Capstone Project - The Battle of the Neighbourhoods

Applied Data Science Capstone by IBM/Coursera

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1. Introduction: Business Problem

The objective of this project is to compare the neighbourhoods of two major cities: **London, the UK** and **Toronto, Canada**. In this project, I will focus on downtown Toronto and the western central London. By exploring the most common venues in each neighbourhood, I am trying to identify **the differences between the European and North American cities**, which may reflect *different city designs, lifestyles and cultures.*

This project might be interesting for:

- Students who want to study abroad in either North America or Europe
- Adults who are considering working abroad
- Travellers who are looking for their next destinations
- Researchers in the field of urban studies/human geography

2. Data

I will use the following datasets to collect the information needed for this project.

- The postal codes of western central London will be obtained from
  https://en.wikipedia.org/wiki/WC_postcode_area (https://en.wikipedia.org/wiki/WC_postcode_area).
- The postal codes of downtown Toronto will be obtained from
  https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
  (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M).
- The geographical coordinates of each neighbourhood will be obtained using **Python Geocoder package**.
- The types and locations of venues in each neighborhood will be obtained using **Foursquare API**.

Below is the cleaned dataset of the central London.

	PostalCode	PostTown	Neighbourhood	Latitude	Longitude
0	WC1A	LONDON	New Oxford Street	51.517302	-0.123046
1	WC1B	LONDON	Bloomsbury	51.523126	-0.126066
2	WC1E	LONDON	University College London	51.523161	-0.128204
4	WC1N	LONDON	Russell Square	51.521699	-0.126074
5	WC1R	LONDON	Gray's Inn	51.518938	-0.112812
6	WC1V	LONDON	High Holborn	51.517702	-0.118897
7	WC1X	LONDON	Kings Cross Station	51.531748	-0.122560
8	WC2A	LONDON	Lincoln's Inn Fields	51.516899	-0.117024
9	WC2B	LONDON	Drury Lane	51.514497	-0.121917
10	WC2E	LONDON	Covent Garden	51.512874	-0.122544
11	WC2H	LONDON	Leicester Square	51.509900	-0.130392
13	WC2R	LONDON	Somerset House	51.510935	-0.118109

Below is the cleaned dataset of downtown Toronto.

	PostalCode	Borough	Neighbourhood	Latitude	Longitude
0	M4W	Downtown Toronto	Rosedale	43.679563	-79.377529
1	M4X	Downtown Toronto	Cabbagetown, St. James Town	43.667967	-79.367675
2	M4Y	Downtown Toronto	Church and Wellesley	43.665860	-79.383160
3	M5A	Downtown Toronto	Harbourfront, Regent Park	43.654260	-79.360636
4	M5B	Downtown Toronto	Ryerson, Garden District	43.657162	-79.378937
5	M5C	Downtown Toronto	St. James Town	43.651494	-79.375418
6	M5E	Downtown Toronto	Berczy Park	43.644771	-79.373306
7	M5G	Downtown Toronto	Central Bay Street	43.657952	-79.387383
8	M5H	Downtown Toronto	Adelaide, King, Richmond	43.650571	-79.384568
9	M5J	Downtown Toronto	Harbourfront East, Toronto Islands, Union Station	43.640816	-79.381752
10	M5K	Downtown Toronto	Design Exchange, Toronto Dominion Centre	43.647177	-79.381576
11	M5L	Downtown Toronto	Commerce Court, Victoria Hotel	43.648198	-79.379817
12	M5S	Downtown Toronto	Harbord, University of Toronto	43.662696	-79.400049
13	M5T	Downtown Toronto	Chinatown, Grange Park, Kensington Market	43.653206	-79.400049
14	M5V	Downtown Toronto	CN Tower, Bathurst Quay, Island airport, Harbo...	43.628947	-79.394420
15	M5W	Downtown Toronto	Stn A PO Boxes 25 The Esplanade	43.646435	-79.374846
16	M5X	Downtown Toronto	First Canadian Place, Underground city	43.648429	-79.382280
17	M6G	Downtown Toronto	Christie	43.669542	-79.422564

3. Methodology

After cleaning the data, I will first visualize all neighourhoods in the central London (using **folium map**) to take a closer look at their locations.

