

Data Science Capstone Project 2021

JULY 18

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The Battle of the Neighborhood

Helping Small Business Restaurants

Introduction

Due to the "Lockdown" in 2020, several restaurants closed their doors, with the need to adapt their ways of serving their customers.

Two forms of service were established by most restaurants and snack bars: delivery and on-site collection (courtside pick up), as they present the lowest initial investment.



In "courtside pick up" mode, the customer continues to go to the place but withdrawing their orders, where the cost is almost zero for the entrepreneur. The other modality that already existed before was delivery through companies such as Ritual, Doordash, Skip the Dishes, among others, but the cost is high.

Thus, some entrepreneurs thought of themselves starting the process of delivering products to their customers, within a restricted distance area.

This is an excellent opportunity to create a model that can be suitable for any restaurant that wants this analysis, helping small business owners to adapt their businesses, get to know the competition better, and make a better investment decision in this service (or not). It is time to reinvent themselves!

"Is the definition of insanity doing the same thing repeatedly and expecting different results."

Albert Einstein

Business Problem

There are some key questions/data that we need to find the answers to build the model and shows to the restaurants:

- Need to Know better your Neighborhood and competition for delivery services.
- How many restaurants are there in the area to offer the analysis?
- What types of restaurants are in this region?
- What is the income of people in the same region to determine the prices to be charged?
- Where is the best area to provide the delivery services with the best return on investment?

We know the budget is limited at this time, and all investments must be very well oriented.

Our Objective

Create an Analytical Model to obtain all data and raise all the information necessary to help the small business owner to keep suing business during the lockdown and after.

For that, we will create a first model using Toronto as a reference and seek for the restaurants that are 5km away from Toronto to be used as a benchmark.

One key outcome of this model is determining the most strategic region(s) in Toronto for restaurant(s) can strategically expand its services, as the budget is limited due to the limitations imposed during the pandemic.

The model will be able to serve several restaurant owners who need to provide delivery services. This business analysis model can be applied to any restaurant, we just will need to include the locations to provide this analytical report to the customer and help him to understand the scenario and data relevant for the investments.

The process to reach the goals

Join libraries and databases data into a data frame.

For the number of restaurants, types, etc., I used the Foursquare into 5 Km distance of a specific point (this point can be changed as need per the restaurant interested in this analysis).

All strategic data as locations, neighborhoods, incomes (net) will be analyzed via k-means clustering.

Sources/Databases

- Foursquare to find restaurants
- Wellbeing Toronto for Demographic/ socioeconomic
- Wikipedia to find the locations

Toronto Data

# of Lines	Postcode	Borough	Neighbourhood	Latitude	Longitude
0	M3A	North York	Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Harbourfront	43.65426	-79.360636
3	M6A	North York	Lawrence Heights	43.718518	-79.464763
4	M6A	North York	Lawrence Manor	43.718518	-79.464763
...
205	M8Z	Etobicoke	Kingsway Park South West	43.628841	-79.520999
206	M8Z	Etobicoke	Mimico NW	43.628841	-79.520999
207	M8Z	Etobicoke	The Queensway West	43.628841	-79.520999
208	M8Z	Etobicoke	Royal York South West	43.628841	-79.520999
209	M8Z	Etobicoke	South of Bloor	43.628841	-79.520999

(sample data, not complete data frame)

Here we have a scenario about the neighborhoods and geographic data about each one to start our analysis.

Neighborhood and Total Population

# of Lines	Neighbourhood	Total Population
0	West Humber-Clairville	33312
1	Mount Olive-Silverstone-Jamestown	32954
2	Thistletown-Beaumont Heights	10360
3	Rexdale-Kipling	10529
4	Elms-Old Rexdale	9456
...
135	West Hill	27392
136	Woburn	53485
137	Eglinton East	22776
138	Scarborough Village	16724
139	Guildwood	9917

(sample data, not complete data frame)

Now we have all join information about the number of people in each neighborhood and we need to join all information in one data set.

Join Datasets

# of rows	Neighbourhood	After-Tax Household Income	Total Population	Postcode	Borough	Latitude	Longitude
0	Markland Wood	\$ 64,297	10554	M9C	Etobicoke	43.64352	-79.577201
1	New Toronto	\$ 40,859	11463	M8V	Etobicoke	43.60565	-79.501321
2	Long Branch	\$ 47,680	10084	M8W	Etobicoke	43.60241	-79.543484
3	Alderwood	\$ 61,402	12054	M8W	Etobicoke	43.60241	-79.543484
4	Humber Summit	\$ 53,272	12416	M9L	North York	43.7563	-79.565963
5	Bathurst Manor	\$ 51,076	15873	M3H	North York	43.75433	-79.442259
6	Willowdale West	\$ 54,226	16936	M2R	North York	43.78274	-79.442259
7	Victoria Village	\$ 43,743	17510	M4A	North York	43.72588	-79.315572
8	Flemington Park	\$ 43,511	21933	M3C	North York	43.7259	-79.340923
9	Hillcrest Village	\$ 57,682	16934	M2H	North York	43.80376	-79.363452

