A. Introduction

A.1. The Background

Toronto is the capital of Canada and one of the biggest city in Canada. Toronto is the most popular city of Canada.

Toronto is a prominent center for music, theatre, motion picture production, television production, and is home to the headquarters of Canada's major national broadcast networks and media outlets. Its varied cultural institutions, which include numerous museums and galleries, festivals and public events, entertainment districts, national historic sites, and sports activities, attract over 43 million tourists each year.

Toronto is a city with many venues for the tourists. As a tourist, it is difficult visit all these venues in a trip. Especially the trip which is for short period of time, it is a problem to prioritize things to do or places to visit.

When we consider this problem, we can create a map and information chart where the most 10 common venues at the dedicated neighborhoods in Toronto.
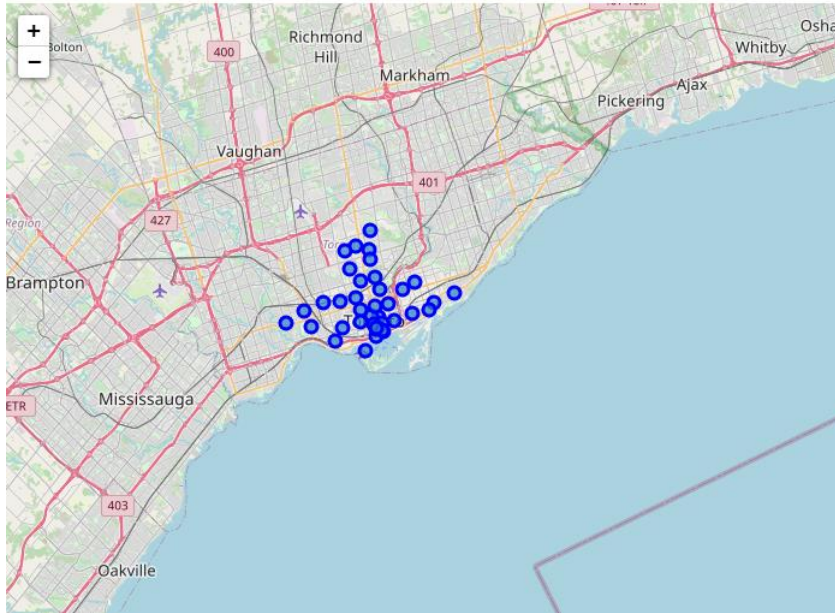
A.2. Data Description

To consider the problem we can list the datas as below:

- The city of Toronto data that contains list Boroughs, Neighborhoods along with their latitude and longitude.
- Venues in each neighborhood of the city of Toronto.
- GeoSpace data
- Forsquare API to get the most common venues of the city of Toronto.

B. Methodology

1. We begin by collecting the city of Toronto data from https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
2. We use python folium library to visualize geographic details of Toronto and its boroughs and create a map of Toronto with boroughs superimposed on top by using latitude and longitude values to get the visual as below;

	PostalCode	Borough	Neighborhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Regent Park, Harbourfront
3	M6A	North York	Lawrence Manor, Lawrence Heights
4	M7A	Queen's Park	Ontario Provincial Government

3. We will find all venues for each neighborhood using FourSquare API.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Regent Park, Harbourfront	43.65426	-79.360636	Roselle Desserts	43.653447	-79.362017	Bakery
1	Regent Park, Harbourfront	43.65426	-79.360636	Tandem Coffee	43.653559	-79.361809	Coffee Shop
2	Regent Park, Harbourfront	43.65426	-79.360636	Cooper Koo Family YMCA	43.653249	-79.358008	Distribution Center
3	Regent Park, Harbourfront	43.65426	-79.360636	Body Blitz Spa East	43.654735	-79.359874	Spa
4	Regent Park, Harbourfront	43.65426	-79.360636	Impact Kitchen	43.656369	-79.356980	Restaurant

