Finding a Locality to set-up an Indian Restaurant

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1. Introduction

1.1 Background

BarBeeQ is an Indian chain of restaurants operating in India at present and it is looking forward to launch an outlet in Toronto, Canada since it has a large Indian population of 78,870.

1.2 Problem

The restaurant is to be opened in area which has lower density of Indian restaurants and is closer to the centre of the city. However, due to cost constraints, the restaurant cannot be set up very close to the city centre. The location has to be selected in such a way that it is also close to the areas majorly populated by Indians.

1.3 Target Audience

The target audience in this problem would be the owners of the restaurant chain and they would care about it since the solution to the problem will directly have an impact on the cost of establishing a restaurant, its footfall and consequentially its profit.

2. Data

2.1 Variables defined

The variables crucial for the problem are:

1. Not more than two restaurants within 300 metre from the locality
2. Not more than one restaurant within 1 km from the locality
3. Distance from Toronto City to the locality < 9 km
4. Distance from Etobicoke to the locality < 9km

2.2 Data Source

The data required for the aforementioned problem will be taken from Foursquare API. It will include:

1. List of Indian restaurants in Toronto
2. Location, distance from the city centre, name of the restaurant, address, zip code.
3. The radius selected is 20 km for finding the restaurants from Toronto city centre

Coordinates of Toronto city centre will be obtained using Google Maps API geocoding.

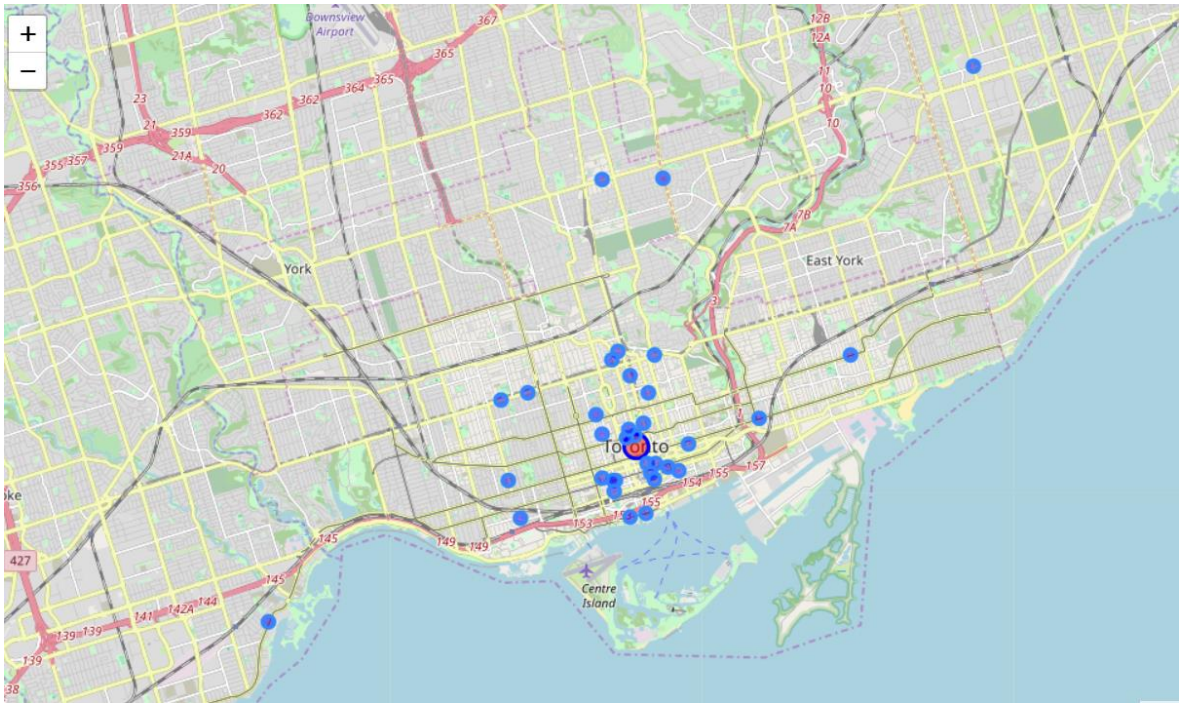
The clustering of restaurants will be done through which a neighbourhood that satisfies the aforementioned variables will be selected. For example: It is found that Scarborough satisfies the variables. Then I will explore Scarborough to find the Indian restaurants present and using the variables, I will find a locality within the neighbourhood where the restaurant can be set up. Further, within the selected neighbourhood, restaurants will be clustered to find a locality that fits the aforementioned variables with even greater accuracy.