10	Bayview Village	\$	58,028	21396	M2K	North York	43.78695	-79.385975
11	Henry Farm	\$	47,659	15723	M2J	North York	43.77852	-79.346556
12	Thornccliffe Park	\$	38,645	21108	M4H	East York	43.70537	-79.349372
13	The Beaches	\$	70,957	21567	M4E	East Toronto	43.67636	-79.293031
14	Little Portugal	\$	52,519	15559	M6J	West Toronto	43.64793	-79.41975
15	Roncesvalles	\$	46,883	14974	M6R	West Toronto	43.64896	-79.456325
16	Forest Hill North	\$	53,978	12806	M5P	Central Toronto	43.69695	-79.411307
17	Humewood-Cedarvale	\$	49,252	14365	M6C	York	43.69378	-79.428191
18	Weston	\$	41,356	17992	M9N	York	43.70688	-79.518188
19	Mount Dennis	\$	43,790	13593	M6M	York	43.69112	-79.476013
20	Oakridge	\$	32,079	13845	M1L	Scarborough	43.71111	-79.284577
21	Cliffcrest	\$	60,384	15935	M1M	Scarborough	43.71632	-79.239476
22	Kennedy Park	\$	41,776	17123	M1K	Scarborough	43.72793	-79.262029
23	Ionview	\$	42,971	13641	M1K	Scarborough	43.72793	-79.262029
24	Dorset Park	\$	47,630	25003	M1P	Scarborough	43.75741	-79.273304
25	Agincourt North	\$	55,893	29113	M1V	Scarborough	43.81525	-79.284577
26	Milliken	\$	55,464	26572	M1V	Scarborough	43.81525	-79.284577
27	Rouge	\$	72,784	46496	M1B	Scarborough	43.80669	-79.194353
28	Malvern	\$	53,425	43794	M1B	Scarborough	43.80669	-79.194353
29	Highland Creek	\$	87,321	12494	M1C	Scarborough	43.78454	-79.160497
30	Morningside	\$	50,069	17455	M1E	Scarborough	43.76357	-79.188711
31	West Hill	\$	46,803	27392	M1E	Scarborough	43.76357	-79.188711
32	Woburn	\$	47,908	53485	M1G	Scarborough	43.77099	-79.216917
33	Scarborough Village	\$	40,181	16724	M1J	Scarborough	43.74473	-79.239476
34	Guildwood	\$	67,678	9917	M1E	Scarborough	43.76357	-79.188711

With this data together we can localize the restaurants at 5 Km from Toronto.

Foursquare

Link to access the data:

https://api.foursquare.com/v2/venues/search?client_id=4BED2AZYUDCEWQPPQQZZ5RBDQXDMQFBCWMHWNORZA3BOWSRC&client_secret=SHNJOCVCLRZO2EOKPR53ASTBYF0PQH1ZRDR05B52PGICWF04&ll=43.643515,-79.577201&oauth_token=DWHEBCWF3JGXKY0Z5YQJBABAFILEDGU0FL5K1UII45LYFX1H&v=20180604&query=Restaurant*&radius=5000&limit=300

# or Rows	name	categories	location.address	location.crossStreet	location.lat	location.lng
0	Muddy Duck Restaurant	American Restaurant	2200 Dundas St. E	btw Regional Rd. 4 & Highway 407	43.625972	-79.565427
1	Silk Road Restaurant ????	Xinjiang Restaurant	1852 Dundas St E	at Wharton Way	43.619278	-79.573031
2	Kahramana Restaurant	Iraqi Restaurant	3415 Dixie Road Unit 4A	NaN	43.617805	-79.595215
3	Cross Eyed Bear Restaurant	Restaurant	555 Burnhamthorpe	The West Mall	43.644725	-79.568009
4	The Olive Restaurant	Restaurant	100 The East Mall	North Queen	43.619846	-79.54969
5	VAHALLA RESTAURANT	Scandinavian Restaurant	314 W Center Ave	NaN	43.640954	-79.564951
6	Best Friend Chinese Restaurant ?????	Chinese Restaurant	888 Dundas St. E., Unit D1B	NaN	43.597756	-79.594227
7	Restaurant Savana	American Restaurant	NaN	NaN	43.652166	-79.64177
8	Perkins Restaurant & Bakery	American Restaurant	600 Dixon Rd	at Martin Grove Rd	43.691977	-79.572811
9	Golden Wok Chinese Restaurant	Chinese Restaurant	120 Eringate Dr. Unit #3	Renforth Dr	43.660491	-79.582319
10	Croatia Restaurant	Eastern European Restaurant	1989 Dundas St E	NaN	43.62214	-79.571942
11	Sky Restaurant Cocktail Lounge	American Restaurant	2680 Skymark Avenue	NaN	43.659396	-79.596291

(sample data, not complete data frame)

The entire table contains the following columns:

or Rows
name
categories
location.address
location.crossStreet
location.lat
location.lng
location.labeledLatLngs
location.distance
location.postalCode
location.cc
location.neighborhood
location.city
location.state
location.country
location.formattedAddress
id

Looking overall data raised, there are 50 Restaurants, under 5 Km Range from Toronto th at we can offer these services.

