

Top 10 venues corresponding to each neighborhood in Toronto

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1. Introduction

1.1. Problem Statement

Can we group each neighborhood and find out top 10 venues corresponding to that neighborhood in Toronto, to map offers/coupons based on neighborhood?

1.2. Problem Description

Many offers/coupons are rolled out by different businesses as a strategy to attract more customer base. But most of the offers are not used by customers, because they don't find it useful or those offers are irrelevant in the neighborhood that they live in. For Example, In Berczy Park neighborhood, there are a lot of coffee shops but not many spa venues. So, for a customer residing in Berczy Park neighborhood, coffee shop coupons/offers are more relevant than spa coupons.

1.3. Client Base who might be interested in this project

- a. Financial Institutions in Toronto dealing with credit cards - This group of business can utilize this project as a basis to map their credit card offers to customers based on the residence neighborhood of the customer.
- b. Anyone planning to set up a new business in Toronto - This person/group can utilize this project to decide on the type of business they want to setup, the neighborhood where they can setup etcetera.

1.4. Analytic Approach

For achieving the grouping as stated in the problem statement, I can make use of k-means clustering. K -means clustering is a type of unsupervised learning, which is used when you have unlabeled data (i.e., data without defined categories or groups). The goal of this algorithm is to find groups in the data, with the number of groups represented by the variable K. The algorithm works iteratively to assign each data point to one of K groups based on the features that are provided.

I will be using k-means clustering to group neighborhoods in Toronto and find out top 10 venues in each neighborhood.

2. Data

2.1. Data Requirements

For this project I will require the below mentioned data:

a. Neighborhood data of Toronto - I will make use of Wikipedia link 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M' to get the neighborhood data required for this project.

b. Location data of each neighborhood in Toronto - I will make use of Foursquare APIs to get location details of each neighborhood derived in step 1.

2.2. Data Collection

a. I will do a web scraping of the following Wikipedia link 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M' using Beautiful Soup python library to get the CANADA neighborhood mapped to Postal Code and Borough. I will use 'https://cocl.us/Geospatial_data' to get the mapping of latitude and longitude of each postal code.

b. I will filter only the Toronto Borough Data from the table of data collected in step 1 for this project.

c. I will use foursquare API calls to get the location details corresponding to each neighborhood captured in step 2, something as mentioned below:

create the API request URL

```
url
'https://api.foursquare.com/v2/venues/explore?&client_id={} &client_secret={} &v={} &ll={}
,{} &radius={} &limit={} '.format(
```

CLIENT_ID,

CLIENT_SECRET,

VERSION,

lat,

lng,

radius,

LIMIT)

make the GET request

results = requests.get(url).json()["response"][0]['items']

2.3. Data Understanding

For understanding the data collected in the Data collection stage, I will explore the data and do some analysis like:

- Explore the neighborhoods in Toronto
- Analyze each neighborhood.
- Explore the venues corresponding to any one of the neighborhoods.

2.4. Data Preparation

This stage involves in exploring the data further and making sure that it is in the right format for k-means clustering that I selected in the analytic approach stage.

- If I see any gap in the data, the I will go back to the data collection stage and collect any missing data.
- If I see any erroneous data / unnecessary data, then I will filter and remove those data to prepare the final data which will be used in clustering.

At the end of this stage, I should have the dataset ready to be fed into the clustering analysis.

3. Data Analysis

3.1. Preparing neighborhood data

- Extract the table with postal code, borough and neighborhood data from the Wikipedia link 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M' using BeautifulSoup library and save it in a csv file.
- Create a data frame from the csv file created in step 1 and filter rows with borough='Not assigned' (as shown below).

	PostalCode	Borough	Neigh
0	M1A	Not assigned	N
1	M2A	Not assigned	N

- c. If a postal code has a borough but a Not assigned neighborhood (as shown below), then the neighborhood will be the same as the borough.

