Predicting the best Restaurant location and Restaurant type in Toronto

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1. Introduction

1.1 Background

ABC company is a leading restaurant owners in Asia with over 100 restaurant outlets. Their cuisine will be different from place to place depends on the region. As per the new business plan they are planning to open restaurants in other part of the world also starting from Toronto, Canada. They wish to start only one outlet now to see how the business works. So it is ideal to find a best place and best cuisine which people chooses.

1.2 Challenges

As ABC company is new to the place Toronto they have only limited resources to search for the data of existing restaurants in there and what cuisine most people choose. But they don't want to start based on only hopes. Their only solution was to form a search team to find the data by conducting surveys and observing by physically going there. This will take a lot of time and effort and ABC don't want to spend these much time on this. So they consulted us to get some recommendations of place and type of restaurant as quickly as possible by comparing the existing data.

1.3 Business Problem

We have to address 2 business problems here. As company is planning to open only one outlet for now, it must be placed in the best location possible. Not a deserted area where the population is very less or number of restaurant too small. Not an area that is crowded with too much restaurants as this will divide the crowd and will create a greater competition. We have to make a trade off between them.

Also Toronto is a place where people from all over the world will be coming. So it is also a challenge to find which cuisine to use as using the local cuisine will be a problem for the foreigners. So we have to find the most popular restaurant types in Toronto and gave recommendations based on that.

2. Data

As we need to find the best neighbourhood to start a restaurant, we have analyzed the existing neighbourhood data which contains postal code name of borough and neighbourhoods.

https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

We have to find the location (latitude and longitude) of these locations. For that we have used the geospatial data.

http://cocl.us/Geospatial_data

Our ultimate goal is to analyze the existing restaurants in Toronto and gave recommendations based on that. To get the existing restaurant information we have used the four square API to explore venues in the neighbourhood and sorted out the Restaurants from it. Data looks like this:

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	Indexes
1	Parkwoods	43.753259	-79.329656	KFC	43.754387	-79.333021	Fast Food Restaurant	10
5	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant	11
6	Victoria Village	43.725882	-79.315572	The Frig	43.727051	-79.317418	French Restaurant	7
15	Harbourfront, Regent Park	43.654260	-79.360636	Impact Kitchen	43.656389	-79.356980	Restaurant	-1
31	Harbourfront, Regent Park	43.654260	-79.360636	El Catrin	43.650601	-79.358920	Mexican Restaurant	8

3. Methodology

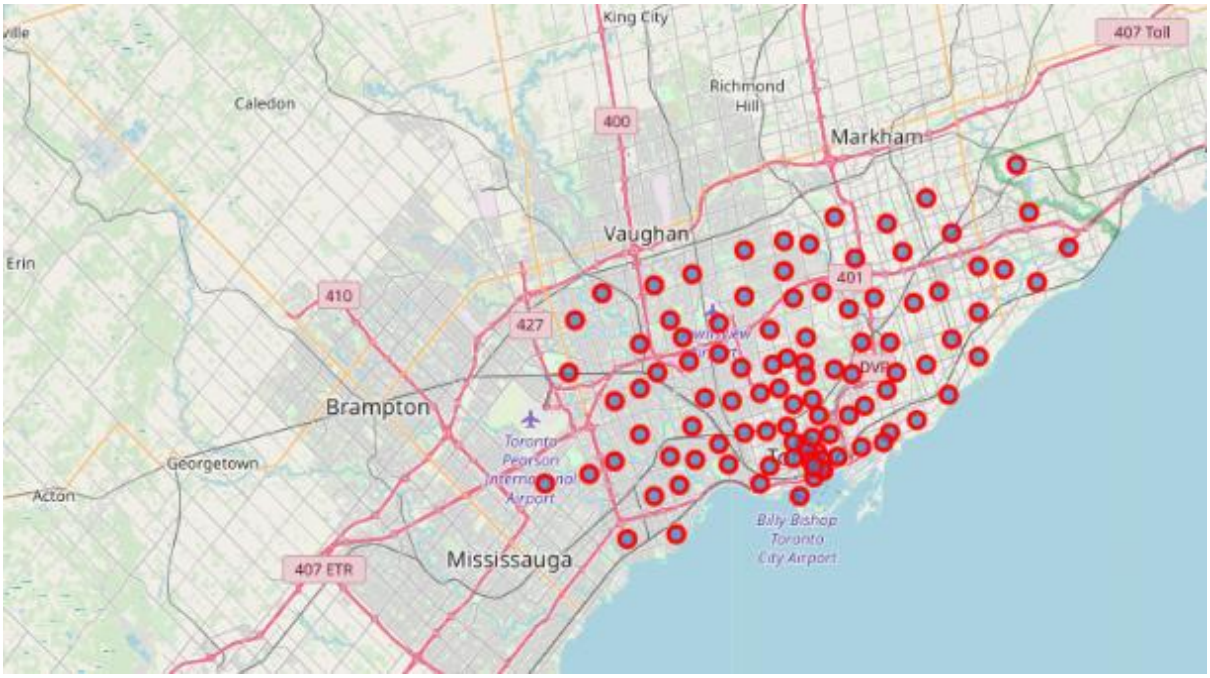
As the data consist of web data, location data from Four square we have to clean it first to make it ready to analyze. We have scarped the web data using “Beautifulsoup” library did some pre processing like dropping the “no data” rows and combining the same locations together and converted into a data frame in pandas format so it will be easy to analyze. We have selected only the needed features ie; postal code Borough and neighbourhood names. After cleaning data looked like this.

