FINAL REPORT

Capstone Project - The Battle of Neighbourhoods

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Introduction:

Toronto is the capital of the province of Ontario. It is the most populous city in Canada and it is recognized as one of the most multicultural and cosmopolitan cities in the world.

Cultural diversity causes food diversity as well. So, there are different restaurants in this city that give us the chance to experience a new taste in different categories. as we know, seafood is among the healthiest foods loaded with important nutrients, such as protein and vitamin D, and a great source of omega-3 fatty acids, which are incredibly important for our body and brain. As a result, many people prefer to go to seafood restaurants to have healthy food.

we want to help stakeholders interested in opening a seafood restaurant to find the best place in Toronto. Therefore, it is important to be considered in all aspects such as food quality, location, and so on to have a successful business in this competitive era. We try to help stakeholders to find the right locations to open a seafood restaurant.

In this project I want to answer the following questions:

- How many seafood restaurants are in Toronto?
- Visualize the area includes seafood restaurants.
- Which areas have the best seafood restaurant?
- Which area is lack of seafood restaurant?
- Which area is right place for opening seafood restaurant based on the population and people's income

Data:

Following data sources will be needed to extract/generate the required information: Scrape the Wikipedia page, https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M, we can get postal codes, boroughs, neighbourhoods in Toronto.

We need the latitude and longitude of each borough, for this reason, a link to a CSV file that has the geographical coordinates of each postal code: http://cocl.us/Geospatial_data. Finding restaurants in each neighbourhood of Toronto using Foursquare API. We need to analyse the population and income distribution of each neighbourhood, so, we get this data from https://www.toronto.ca/city-government/data-research-maps/open-data/open-data-catalogue

Methodology:

The first step in this project is processing data and keep the required data to find the all restaurants in Toronto. We want to find the best place to set up a seafood restaurant. So we need to explore and analyse the

neighbourhood in Toronto that is lack of seafood restaurant and also we need to analyse the population and income distribution in Toronto neighbourhood.

First, using web scraping and extract data from Wikipedia to get postal codes, boroughs, neighbourhoods and their latitude and longitude in Toronto.

	PostalCode	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	Regent Park, Harbourfront	43.654260	-79.360636
3	M6A	North York	Lawrence Manor, Lawrence Heights	43.718518	-79.464763
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
...	...	...	...	...	...
98	M8X	Etobicoke	The Kingsway, Montgomery Road, Old Mill North	43.653654	-79.506944
99	M4Y	Downtown Toronto	Church and Wellesley	43.665860	-79.383160
100	M7Y	East Toronto	Business reply mail Processing Centre, South C...	43.662744	-79.321558
101	M8Y	Etobicoke	Old Mill South, King's Mill Park, Sunnylea, Hu...	43.636258	-79.498509
102	M8Z	Etobicoke	Mimico NW, The Queensway West, South of Bloor,...	43.628841	-79.520999

103 rows × 5 columns

Figure 1 : Borough and neighbourhood location in Toronto

Also, we need to population and income distribution of each neighbourhood for analysing the optimal place for starting seafood restaurant.

	PostalCode	Neighbourhood Number	Population, 2016	Population density per square kilometre	Land area in square kilometres	Total - Household total income groups in 2015	Under $5,000	5,000 to 9,999	10,000 to 14,999	15,000 to 19,999	...	50,000 to 59,999	60,000 to 69,999	70,000 to 79,999	80,000 to 89,999	90,000 to 99,999	$1 an
0	M1B	263	90290	6208	45.74	26825	290	240	420	720	...	2330	2150	1930	1845	1640	
1	M1C	134	12494	2403	5.20	3700	60	25	45	60	...	230	230	200	195	210	
2	M1E	411	54764	8570	19.04	19855	315	540	815	970	...	1565	1360	1255	1140	1050	
3	M1G	137	53485	4345	12.31	18445	435	455	685	1170	...	1725	1405	1240	1070	865	
4	M1H	127	29960	4011	7.47	10765	615	220	255	450	...	935	845	765	615	575	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
83	M9M	23	10722	2547	4.21	3715	45	45	50	80	...	285	285	240	240	250	
84	M9N	113	17992	7197	2.50	7595	150	265	465	670	...	615	510	425	310	295	
85	M9P	108	14257	7791	1.83	5730	105	135	190	290	...	470	430	415	370	315	
86	M9R	10	32529	8585	7.54	11635	185	190	310	480	...	1100	930	795	660	625	
87	M9V	59	65924	16967	14.75	21065	320	365	515	810	...	2005	1740	1430	1245	1100	