2.3 Data Cleaning

The data obtained from Foursquare API is cleaned to obtain a dataframe consisting the required columns, namely, categories, name, address, crossStreet, lat, lng, distance, postalCode, city, state, country, neighbourhood, id, formatted address and labeledLatLngs. The other columns were dropped since they did not involve any data critical for plotting the location of the restaurants on a map. Distance of the restaurant from the city centre is critical to selecting a locality, therefore, it has been taken into consideration.

2.4 Data Visualisation

The data is explored by visualising it using folium maps. The locations of restaurants obtained from Foursquare API are plotted on the map. The map can be seen below.



It can be seen that the density of Indian restaurants is high towards the North and South of the Toronto City centre. Whereas, towards the West and East of the city centre it is comparatively lower. Also, Etobicoke and Brampton lie towards the West of the city centre. Therefore, a locality towards the West of the city centre can be chosen.

3. Methodology

The Indian restaurants around Toronto City, as visualised above, will be clustered using K-means clustering to find clusters with lower restaurant density and the one with the lower concentration of restaurants will be selected for exploration purposes.

After clustering the Indian restaurants, we will find a locality towards the West of Toronto city centre as Etobicoke and Brampton lie towards the west of it such that the density of Indian restaurants in that locality is low and it is also within 9 km from the Toronto City centre and Etobicoke. The distance will be calculated by using the location coordinates of the respective locations.

After identifying this locality, we will explore the restaurants (all cuisines) around it using Foursquare API to check if that area has a high concentration of other restaurants. If that is the case then another locality will have to be selected where competition from other restaurants will be low.

We also want that the restaurants within 300 m of the locality be no more than two and Indian restaurants within 1 km of the locality be no more than one.

