

**Applied Data Science Capstone Project - The Battle of
Neighborhoods (Week 1)**

Purpose of project:

**Identify the most appropriate location to open a Gym within the
area of PATH in Toronto City, Ontario - Canada**

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INTRODUCTION:

Having a gym within a busy business area will be very beneficial, especially around the PATH area in Toronto City, Ontario, Canada. It's a busy business and educational area, a lot of employees, students, faculty, health care sector employees, individuals, ... etc can get the benefit of having a gym close by their area, where they can just drop in during their breaks, before or after working hours / classes, to have a good boost of energy and fitness.

A Canadian study, by McMaster University, shows that "Just 60 seconds of intense exercise can boost your fitness level".

"A lot of people think, if I don't have 45 minutes in my day, I can't get a quality workout in," says senior author Martin Gibala, professor and chair of McMaster's department of kinesiology. "But this is a reminder that even if you have 10 minutes in your day — on your lunch hour — you can get in a quality workout with intense exercise."

That indicates how important a gym close to your office / University / College is important, where you can drop by anytime you are free.

That will open an opportunity of opening a Gym around the PATH area that can support the need for people to boost their energy during their busy day.

PATH is network of underground pedestrian tunnels, elevated walkways, and at-grade walkways connecting the office towers of Downtown Toronto, Ontario, Canada. It connects more than 70 buildings via 30 kilometres of tunnels, walkways, and shopping areas, it was opened in 1987, has around 1,200 stores and services, and has around 20 parking garages, and connected with TTC subways, where it's very accessible to anyone, and make it the best location for opening a Gym.

BUSINESS PROBLEM:

Searching for the best location and spot definitely no an easy thing, it's needs a lot of search, generating useful information and facts, money involved as it's an easy investment. Therefore, a need for an intense study make a big difference, choosing the right location is one of the key factors of any business's success, and play a very effective role in the decision making, easy access, ...etc.

This study will help any business owner to have a clear vision, and would assist in the decision-making process, by finding the number of gyms within the PATH area, would really help business owner/s on choosing the most appropriate location with a high return over investment.

Therefore, the main problem, which we need to find solutions for with this study, is by answering the following inquiries:

- a. Which building has the most focus / least focus of Gym/s, within the PATH area?
- b. What would be the most appropriate location (based on this study) to open a Gym?

Data will be used to solve the problem

DATA:

In order to identify and answer the problem inquires / questions, the following data sources will be used in this study:

- a. Directory of PATH buildings, Toronto, Ontario – Canada. **Purpose of doing that:** listing down the major PATH buildings.
- b. Location coordinates “Latitude and Longitude” to each of the PATH buildings. **Purpose of doing that:** Plotting Gyms linked to PATH buildings.
- c. List of Gyms, by category of each PATH buildings from Foursquare. **Purpose of doing that:** identifying gyms and services they offer.
- d. Data of PATH buildings. **Purpose of doing that:** clustering on the neighbourhood.

METHODOLOGY:

Data Requirements:

At this project, will be using the Foursquare API to retrieve the following location data on Gym's within the PATH area in Toronto, Ontario - Canada:

- VenueName.
- VenueID.
- VenueLocation.
- VenueCategory.

CLUSTERING APPROACH:

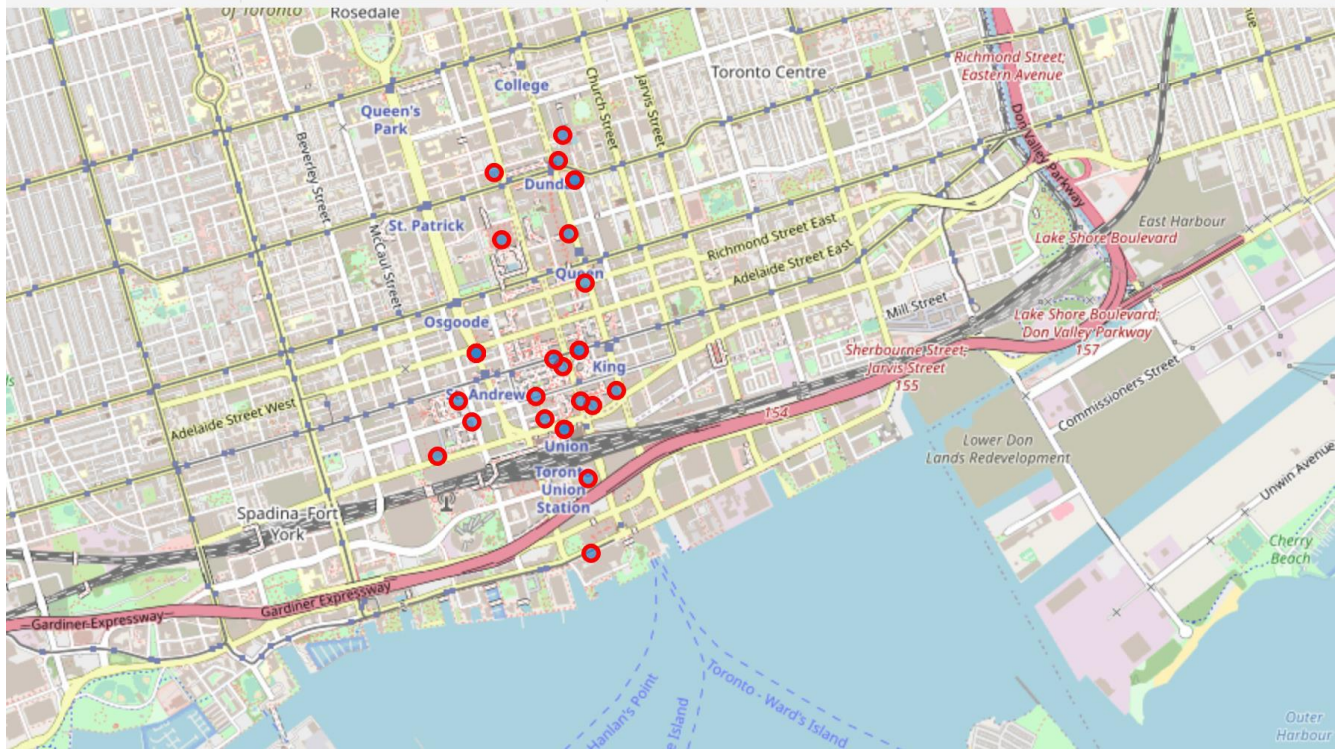
In order to compare the similarities of the building located within the PATH Toronto, Ontario – Canada:

