New Indian Restaurant

(The Battle of the Neighborhoods)

Capstone Project (Week 2)

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1. Introduction: Business Problem

Background:

For many people in the world it is always a dream to have a business in America or Europe. When people look towards these destinations they have many questions in their mind.

Problem:

In this project we will try to find a one of the best location in the world's top two business centers (Toronto Vs San Francisco) for opening a new Indian restaurant. Choice of business city will depend upon many factors but here for opening a new Indian restaurant we will consider Only two of them 1. Size of Indian Community and 2. Immigration and Business Policies. Based on these two factors we will have a city of choice.

Once a business city is decided, we will try to find a best location for Indian restaurant in that city. In this process we will try to find pre existing Indian Restaurants in that city and look for a location where there is little ore no Indian restaurant restaurants available and it is close to the city center.

Key Question:

So our key question is - How to find a best location for opening a Indian Restaurant in selected city?

Target -

Target of this project will be Indian origin people who interested in opening a Indian restaurant in abroad like Toronto or San Francisco

We will use data science tools and Foursquare API to generate and process the neighborhoods information and location. Advantages of each area will then be clearly expressed for best possible final location for stakeholders.

2. Data acquisition, cleaning & Analysis

Based on definition of our problem, factors that will influence our decision are:

- Number of Indian community in Toronto and San Francisco
- Immigration and Business Policies of USA and Canada
- Number of any type existing restaurants in the neighborhood
- Number of Indian Restaurant in the Neighborhood
- Distance to Indian Restaurants in the neighborhood, if any
- distance of neighborhood from city center

We decided to use circular area search using foursquare API with radius 5 KM

Following data sources will be needed to extract/generate the required information:

Data Source –

1. Wikipedia Page - Indo Canadian Data
   https://en.wikipedia.org/wiki/Indo-Canadians
2. Indian Immigration to Canada - 1980 - 2013 data
   https://ibm.box.com/shared/static/lw190pt9zpy5bd1ptyg2aw15awomz9pu.xlsx
3. Canada M Postal Codes, borough, neighborhood
   https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
4. Canada M Postal Codes, latitude , longitude
   http://cocl.us/Geospatial_data
5. Number of restaurants, type, location and neighborhood - **Foursquare API**
   https://foursquare.com
6. Foursquare categories of Restaurant (Indian)
   https://developer.foursquare.com/docs/resources/categories

Data cleaning–

1. Data downloaded or scraped from multiple sources were combined into dataframe(Table).
2. Find missing value
3. Try to replace missing value
4. Remove missing values rows(If can not be repaired or replaced)
5. Check for duplicate values
6. Remove duplicate values

Data cleaning–

1. Data returned by Foursquare contains large number of features but we have used only selected features –

   name
   categories
   address
   distance
   formattedAddress
   lat
   lng
   id

2. We have also added some by splitting ‘categories’ features into like
   'categoriesID', and 'categoriesName',
3. We have also added some features of multiple dat frame
   'neighborhoodName', 'neighborhoodLatitude', 'neighborhoodLongitude'

We have also try to save web scrapped and cleaned data into csv file for offline load and use

Toronto Vs San Francisco(City of Choice)

Toronto and San Francisco are well developed and multi ethnic and multi culture business centers but Due to resent changes in USA business policies and H1-B visa and reforms, it has become a bit risky and fificult for outsider to open a new business.
So Toronto, Canada will be the first city of choice for opening a new Indian restaurant. It has very Open and favorable business policies and environment for outsiders.
***Data Source – Resent News and Media Report