	PostalCode	Borough	Neighborhood
8	M7A	Queen's Park	Not assigned

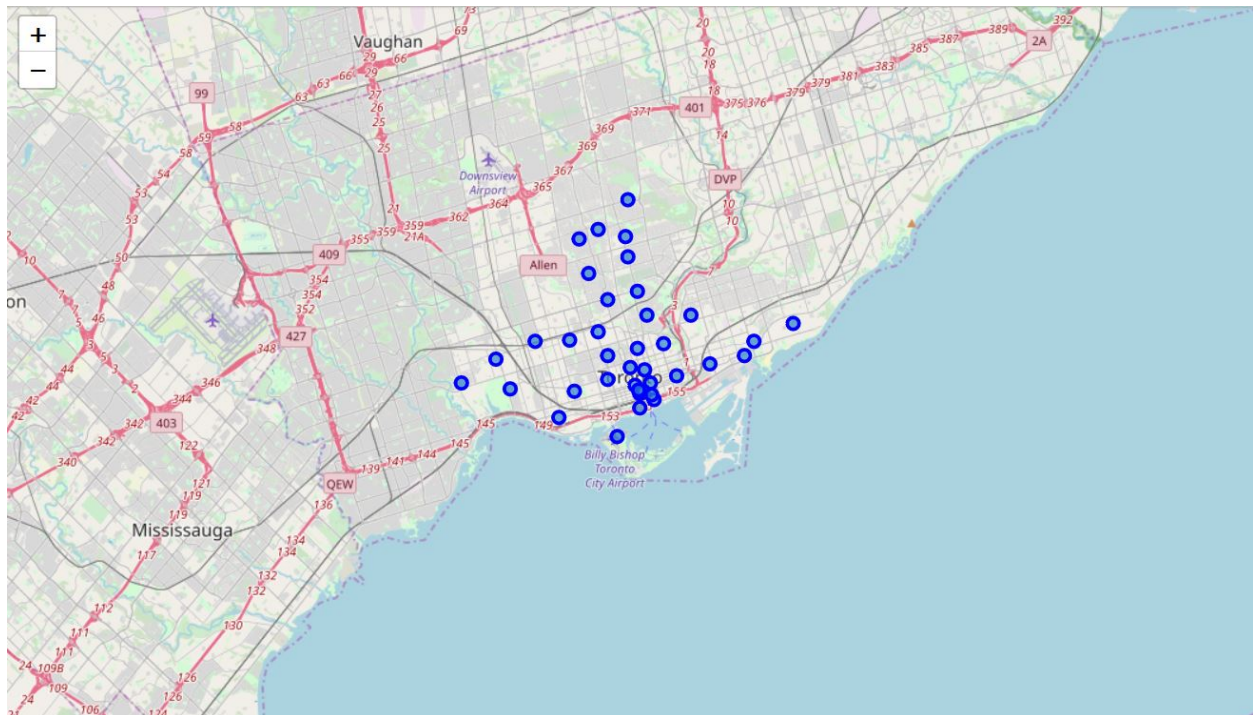
- d. Group neighborhood based on postal code and borough. Below screenshot shows the total groups created from the data:

PostalCode	1
Borough	1
Neighborhood	1

- e. Read the geo spatial data from 'https://cocl.us/Geospatial_data' and merge it with the data frame created in step d. The resulting data frame looks something like:

	PostalCode	Borough	Neighborhood	Latitude
0	M1B	Scarborough	Malvern, Rouge	43.8066
1	M1C	Scarborough	Highland Creek, Rouge Hill, Port Union	43.7845
2	M1E	Scarborough	Morningside, Guildwood, West Hill	43.7635
3	M1G	Scarborough	Woburn	43.7709

3.2. Create a map showing the neighborhoods in Toronto



3.3. Test the Foursquare API to get venues for one neighborhood, “The Beaches”

The venues details collected using the neighborhood data and Foursquare API for “The Beaches” neighborhood is as below:

	name	categories	lat
0	The Big Carrot Natural Food Market	Health Food Store	43.67887
1	Grover Pub and Grub	Pub	43.67918
2	Starbucks	Coffee Shop	43.67879
3	Glen Stewart Park	Park	43.67527

3.4. Check how many venues are there for each neighborhood

There are 236 unique venue categories in the neighborhood data.