4. We will then filter out all 10 most common venues.

	Borough	Cluster Labels	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	Downtown Toronto	0	Café	Theater	Shopping Mall	Fast Food Restaurant	Japanese Restaurant	Sandwich Place	Ramen Restaurant	Diner	Coffee Shop	Burger Joint
2	Downtown Toronto	0	Gastropub	Café	Farmers Market	Coffee Shop	Restaurant	Hotel	Italian Restaurant	Japanese Restaurant	Jazz Club	Diner
3	East Toronto	0	Trail	Pub	Health Food Store	Wine Shop	Creperie	Dog Run	Distribution Center	Discount Store	Diner	Dessert Shop
4	Downtown Toronto	0	Cheese Shop	Seafood Restaurant	Cocktail Bar	Farmers Market	Tailor Shop	Jazz Club	Museum	Liquor Store	Beer Bar	Basketball Stadium
6	Downtown Toronto	0	Grocery Store	Café	Park	Restaurant	Coffee Shop	Nightclub	Italian Restaurant	Candy Store	Baby Store	Discount Store
7	Downtown Toronto	0	Coffee Shop	Café	Seafood Restaurant	Hotel	Restaurant	Steakhouse	Bakery	Speakeasy	Smoke Shop	Plaza
8	West Toronto	0	Pharmacy	Bakery	Wine Shop	Supermarket	Grocery Store	Gym	Liquor Store	Middle Eastern Restaurant	Music Venue	Park
10	Downtown Toronto	0	Park	Plaza	Café	Hotel	Chinese Restaurant	Lounge	Performing Arts Venue	New American Restaurant	Lake	Dance Studio
11	West Toronto	0	Bar	Vietnamese Restaurant	Coffee Shop	Asian Restaurant	Yoga Studio	Art Gallery	Ice Cream Shop	Cuban Restaurant	Korean Restaurant	Pizza Place
12	East Toronto	0	Greek Restaurant	Italian Restaurant	Ice Cream Shop	Coffee Shop	Yoga Studio	Cosmetics Shop	Brewery	Juice Bar	Restaurant	Bookstore
13	Downtown Toronto	0	Café	Coffee Shop	Japanese Restaurant	Restaurant	Gym	Seafood Restaurant	Deli / Bodega	Beer Bar	Pub	Hotel

5. Finally, we will visualize the ranking of the venues using python's Folium library.

C. Results

- Cluster 0;

	Borough	Cluster Labels	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	Downtown Toronto	0	Café	Theater	Shopping Mall	Fast Food Restaurant	Japanese Restaurant	Sandwich Place	Ramen Restaurant	Diner	Coffee Shop	Burger Joint
2	Downtown Toronto	0	Gastropub	Café	Farmers Market	Coffee Shop	Restaurant	Hotel	Italian Restaurant	Japanese Restaurant	Jazz Club	Diner
3	East Toronto	0	Trail	Pub	Health Food Store	Wine Shop	Creperie	Dog Run	Distribution Center	Discount Store	Diner	Dessert Shop
4	Downtown Toronto	0	Cheese Shop	Seafood Restaurant	Cocktail Bar	Farmers Market	Tailor Shop	Jazz Club	Museum	Liquor Store	Beer Bar	Basketball Stadium
6	Downtown Toronto	0	Grocery Store	Café	Park	Restaurant	Coffee Shop	Nightclub	Italian Restaurant	Candy Store	Baby Store	Discount Store
7	Downtown Toronto	0	Coffee Shop	Café	Seafood Restaurant	Hotel	Restaurant	Steakhouse	Bakery	Speakeasy	Smoke Shop	Plaza
8	West Toronto	0	Pharmacy	Bakery	Wine Shop	Supermarket	Grocery Store	Gym	Liquor Store	Middle Eastern Restaurant	Music Venue	Park
10	Downtown Toronto	0	Park	Plaza	Café	Hotel	Chinese Restaurant	Lounge	Performing Arts Venue	New American Restaurant	Lake	Dance Studio

- Cluster 1;

	Borough	Cluster Labels	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
18	Central Toronto	1	Bus Line	Park	Swim School	Wine Shop	Dog Run	Distribution Center	Discount Store	Diner	Dessert Shop	Department Store
33	Downtown Toronto	1	Park	Playground	Trail	Wine Shop	Coworking Space	Distribution Center	Discount Store	Diner	Dessert Shop	Department Store

- Cluster 2, 3 and 4;