Toronto

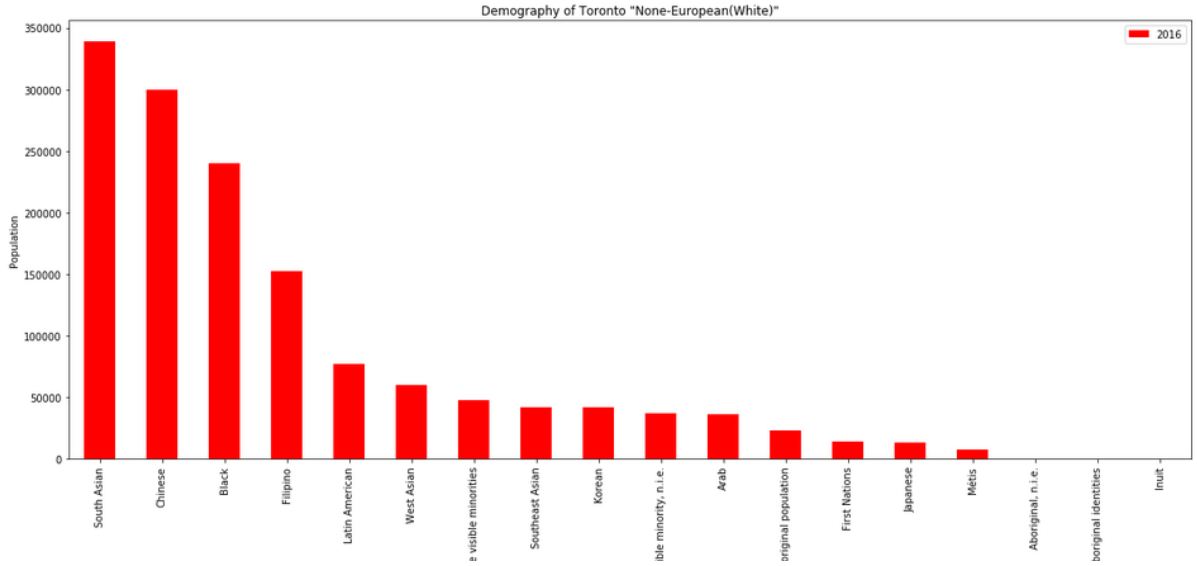
Data Sample

1. Percentage of Indian population in Canada

	City	Province	Indian	Percentage
0	Toronto	Ontario	643370	10.40%
1	Greater Vancouver	British Columbia	243135	10.00%
2	Montréal	Quebec	48485	1.20%
3	Calgary	Alberta	90625	6.50%
4	Edmonton	Alberta	72245	5.50%
5	Ottawa	Ontario	28945	2.20%
6	Winnipeg	Manitoba	30800	4.00%
7	Hamilton	Ontario	23390	3.10%
8	Victoria	British Columbia	9180	2.50%
9	Kitchener	Ontario	19295	3.70%

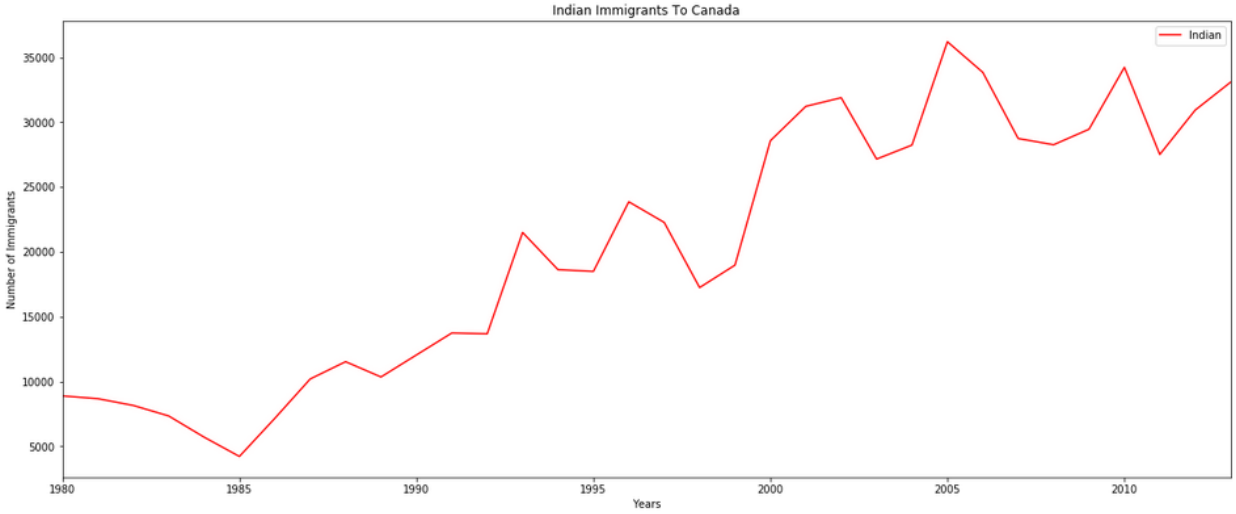
2. Demographics of Toronto 2006 to 2016

	2016	2011	2006
European (White)	1282750	1292365	1300330
South Asian	338965	317100	298370
Chinese	299460	278390	283075
Black	239850	218160	208555
Filipino	152715	132445	102555

