

Introduction

- In this project, we will discuss the problem that how to select a location if someone is looking to open a restaurant in Toronto, CA.
- The target group who would be interested in this project is the restaurateur or the inventor.
- The problem they are interested in could be summarized into that where the restaurant would locate to attract as many as customers.



Data Source

- Neighbourhood information grouped by postal code is collected from Wiki page and then is processed.
- Geographical coordinates of each neighbourhood can be assessed through .csv file offered in assignment of last week.
- Trending Venues around each neighbourhood are acquired from FourSquare

Methodology

- To address the problem that attracting as many as customers, we define a parameter "Score" to measure the geographical convenience of the restaurant to its target customer group.

$$Score = \sum D_i * QD_i$$

D_i --distance

QD_i --quantity demanded

- It represents the sum of product of the distance between the neighbourhood where the restaurant locates and other neibourhoods and quantity demanded of this kind of restaurant. The less the value is, the easier to be approached the restaurant is for its customers.
- The distance can be calculated by geographical coordinates of each neighbourhood.
- And the quantity demanded is represented by trending venues. The more frequently a type of restaurant appears, the greater its demand is in this neighbourhood.

geographical data of each neighbourhood

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M4E	East Toronto	The Beaches	43.676357	-79.293031
1	M4K	East Toronto	The Danforth West, Riverdale	43.679557	-79.352188
2	M4L	East Toronto	The Beaches West, India Bazaar	43.668999	-79.315572
3	M4M	East Toronto	Studio District	43.659526	-79.340923
4	M4N	Central Toronto	Lawrence Park	43.728020	-79.388790
5	M4P	Central Toronto	Davisville North	43.712751	-79.390197
6	M4R	Central Toronto	North Toronto West	43.715383	-79.405678
7	M4S	Central Toronto	Davisville	43.704324	-79.388790
8	M4T	Central Toronto	Moore Park, Summerhill East	43.689574	-79.383160
9	M4V	Central Toronto	Deer Park, Forest Hill SE, Rathnelly, South Hi...	43.686412	-79.400049
10	M4W	Downtown Toronto	Rosedale	43.679563	-79.377529

trending venues of each neighbourhood

	Neighborhood	Yoga Studio	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	...	Swim School	Taco Place	Tea Room	Tennis Court	Restau
0	Adelaide, King, Richmond	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00	0.000000	0.000000	0.00	0.00
1	Berczy Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00	0.000000	0.066667	0.00	0.06
2	Brockton, Exhibition Place, Parkdale Village	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00	0.000000	0.000000	0.00	0.00
3	Business reply mail Processing Centre969 Eastern	0.066667	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00	0.000000	0.000000	0.00	0.00

Park	2.308333
Coffee Shop	2.204762
Café	2.066667
Restaurant	1.188095
Pub	1.066667
Italian Restaurant	0.933333
Ice Cream Shop	0.833333
Bakery	0.800000
Pizza Place	0.791667
Gastropub	0.733333
Sushi Restaurant	0.716667
Breakfast Spot	0.667857
Garden	0.566667
Bar	0.538095
Sandwich Place	0.525000
Playground	0.500000
Trail	0.500000
Steakhouse	0.466667

Coffee Shop is highly demanded!

calculate distance between each two neighbourhood

Neighborhood	The Beaches	The Danforth West, Riverdale	The Beaches West, India Bazaar	Studio District	Lawrence Park	Davisville North	North Toronto West	Davisville	Moore Park, Summerhill East	Deer Park, Forest Hill SE, Rathnelly, South Hill, Summerhill West	...	Stn A PO Boxes 25 The Esplanade	First Canadian Place, Underground city	Christi
Neighborhood														
The Beaches	0.000000	0.003510	0.000562	0.002577	1.183884e-02	0.010766	0.014212	0.009952	0.008298	0.011554	...	7.589000e-03	0.008745	0.01682
The Danforth West, Riverdale	0.003510	0.000000	0.001452	0.000528	3.688415e-03	0.002547	0.004145	0.001953	0.001060	0.002338	...	1.610445e-03	0.001874	0.00505
The Beaches West, India Bazaar	0.000562	0.001452	0.000000	0.000732	8.844545e-03	0.007483	0.010271	0.006609	0.004992	0.007440	...	4.022557e-03	0.004873	0.01144