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude
Neighborhood				
Adelaide, Richmond, King	100	100	100	100
Berczy Park	57	57	57	57
Business Reply Mail Processing Centre 969 Eastern	18	18	18	18
Central Bay Street	84	84	84	84
Christie	16	16	16	16
Church and Wellesley	82	82	82	82
Commerce Court, Victoria Hotel	100	100	100	100
Davisville	32	32	32	32
Davisville North	9	9	9	9
Design Exchange, Toronto Dominion Centre	100	100	100	100
Dovercourt Village, Dufferin	22	22	22	22
Exhibition Place, Parkdale Village, Brockton	21	21	21	21
Forest Hill West, Forest Hill North	4	4	4	4
Harbourfront East, Toronto Islands, Union Station	100	100	100	100
Little Portugal, Trinity	60	60	60	60
North Toronto West	21	21	21	21
Parkdale, Roncesvalles	16	16	16	16
Riverdale, The Danforth West	42	42	42	42
Rosedale	4	4	4	4
Roselawn	1	1	1	1
Ryerson, Garden District	100	100	100	100
South Niagara, Bathurst Quay, King and Spadina, Railway Lands, CN Tower, Harbourfront West, Island airport	14	14	14	14
St. James Town	100	100	100	100
St. James Town, Cabbagetown	46	46	46	46
Stn A PO Boxes 25 The Esplanade	93	93	93	93
Studio District	40	40	40	40
Summerhill East, Moore Park	3	3	3	3
Summerhill West, Forest Hill SE, Deer Park, South Hill, Rathnelly	14	14	14	14
Swansea, Runnymede	38	38	38	38
The Beaches	5	5	5	5

3.5. Apply One hot encoding and group rows on neighborhood by taking mean

The resulting data would look something like the below table, where the point of interest is that there are 38 neighborhoods and 236 unique categories.

	Neighborhood	Yoga Studio	Adult Boutique	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	...	Toy / Game Store	Trail	Train Station	Vegetarian / Vegan Restaurant	Video Game Store	Vietnamese Restaurant	Wine Bar
0	Adelaide, Richmond, King	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.010000	0.000000	0.000000	0.010000
1	Berczy Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
2	Business Reply Mail Processing Centre 969 Eastern	0.055556	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
3	Central Bay Street	0.011905	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.011905	0.000000	0.000000	0.011905
4	Christie	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
5	Church and Wellesley	0.012195	0.012195	0.012195	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.012195	0.012195	0.000000
6	Commerce Court, Victoria Hotel	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.010000
7	Davisville	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.03125	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
8	Davisville North	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
9	Design Exchange, Toronto Dominion Centre	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.01	0.000000	0.000000	0.000000	0.010000
10	Dovercourt Village, Dufferin	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
11	Exhibition Place, Parkdale Village, Brockton	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
12	Forest Hill West, Forest Hill North	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.250000	0.00	0.000000	0.000000	0.000000	0.000000
13	Harbourfront East, Toronto Islands, Union Station	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.01	0.010000	0.000000	0.000000	0.010000
14	Harbourfront, Regent Park	0.020833	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
15	High Park, The Junction South	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
16	Kensington Market, Grange Park, Chinatown	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.051546	0.000000	0.041237	0.010309
17	Lawrence Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
18	Little Portugal, Trinity	0.016667	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.033333	0.016667
19	North Toronto West	0.047619	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
20	Parkdale, Roncesvalles	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
21	Riverdale, The Danforth West	0.023810	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.023810	0.00	0.000000	0.000000	0.000000	0.000000
22	Rosedale	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.250000	0.00	0.000000	0.000000	0.000000	0.000000
23	Roselawn	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
24	Ryerson, Garden District	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.010000	0.000000	0.00	0.010000	0.010000	0.010000	0.010000
25	South Niagara, Bathurst Quay, King and Spadina...	0.000000	0.000000	0.000000	0.071429	0.071429	0.071429	0.142857	0.142857	0.142857	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
26	St. James Town	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
27	St. James Town, Cabbagetown	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
28	Stn A PO Boxes 25 The Esplanade	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
29	Studio District	0.025000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
30	Summerhill East, Moore Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.333333	0.00	0.000000	0.000000	0.000000	0.000000
31	Summerhill West, Forest Hill SE, Deer Park, So...	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.071429	0.000000
32	Swansea, Runnymede	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.026316	0.000000	0.000000	0.000000
33	The Beaches	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
34	The Beaches West, India Bazaar	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000
35	Underground City, First Canadian Place	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.01	0.010000	0.000000	0.000000	0.010000
36	University of Toronto, Harbord	0.027778	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.000000	0.027778	0.000000	0.000000
37	Yorkville, The Annex, North Midtown	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.00	0.038462	0.000000	0.000000	0.000000

38 rows × 236 columns

3.6. Find the top 10 common venues in each neighborhood

Below table shows how the data looks for all the neighborhoods with a sample of 5 neighborhoods.