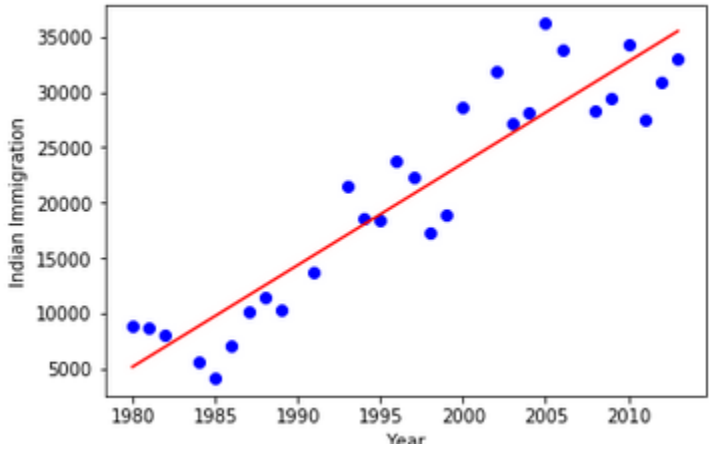


3. Indian immigration to Canada (1980 to 2013)

	Indian
Year	
1980	8880
1981	8670
1982	8147
1983	7338
1984	5704



4. Regression Model of Indian Immigration to Canada

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Mean absolute error: 2698.25
Residual sum of squares (MSE): 11865109.78
R2-score: 0.80
```

5. Indian Immigration prediction by 2025 (Canada)

Year	Indian
2020	42305
2021	43239
2022	44173
2023	45108
2024	46042
2025	46976

6. Toronto Neighborhood and It's Postal Code

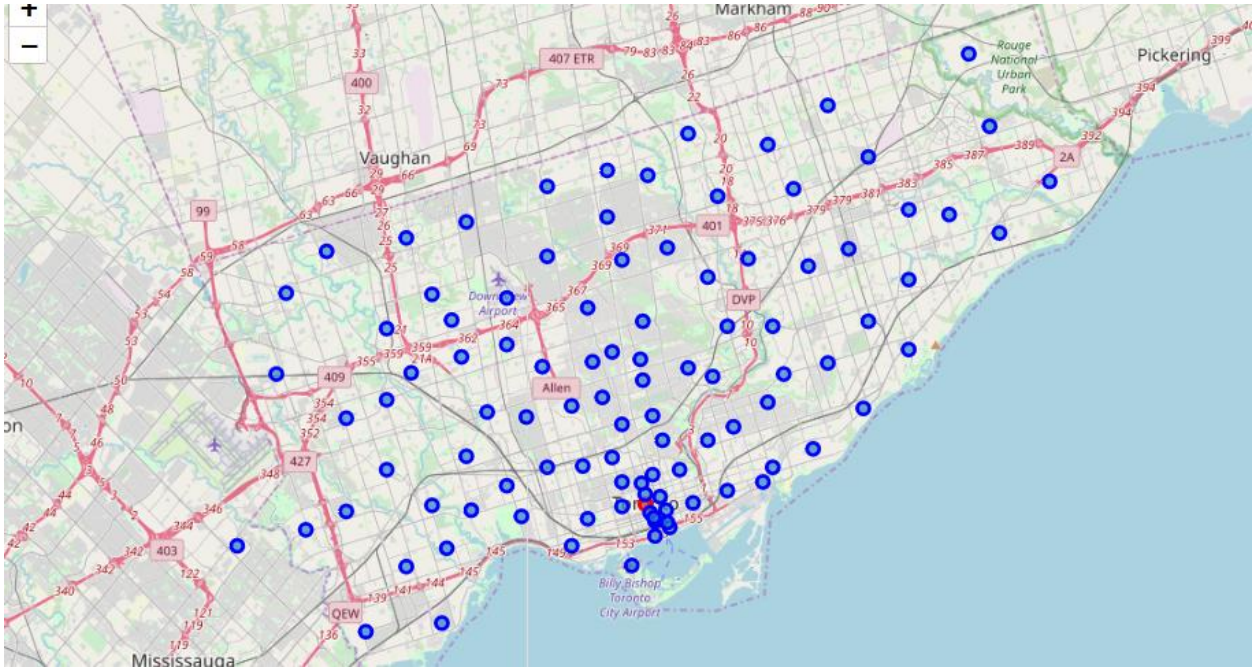
Postal Code	Borough	Neighborhood
M3A	North York	Parkwoods
M4A	North York	Victoria Village
M5A	Downtown Toronto	Harbourfront
M5A	Downtown Toronto	Regent Park
M6A	North York	Lawrence Heights

7. Toronto Postal code latitude and longitude

Postal Code	Latitude	Longitude
M1B	43.806686	-79.194353
M1C	43.784535	-79.160497
M1E	43.763573	-79.188711
M1G	43.770992	-79.216917
M1H	43.773136	-79.239476

8. Toronto Neighborhood with latitude and longitude

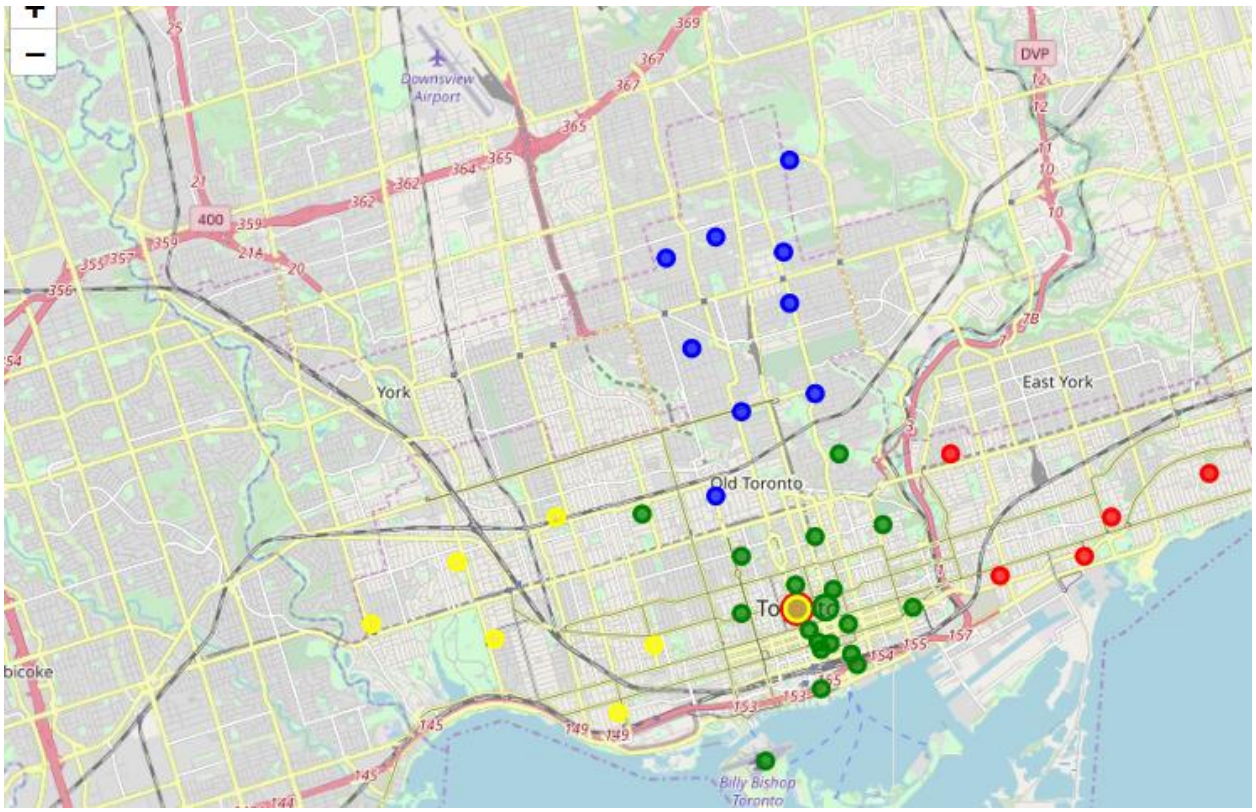
Postal Code	Borough	Neighborhood	Latitude	Longitude
M1B	Scarborough	Rouge, Malvern	43.806686	-79.19435
M1C	Scarborough	Highland Creek, Rouge Hill, Port Union	43.784535	-79.1605
M1E	Scarborough	Guildwood, Morningside, West Hill	43.763573	-79.18871
M1G	Scarborough	Woburn	43.770992	-79.21692
M1H	Scarborough	Cedarbrae	43.773136	-79.23948



9. Filtered borough that contains word “Toronto”

Postal Code	Borough	Neighborhood	Latitude	Longitude
M4E	East Toronto	The Beaches	43.676357	-79.29303
M4K	East Toronto	The Danforth West, Riverdale	43.679557	-79.35219
M4L	East Toronto	The Beaches West, India Bazaar	43.668999	-79.31557
M4M	East Toronto	Studio District	43.659526	-79.34092
M4N	Central Toronto	Lawrence Park	43.72802	-79.38879

10. Clustering of Each Borough (Toronto)



11. Neighborhoods of borough Central Toronto

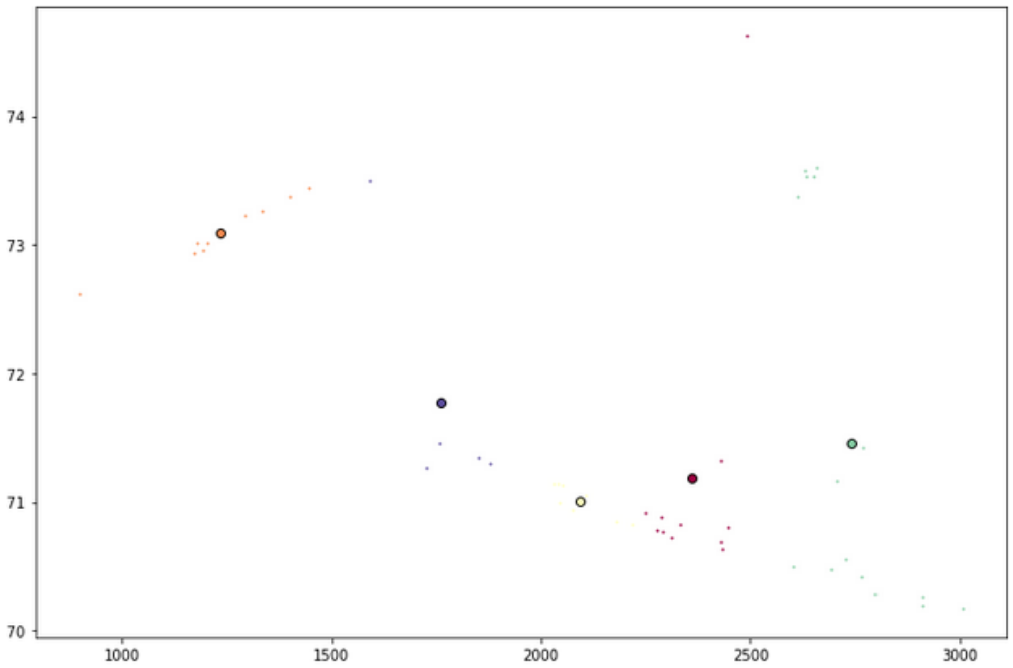
Postal Code	Borough	Neighborhood	Latitude	Longitude