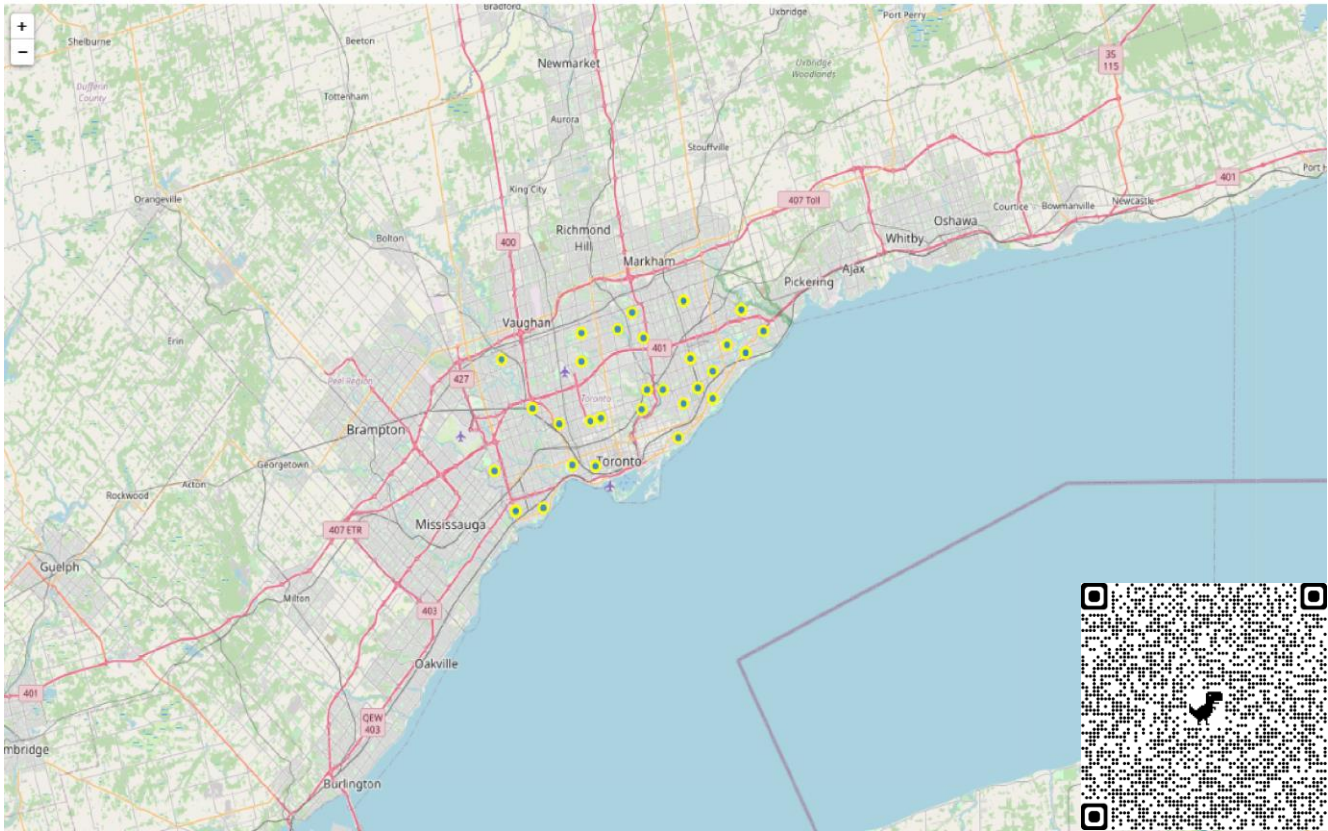
Now we will present the number of Restaurants per Neighborhood to understand the pot ential customers and businesses are available.

Restaurants per Neighborhood to offer our Business Model Analysis

# of rows	Neighborhood	After-Tax Household Income	Total Population	Postcode	Borough	Latitude	Longitude	Restaurant Count
0	Markland Wood	64297	10554	M9C	Etobicoke	43.643515	-79.577201	50
1	New Toronto	40859	11463	M8V	Etobicoke	43.605647	-79.501321	50
2	Long Branch	47680	10084	M8W	Etobicoke	43.602414	-79.543484	50
3	Alderwood	61402	12054	M8W	Etobicoke	43.602414	-79.543484	50
4	Humber Summit	53272	12416	M9L	North York	43.756303	-79.565963	50
5	Bathurst Manor	51076	15873	M3H	North York	43.754328	-79.442259	50
6	Willowdale West	54226	16936	M2R	North York	43.782736	-79.442259	48
7	Victoria Village	43743	17510	M4A	North York	43.725882	-79.315572	48
8	Flemingdon Park	43511	21933	M3C	North York	43.7259	-79.340923	48
9	Hillcrest Village	57682	16934	M2H	North York	43.803762	-79.363452	48
10	Bayview Village	58028	21396	M2K	North York	43.786947	-79.385975	48
11	Henry Farm	47659	15723	M2J	North York	43.778517	-79.346556	46
12	Thorndiffe Park	38645	21108	M4H	East York	43.705369	-79.349372	49
13	The Beaches	70957	21567	M4E	East Toronto	43.676357	-79.293031	48
14	Little Portugal	52519	15559	M6J	West Toronto	43.647927	-79.41975	50
15	Roncesvalles	46883	14974	M6R	West Toronto	43.64896	-79.456325	50
16	Forest Hill North	53978	12806	M5P	Central Toronto	43.696948	-79.411307	50
17	Humewood-Cedarvale	49252	14365	M6C	York	43.693781	-79.428191	50
18	Weston	41356	17992	M9N	York	43.706876	-79.518188	49
19	Mount Dennis	43790	13593	M6M	York	43.691116	-79.476013	50
20	Oakridge	32079	13845	M1L	Scarborough	43.711112	-79.284577	50
21	Cliffcrest	60384	15935	M1M	Scarborough	43.716316	-79.239476	49
22	Kennedy Park	41776	17123	M1K	Scarborough	43.727929	-79.262029	50
23	Ionview	42971	13641	M1K	Scarborough	43.727929	-79.262029	50
24	Dorset Park	47630	25003	M1P	Scarborough	43.75741	-79.273304	49
25	Agincourt North	55893	29113	M1V	Scarborough	43.815252	-79.284577	49
26	Milliken	55464	26572	M1V	Scarborough	43.815252	-79.284577	49
27	Rouge	72784	46496	M1B	Scarborough	43.806686	-79.194353	49
28	Malvern	53425	43794	M1B	Scarborough	43.806686	-79.194353	49
29	Highland Creek	87321	12494	M1C	Scarborough	43.784535	-79.160497	22
30	Morningside	50069	17455	M1E	Scarborough	43.763573	-79.188711	46
31	West Hill	46803	27392	M1E	Scarborough	43.763573	-79.188711	46
32	Woburn	47908	53485	M1G	Scarborough	43.770992	-79.216917	50
33	Scarborough Village	40181	16724	M1J	Scarborough	43.744734	-79.239476	50
34	Guildwood	67678	9917	M1E	Scarborough	43.763573	-79.188711	46

Now we have all data needs to start to do our analysis, as well as create a visualization about the region selected, with all marks to identify the key spots.