	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
0	Adelaide, Richmond, King	Coffee Shop	Café	Thai Restaurant	Bar	Steakhouse	Asian Restaurant	Restaurant	Burger Joint
1	Berczy Park	Coffee Shop	Cocktail Bar	Farmers Market	Bakery	Beer Bar	Steakhouse	Cheese Shop	Café
2	Business Reply Mail Processing Centre 969 Eastern	Light Rail Station	Yoga Studio	Auto Workshop	Gym / Fitness Center	Garden Center	Garden	Fast Food Restaurant	Farmers Market
3	Central Bay Street	Coffee Shop	Café	Italian Restaurant	Bubble Tea Shop	Burger Joint	Bar	Sushi Restaurant	Juice Bar

Now that I have the required top 10 data ready, I will proceed to the clustering of the data thus prepared in the above section.

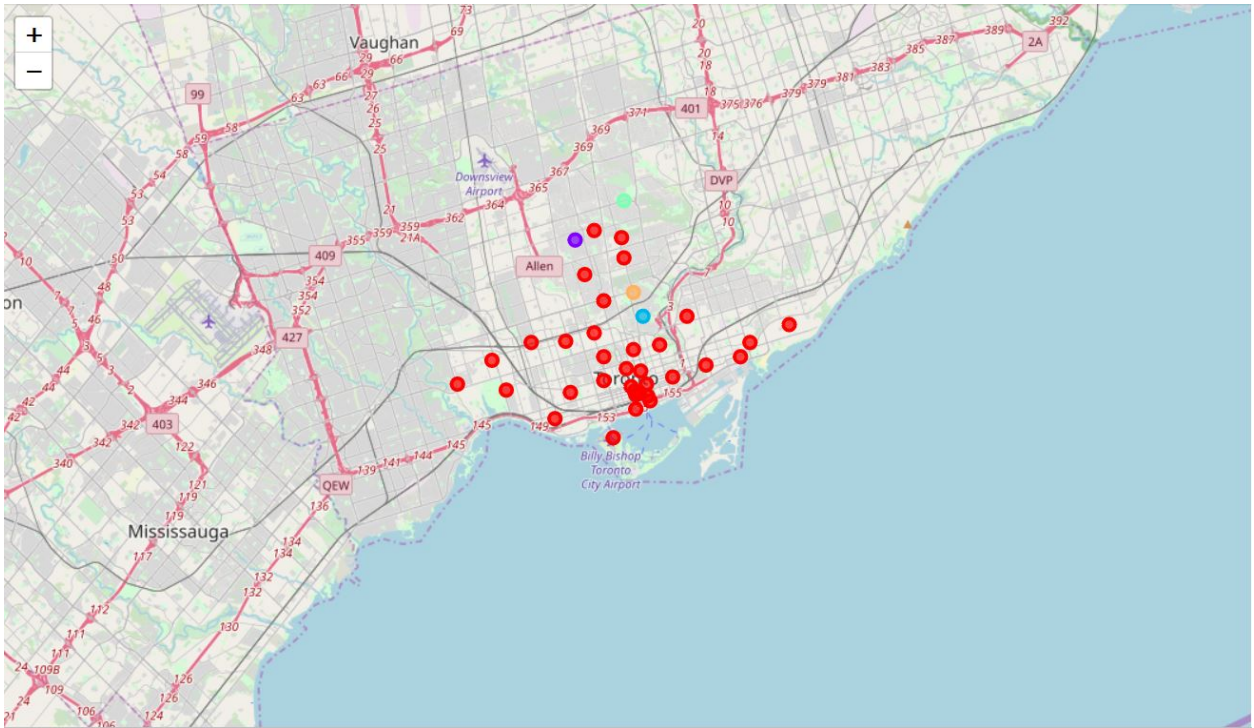
4. Cluster Neighborhoods

I will use K-Means clustering for grouping the data of the neighborhoods in Toronto. K - means clustering is a type of unsupervised learning, which is used when you have unlabeled data (i.e., data without defined categories or groups). The goal of this algorithm is to find groups in the data, with the number of groups represented by the variable K. The algorithm works iteratively to assign each data point to one of K groups based on the features that are provided.

I created 5 clusters for the 38 neighborhood groups indicating the top 10 venues. The clustered data look like the table as shown below:

	PostalCode	Borough	Neighborhood	Latitude	Longitude	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
0	M4E	East Toronto	The Beaches	43.676357	-79.293031	0	Pub	Coffee Shop	Health Food Store	Park	Women's Store	Dim Sum Restaurant	Diner
1	M4K	East Toronto	Riverdale, The Danforth West	43.679557	-79.352188	0	Greek Restaurant	Coffee Shop	Ice Cream Shop	Bookstore	Italian Restaurant	Pub	Indian Restaurant
2	M4L	East Toronto	The Beaches West, India Bazaar	43.668999	-79.315572	0	Sandwich Place	Ice Cream Shop	Movie Theater	Liquor Store	Burger Joint	Burrito Place	Fast Food Restaurant
3	M4M	East Toronto	Studio District	43.659526	-79.340923	0	Café	Coffee Shop	Italian Restaurant	Bakery	Gastropub	American Restaurant	Diner

I created matplotlib folium maps to visualize the clusters.