M4N	Central Toronto	Lawrence Park	43.72802	-79.38879
M4P	Central Toronto	Davisville North	43.712751	-79.3902
M4R	Central Toronto	North Toronto West	43.715383	-79.40568
M4S	Central Toronto	Davisville	43.704324	-79.38879
M4T	Central Toronto	Moore Park, Summerhill East	43.689574	-79.38316

12. Top 100 Restaurants that are in Central Toronto - Lawrence Park within a radius of 5 km meters

name	categories	location.address	location.distance	id
Indian Bread Bar	[{'id': '54135bf5e4b08f3d2429dfdd', 'name': 'N...	3305 Yonge St	1179	54dd1704498e6bef053d2cdf
Banjara Indian Cuisine	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	164 Eglinton Ave E	2278	4b7ccc72f964a520e3a52fe3
Indian Street Food Co.	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	1701 Bayview	2448	5650eed9498e376aac0c2478
Alleycatz Live Jazz Bar	[{'id': '4bf58dd8d48988d1e7931735', 'name': 'J...	2409 Yonge St.	2106	4ad4c05df964a52032f620e3

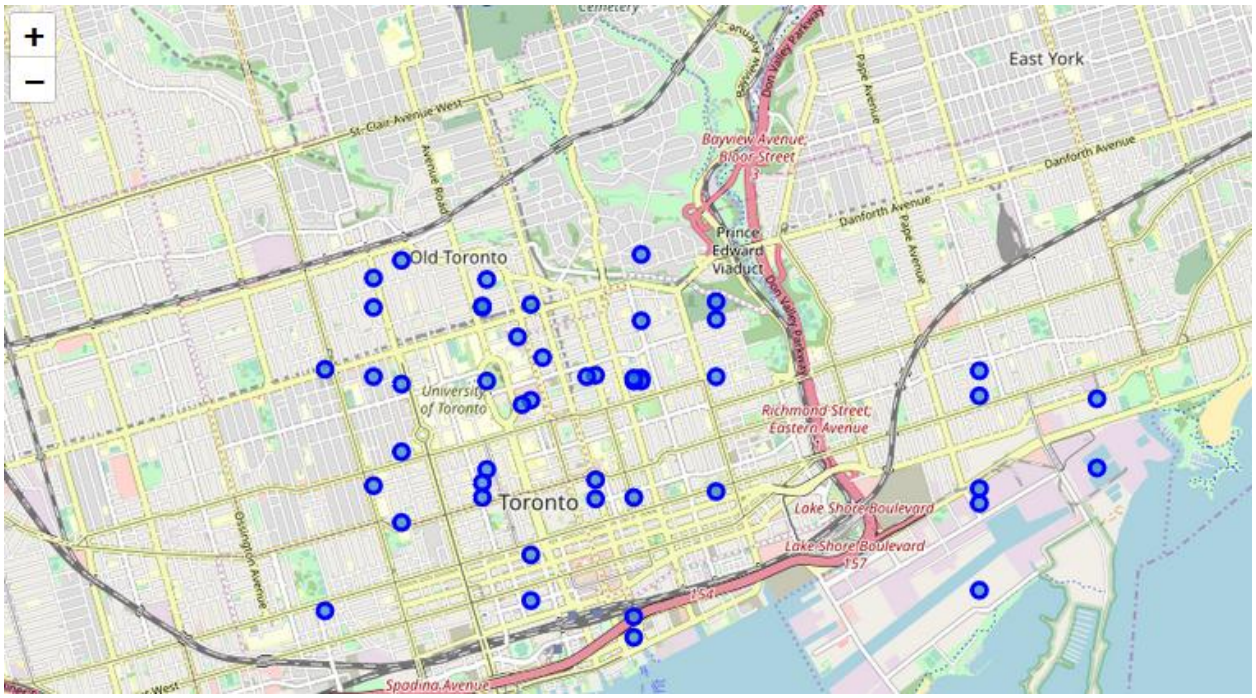
13. K-Means Clustering

	distance	lat	lng
Clus_km			
0	2093.75	43.710103	-79.39558
1	2742.25	43.714588	-79.396789
2	1235.666667	43.730912	-79.403304
3	2361.454545	43.711813	-79.39197
4	1760.8	43.71773	-79.399427



14. Indian Restaurant in Central Toronto Neighborhoods (Radius 5km)

name	categories	address	distance	lat	lng	postalCode	state	id
Aroma Fine Indian Restaurant	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	287 King St. W	3194	43.64646	-79.3896	M5V 1J5	ON	4aef8854f96
Aroma Fine Indian Restaurant	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	287 King St. W	4525	43.64646	-79.3896	M5V 1J5	ON	4aef8854f96
Aroma Fine Indian Restaurant	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	287 King St. W	4827	43.64646	-79.3896	M5V 1J5	ON	4aef8854f96
Aroma Fine Indian Restaurant	[{'id': '4bf58dd8d48988d10f941735', 'name': 'I...	287 King St. W	5884	43.64646	-79.3896	M5V 1J5	ON	4aef8854f96



15. Category ID for Indian Restaurant

['54135bf5e4b08f3d2429dfe5','54135bf5e4b08f3d2429dff3','54135bf5e4b08f3d2429dff5',