88 rows × 26 columns

Figure 2 : The dataset for population and income distribution of each borough

Then, defining a function to find all neighbours venue in Toronto using Foursquare API. After that we keep just restaurants in Toronto and keep the following dataframe.

	PostalCode	Borough	Neighbourhood	Latitude	Longitude	total_restaurant	Seafood_restaurant
0	M1B	Scarborough	Malvern, Rouge	43.806686	-79.194353	8	0
1	M1C	Scarborough	Rouge Hill, Port Union, Highland Creek	43.784535	-79.160497	4	0
2	M1E	Scarborough	Guildwood, Morningside, West Hill	43.763573	-79.188711	5	0
3	M1G	Scarborough	Woburn	43.770992	-79.216917	17	0
4	M1H	Scarborough	Cedarbrae	43.773136	-79.239476	24	0
...	...	...	...	...	...	...	...
98	M9N	York	Weston	43.706876	-79.518188	9	0
99	M9P	Etobicoke	Westmount	43.696319	-79.532242	5	0
100	M9R	Etobicoke	Kingsview Village, St. Phillips, Martin Grove ...	43.688905	-79.554724	13	0
101	M9V	Etobicoke	South Steeles, Silverstone, Humbergate, Jamest...	43.739416	-79.588437	13	0
102	M9W	Etobicoke	Northwest, West Humber - Clairville	43.706748	-79.594054	7	0

103 rows × 7 columns

Figure 3 : Result of calculating the number of restaurants in every region.

We visualize the dense of all restaurants and the dense of seafood restaurants in Toronto to compare the locations where are crowded or lack of restaurants.