4. Analysis

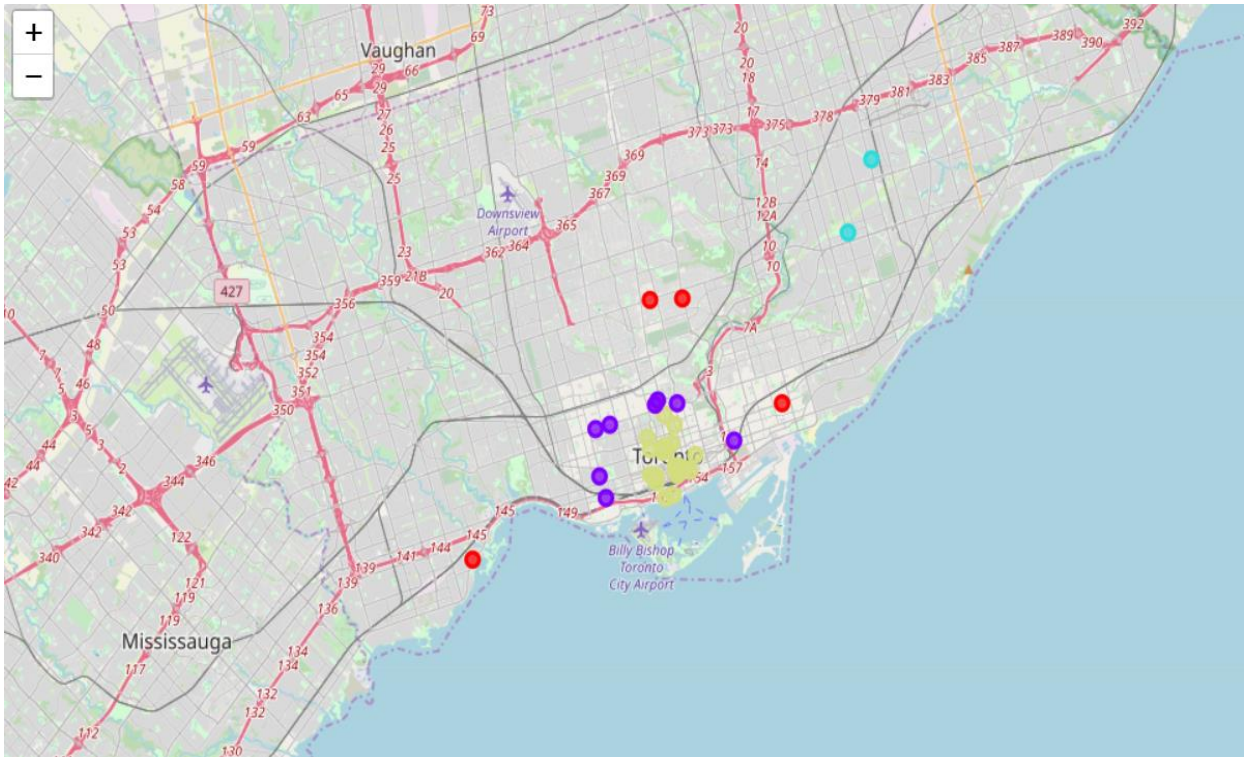
4.1 K-means Clustering

K-means clustering has been used to create clusters of Indian restaurants to identify the clusters with lower restaurant density.

Before, creating the clusters, the dataframe was modified and parameters with string data type were replaced by dummies. Below is the picture of the dataframe.

	distance	lat	lng	Etobicoke	Toronto	0B7	1B5	1B8	1C7	1E2	...	M5E	M5G	M5H	M5J	M5L	M5R	M5S	M5V	M6G	M8V
0	906	43.646463	-79.389644	0	1	0	0	0	0	0	...	0	0	0	0	0	0	0	1	0	0
1	946	43.646394	-79.390418	0	1	0	0	0	0	0	...	0	0	0	0	0	0	0	1	0	0
2	241	43.655649	-79.384119	0	1	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
3	284	43.655120	-79.386645	0	1	0	0	0	1	0	...	0	1	0	0	0	0	0	0	0	0
4	464	43.650050	-79.380662	0	1	0	0	0	0	0	...	0	0	1	0	0	0	0	0	0	0

The clustering has been done into 4 clusters and the clusters have been plotted on the map. Below is the clustered map.