'54135bf5e4b08f3d2429dfe2','54135bf5e4b08f3d2429dff2','54135bf5e4b08f3d2429dfe1',
'54135bf5e4b08f3d2429dfe3','54135bf5e4b08f3d2429dfe8','54135bf5e4b08f3d2429dfe9',
'54135bf5e4b08f3d2429dfe6','54135bf5e4b08f3d2429dfdf','54135bf5e4b08f3d2429dfe4',
'54135bf5e4b08f3d2429dfe7','54135bf5e4b08f3d2429dfea','54135bf5e4b08f3d2429dfeb',
'54135bf5e4b08f3d2429dfed','54135bf5e4b08f3d2429dfee','54135bf5e4b08f3d2429dff4',
'54135bf5e4b08f3d2429dfe0','54135bf5e4b08f3d2429dfdd','54135bf5e4b08f3d2429dff6',
'54135bf5e4b08f3d2429dfef','54135bf5e4b08f3d2429dff0','54135bf5e4b08f3d2429dff1',
'54135bf5e4b08f3d2429dfde','54135bf5e4b08f3d2429dfec','4bf58dd8d48988d10f941735']

3. Methodology

In this project we have put our efforts to find a location in In Central Toronto where number of Indian restaurant are minimum. We will limit our analysis to area = 5km around each neighborhood based on postal code.

In first step we have collected the required information about Toronto demography and Indian immigration data to justify the selection of city for opening Indian restaurant.

In second step we have collected the required **data: location and type (category) of postal codes of Toronto neighborhood.

In third step we collected the data related with Indian Restaurant of central Toronto neighborhoods within the radius of 5KM. We have identified and located Indian Restaurant in neighborhood as per Foursquare Categorization.

Fourth and final step includes analysis of Foursquare data '**No of Indian restaurant in neighborhoods**' for identifying locations with minimum number of Indian Restaurants

4. Results

Let's perform some basic explanatory data analysis and derive some additional info from our raw data. First let's count the **number of Indian restaurants in every area neighborhood**:

Due to selection of a bit larger radius in foursquare search, there are some overlaps in selected circular area and as result some restaurants selected in multiple neighborhoods of Central Toronto.