	Postalcode	Borough	Neighbourhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Harbourfront, Regent Park
3	M6A	North York	Lawrence Heights, Lawrence Manor
4	M7A	Queen's Park	Queen's Park
5	M9A	Etobicoke	Islington Avenue
6	M1B	Scarborough	Rouge, Malvern
7	M3B	North York	Don Mills North
8	M4B	East York	Woodbine Gardens, Parkview Hill
9	M5B	Downtown Toronto	Ryerson, Garden District

After getting the neighbourhood data, we have used the geospatial data to get the latitude and longitude info places and combined with the neighbourhood data we got above.

	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	Harbourfront, Regent Park	43.654260	-79.360636
3	M6A	North York	Lawrence Heights, Lawrence Manor	43.718518	-79.464763
4	M7A	Queen's Park	Queen's Park	43.662301	-79.389494

After getting the location data we have used the folium library to plot the points to see which all locations we got. The places are indicated by the red circles.



Four square API

After this we have used the Foursquare API to get the nearby venues in these locations. We set the radius around 1000 and limit around 500 to get a big data set to analyze. We have sorted out Neighbourhood, neighbourhood latitude, longitude, venue, venue category, venue latitude and longitude. Fetched data looked like below.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Parkwoods	43.753259	-79.329656	Allwyn's Bakery	43.759840	-79.324719	Caribbean Restaurant
1	Parkwoods	43.753259	-79.329656	Brookbanks Park	43.751976	-79.332140	Park
2	Parkwoods	43.753259	-79.329656	Tim Hortons	43.760668	-79.326368	Café
3	Parkwoods	43.753259	-79.329656	A&W Canada	43.760643	-79.326865	Fast Food Restaurant
4	Parkwoods	43.753259	-79.329656	Bruno's valu-mart	43.746086	-79.324978	Grocery Store
5	Parkwoods	43.753259	-79.329656	Food Basics	43.760865	-79.326015	Supermarket
6	Parkwoods	43.753259	-79.329656	Shoppers Drug Mart	43.745303	-79.325249	Pharmacy
7	Parkwoods	43.753259	-79.329656	High Street Fish & Chips	43.745260	-79.324949	Fish & Chips Shop
8	Parkwoods	43.753259	-79.329656	Shoppers Drug Mart	43.760857	-79.324961	Pharmacy
9	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop

This data contains all the venues nearby. But we only needed the restaurant data. So we have searched for restaurant in this data and sorted out as below.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	Indexes
1	Parkwoods	43.753259	-79.329656	KFC	43.754387	-79.333021	Fast Food Restaurant	10
5	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant	11
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After doing all this we have found out that we can use this for the exploratory analysis and getting some inferences

4. Exploratory Analysis

We can use plotting libraries like matplotlib and seaborn to plot the data to get some insights which will be visually good also. But as our data is not that complicated to understand we have uded the tabular form itself.

As we know we have to find best location to start a restaurant and most popular restaurant types to give suggestions.

So we have sorted the neighbourhood data to get the number of restaurants in each neighbourhood which will help us to select the appropriate neighbourhood to start a restaurant. Data looked like below after sorting.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	Indexes
13	Chinatown, Grange Park, Kensington Market	34	34	34	34	34	34	34
15	Church and Wellesley	30	30	30	30	30	30	30
0	Adelaide, King, Richmond	28	28	28	28	28	28	28
28	First Canadian Place, Underground city	27	27	27	27	27	27	27
19	Commerce Court, Victoria Hotel	27	27	27	27	27	27	27
12	Central Bay Street	25	25	25	25	25	25	25
55	St. James Town	25	25	25	25	25	25	25
54	Ryerson, Garden District	24	24	24	24	24	24	24
56	Stn A PO Boxes 25 The Esplanade	23	23	23	23	23	23	23
23	Design Exchange, Toronto Dominion Centre	22	22	22	22	22	22	22
44	Little Portugal, Trinity	20	20	20	20	20	20	20
60	The Danforth West, Riverdale	16	16	16	16	16	16	16
34	Harbourfront East, Toronto Islands, Union Station	14	14	14	14	14	14	14
65	Willowdale South	13	13	13	13	13	13	13
27	Fairview, Henry Farm, Oriole	11	11	11	11	11	11	11
5	Berczy Park	11	11	11	11	11	11	11
8	Cabbagetown, St. James Town	10	10	10	10	10	10	10
4	Bedford Park, Lawrence Manor East	10	10	10	10	10	10	10
20	Davisville	10	10	10	10	10	10	10
57	Studio District	10	10	10	10	10	10	10
33	Harbord, University of Toronto	9	9	9	9	9	9	9

