The numerous neighborhoods of Toronto offer a wide range of opportunities for people to open offices and gyms. The recommender looks at different neighborhoods in Toronto to offer the best location for people to open a gym or a fitness center

Recommender for building a Fitness Center in Toronto

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Introduction

The rising awareness of fitness and its importance for the wellbeing of people led me to choose the issue of locating areas in Toronto where the fitness industry would flourish. Toronto being one of the biggest metros in the world has a booming population and multiple neighborhoods offering unique opportunities to set up a business. Research shows that on an average 20 million requests are made to google with the search phrase “fitness near me”. The revenue generated by the fitness industry in Toronto alone was 224 Million USD in 2017 that grew to 350 Million USD in 2020.

Business Problem

The massive revenue and growth have sparked an increasing number of businessmen and fitness enthusiasts alike to get in on the game. The increasing competition in the marketplace requires businesses to make informed decisions about the locations at which new gyms should be open. To be able to compete in the market, the fitness industry is diversifying with respect to the kind of gyms to setup. There is an increase in fitness sector opening up doors to avenues that were previously non-existent like climbing, cross-fit, spin classes, hot yoga, martial arts just to name a few. The recommender tries to look at the clusters of gyms as a whole in each area followed by the distribution of types of fitness industries to help the stakeholder to make an informed decision about the location and kind of gym to open up.

Data

Data Requirements

1. The complete list of neighborhoods in Toronto. The list provides us with valuable information about the number of suburbs and districts (boroughs) associated with the city of Toronto, the financial capital of Canada.

2. The latitude and longitudes of each suburb to extract information about venues around these suburbs which can further be filtered to extract information about gyms in those areas.

Data Source

1. The complete list of neighborhoods in Toronto was obtained by a simple google search. The Wikipedia page https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M lists out all the necessary data that we can scrape off using beautifulsoup package in

python. The coordinates of these neighborhoods can then be extracted using Geocoder package in Python.

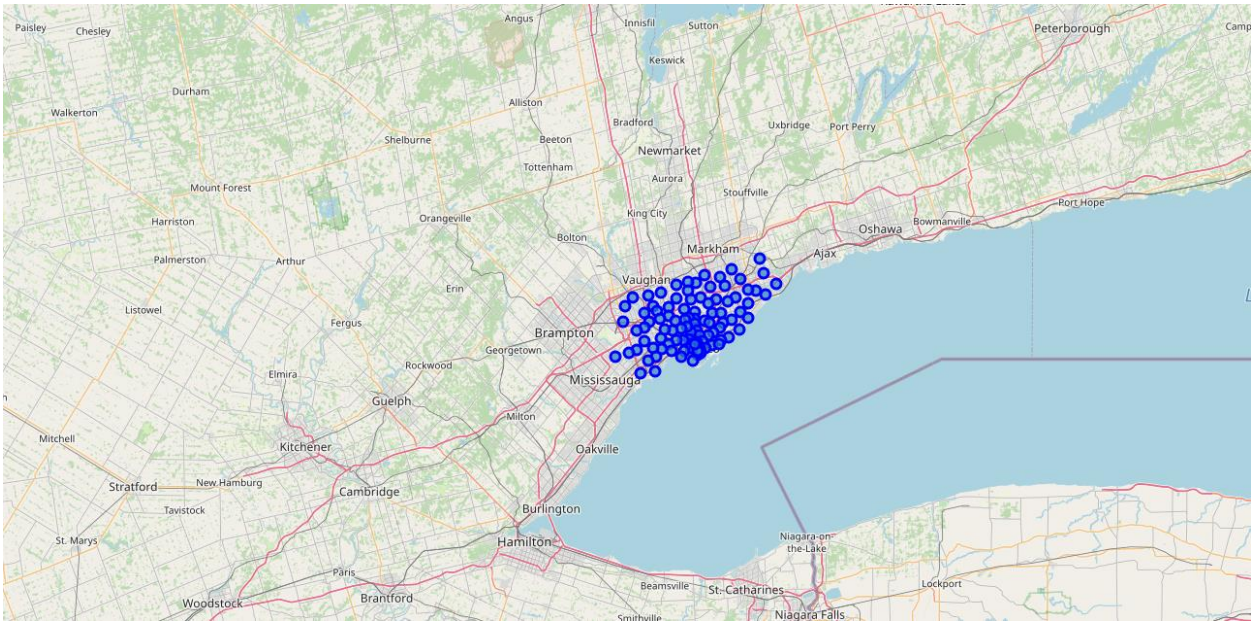
2. Foursquare API can then be used to explore each one of these neighborhoods to extract venue information. The venues can be filtered out by using the *fitness* key phrase which gives us all the information we need for creating clusters and show frequency of occurrence of gyms in that neighborhood.

