]: manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 4, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]
```

[66]:

	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	10th Most Common Venue
0	Marble Hill	Discount Store	Coffee Shop	Yoga Studio	Gym	Seafood Restaurant	Sandwich Place	Steakhouse	Supplement Shop	Donut Shop	Diner
5	Manhattanville	Italian Restaurant	Indian Restaurant	Ramen Restaurant	Mexican Restaurant	Café	Seafood Restaurant	Lounge	Bike Trail	Supermarket	Climbing Gym
7	East Harlem	Mexican Restaurant	Pet Store	Donut Shop	Beer Bar	Latin American Restaurant	Thai Restaurant	Steakhouse	Clothing Store	French Restaurant	Coffee Shop
10	Lenox Hill	Gym	Thai Restaurant	Salad Place	Taco Place	Gift Shop	Smoke Shop	Gourmet Shop	Dessert Shop	College Academic Building	Liquor Store
16	Murray Hill	Hotel	Speakeasy	Jazz Club	Shanghai Restaurant	Museum	Sandwich Place	Lounge	Chinese Restaurant	Restaurant	Ramen Restaurant
23	Soho	Women's Store	Salon / Barbershop	Men's Store	Clothing Store	Yoga Studio	Arts & Crafts Store	Tea Room	Miscellaneous Shop	Optical Shop	Art Museum
24	West Village	Cosmetics Shop	Italian Restaurant	Coffee Shop	Cocktail Bar	Chinese Restaurant	Bakery	Gourmet Shop	Mediterranean Restaurant	Gastropub	Candy Store
29	Financial District	Coffee Shop	Pizza Place	Gym / Fitness Center	Doctor's Office	Food Truck	Falafel Restaurant	Event Space	Steakhouse	Café	New American Restaurant
31	Noho	Coffee Shop	Cocktail Bar	Rock Club	French Restaurant	Italian Restaurant	Hotel	Gym	Deli / Bodega	Sandwich Place	Southern / Soul Food Restaurant
32	Civic Center	Spa	Falafel Restaurant	Yoga Studio	Gym	Monument / Landmark	French Restaurant	Sushi Restaurant	General Entertainment	Molecular Gastronomy Restaurant	Bar



Observations & Recommendations

Historical places are situated in Downtown Toronto neighborhoods and monument venues are in Manhattan neighborhoods. Venues like Airport lounges, Harbor, Gym, museums and night clubs are available for tourists in Downtown Toronto.

At first sight we can primarily recommend, Downtown Toronto neighborhoods as they have easy access to Airports to save time and save some money. Easy access to traveling always leads to convenience for tourists, students and emigrants.

Conclusion

The downtown Toronto and Manhattan neighborhoods have more like similar venues. Most of the times choices and needs also drive the tourists so Asian might more incline towards the Toronto while European may towards Manhattan due to some cultural background and immigration benefits.