Toronto Map

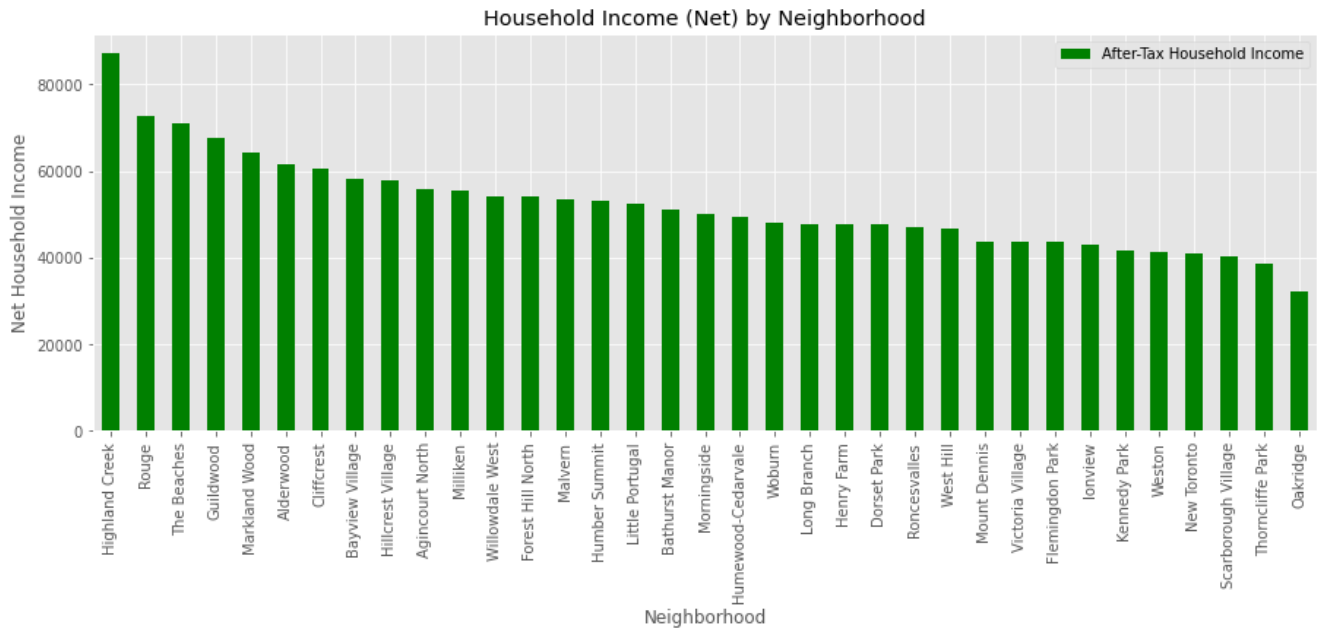


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Above you have a sample of the map generated to start our visualization. Also, the link to see and interact with the map create as well as OCR code of our analysis, as well.

Now we will visualize the Household Income (Net) to have an idea about the prices that the restaurants can offer or adapt their offers to the potential customers.

Household Income (Net)



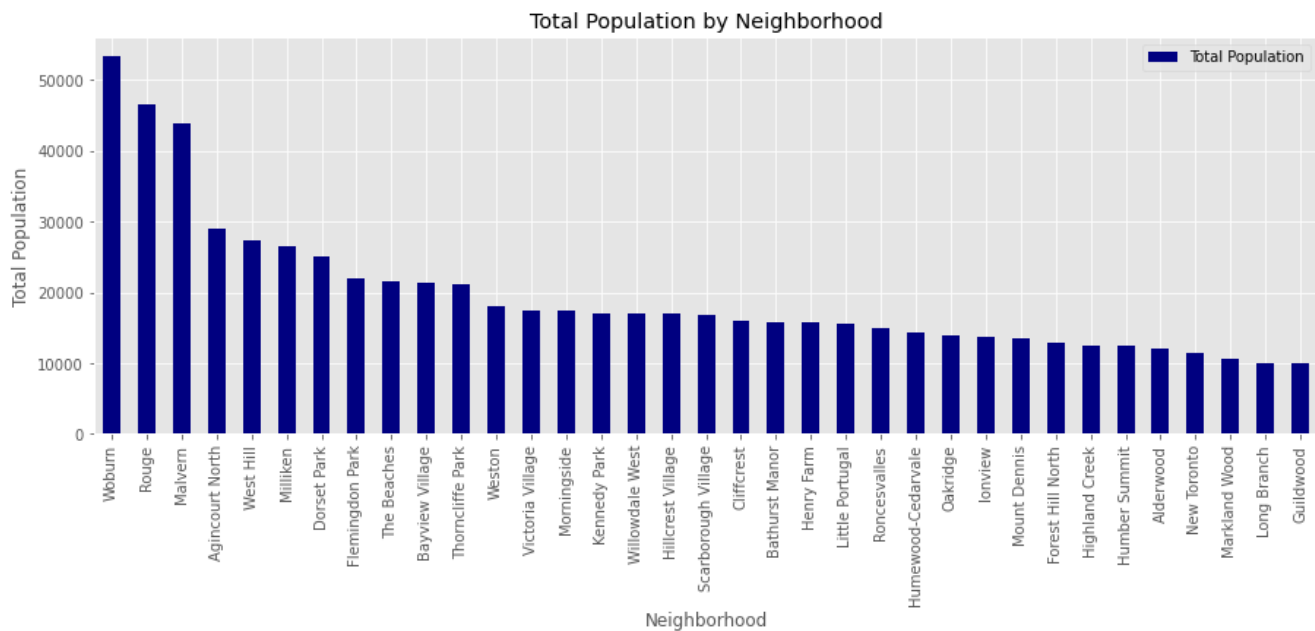
The Highland Creek shows the best income per family in the region, and we can suggest to the business owners to consider the Woburn average to start the pricing strategies.