Using the **Foursquare API**, I will then explore the top 100 venues that are in each neighbourhood within a radius of 500 meters. The coordinate and category of each venue is recorded in a dataset called *london_venues*.

By calculating the average frequency of occurrence of each category, I will identify the top 10 most common venues in each neighborhood, which are recorded in a dataset called *london_neighborhoods_venues_sorted*.

Next, I will employ a machine learning algorithm called **K Means Clustering** to separate the neighbourhoods into three clusters, and visualize them on the map. I will then label each cluster based on its most common venues.

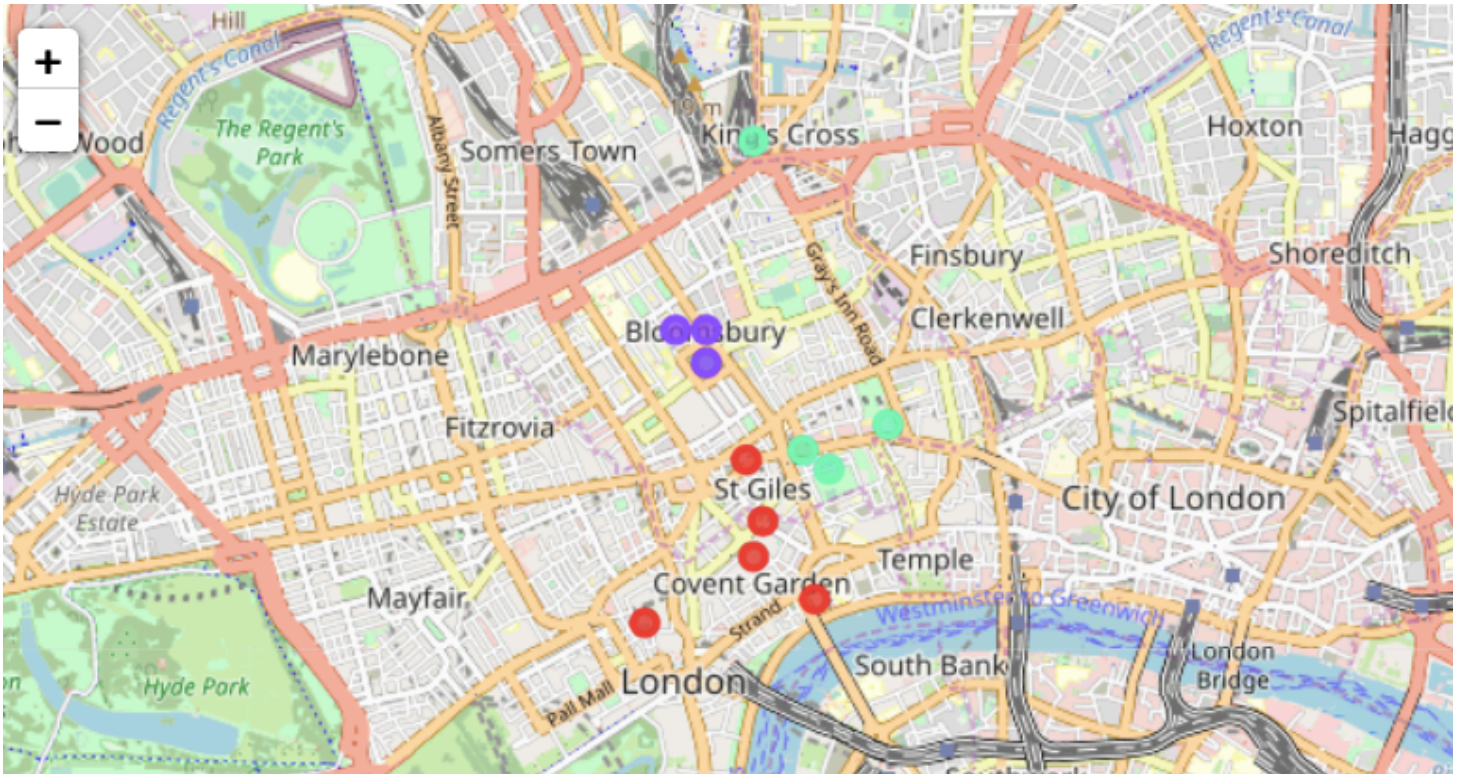The same analysis will be performed on the dataset of downtown toronto to cluster its neighourhoods.