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#Cluster3
toronto_merged.loc[toronto_merged['Cluster Labels'] == 2, toronto_merged.columns[[1] + list(range(5, toronto_merged.shape[1]))]]
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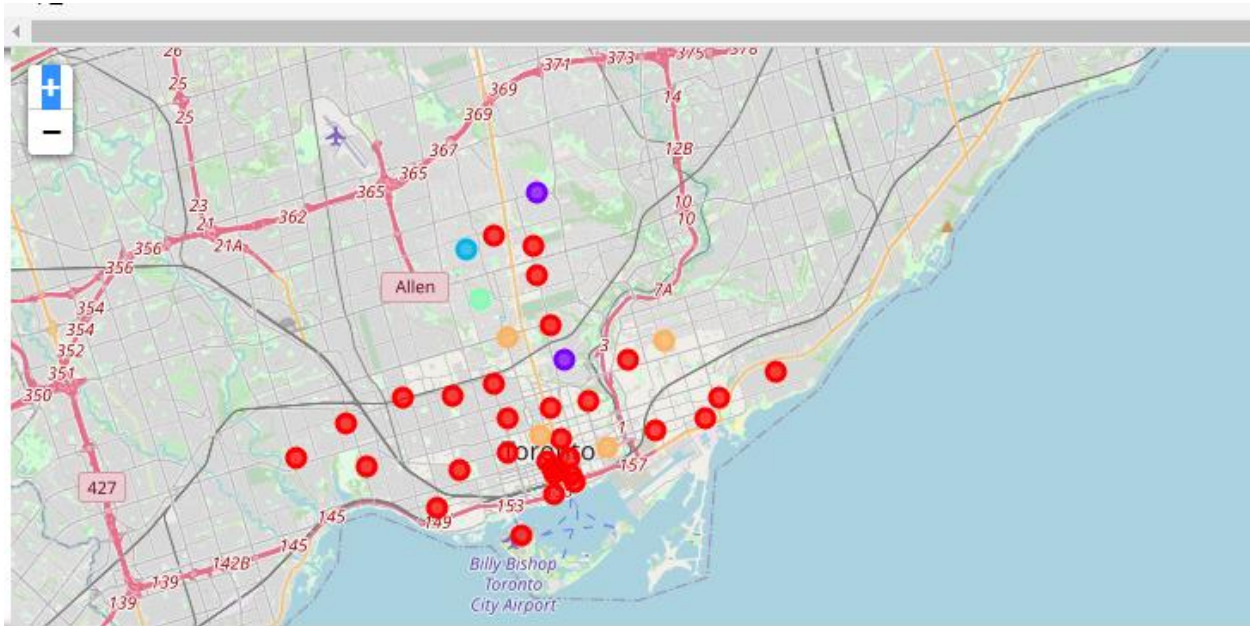
	Borough	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
19	Central Toronto	2	Home Service	Garden	Music Venue	Creperie	Dog Run	Distribution Center	Discount Store	Diner	Dessert Shop	Department Store

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#Cluster4
toronto_merged.loc[toronto_merged['Cluster Labels'] == 3, toronto_merged.columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

	Borough	Cluster Labels	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
21	Central Toronto	3	Jewelry Store	Trail	Sushi Restaurant	Mexican Restaurant	Cuban Restaurant	Dog Run	Distribution Center	Discount Store	Diner	Dessert Shop

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#Cluster5
toronto_merged.loc[toronto_merged['Cluster Labels'] == 4, toronto_merged.columns[[1] + list(range(5, toronto_merged.shape[1]))]]
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	Borough	Cluster Labels	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	Downtown Toronto	4	Coffee Shop	Park	Bakery	Café	Breakfast Spot	Historic Site	Performing Arts Venue	Chocolate Shop	Mexican Restaurant	Pub
5	Downtown Toronto	4	Coffee Shop	Café	Italian Restaurant	Modern European Restaurant	Middle Eastern Restaurant	Comic Shop	Poke Place	Portuguese Restaurant	Sushi Restaurant	Bubble Tea Shop
9	East York/East Toronto	4	Coffee Shop	Park	Intersection	Convenience Store	Dance Studio	Donut Shop	Dog Run	Distribution Center	Discount Store	Diner
31	Central Toronto	4	Light Rail Station	Coffee Shop	Sushi Restaurant	Pub	Bagel Shop	Liquor Store	Bank	Restaurant	American Restaurant	Supermarket

D. Conclusion

As a result, there are many attractions in the city center of Toronto, depending on the area there are different venue options to utilize. Above data can be used to plan the trip in advance accordingly to people's interests and where to visit or what to do.