Here is the data in a data frame:

Neighborhood	After-Tax Household Income
Highland Creek	\$ 87,321
Rouge	\$ 72,784
The Beaches	\$ 70,957
Guildwood	\$ 67,678
Markland Wood	\$ 64,297
Alderwood	\$ 61,402
Cliffcrest	\$ 60,384
Bayview Village	\$ 58,028
Hillcrest Village	\$ 57,682
Agincourt North	\$ 55,893
Milliken	\$ 55,464
Willowdale West	\$ 54,226
Forest Hill North	\$ 53,978
Malvern	\$ 53,425
Humber Summit	\$ 53,272

Little Portugal	\$	52,519
Bathurst Manor	\$	51,076
Morningside	\$	50,069
Humewood-Cedarvale	\$	49,252
Woburn	\$	47,908
Long Branch	\$	47,680
Henry Farm	\$	47,659
Dorset Park	\$	47,630
Roncesvalles	\$	46,883
West Hill	\$	46,803
Mount Dennis	\$	43,790
Victoria Village	\$	43,743
Flemingdon Park	\$	43,511
Ionview	\$	42,971
Kennedy Park	\$	41,776
Weston	\$	41,356
New Toronto	\$	40,859
Scarborough Village	\$	40,181
Thorncliffe Park	\$	38,645
Oakridge	\$	32,079

Now we will present the number of people per neighborhood to understand the volume of potential orders to the business owners.



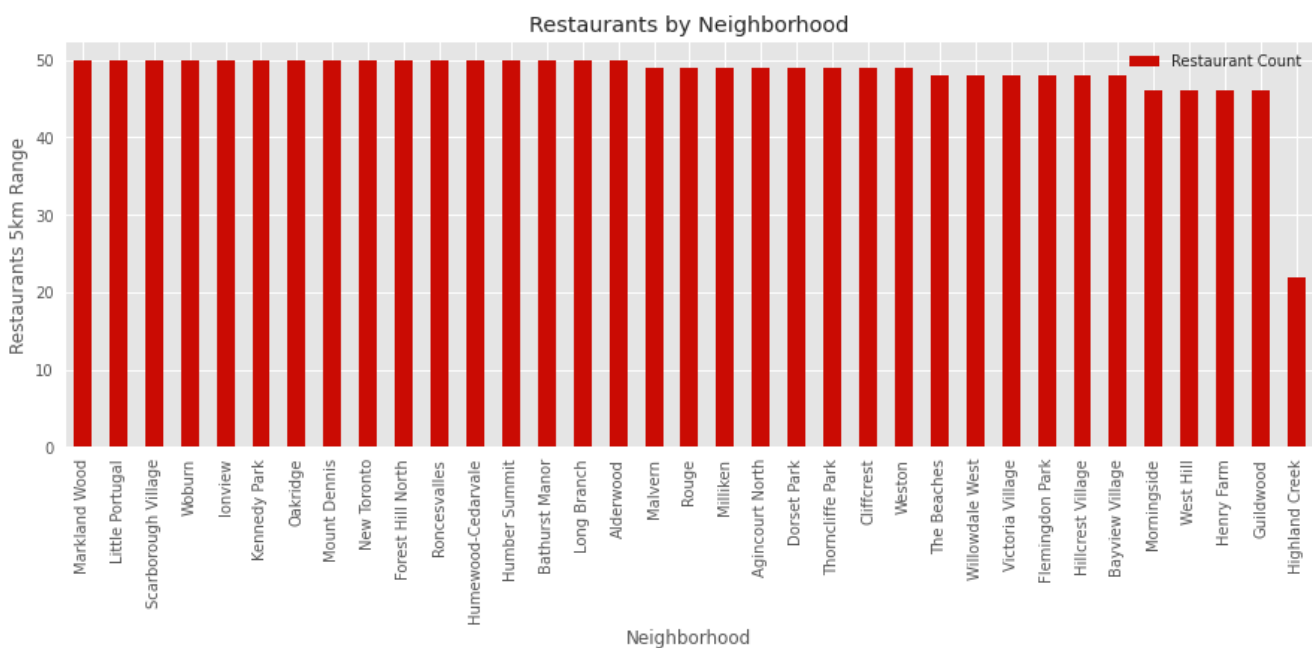
As mentioned before, the Woburn shows the most populated neighborhood, with an average income per family in the region. In this way, we can see that could be the best place to deliver business services.

Here is the data in a data frame:

Neighborhood	Total Population
Woburn	\$ 53,485
Rouge	\$ 46,496
Malvern	\$ 43,794
Agincourt North	\$ 29,113
West Hill	\$ 27,392
Milliken	\$ 26,572
Dorset Park	\$ 25,003
Flemingdon Park	\$ 21,933
The Beaches	\$ 21,567
Bayview Village	\$ 21,396
Thorncliffe Park	\$ 21,108
Weston	\$ 17,992
Victoria Village	\$ 17,510
Morningside	\$ 17,455
Kennedy Park	\$ 17,123
Willowdale West	\$ 16,936
Hillcrest Village	\$ 16,934
Scarborough Village	\$ 16,724
Cliffcrest	\$ 15,935
Bathurst Manor	\$ 15,873
Henry Farm	\$ 15,723
Little Portugal	\$ 15,559
Roncesvalles	\$ 14,974
Humewood-Cedarvale	\$ 14,365
Oakridge	\$ 13,845
Ionview	\$ 13,641
Mount Dennis	\$ 13,593
Forest Hill North	\$ 12,806
Highland Creek	\$ 12,494
Humber Summit	\$ 12,416

Alderwood	\$	12,054
New Toronto	\$	11,463
Markland Wood	\$	10,554
Long Branch	\$	10,084
Guildwood	\$	9,917

Let's now visualize the number of restaurants to see the volume of opportunities there in the region.