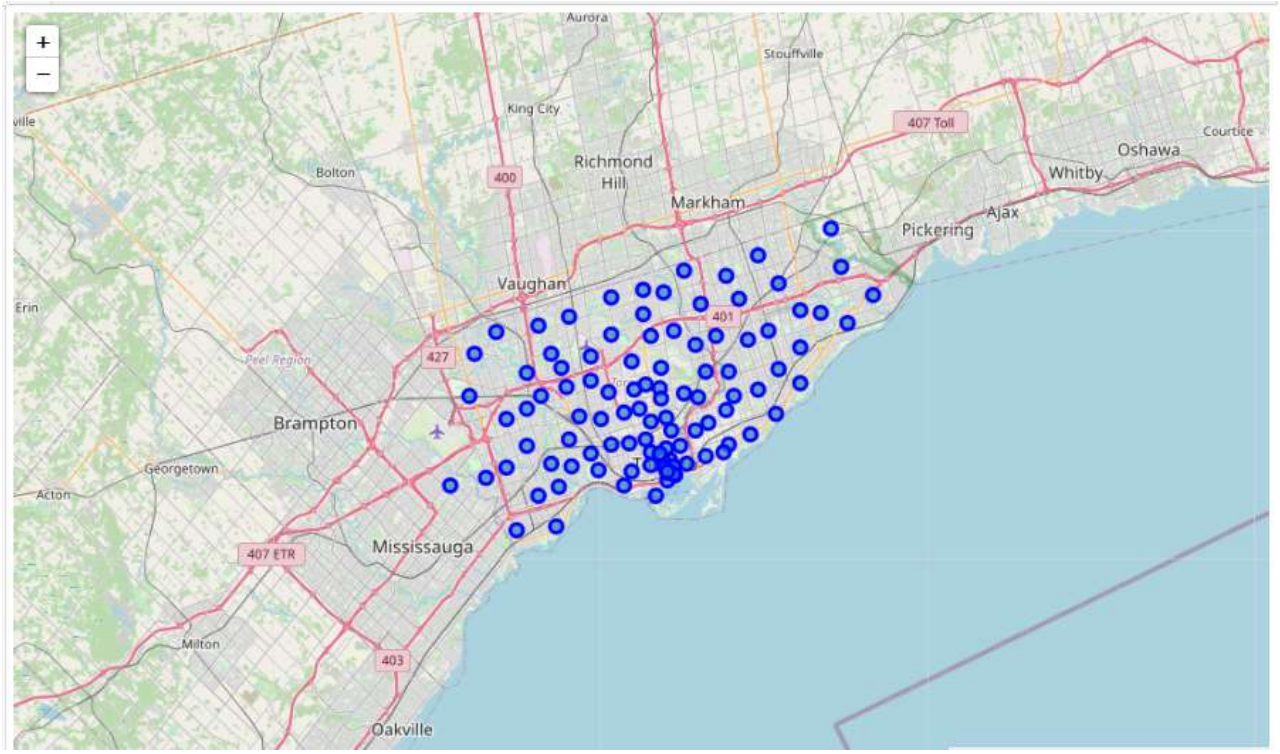

Figure 4 : Location of all restaurants in Toronto

Following map shows the dense of seafood restaurants in different neighbourhood of Toronto.