We can find that the maximum number of restaurants is in Chinatown, Grange Park area. Around 34 restaurants, so it is not advisable to open a new restaurant there as the competition will be high. There are places where the number of restaurants is less than 5. These places may be too deserted or not a good area. So it is not advisable there also. Considering this we have eliminated the areas with no of restaurants greater than 15 and Areas with no of restaurants less than 10. As our client need only precise locations we have tightened our cut off criteria. So after filtering we have got the 4 ideal places where there are some optimal number of restaurants only. Those are the below locations

	Neighbourhood	No of restaurants
0	Harbourfront East, Toronto Islands, Union Station	14
1	Willowdale South	13
2	Fairview, Henry Farm, Oriole	11
3	Berczy Park	11

To find the best type of restaurants we have sorted out the restaurant data obtained from Four square API in terms of restaurant types. Data looks like below.

	Venue Category	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Indexes
43	Restaurant	59	59	59	59	59	59	59
28	Italian Restaurant	52	52	52	52	52	52	52
18	Fast Food Restaurant	38	38	38	38	38	38	38
29	Japanese Restaurant	35	35	35	35	35	35	35
1	American Restaurant	29	29	29	29	29	29	29
46	Sushi Restaurant	27	27	27	27	27	27	27
7	Chinese Restaurant	25	25	25	25	25	25	25
44	Seafood Restaurant	24	24	24	24	24	24	24
49	Thai Restaurant	21	21	21	21	21	21	21
52	Vegetarian / Vegan Restaurant	20	20	20	20	20	20	20
23	Greek Restaurant	17	17	17	17	17	17	17
35	Mexican Restaurant	16	16	16	16	16	16	16
26	Indian Restaurant	15	15	15	15	15	15	15
36	Middle Eastern Restaurant	14	14	14	14	14	14	14
2	Asian Restaurant	13	13	13	13	13	13	13
53	Vietnamese Restaurant	12	12	12	12	12	12	12
20	French Restaurant	12	12	12	12	12	12	12
6	Caribbean Restaurant	9	9	9	9	9	9	9
39	New American Restaurant	8	8	8	8	8	8	8
42	Ramen Restaurant	8	8	8	8	8	8	8

From above it is evident that if the client is planning to choose a particular cuisine, it will be better to go with “Italian Restaurant” as it is most popular among the people. To give suggestions we have sorted out around top 9 type of restaurants as below.

	Type of restaurant	Count in Toronto
1	Italian Restaurant	52
2	Fast Food Restaurant	38
3	Japanese Restaurant	35
4	American Restaurant	29
5	Sushi Restaurant	27
6	Chinese Restaurant	25
7	Seafood Restaurant	24
8	Thai Restaurant	21
9	Vegetarian / Vegan Restaurant	20

As these are the most popular cuisines, our client can choose any one of them as a good suggestion.

5. Conclusion

So after the analysis we have got the four best locations to start new restaurants as below.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude
1707	Harbourfront East, Toronto Islands, Union Station	43.640816	-79.381752

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude
2720	Willowdale South	43.77012	-79.408493

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude
1548	Fairview, Henry Farm, Oriole	43.778517	-79.346556

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude
842	Berczy Park	43.644771	-79.373306

We have also chosen the best cuisine type available

	Type of restaurant	Count in Toronto
1	Italian Restaurant	52
2	Fast Food Restaurant	38
3	Japanese Restaurant	35
4	American Restaurant	29
5	Sushi Restaurant	27
6	Chinese Restaurant	25
7	Seafood Restaurant	24
8	Thai Restaurant	21
9	Vegetarian / Vegan Restaurant	20

So as per all these we can give these 4 location suggestions and 9 restaurant suggestions to the client and he can choose from them.

6. Future Scope

This idea can be used to find location to start new cinema and other stores based on the relevant data. Also we can use this for finding the best restaurant locations in other part of the world also . As this is only a rough basic idea , after getting the feedback we can include more features and can improve the algorithm to a further level.