As we can see, practically all neighborhood has the same number of restaurants with a good variety of categories. Based on that, we have a great potential offer to show to all restaurants in Toronto (considering the 5 Km range).

Here is the data in a data frame:

Neighborhood	Restaurant Count
Markland Wood	50
Little Portugal	50
Scarborough Village	50
Woburn	50
Ionview	50
Kennedy Park	50
Oakridge	50

Mount Dennis	50
New Toronto	50
Forest Hill North	50
Roncesvalles	50
Humewood-Cedarvale	50
Humber Summit	50
Bathurst Manor	50
Long Branch	50
Alderwood	50
Malvern	49
Rouge	49
Milliken	49
Agincourt North	49
Dorset Park	49
Thorncliffe Park	49
Cliffcrest	49
Weston	49
The Beaches	48
Willowdale West	48
Victoria Village	48
Flemingdon Park	48
Hillcrest Village	48
Bayview Village	48
Morningside	46
West Hill	46
Henry Farm	46
Guildwood	46
Highland Creek	22

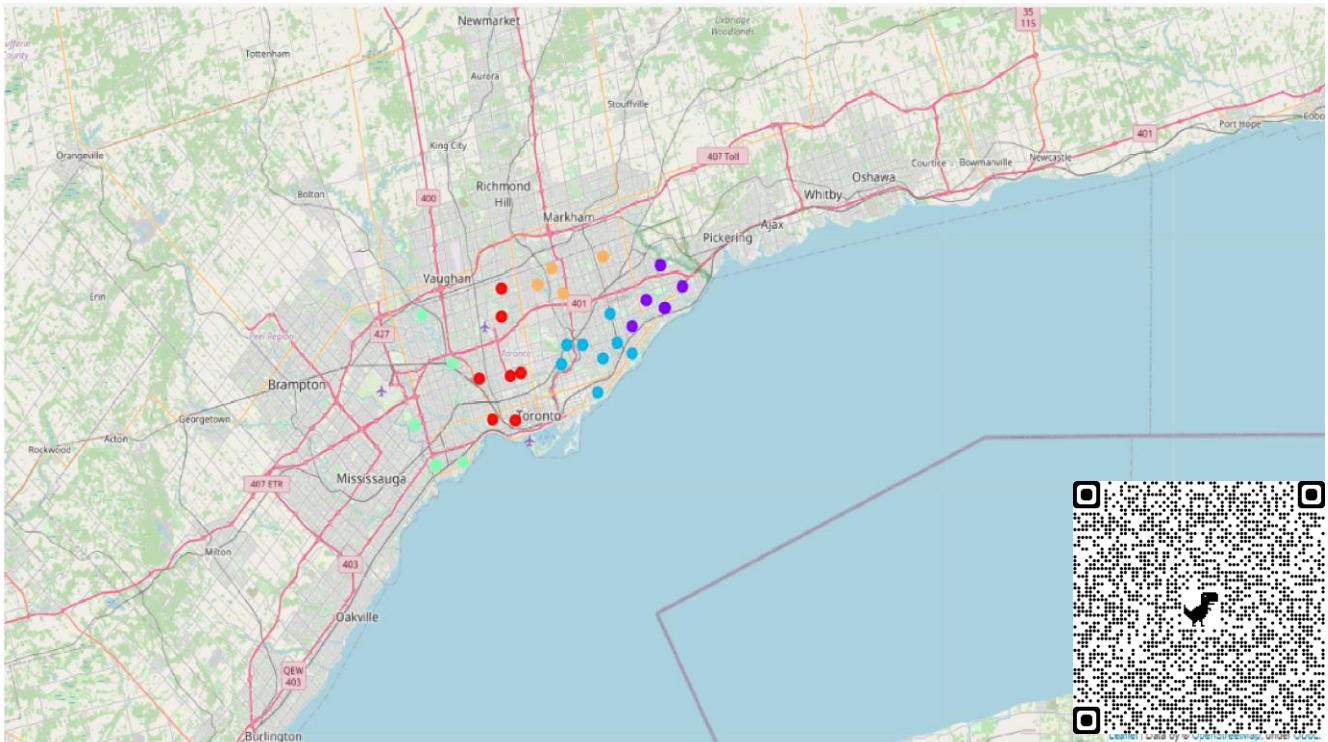
Based on that information, now we will be identifying and grouping similar data points in larger datasets without concern for the specific outcome.

Clustering

Here we will present the information raised and the clustering labels to create the map after and further analysis.