neighborhoodName	categoriesName	name	distance	lat	lng	id
The Annex, North Midtown, Yorkville	Indian Restaurant	Aroma Fine Indian Restaurant	3194	43.64646	-79.39	4aef8854f964a5201cd921e3
Deer Park, Forest Hill SE, Rathnelly, South Hi...	Indian Restaurant	Aroma Fine Indian Restaurant	4525	43.64646	-79.39	4aef8854f964a5201cd921e3
Moore Park, Summerhill East	Indian Restaurant	Aroma Fine Indian Restaurant	4827	43.64646	-79.39	4aef8854f964a5201cd921e3
Forest Hill North, Forest Hill West	Indian Restaurant	Aroma Fine Indian Restaurant	5884	43.64646	-79.39	4aef8854f964a5201cd921e3

We can overcome this problem by either reducing the search radius or remove restaurants reflected in multiple neighborhoods by using distance column

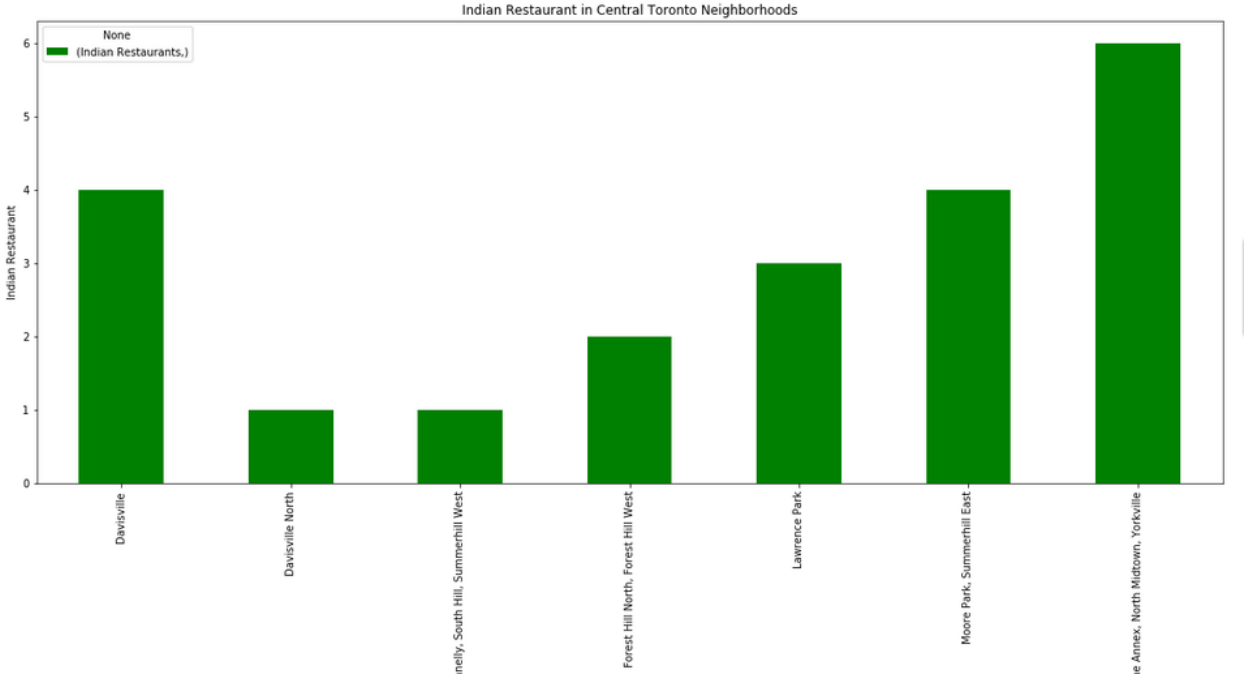
neighborhoodName	categoriesName	name	distance	lat	lng	id
Davisville	Indian Restaurant	Banjara Indian Cuisine	531	43.70781	-79.3933	4b7ccc72f964a520
Davisville	Indian Restaurant	Eat Indian By Amaya	1104	43.70559	-79.3752	4c51e0069d642d7
Davisville	Indian Restaurant	Indian Street Food Co.	1102	43.70803	-79.3761	5650eed9498e376
Davisville	Indian Restaurant	Marigold Indian Bistro	172	43.70288	-79.388	5169d445e4b07de
Davisville North	Indian Restaurant	Mt Everest Restaurant	1905	43.71327	-79.3665	504bcf32e4b0ef19
Deer Park, Forest Hill SE, Rathnelly, South Hi...	Indian Restaurant	Chef of India	525	43.68739	-79.3937	4b7c2a4ff964a520
Forest Hill North, Forest Hill West	Indian Restaurant	Earth Indian Express	969	43.70489	-79.4064	4ffb595be4b068da
Lawrence Park	North Indian Restaurant	Indian Bread Bar	1179	43.73015	-79.4032	54dd1704498e6be

Lawrence Park	Indian Restaurant	Indian Crown	4032	43.76008	-79.4122	5a3aa72566fc6574
Lawrence Park	Indian Restaurant	Patio Indian Restaurant	4324	43.7221	-79.3357	59e94c0260255e6
Moore Park, Summerhill East	Indian Restaurant	Indian Roti House	2812	43.66438	-79.3805	547f94e9498e62f6
Moore Park, Summerhill East	Indian Restaurant	Maja Indian Cuisine	1984	43.67204	-79.3787	55f75919498ea27