Finally, I will compare the neighbourhood clusters in these two cities, identify and discuss any difference/similarity.

4. Results

Below are the top 10 most common venues in each neighbourhood in the central London.

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
Bloomsbury	Coffee Shop	Café	Hotel	Pub	Exhibit	Bookstore	Park	Sandwich Place	Plaza	Bar
Covent Garden	Theater	Coffee Shop	Dessert Shop	Clothing Store	Indian Restaurant	Italian Restaurant	Bakery	Ice Cream Shop	Restaurant	French Restaurant
Drury Lane	Theater	Clothing Store	Restaurant	Coffee Shop	Indian Restaurant	French Restaurant	Dessert Shop	Japanese Restaurant	Italian Restaurant	Ice Cream Shop
Gray's Inn	Coffee Shop	Pub	Korean Restaurant	Restaurant	Gym / Fitness Center	Bar	French Restaurant	Sandwich Place	Bookstore	Beer Bar
High Holborn	Pub	Coffee Shop	Hotel	Restaurant	Café	Bookstore	Italian Restaurant	Korean Restaurant	Japanese Restaurant	Gastropub
Kings Cross Station	Pub	Hotel	Coffee Shop	Burger Joint	Café	Pizza Place	Bookstore	English Restaurant	Plaza	Restaurant
Leicester Square	Theater	Ice Cream Shop	Italian Restaurant	Hotel	Cocktail Bar	Wine Bar	Plaza	Pub	Coffee Shop	Steakhouse
Lincoln's Inn Fields	Pub	Coffee Shop	Restaurant	Hotel	Theater	Bar	Japanese Restaurant	Sushi Restaurant	Café	Plaza
New Oxford Street	Coffee Shop	Hotel	Theater	Exhibit	Restaurant	Ramen Restaurant	Pub	Burger Joint	Plaza	Gift Shop
Russell Square	Coffee Shop	Café	Pub	Bookstore	Plaza	Hotel	Exhibit	Park	Bar	Sandwich Place
Somerset House	Theater	Coffee Shop	French Restaurant	Dessert Shop	Cocktail Bar	American Restaurant	Restaurant	Tea Room	Burger Joint	Indian Restaurant
University College London	Café	Coffee Shop	Exhibit	Hotel	Pub	Plaza	Bookstore	Bar	Sandwich Place	Park