# of rows	Cluster Labels	Neighbourhood	After-Tax Household Income	Total Population	Postcode	Borough	Latitude	Longitude	Restaurant Count
0	3	Markland Wood	\$ 64,297	10554	M9C	Etobicoke	43.643515	-79.577201	50
1	3	New Toronto	\$ 40,859	11463	M8V	Etobicoke	43.605647	-79.501321	50
2	3	Long Branch	\$ 47,680	10084	M8W	Etobicoke	43.602414	-79.543484	50
3	3	Alderwood	\$ 61,402	12054	M8W	Etobicoke	43.602414	-79.543484	50
4	3	Humber Summit	\$ 53,272	12416	M9L	North York	43.756303	-79.565963	50
5	0	Bathurst Manor	\$ 51,076	15873	M3H	North York	43.754328	-79.442259	50
6	0	Willowdale West	\$ 54,226	16936	M2R	North York	43.782736	-79.442259	48
7	2	Victoria Village	\$ 43,743	17510	M4A	North York	43.725882	-79.315572	48
8	2	Flemingdon Park	\$ 43,511	21933	M3C	North York	43.7259	-79.340923	48
9	4	Hillcrest Village	\$ 57,682	16934	M2H	North York	43.803762	-79.363452	48
10	4	Bayview Village	\$ 58,028	21396	M2K	North York	43.786947	-79.385975	48
11	4	Henry Farm	\$ 47,659	15723	M2J	North York	43.778517	-79.346556	46
12	2	Thorncliffe Park	\$ 38,645	21108	M4H	East York	43.705369	-79.349372	49
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14	0	Little Portugal	\$ 52,519	15559	M6J	West Toronto	43.647927	-79.41975	50
15	0	Roncesvalles	\$ 46,883	14974	M6R	West Toronto	43.64896	-79.456325	50
16	0	Forest Hill North	\$ 53,978	12806	M5P	Central Toronto	43.696948	-79.411307	50
17	0	Humewood-Cedarval	\$ 49,252	14365	M6C	York	43.693781	-79.428191	50
18	3	Weston	\$ 41,356	17992	M9N	York	43.706876	-79.518188	49
19	0	Mount Dennis	\$ 43,790	13593	M6M	York	43.691116	-79.476013	50
20	2	Oakridge	\$ 32,079	13845	M1L	Scarborough	43.711112	-79.284577	50
21	2	Cliffcrest	\$ 60,384	15935	M1M	Scarborough	43.716316	-79.239476	49
22	2	Kennedy Park	\$ 41,776	17123	M1K	Scarborough	43.727929	-79.262029	50
23	2	Ionview	\$ 42,971	13641	M1K	Scarborough	43.727929	-79.262029	50
24	2	Dorset Park	\$ 47,630	25003	M1P	Scarborough	43.75741	-79.273304	49
25	4	Agincourt North	\$ 55,893	29113	M1V	Scarborough	43.815252	-79.284577	49
26	4	Milliken	\$ 55,464	26572	M1V	Scarborough	43.815252	-79.284577	49
27	1	Rouge	\$ 72,784	46496	M1B	Scarborough	43.806686	-79.194353	49
28	1	Malvern	\$ 53,425	43794	M1B	Scarborough	43.806686	-79.194353	49
29	1	Highland Creek	\$ 87,321	12494	M1C	Scarborough	43.784535	-79.160497	22
30	1	Morningside	\$ 50,069	17455	M1E	Scarborough	43.763573	-79.188711	46
31	1	West Hill	\$ 46,803	27392	M1E	Scarborough	43.763573	-79.188711	46
32	1	Woburn	\$ 47,908	53485	M1G	Scarborough	43.770992	-79.216917	50
33	1	Scarborough Village	\$ 40,181	16724	M1J	Scarborough	43.744734	-79.239476	50
34	1	Guildwood	\$ 67,678	9917	M1E	Scarborough	43.763573	-79.188711	46