Then I examined the data in the 5 clusters that are created.

Cluster5:

	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
8	Central	4	Playground	Trail	Summer Camp	Women's Store	Department	Ethiopian	Electronics	East European

Cluster4:

	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
4	Central Toronto	3	Park	Swim School	Bus Line	Women's Store	Dessert Shop	Ethiopian Restaurant	Electronics Store	East European

Cluster3:

	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
10	Downtown Toronto	2	Park	Playground	Trail	Women's Store	Department Store	Ethiopian Restaurant	Electronics Store	East European

Cluster2:

	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
22	Central Toronto	1	Garden	Women's Store	Department Store	Event Space	Ethiopian Restaurant	Electronics Store	Eastern European Restaurant	Dump Restaurant

Cluster1:

	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	East Toronto	0	Pub	Coffee Shop	Health Food Store	Park	Women's Store	Dim Sum Restaurant	Diner	Discount Store	Dog Run	Doner Restaurant
1	East Toronto	0	Greek Restaurant	Coffee Shop	Ice Cream Shop	Bookstore	Italian Restaurant	Pub	Indian Restaurant	Bakery	Diner	Sports Bar
2	East Toronto	0	Sandwich Place	Ice Cream Shop	Movie Theater	Liquor Store	Burger Joint	Burrito Place	Fast Food Restaurant	Fish & Chips Shop	Steakhouse	Italian Restaurant
3	East Toronto	0	Café	Coffee Shop	Italian Restaurant	Bakery	Gastropub	American Restaurant	Diner	Fish Market	Juice Bar	Bookstore
5	Central Toronto	0	Gym	Hotel	Breakfast Spot	Burger Joint	Food & Drink Shop	Sandwich Place	Dance Studio	Restaurant	Park	Coworking Space
6	Central Toronto	0	Clothing Store	Coffee Shop	Sporting Goods Shop	Park	Shoe Store	Sandwich Place	Salon / Barbershop	Rental Car Location	Chinese Restaurant	Cosmetics Shop
7	Central Toronto	0	Dessert Shop	Sandwich Place	Pizza Place	Café	Coffee Shop	Sushi Restaurant	Italian Restaurant	Japanese Restaurant	Indian Restaurant	Deli / Bodega
9	Central Toronto	0	Coffee Shop	Pub	American Restaurant	Convenience Store	Light Rail Station	Sports Bar	Bagel Shop	Supermarket	Sushi Restaurant	Fried Chicken Joint
11	Downtown Toronto	0	Coffee Shop	Park	Restaurant	Bakery	Pizza Place	Flower Shop	Pub	Café	Italian Restaurant	Bank
12	Downtown Toronto	0	Coffee Shop	Japanese Restaurant	Sushi Restaurant	Gay Bar	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Burger Joint	Pub	Gastropub
13	Downtown Toronto	0	Coffee Shop	Bakery	Café	Pub	Park	Theater	Breakfast Spot	Mexican Restaurant	Gym / Fitness Center	Italian Restaurant
14	Downtown Toronto	0	Clothing Store	Coffee Shop	Café	Cosmetics Shop	Fast Food Restaurant	Middle Eastern Restaurant	Burger Joint	Pizza Place	Bubble Tea Shop	Italian Restaurant
15	Downtown Toronto	0	Coffee Shop	Restaurant	Café	Hotel	Cosmetics Shop	Breakfast Spot	Italian Restaurant	Gastropub	Park	Cocktail Bar
16	Downtown Toronto	0	Coffee Shop	Cocktail Bar	Farmers Market	Bakery	Beer Bar	Steakhouse	Cheese Shop	Café	Italian Restaurant	Seafood Restaurant
17	Downtown Toronto	0	Coffee Shop	Café	Italian Restaurant	Bubble Tea Shop	Burger Joint	Bar	Sushi Restaurant	Juice Bar	Salad Place	Spa
18	Downtown Toronto	0	Coffee Shop	Café	Thai Restaurant	Bar	Steakhouse	Asian Restaurant	Restaurant	Burger Joint	Bakery	Gym
19	Downtown Toronto	0	Coffee Shop	Hotel	Aquarium	Café	Pizza Place	Scenic Lookout	Bakery	Restaurant	Brewery	Italian Restaurant
