Capstone Project

1. Introduction to Business Problem

I live in Downtown Toronto (postal code: M5S) and work for a IT company there. My wife is running a Gyms, sport clothes & accessories shop at home. Due to company requirement, I have to move to work for company's branch in Scarborough next month, so all of my family have to move to Scarborough.

My wife also would like to keep to running her business in Scarborough. Hence, **it comes to the question that which neighborhood we should live there to support her business**.

To answer above question, my idea is that we will explore Scarborough neighborhoods to find out which neighborhood has highest number of Gym / Fitness Center, Sport clubs, parks (where people can do exercise), swimming pools and so on. Neighborhood which is met above condition is one of important condition to support my wife business running well there.

2. Data requirements:

Below is data that I plan to use for this project:

1. Canada's postal code, neighborhoods and geographic data
   + https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'
   + https://cocl.us/Geospatial_data'
2. Venues and venues category information in Scarborough (from Foursquare data)

3. Data Processing:

Step 1: Processing Scarborough geography data:

- Processing data to get geography data of Scarborough as below table. This is the result of collecting data from provided sources above.
- This data will help to explore about Scarborough neighborhood via Foursquare API in next step.

	PostalCode	Borough	Neighbourhood	Latitude	Longitude
0	M1B	Scarborough	Rouge, Malvern	43.806686	-79.194353
1	M1C	Scarborough	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497
2	M1E	Scarborough	Morningside, West Hill	43.763573	-79.188711
3	M1G	Scarborough	Woburn	43.770992	-79.216917
4	M1H	Scarborough	Cedarbrae	43.773136	-79.239476

Step 2: Explore Scarborough venues via Foursquare API

- Explore venues category from Foursquare and select categories which will be impacted to my wife business: {*'Gym', 'Park', 'Yoga Studio', 'Gym / Fitness Center', 'Soccer Field', 'Beach' 'Gym Pool', 'Badminton Court', 'Pool', 'Pool Hall','Golf Course', 'Tennis Court*'}

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Rouge, Malvern	43.806686	-79.194353	Images Salon & Spa	43.802283	-79.198565	Spa
1	Rouge, Malvern	43.806686	-79.194353	Caribbean Wave	43.798558	-79.195777	Caribbean Restaurant
2	Rouge, Malvern	43.806686	-79.194353	Harvey's	43.800106	-79.198258	Fast Food Restaurant
3	Rouge, Malvern	43.806686	-79.194353	Wendy's	43.807448	-79.199056	Fast Food Restaurant
4	Rouge, Malvern	43.806686	-79.194353	Wendy's	43.802008	-79.198080	Fast Food Restaurant

- Using onehot technique to create below table which only contained category which I need to focus on

Neighborhood	Gym	Park	Yoga Studio	Gym / Fitness Center	Soccer Field	Beach	Gym Pool	Badminton Court	Pool	Pool Hall	Golf Course	Tennis Court
Agincourt	0	1	0	0	0	0	0	1	1	1	0	0
Agincourt North, Milliken	1	2	0	0	0	0	0	0	0	0	0	0
Birch Cliff	1	2	0	0	0	0	1	0	0	0	0	0
Cedarbrae	0	0	1	1	0	0	0	0	0	0	0	0
Clairlea, Golden Mile, Oakridge	1	2	0	0	1	0	0	0	0	0	0	0

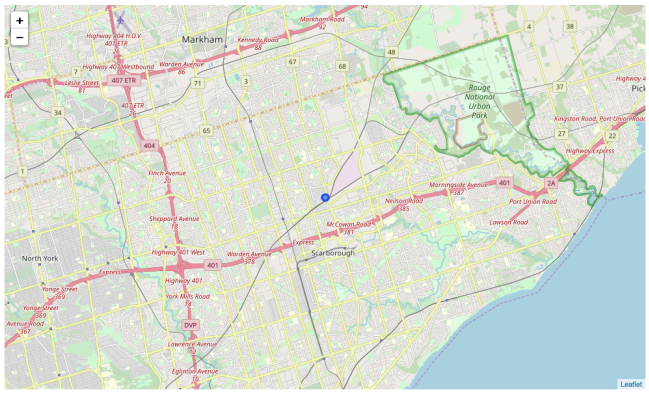
- Using K-means algorithm to cluster our neighborhood into 5 different groups (k=5). Group with highest ‘Total Sum’ will be the group which is most fitted to my purpose.

	Gym	Park	Yoga Studio	Gym / Fitness Center	Soccer Field	Beach	Gym Pool	Badminton Court	Pool	Pool Hall	Golf Course	Tennis Court	Total Sum
G5	0.0	1.000	0.000	0.00	0.000000	0.0	0.000000	1.000	1.0	1.0	0.000	0.000000	4.000000
G1	1.0	2.000	0.000	0.00	0.333333	0.0	0.333333	0.000	0.0	0.0	0.000	0.000000	3.666667
G3	0.0	1.000	0.000	0.00	0.000000	2.0	0.000000	0.000	0.0	0.0	0.000	0.000000	3.000000
G4	1.0	0.000	0.000	0.00	0.000000	0.0	0.333333	0.000	0.0	0.0	0.000	0.333333	1.666667
G2	0.0	0.375	0.125	0.25	0.125000	0.0	0.000000	0.125	0.0	0.0	0.125	0.000000	1.125000

4. Result:

- With K-means algorithm, **Agincourt** is the best neighborhood which my family should move in and find a new house there.
- In case of, the cost to rent a house in Agincourt is too expensive, “Agincourt North, Milliken”, “Birch Cliff”, “Clairlea, Golden Mile, Oakridge” are also other options for us to consideration.

	Neighborhood	Group
0	Agincourt	5
1	Agincourt North, Milliken	1
2	Birch Cliff	1
3	Cedarbrae	2
4	Clairlea, Golden Mile, Oakridge	1
5	Cliffcrest, Cliffside	3
6	Dorset Park, Scarborough Town Centre, Wexford ...	2
7	Highland Creek, Rouge Hill, Port Union	2
8	Ionview, Kennedy Park	2
9	Maryvale, Wexford	2
10	Morningside, West Hill	4
11	Rouge, Malvern	4
12	Scarborough Village	2
13	Steeles West	4
14	Tam O'Shanter	2
15	Woburn	2



5. Conclusion:

- In the limitation of data source, this report is only considered the around environments which have good impact to provided business. Others condition (like rental cost, populations, etc.) have not taken into account yet.