Clustering Map

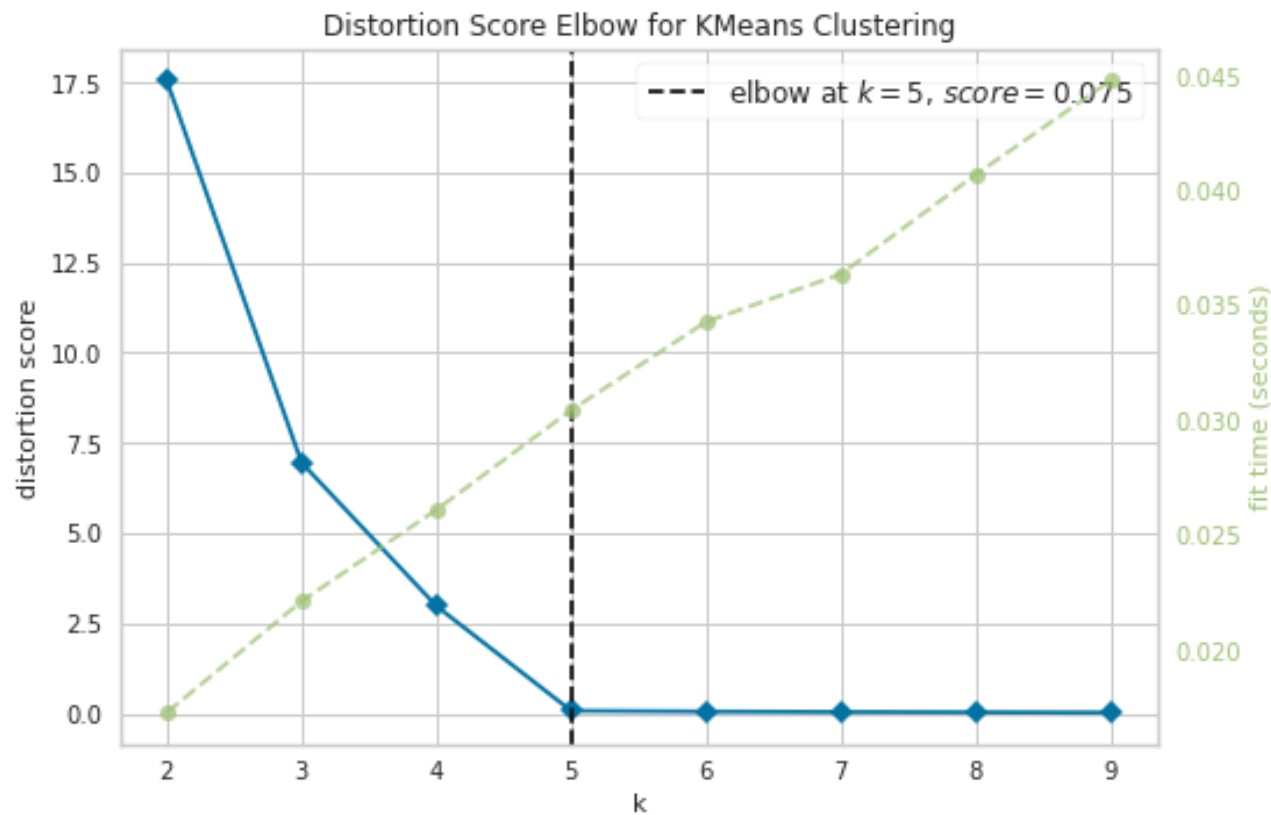


<https://dataplatform.cloud.ibm.com/analytics/notebooks/v2/9f6a2ac3-50f7-4da0-a35d-34a6ac2b4276?projectid=bc1e5ffd-5b02-46c6-a9a1-809c6924a30b&projectTitle=Capstone%20Project%20Notebook%20-%20MF&context=cpdaas>

Now that we found the groups, let us analyze which have not been explicitly labeled in the data. We will do it to confirm our business assumptions about what types of groups exist or to identify unknown groups in complex data sets.

Clustering Analysis

Bellow the distortion found to KMeans that we will use to visualize the scores per label.



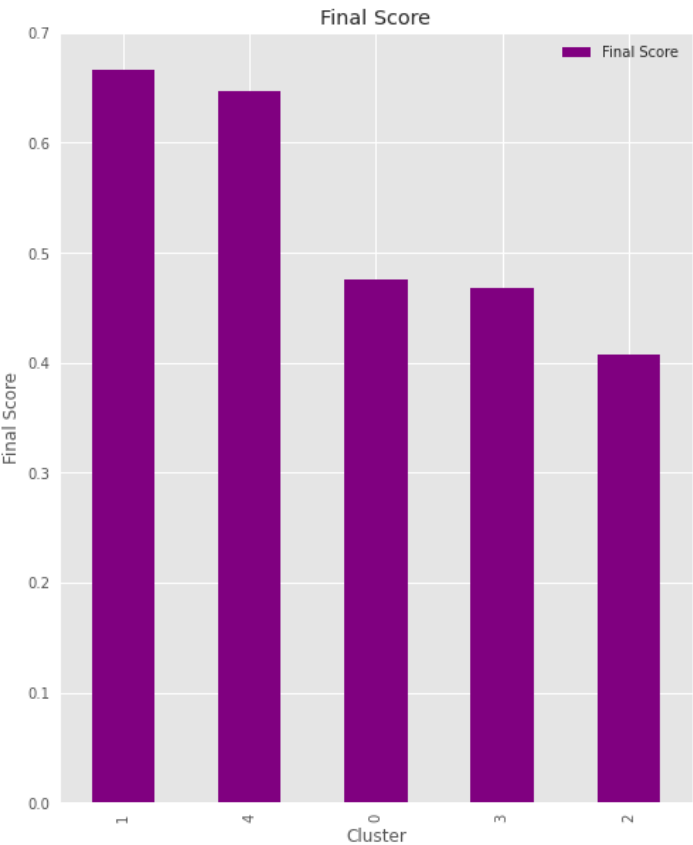
K-means Cluster Analysis

Cluster Labels	0.000000
After-Tax Household Income	50246.285714
Total Population	14872.285714
Latitude	43.702257
Longitude	-79.439444
Restaurant Count	49.714286

All Clusters labeled for our visualization.

Cluster Labels	After-Tax Household Income	Total Population	Latitude	Longitude	Restaurant Count
0	\$ 50,246	14872.286	43.702257	-79.439444	49.714286
1	\$ 58,271	28469.625	43.775544	-79.196466	44.75
2	\$ 46,855	18629.444	43.719356	-79.291146	49
3	\$ 51,478	12427.167	43.652861	-79.541607	49.833333
4	\$ 54,945	21947.6	43.799946	-79.333027	48

Final Score



Here is the data in a data frame:

	0	1	2
0	0.29705	0.15242	0.97658
1	1.00000	1.00000	0.00000
2	0.00000	0.38662	0.83607
3	0.40492	0.00000	1.00000
4	0.70866	0.59345	0.63934

Final Analysis

Cluster 4 is the best region for us to help the restaurants to implement the new delivery services, followed by cluster 1.

Both clusters have a final score greater than 0.5 and therefore we consider them the most ideal for our work.

Conclusion

Joint activities with dissemination on social networks, combined with the data reported here, and the resilience of small business owners will be key to the success of this model created. The model created assumes that only the restaurants within this 5 km radius will serve customers residing in the neighborhood.

Although this is potentially true, there are still other external factors that can influence it, such as delivery services for franchise networks that can operate within the same radius as the small business owner, so we always suggest that this analysis considers what should be done a marketing effort to support small local businesses.



We do not believe that even after the lockdown falls, the model will become obsolete once the lockdown ends, as people will certainly see the social value of helping small businesses and creating jobs in their regions. Even if people go back to work in offices, we believe that small restaurants can offer this service at a cost differential for the consumer, who is already used to the same service done before.

Population size and average family income alone produce limited results, but demand can also be driven by external data such as the popularity of available restaurants, the average age of the population in the regions, origin, quality of products, delivery to the time, fees, etc.

In this way, we believe that we have an excellent tool to present to small business owners who want to expand their delivery services, especially restaurants and snack bars, and in this way, we will be helping them to have an alternative service, keeping their customers satisfied.