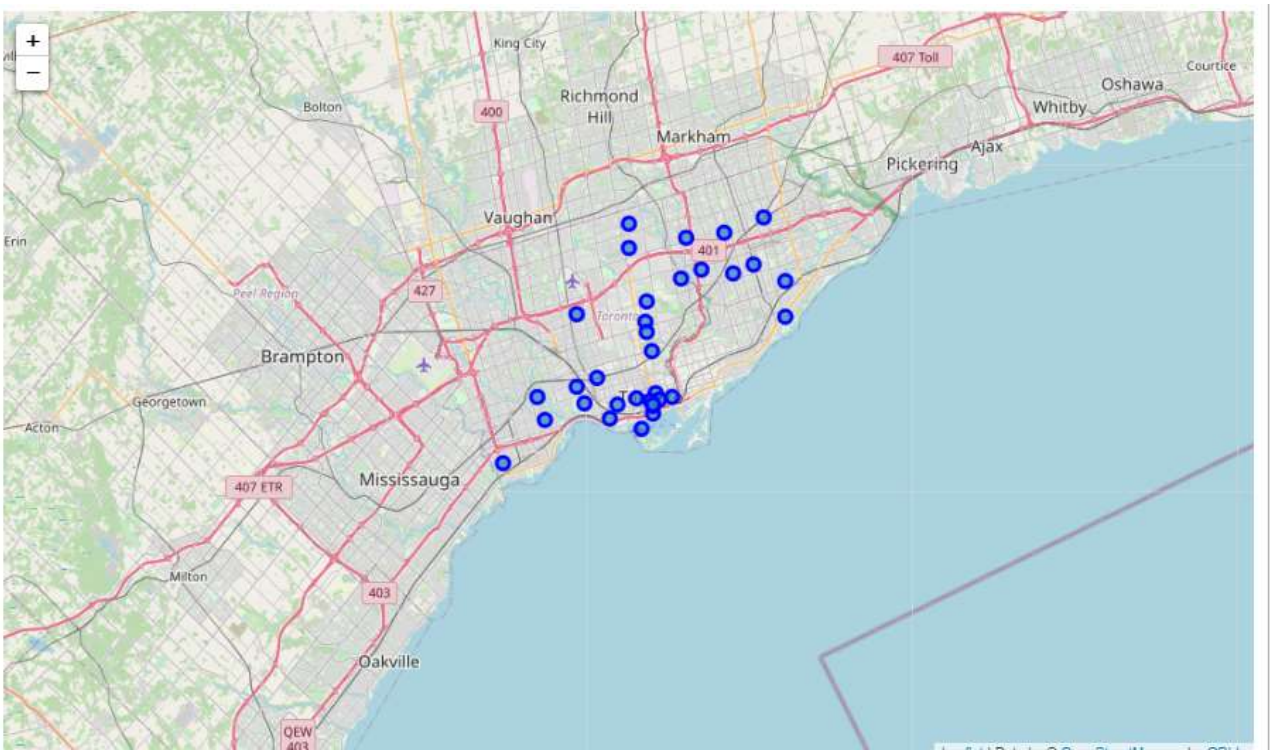

Figure 5 : Location of all seafood restaurants in Toronto

Considering the distribution of seafood restaurants in above maps, in some boroughs close to the water, is lack of seafood restaurants. We should investigate the income distribution to filter some data and have further analysis to them.

First, we add a field of count/population to the data frame which shows the count of people who have different income range divided by the population. There are 10 boroughs in Toronto that we plot the relation of count/population to income distribution for all of those boroughs.

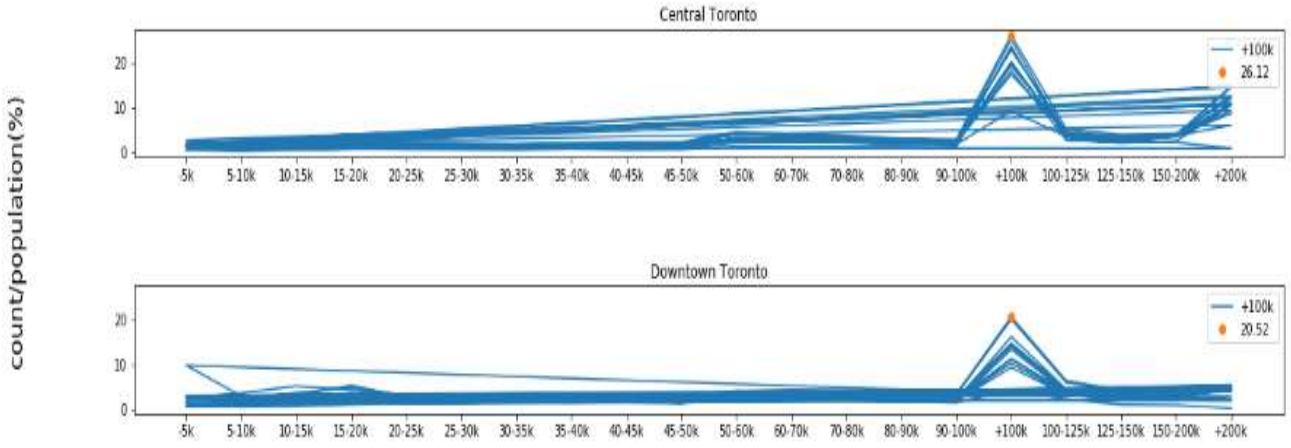

Figure 6: The relation of income distribution and the percent of people in each borough

According to the above results, shows that in 'Etobicoke' and 'Central Toronto', and 'East York' boroughs respectively, the income of more than 100k is higher than other boroughs in compare to their population. So, we filter the regions and do further analysis on these three boroughs.

The population of each neighbourhood in these three borough are different that is shown in the following chart.