Methodology

The data for various neighborhoods and boroughs for the city of Toronto from Wikipedia. The data was cleaned and corrected to check for datatypes, removing null values and replacing neighborhoods without a name with the same name of the Borough. The neighborhoods that belong only in Toronto were extracted. Using Foursquare API, data was extracted for all the venues around the said latitudes and longitudes. A new data-frame with just the venue categories of gyms were extracted. K-Means clustering was used to cluster the gyms into 3 different clusters. The new clusters were merged with the entire data frame based on neighborhood to create a master data frame that were clustered based on gyms.

Results

The map of city of Toronto with all the neighborhoods plotted are shown in the image below:



The blue dots represent the boroughs that are plotted using the package folium. The boroughs that do not belong to the greater city of Toronto are removed and only the ones belong to GTA

are kept. The venues were obtained using Foursquare API, the results were made into a data frame. The number of venues for each of the area can be shown as:

[32]:

Neighborhood	Postal Code	Borough	BoroughLatitude	BoroughLongitude	VenueName	VenueLatitude	VenueLongitude	VenueCategory
Berczy Park	58	58	58	58	58	58	58	58
Brockton, Parkdale Village, Exhibition Place	22	22	22	22	22	22	22	22
Business reply mail Processing Centre, South Central Letter Processing Plant Toronto	18	18	18	18	18	18	18	18
CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst Quay, South Niagara, Island airport	14	14	14	14	14	14	14	14
Central Bay Street	65	65	65	65	65	65	65	65
Christie	17	17	17	17	17	17	17	17
Church and Wellesley	76	76	76	76	76	76	76	76
Commerce Court, Victoria Hotel	100	100	100	100	100	100	100	100
Davisville	35	35	35	35	35	35	35	35
Davisville North	8	8	8	8	8	8	8	8
Dufferin, Dovercourt Village	17	17	17	17	17	17	17	17
First Canadian Place, Underground city	100	100	100	100	100	100	100	100
Forest Hill North & West, Forest Hill Road Park	6	6	6	6	6	6	6	6
Garden District, Ryerson	100	100	100	100	100	100	100	100
Harbourfront East, Union Station, Toronto Islands	100	100	100	100	100	100	100	100
High Park, The Junction South	25	25	25	25	25	25	25	25
India Bazaar, The Beaches West	20	20	20	20	20	20	20	20
Kensington Market, Chinatown, Grange Park	63	63	63	63	63	63	63	63
Lawrence Park	3	3	3	3	3	3	3	3
Little Portugal, Trinity	44	44	44	44	44	44	44	44
Moore Park, Summerhill East	2	2	2	2	2	2	2	2

The data was extracted for all the gyms in the Toronto area.

	Neighborhoods	Gym
0	Berczy Park	0.000000
1	Brockton, Parkdale Village, Exhibition Place	0.045455
2	Business reply mail Processing Centre, South C...	0.000000
3	CN Tower, King and Spadina, Railway Lands, Har...	0.000000
4	Central Bay Street	0.000000

The gym data was then used to cluster using K-Means. The results obtained from the clusters are as shown below:

	Neighborhood	Gym	Cluster Labels
0	Berczy Park	0.000000	1
1	Brockton, Parkdale Village, Exhibition Place	0.045455	0
2	Business reply mail Processing Centre, South C...	0.000000	1
3	CN Tower, King and Spadina, Railway Lands, Har...	0.000000	1
4	Central Bay Street	0.000000	1

The clusters that are obtained are marked on the map as shown below:

As we can see, the cluster 1 marked with red has the highest density of gyms, while the cluster 2 marked In blue comes second with cluster 3 with only 1 venue comes in third.

Cluster 1:

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[58]: tor_merged.loc[(tor_merged['Cluster Labels'] ==0) & (tor_merged['VenueCategory'] == 'Gym') ]
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[58]:

	Neighborhood	Gym	Cluster Labels	Postal Code	Borough	BoroughLatitude	BoroughLongitude	VenueName	VenueLatitude	VenueLongitude	VenueCategory
11	First Canadian Place, Underground city	0.040000	0	M5X	Downtown Toronto	43.648429	-79.382280	Equinox Bay Street	43.648100	-79.379989	Gym
11	First Canadian Place, Underground city	0.040000	0	M5X	Downtown Toronto	43.648429	-79.382280	Toronto Athletic Club	43.647360	-79.381177	Gym
7	Commerce Court, Victoria Hotel	0.040000	0	M5L	Downtown Toronto	43.648198	-79.379817	GoodLife Fitness Toronto Street Women's Only	43.650400	-79.376700	Gym
8	Davisville	0.057143	0	M4S	Central Toronto	43.704324	-79.388790	GoodLife Fitness Toronto Mount Pleasant and Da...	43.700802	-79.386417	Gym
8	Davisville	0.057143	0	M4S	Central Toronto	43.704324	-79.388790	Crossfit Metric	43.707480	-79.389857	Gym
11	First Canadian Place, Underground city	0.040000	0	M5X	Downtown Toronto	43.648429	-79.382280	The Cambridge Club	43.651663	-79.383075	Gym
11	First Canadian Place, Underground city	0.040000	0	M5X	Downtown Toronto	43.648429	-79.382280	GoodLife Fitness Toronto 137 Yonge Street	43.651242	-79.378068	Gym
31	Stn A PO Boxes	0.020619	0	M5W	Downtown Toronto	43.646435	-79.374846	Equinox Bay Street	43.648100	-79.379989	Gym
31	Stn A PO Boxes	0.020619	0	M5W	Downtown Toronto	43.646435	-79.374846	GoodLife Fitness Toronto Street Women's Only	43.650400	-79.376700	Gym
25	Richmond, Adelaide, King	0.042553	0	M5H	Downtown Toronto	43.650571	-79.384568	Equinox Bay Street	43.648100	-79.379989	Gym
25	Richmond, Adelaide, King	0.042553	0	M5H	Downtown Toronto	43.650571	-79.384568	Toronto Athletic Club	43.647360	-79.381177	Gym
25	Richmond, Adelaide, King	0.042553	0	M5H	Downtown Toronto	43.650571	-79.384568	Cardio-Go	43.647017	-79.388143	Gym
29	St. James Town	0.025316	0	M5C	Downtown Toronto	43.651494	-79.375418	Wynn Fitness	43.648009	-79.373720	Gym
25	Richmond, Adelaide, King	0.042553	0	M5H	Downtown Toronto	43.650571	-79.384568	GoodLife Fitness Toronto Bell Trinity Centre	43.653436	-79.382314	Gym
1	Brockton, Parkdale Village, Exhibition Place	0.045455	0	M6K	West Toronto	43.636847	-79.428191	Reebok Crossfit Liberty Village	43.637036	-79.424802	Gym
23	Queen's Park, Ontario Provincial Government	0.031250	0	M7A	Downtown Toronto	43.662301	-79.389494	Hart House Gym	43.664172	-79.394888	Gym
7	Commerce Court, Victoria Hotel	0.040000	0	M5L	Downtown Toronto	43.648198	-79.379817	Equinox Bay Street	43.648100	-79.379989	Gym
7	Commerce Court, Victoria Hotel	0.040000	0	M5L	Downtown Toronto	43.648198	-79.379817	GoodLife Fitness Toronto 137 Yonge Street	43.651242	-79.378068	Gym
7	Commerce Court, Victoria Hotel	0.040000	0	M5L	Downtown Toronto	43.648198	-79.379817	Toronto Athletic Club	43.647360	-79.381177	Gym
29	St. James Town	0.025316	0	M5C	Downtown Toronto	43.651494	-79.375418	GoodLife Fitness Toronto 137 Yonge Street	43.651242	-79.378068	Gym
16	India Bazaar, The Beaches West	0.050000	0	M4L	East Toronto	43.668999	-79.315572	System Fitness	43.667171	-79.312733	Gym
28	Runnymede, Swansea	0.029412	0	M6S	West Toronto	43.651571	-79.484450	Think Fitness	43.647966	-79.486462	Gym

Cluster 2:

	Neighborhood	Gym	Cluster Labels	Postal Code	Borough	BoroughLatitude	BoroughLongitude	VenueName	VenueLatitude	VenueLongitude	VenueCategory
37	Toronto Dominion Centre, Design Exchange	0.01	1	M5K	Downtown Toronto	43.647177	-79.381576	Equinox Bay Street	43.648100	-79.379989	Gym
13	Garden District, Ryerson	0.01	1	M5B	Downtown Toronto	43.657162	-79.378937	GoodLife Fitness Toronto Bell Trinity Centre	43.653436	-79.382314	Gym

Cluster 3:

	Neighborhood	Gym	Cluster Labels	Postal Code	Borough	BoroughLatitude	BoroughLongitude	VenueName	VenueLatitude	VenueLongitude	VenueCategory
9	Davisville North	0.125	2	M4P	Central Toronto	43.712751	-79.390197	Gym	43.713126	-79.393537	Gym

Discussion

Based on the analysis of data from Toronto Neighborhood it is clear that though there is a lot of opportunity to open a gym, most of the gyms are located in cluster 1 around the areas of Richmond, St James Town and First Canadian place, the best place to open a gym would be in the areas of cluster 3 around Davisville in Central Toronto.