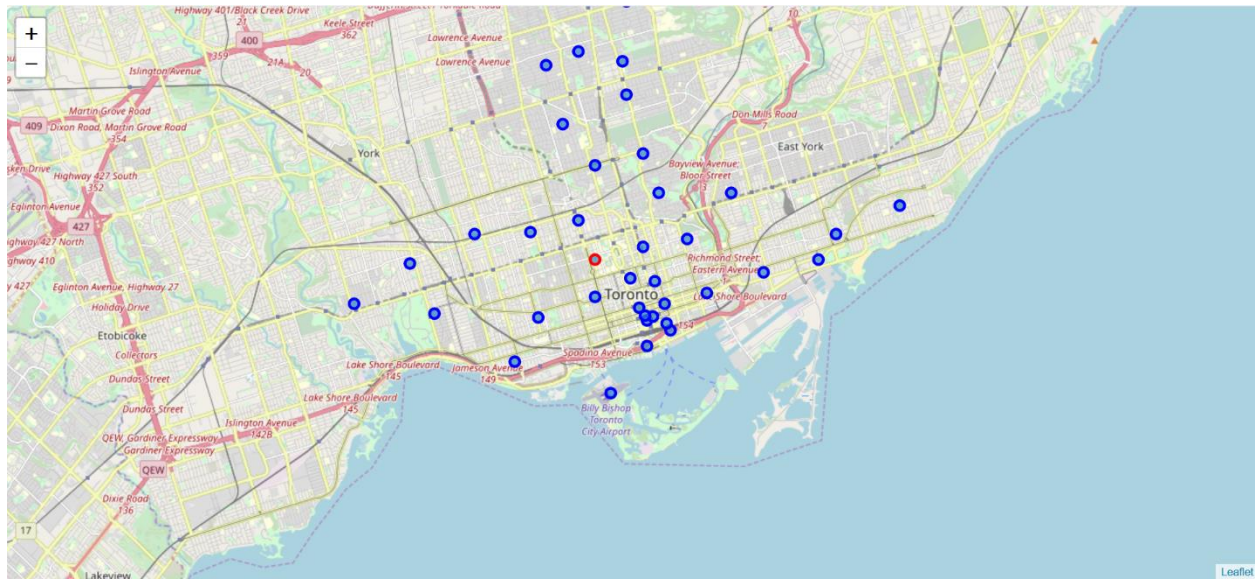
after normalization

Neighborhood	The Beaches	The Danforth West, Riverdale	The Beaches West, India Bazaar	Studio District	Lawrence Park	Davisville North	North Toronto West	Davisville	Moore Park, Summerhill East	Deer Park, Forest Hill SE, Rathnelly, South Hill, Summerhill West	Stn A PO Boxes 25 The Esplanade	First Canadian Place, Underground city	Chri
Neighborhood													
The Beaches	0.000000	0.094208	0.015091	0.069169	3.177743e-01	0.288972	0.381485	0.267126	0.222729	0.310128	2.037014e-01	0.234740	0.451
The Danforth West, Riverdale	0.094208	0.000000	0.038981	0.014177	9.900322e-02	0.068354	0.111252	0.052425	0.028442	0.062748	4.322704e-02	0.050314	0.135
The Beaches West, India Bazaar	0.015091	0.038981	0.000000	0.019660	2.374024e-01	0.200865	0.275685	0.177393	0.133981	0.199695	1.079722e-01	0.130803	0.307
Studio District	0.069169	0.014177	0.019660	0.000000	1.874307e-01	0.141212	0.196303	0.115371	0.072121	0.113240	3.548807e-02	0.049215	0.181
Lawrence Park	0.317774	0.099003	0.237402	0.187431	9.764943e-11	0.006311	0.011942	0.015072	0.040526	0.049872	1.838815e-01	0.171173	0.122
Davisville North	0.288972	0.068354	0.200865	0.141212	6.311426e-03	0.000000	0.006619	0.001959	0.015748	0.021226	1.243700e-01	0.112735	0.075
North Toronto West	0.381485	0.111252	0.275685	0.196303	1.194215e-02	0.006619	0.000000	0.010938	0.031490	0.023379	1.531181e-01	0.135023	0.064
Davisville	0.267126	0.052425	0.177393	0.115371	1.507174e-02	0.001959	0.010938	0.000000	0.006691	0.012015	9.516976e-02	0.084998	0.063

calculate Score of each neighbourhood and sort it

	PostalCode	Borough	Neighborhood	Latitude	Longitude	Score
25	M5S	Downtown Toronto	Harbord, University of Toronto	43.662696	-79.400049	0.147527
17	M5G	Downtown Toronto	Central Bay Street	43.657952	-79.387383	0.151137
12	M4Y	Downtown Toronto	Church and Wellesley	43.665860	-79.383160	0.151916
24	M5R	Central Toronto	The Annex, North Midtown, Yorkville	43.672710	-79.405678	0.155659
26	M5T	Downtown Toronto	Chinatown, Grange Park, Kensington Market	43.653206	-79.400049	0.15632
14	M5B	Downtown Toronto	Ryerson, Garden District	43.657162	-79.378937	0.162824
18	M5H	Downtown Toronto	Adelaide, King, Richmond	43.650571	-79.384568	0.1639
29	M5X	Downtown Toronto	First Canadian Place, Underground city	43.648429	-79.382280	0.170912
9	M4V	Central Toronto	Deer Park, Forest Hill SE, Rathnelly, South Hi...	43.686412	-79.400049	0.172161
10	M4W	Downtown Toronto	Rosedale	43.679563	-79.377529	0.172314
20	M5K	Downtown Toronto	Design Exchange, Toronto Dominion Centre	43.647177	-79.381576	0.174589
21	M5L	Downtown Toronto	Commerce Court, Victoria Hotel	43.648198	-79.379817	0.175188
15	M5C	Downtown Toronto	St. James Town	43.651494	-79.375418	0.177546

display the location in map



Results

- Coffee shop appears frequently.
- Neighborhood 'Harbord, University of Toronto' has lowest value (0.147527) in parameter 'Score' we define.

Discussion

- Coffee shop is the most popular type of restaurant. It also means larger quantity demanded.
- To make all customers who like coffee shop assess it conveniently, the value of the parameter 'Score' should be as low as it could be. So we choose the Neighborhood 'Harbord, University of Toronto' to open a coffee shop as it has lowest value 0.147527.
- It can be also shown that the Neighborhood 'Harbord, University of Toronto' locates in the center of Toronto, which makes customers from all other neighborhood easy to approach it.

Conclusion

- According to analysis, we would recommend that you could open a coffee shop in the Neighborhood 'Harbord, University of Toronto'.