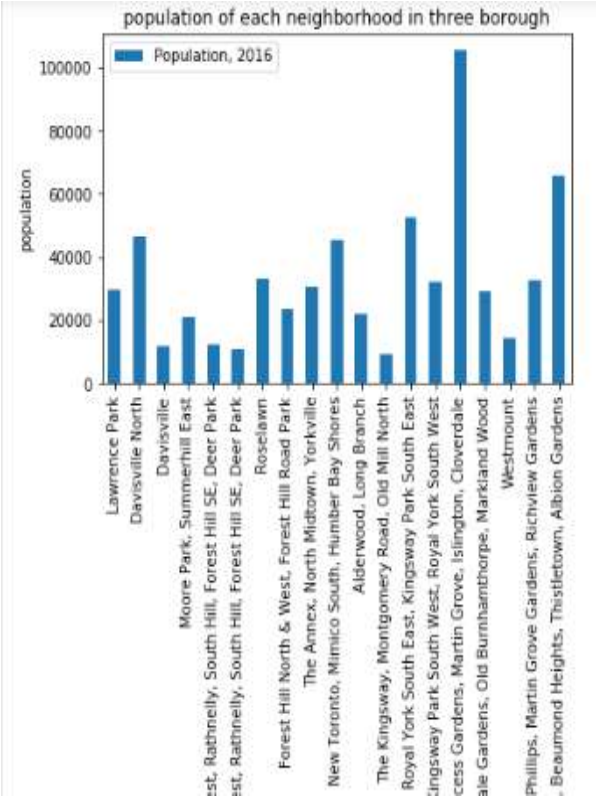

Figure 7: Population of each neighbourhood in three borough

The most populous neighbourhoods is in Etobicoke borough, so we need to analyse the count of total restaurants and seafood restaurants in this location to find the best neighbourhood to start the seafood restaurant.

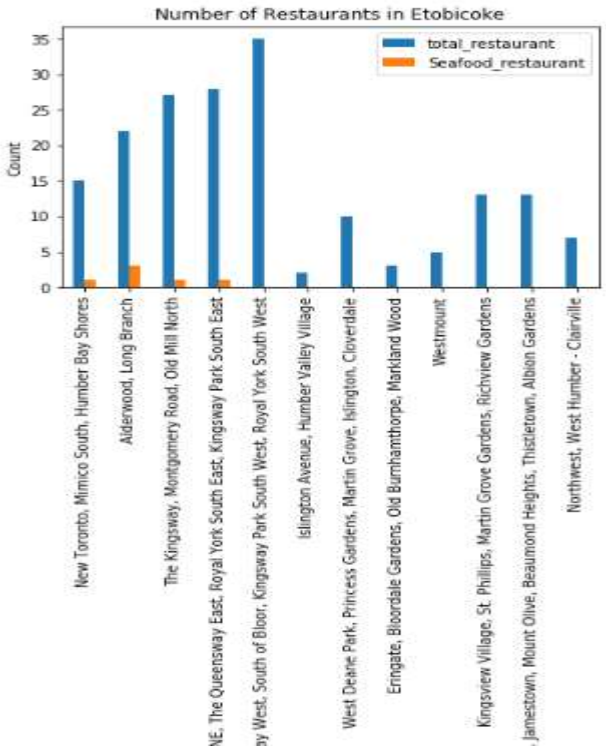

Figure 8: number of restaurants in Etobicoke borough

Discussion:

From the results of the relation of income distribution and the percent of people in each income ranges in each borough, it was determined that neighbourhoods corresponding to ‘Etobicoke' and 'Central Toronto', and 'East York' boroughs respectively were the best choices for opening a seafood restaurant based on the income distribution. Then based on the figure7 the population of Cloverdale, Islington, Martin Grove, Princess Gardens, West Deane Park in the borough of Etobicoke is greater than other neighbours. Finally based on the figure 8 can be determined this neighbour is good enough to open seafood restaurant because is lack of seafood restaurant and the amount of total restaurants based on the population is not so much.

Conclusion:

It is necessary to search different aspects for starting a business such as opening a restaurant. Finding optimal place to start a restaurant would greatly increase the likelihood of the restaurant succeeding. According to the analysis and discussion, I suggest Cloverdale, Islington, Martin Grove, Princess Gardens, West Deane Park.