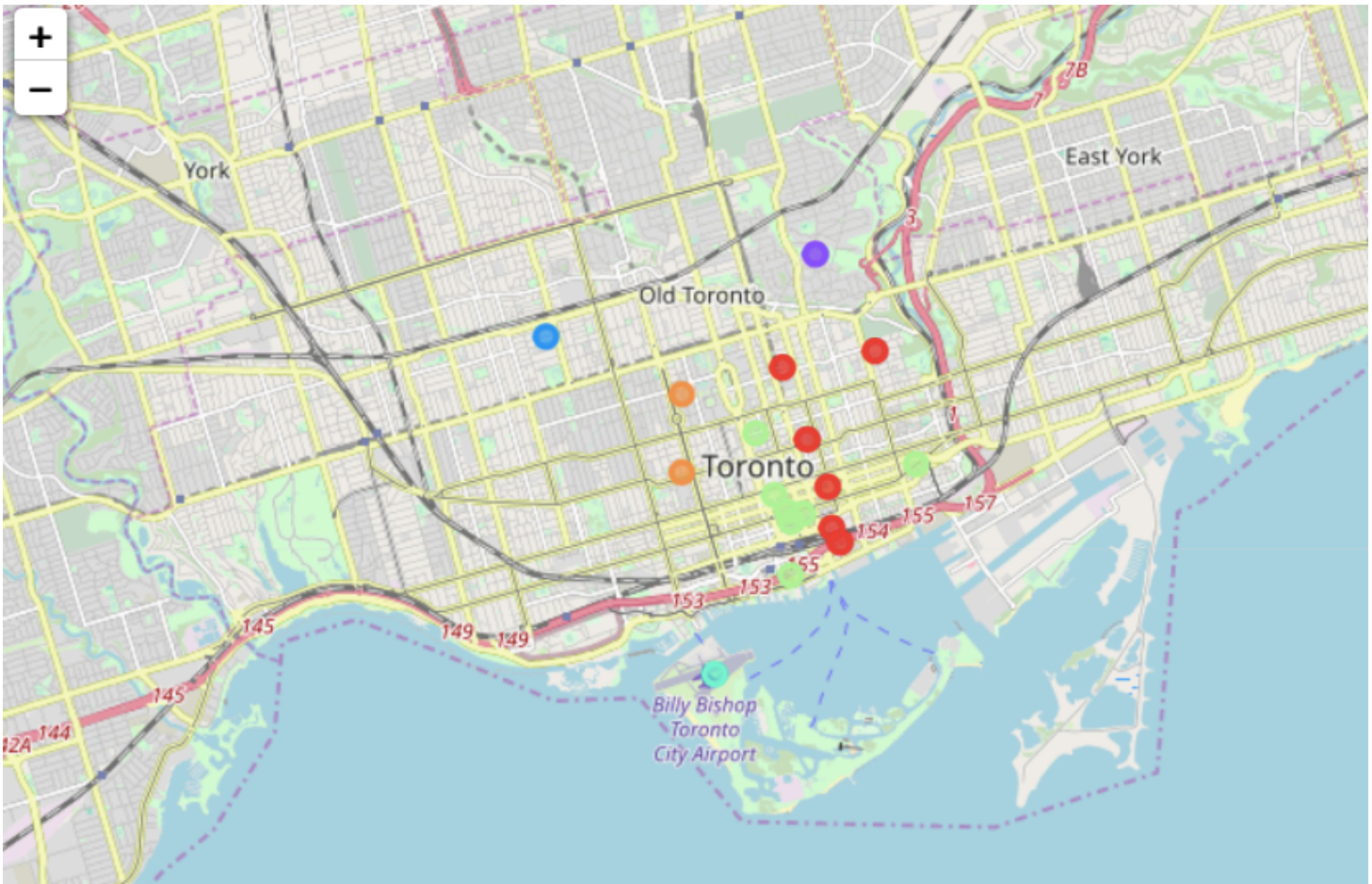I categorized London neighbourhoods into 3 clusters.

Below are the top 10 most common venues in each neighbourhood in downtown Toronto.

	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	Adelaide, King, Richmond	Coffee Shop	Café	Steakhouse	Bar	Thai Restaurant	Burger Joint	Gym	Asian Restaurant	American Restaurant	Bakery
1	Berczy Park	Coffee Shop	Cocktail Bar	Seafood Restaurant	Restaurant	Bakery	Steakhouse	Cheese Shop	Café	Farmers Market	Italian Restaurant
2	CN Tower, Bathurst Quay, Island airport, Harbo...	Airport Lounge	Airport Service	Airport Terminal	Harbor / Marina	Boat or Ferry	Airport	Airport Food Court	Airport Gate	Sculpture Garden	Plane
3	Cabbagetown, St. James Town	Restaurant	Coffee Shop	Park	Pub	Italian Restaurant	Bakery	Café	Market	Pizza Place	Pharmacy
4	Central Bay Street	Coffee Shop	Café	Italian Restaurant	Bubble Tea Shop	Bar	Burger Joint	Spa	Chinese Restaurant	Sushi Restaurant	Salad Place