***Restaurant with minimum distance belongs to that neighborhood**

Indian Restaurant Group By Neighborhood(Grouping & Clustering)

	Indian Restaurants
neighborhoodName	
Davisville	4
Davisville North	1
Deer Park, Forest Hill SE, Rathnelly, South Hill, Summerhill West	1
Forest Hill North, Forest Hill West	1
Lawrence Park	3
Moore Park, Summerhill East	3
The Annex, North Midtown, Yorkville	5



5. Discussion

In our analysis for opening a new Indian restaurant in world top business centers like Toronto in Canada or San Francisco in USA, we initially focused on deciding a city between Toronto and San Francisco for for Indian Restaurant.

Due to recent change in US polices related to visa and immigrants which might effect thousands of working people in US and there is an speculations about outflow of talent and business towards Canada. So choice was clear i.e Toronto.

initially after selection of Toronto we focused on analysis of its multi ethnicity. We looked and analyze the presence of Indian or South Asian community and try to predict the immigration trends of Indian community towards Canada by 2025. This gives us a picture of how a new Indian restaurant can grow by 2025. In this analysis we have considered South Indian or Indian community as our prime customers for new business. We found the data very encouraging because South Asian community was one of the largest community present in Toronto and immigration trends shows it will increase by time.

For location analysis we first try to find different neighborhoods of Toronto by using M Postal codes. We also grouped some of the neighborhoods having common postal codes and find their latitude and longitude for location. We found Toronto as big city with so many boroughs and their neighborhoods. So we again narrow our search areas by focusing on only boroughs that contains the word 'Toronto'. We further narrow our search area by selecting Central Toronto borough and its neighborhood as our prime search area.