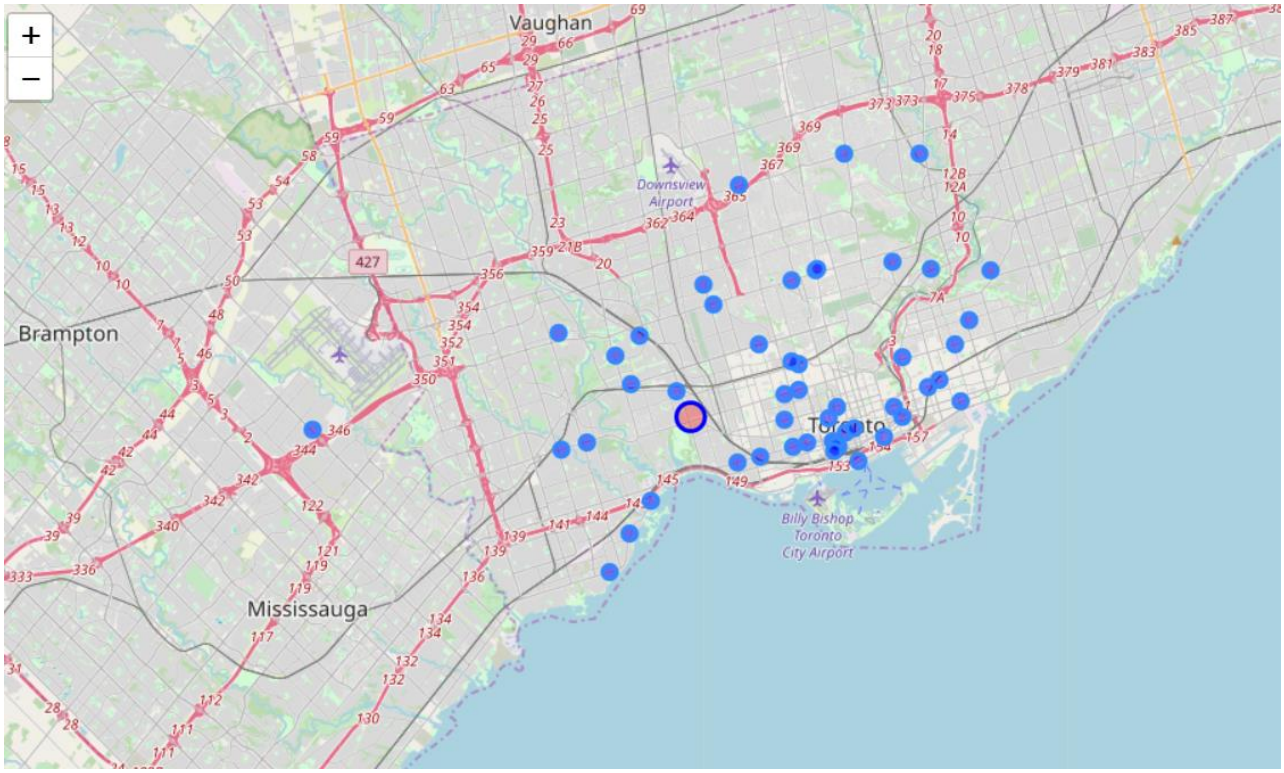


It can be seen that in the area between Brampton and Downsview Airport, there is not a single Indian restaurant. Whereas, a lot of Indians live in Brampton and Etobicoke. Therefore, a locality towards the North-West of Toronto City will be suitable.

4.2 Exploration of Locality

Indian Grove, a locality towards the West of Toronto city centre, was selected initially primarily due to the high Indian presence in the locality. Indian Grove is a street near the Dundas West street and Bloor Street West. The locality is surrounded by various Indian establishments such as the Indian Road Crescent Junior Public School and Indian Trail. The locality also has numerous parks such as High Park, Baird Park and Lithuania Park. Apart from that, there are shopping plazas and malls in the locality such as Crossways Mall and High Park Plaza. Overall, the locality has commercial spaces, low density of restaurants and an Indian population living in it. Therefore, we decided to explore this area to see its restaurant density.

To explore the area its geographical coordinates are obtained using the geopy library. Then a list of restaurants (all cuisines) within a 20 km radius is obtained from Foursquare API. The data is then cleaned and processed and it is plotted on a map. Below is the map.



There are multiple restaurants around Indian Grove. Therefore, we obtain the list of top 10 nearest restaurants from the locality to check if the conditions set in the beginning are being satisfied. Below is the sorted dataframe.