5	Chinatown, Grange Park, Kensington Market	Bar	Café	Vegetarian / Vegan Restaurant	Chinese Restaurant	Coffee Shop	Vietnamese Restaurant	Bakery	Caribbean Restaurant	Mexican Restaurant	Cocktail Bar
6	Christie	Grocery Store	Café	Park	Athletics & Sports	Italian Restaurant	Coffee Shop	Convenience Store	Diner	Nightclub	Restaurant
7	Church and Wellesley	Coffee Shop	Japanese Restaurant	Gay Bar	Sushi Restaurant	Restaurant	Bubble Tea Shop	Burger Joint	Café	Pub	Men's Store
8	Commerce Court, Victoria Hotel	Coffee Shop	Café	Hotel	Restaurant	American Restaurant	Steakhouse	Seafood Restaurant	Deli / Bodega	Gastropub	Bakery
9	Design Exchange, Toronto Dominion Centre	Coffee Shop	Café	Hotel	American Restaurant	Italian Restaurant	Seafood Restaurant	Restaurant	Gastropub	Deli / Bodega	Lounge
10	First Canadian Place, Underground city	Coffee Shop	Café	Hotel	Steakhouse	Restaurant	American Restaurant	Asian Restaurant	Bakery	Burger Joint	Bar
11	Harbord, University of Toronto	Café	Japanese Restaurant	Bar	Bakery	Coffee Shop	Bookstore	Restaurant	Chinese Restaurant	Italian Restaurant	Beer Bar
12	Harbourfront East, Toronto Islands, Union Station	Coffee Shop	Hotel	Aquarium	Italian Restaurant	Café	Scenic Lookout	Pizza Place	Brewery	Restaurant	History Museum
13	Harbourfront, Regent Park	Coffee Shop	Café	Bakery	Park	Pub	Theater	Mexican Restaurant	Breakfast Spot	Shoe Store	Event Space
14	Rosedale	Park	Playground	Trail	Yoga Studio	Department Store	Electronics Store	Eastern European Restaurant	Dumpling Restaurant	Donut Shop	Doner Restaurant
15	Ryerson, Garden District	Coffee Shop	Clothing Store	Café	Cosmetics Shop	Middle Eastern Restaurant	Ramen Restaurant	Tea Room	Burger Joint	Bubble Tea Shop	Pizza Place
16	St. James Town	Coffee Shop	Restaurant	Hotel	Café	Breakfast Spot	Clothing Store	Park	Cocktail Bar	Gastropub	Cosmetics Shop
17	Stn A PO Boxes 25 The Esplanade	Coffee Shop	Restaurant	Café	Seafood Restaurant	Hotel	Cocktail Bar	Fast Food Restaurant	Italian Restaurant	Creperie	Cheese Shop

I categorized Toronto neighbourhoods into 6 clusters.

Below is a table summarizing the categories of 3 clusters in London and 6 clusters in Toronto.

Clusters	London	Toronto
1	Theater	Cafe & Restaurant
2	Cafe	Park
3	Pub	Grocery Store
4	-	Airport
5	-	Cafe
6	-	Bar

5. Discussion and Conclusion

The clustering result reveals that London and Toronto are very similar based on the most common venues in their neighbourhoods.

Both cities have a lot of coffee shops, which is probably true in most western countries. Also, both cities have a wide variety of restaurants, ranging from Italian and French to Japanese and Chinese restaurants. This reflects the fact that both cities are culturally diverse. Different cultures are celebrated and embraced in both cities. Therefore, if you are considering studying or working abroad in either London or Toronto, you may not worry too much about the cultural issues. It is very likely that you will find some signs of your own culture, such as a restaurant which provides food from your hometown.

However, there does exist some differences between London and Toronto.

First, Toronto tends to have more parks than London does. This is a very positive sign, especially for a large crowded city like Toronto. If you are thinking about living abroad for a long period of time, the living environment is an important factor to consider.

Second, London tends to have more theatres, exhibits and bookstores than Toronto does. As we all know, London is famous for its rich history, cultures and arts, so I am not surprised to discover this difference. For people who are interested in history or arts, London is an ideal place to experience and learn the European culture.

With increasing globalization, major cities around the world tend to become more similar in terms of city designs. However, they still have unique history backgrounds and cultures, which make them different from each other to some extent. For researchers in the field of urban studies, I hope this project can provide you with additional insights into the difference between the European and North American cities.

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