Our analysis shows that large number of restaurants present in Central Toronto and its neighborhoods. Using Foursquare API search we looked for Indian Restaurant in each neighborhood within the radius of 5 KM. We have also used Foursquare Category for Indian Restaurant to filter the data. We find the density of Indian Restaurant by counting the number of Restaurants present in each neighborhood in Central Toronto borough.

During analysis we found that at radius of 5KM Foursquare API search area overlaps neighborhoods and this results in repeated names of Indian Restaurants but with different distance value. We used distance column with minimum value to fixed this problem and set the neighborhood of overlapping areas.

after analysis of Central Toronto Borough and its neighborhood for Indian Restaurant we found one of the neighborhood 'Davisville North' has only one Indian restaurant so this many be an ideal location for opening a new Indian Restaurant in Toronto. We also try to get ratings of its only Indian restaurant "Mt Everest Restaurant" which is not very good.

We found another candidate location for Indian Restaurant which has only one Indian restaurant "Deer Park..."

6. Conclusion

Purpose of this project was to identify a location for opening a new Indian restaurants in order to aid stakeholders in narrowing down the search for optimal location. By analyzing restaurant distribution from Foursquare data we have first identified general boroughs that justify further analysis (Central Toronto), and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby Indian restaurants. Clustering of those locations was not requires because some of the neighborhoods has only few Indian restaurants present so nearby locations restaurants are good for opening a new Indian restaurant in Toronto .This works as a starting point for final exploration by stakeholders.

Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each 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.