20	Downtown Toronto	0	Coffee Shop	Café	Hotel	American Restaurant	Restaurant	Gastropub	Deli / Bodega	Japanese Restaurant	Bakery	Bar
21	Downtown Toronto	0	Coffee Shop	Café	Hotel	Restaurant	American Restaurant	Deli / Bodega	Gym	Gastropub	Steakhouse	Italian Restaurant
23	Central Toronto	0	Mexican Restaurant	Trail	Jewelry Store	Sushi Restaurant	Women's Store	Dessert Shop	Ethiopian Restaurant	Electronics Store	Eastern European Restaurant	Dumpling Restaurant
24	Central Toronto	0	Coffee Shop	Sandwich Place	Café	Park	Pizza Place	Pharmacy	Cheese Shop	Liquor Store	Burger Joint	Jewish Restaurant
25	Downtown Toronto	0	Café	Restaurant	Bar	Japanese Restaurant	Bookstore	Bakery	Coffee Shop	Chinese Restaurant	Dessert Shop	Pub
26	Downtown Toronto	0	Café	Bar	Vegetarian / Vegan Restaurant	Chinese Restaurant	Vietnamese Restaurant	Coffee Shop	Bakery	Mexican Restaurant	Dumpling Restaurant	Caribbean Restaurant
27	Downtown Toronto	0	Airport Lounge	Airport Terminal	Airport Service	Harbor / Marina	Sculpture Garden	Boutique	Boat or Ferry	Plane	Airport Gate	Airport
28	Downtown Toronto	0	Coffee Shop	Restaurant	Café	Seafood Restaurant	Hotel	Cocktail Bar	Italian Restaurant	Beer Bar	Cosmetics Shop	Japanese Restaurant
29	Downtown Toronto	0	Café	Coffee Shop	Hotel	Restaurant	American Restaurant	Seafood Restaurant	Bar	Bakery	Gym	Gastropub
30	Downtown Toronto	0	Café	Grocery Store	Park	Athletics & Sports	Nightclub	Coffee Shop	Restaurant	Diner	Baby Store	Italian Restaurant
31	West Toronto	0	Pharmacy	Discount Store	Bakery	Supermarket	Furniture / Home Store	Brewery	Café	Bar	Bank	Middle Eastern Restaurant
32	West Toronto	0	Bar	Asian Restaurant	Coffee Shop	Café	Restaurant	Vietnamese Restaurant	Men's Store	Cocktail Bar	Bakery	Pizza Place
33	West Toronto	0	Breakfast Spot	Café	Coffee Shop	Furniture / Home Store	Burrito Place	Stadium	Bar	Restaurant	Bakery	Italian Restaurant
34	West Toronto	0	Café	Mexican Restaurant	Grocery Store	Arts & Crafts Store	Park	Music Venue	Cajun / Creole Restaurant	Diner	Sandwich Place	Bookstore
35	West Toronto	0	Breakfast Spot	Gift Shop	Restaurant	Dessert Shop	Eastern European Restaurant	Burger Joint	Bar	Bank	Dog Run	Italian Restaurant
36	West Toronto	0	Café	Coffee Shop	Pizza Place	Italian Restaurant	Sushi Restaurant	Sandwich Place	Pharmacy	Bar	Fish & Chips Shop	Indie Movie Theater
37	East Toronto	0	Light Rail Station	Yoga Studio	Auto Workshop	Gym / Fitness Center	Garden Center	Garden	Fast Food Restaurant	Farmers Market	Comic Shop	Park

5. Conclusion

In this study, I created clusters of neighborhoods in Toronto and mapped the top 10 venues with each corresponding neighborhood. Offers/Coupons can be rolled out based on the top 10 venues for the neighborhood of any customer to enhance the probability of utilization of the offers/coupons. For Example: If a customer resides in Studio District neighborhood of Toronto, then the offers/coupons which might be most useful to him/her are the offers/coupons that are related to the top 10 venues in Studio District neighborhood namely – Café, Coffee Shop, Italian Restaurant, Bakery, American Restaurant, Gastropub, Diner, Fish Market, Juice Bar and Book Store. Any financial institution can utilize this study while rolling out their credit card offers. Any other business can also find this clustering of neighborhoods useful for mapping their offers/coupons.

6. References

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