	name	categories	address	lat	lng	labeledLatLngs	distance
5	Subway	Sandwich Place	123 Queen Street West, Suite # C72	43.651194	-79.384234	[{'label': 'display', 'lat': 43.65119366354807...	255
0	Richtree Natural Market Restaurants	Restaurant	14 Queen St W	43.652614	-79.380231	[{'label': 'display', 'lat': 43.65261436174172...	313
2	Valens Restaurants	Restaurant	19 Baldwin Street	43.656096	-79.392839	[{'label': 'display', 'lat': 43.65609618431269...	773
6	Subway	Sandwich Place	101 College St	43.659875	-79.388606	[{'label': 'display', 'lat': 43.65987502486328...	805
1	Imago Restaurants	Restaurant	14 Duncan Street, Suite 203	43.647910	-79.390810	[{'label': 'display', 'lat': 43.64791, 'lng': ...	831
7	Subway	Sandwich Place	200 Wellington St West, Unit 340	43.645951	-79.387824	[{'label': 'display', 'lat': 43.64595052717185...	894
8	Subway	Sandwich Place	287 King St. W	43.646459	-79.389506	[{'label': 'display', 'lat': 43.64645929083939...	901
3	Marigold Indian Bistro I Indian Restaurants in...	Fast Food Restaurant	552 Mt Pleasant	43.644302	-79.390002	[{'label': 'display', 'lat': 43.64430171166487...	1132

It can be seen that there is only one restaurant within 300 metres of Indian Grove and no Indian restaurants within 1 km of it. Therefore, the conditions mentioned above are satisfied. Now let's see if the other conditions are satisfied.

Let’s calculate the distance between Toronto City and Indian Grove. The distance between the two locations is calculated by using their location coordinates. It is found that the distance between Toronto City and Indian Grove is 6.07 km which is lower than 9 km. Therefore, this condition is satisfied.

Further, the distance between Etobicoke and Indian Grove is to be found. The distance comes out to be 8.03 km which is also below 9 km. Therefore, all the conditions mentioned are satisfied by Indian Grove.

5. Results and Discussion

Through the analysis it was seen that there are a great number of restaurants around Toronto city and that their density goes on decreasing as we move farther from the city centre. Highest concentration of restaurants was seen towards the North and South of city centre. The density of restaurants towards the East and the West of city centre was comparatively lower. However, Brampton and Etobicoke lie on the western side and these areas are majorly populated by Indians. Therefore, the region towards the West and North West of city centre was selected.

Indian Grove, a locality towards the West of Toronto city centre, was selected initially primarily due to the high Indian presence in the locality. Indian Grove is a street near the Dundas West street and Bloor Street West. The locality is surrounded by various Indian establishments such as the Indian Road Crescent Junior Public School and Indian Trail. The locality also has numerous parks such as High Park, Baird Park and Lithuania Park.
Apart from that, there are shopping plazas and malls in the locality such as Crossways Mall and High Park Plaza. Overall, the locality has commercial spaces, low density of restaurants and an Indian population living in it. Therefore, we decided to explore this area to see its rest aurant density.

It was seen that there was only one restaurant within 300 metre of the location and no Indian restaurant within 1 km of it. The conditions that had been set earlier were met. After this, the distance between Toronto city centre and the location was found out and it was less than 9km . Similarly, the distance between Etobicoke and the location was found out using geographical coordinates, which was also less than 9 km. Therefore, all the conditions that were set were satisfied by this locality.

The result of this analysis was that a locality was identified near Toronto where an Indian rest aurant could be set up, subject to the given conditions. This, however, does not imply that it is the most optimal location. There can be more locations that are more optimal than the one

suggested by this analysis. Recommended locality should therefore be considered only as a starting point for more detailed analysis which could eventually result in a location which has not only no nearby competition but also other factors taken into account and all other relevant conditions met.

6. Conclusion

Purpose of this project was to identify Toronto areas close to centre with low number of restaurants (particularly Indian restaurants) in order to aid stakeholders in narrowing down the search for optimal location for a new Indian restaurant. By clustering the Indian restaurant s, a basic idea was obtained about the density of Indian restaurants around Toronto city centre and then find a locality which satisfies some basic requirements regarding existing nearby restaurants and distances from Toronto city centre and Etobicoke. After clustering the Indian restaurants, a location towards the West of Toronto had to be identified. Various conditions mentioned above were taken into consideration and it was ensured that they satisfied and thus , a locality was suggested for setting up the restaurant.

Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and the recommended locality, taking into consideration add itional factors like attractiveness of the location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.