Here are the steps:

1. *Exploring PATH geographical location.*
2. *Segmenting PATH buildings and nearby.*
3. *Grouping PATH buildings and Gyms into clusters to find Gyms with close proximity for each PATH building in Downtown Toronto.*
4. *Getting the geographical coordinates.*
5. *Creating a map of Downtown Toronto with PATH Buildings' location superimposed on top.*
6. *Using the Foursquare API exploring the area.*
7. *Listing the places / venues that are within a radius of 3000 meters of the PATH.*
8. *Venues / places were returned of each PATH building.*
9. *Special / unique categories.*
10. *Analyzing PATH Buildings.*
11. *Grouping PATH building by the mean of the frequency of occurrence of each category.*
12. *Creating a new data-frame for Gyms.*
13. *Cluster PATH Buildings.*
14. *Examining Clusters.*

By clustering the data which is type of unsupervised machine learning, using the k-means algorithm, here are the findings:

PATH Toronto, Ontario – Canada building locations map:



RESULTS SECTION:

PATH buildings:

No.	Path_Building	Latitude	Longitude
0	PATH (Toronto)	43.64869	-79.38544
1	10 Dundas East	43.65668	-79.38065
2	Atrium on Bay	43.80128	-79.15029
3	Bay Adelaide Centre	43.65163	-79.37916
4	Brookfield Place (Toronto)	43.64652	-79.37874
5	Canadian Broadcasting Centre	43.64442	-79.38766
6	Commerce Court	43.64879	-79.37952
7	Design Exchange	43.64814	-79.38044
8	Dundas station (Toronto)	43.65589	-79.37975
9	Exchange Tower	43.66473	-79.3983
10	EY Tower	43.75228	-79.30161
11	Fairmont Royal York	43.64595	-79.38143
12	Financial District, Toronto	54.66968	-1.69084
13	First Canadian Place	43.64847	-79.38098
14	Hockey Hall of Fame	43.64711	-79.37734
15	Hudson's Bay Queen Street	43.64869	-79.38544
16	King station (Toronto)	43.77202	-79.18636

17	Maple Leaf Square	43.71225	-79.49059
18	Metro Hall	43.80983	-79.26235
19	Queen station	43.61468	-79.49405
20	RBC Centre	43.64584	-79.3857
21	Roy Thomson Hall	43.6467	-79.38641
22	Royal Bank Plaza	43.64667	-79.37942
23	Ryerson University	43.65777	-79.38044
24	St. Andrew station	43.76055	-79.2527
25	Scotia Plaza	43.64879	-79.37952
26	Scotiabank Arena	43.64344	-79.37896
27	SkyWalk	43.64869	-79.38544
28	South Core, Toronto	43.64869	-79.38544
29	Southcore Financial Centre	43.64869	-79.38544
30	Sun Life Centre	43.74444	-79.2212
31	Telus Harbour	43.64038	-79.37881
32	Toronto City Hall	43.65341	-79.38391
33	Toronto Coach Terminal	43.65617	-79.38439
34	Toronto Eaton Centre	43.65367	-79.38007
35	Toronto-Dominion Centre	43.64686	-79.38194
36	Union Station (Toronto)	43.64552	-79.38031
37	Union station (TTC)	43.64552	-79.38031
38	Yonge–Dundas Square	43.65589	-79.37975

Results for Cluster 0 as follows:

No.	Path_Building	Gym	Cluster Labels	Latitude	Longitude
3	Brookfield Place (Toronto)	0.01	0	43.65163	-79.3792
5	Commerce Court	0.01	0	43.64442	-79.3877
6	Design Exchange	0.01	0	43.64879	-79.3795
8	EY Tower	0.02	0	43.65589	-79.3797
10	Fairmont Royal York	0.01	0	43.75228	-79.3016
12	First Canadian Place	0.01	0	54.66968	-1.69084
13	Hockey Hall of Fame	0.01	0	43.64847	-79.381
19	Queen station	0.01	0	43.61468	-79.4941
22	Royal Bank Plaza	0.01	0	43.64667	-79.3794
24	Scotia Plaza	0.01	0	43.76055	-79.2527
25	Scotiabank Arena	0.01	0	43.64879	-79.3795
35	Toronto-Dominion Centre	0.01	0	43.64686	-79.3819
36	Union Station (Toronto)	0.01	0	43.64552	-79.3803
37	Union station (TTC)	0.01	0	43.64552	-79.3803

Results for Cluster 1 as follows:

No.	Path_Building	Gym	Cluster Labels	Latitude	Longitude
4	Canadian Broadcasting Centre	0.03	1	43.64652	-79.3787
14	Hudson's Bay Queen Street	0.03	1	43.64711	-79.3773
18	PATH (Toronto)	0.03	1	43.80983	-79.2623
20	RBC Centre	0.03	1	43.64584	-79.3857
21	Roy Thomson Hall	0.03	1	43.6467	-79.3864
26	SkyWalk	0.03	1	43.64344	-79.379
27	South Core, Toronto	0.03	1	43.64869	-79.3854
28	Southcore Financial Centre	0.03	1	43.64869	-79.3854
29	St. Andrew station	0.03	1	43.64869	-79.3854
30	Sun Life Centre	0.030303	1	43.74444	-79.2212
31	Telus Harbour	0.04	1	43.64038	-79.3788

Results for Cluster 2 as follows:

No.	Path_Building	Gym	Cluster Labels	Latitude	Longitude
0	10 Dundas East	0	2	43.64869	-79.3854
1	Atrium on Bay	0	2	43.65668	-79.3807
2	Bay Adelaide Centre	0	2	43.80128	-79.1503
7	Dundas station (Toronto)	0	2	43.64814	-79.3804
9	Exchange Tower	0	2	43.66473	-79.3983
11	Financial District, Toronto	0	2	43.64595	-79.3814
15	King station (Toronto)	0	2	43.64869	-79.3854
16	Maple Leaf Square	0	2	43.77202	-79.1864
17	Metro Hall	0	2	43.71225	-79.4906
23	Ryerson University	0	2	43.65777	-79.3804
32	Toronto City Hall	0	2	43.65341	-79.3839
33	Toronto Coach Terminal	0	2	43.65617	-79.3844
34	Toronto Eaton Centre	0	2	43.65367	-79.3801
38	Yonge–Dundas Square	0	2	43.65589	-79.3797

DISCUSSION OF OBSERVATIONS AND RECOMMENDATIONS:

After identifying a total of 3690 venues in the PATH within a radius of 3000 meters, and analysing the data and findings, the highest number of Gyms are located in cluster # 1, We can see that Cluster # 2 has almost no number of Gyms offered than Cluster # 1.

While using k-means cluster algorithm, we can divide the PATH buildings into 3 different clusters around different latitude and longitude, where there are similarities around them, and by answering the problem inquires given above at the Business problem section:

- a. Which building has the most focus / least focus of Gym/s, within the PATH area?

PATH buildings with most focus of Gyms are:

No.	Path_Building	Gym	Cluster Labels	Latitude	Longitude
31	Telus Harbour	0.04	1	43.64038	-79.3788
30	Sun Life Centre	0.030303	1	43.74444	-79.2212
4	Canadian Broadcasting Centre	0.03	1	43.64652	-79.3787
14	Hudson's Bay Queen Street	0.03	1	43.64711	-79.3773
18	PATH (Toronto)	0.03	1	43.80983	-79.2623
20	RBC Centre	0.03	1	43.64584	-79.3857
21	Roy Thomson Hall	0.03	1	43.6467	-79.3864
26	SkyWalk	0.03	1	43.64344	-79.379
27	South Core, Toronto	0.03	1	43.64869	-79.3854
28	Southcore Financial Centre	0.03	1	43.64869	-79.3854
29	St. Andrew station	0.03	1	43.64869	-79.3854

Which is already mentioned in cluster # 1

PATH buildings with least focus of Gyms are:

No.	Path_Building	Gym	Cluster Labels	Latitude	Longitude
0	10 Dundas East	0	2	43.64869	-79.3854
1	Atrium on Bay	0	2	43.65668	-79.3807
2	Bay Adelaide Centre	0	2	43.80128	-79.1503
7	Dundas station (Toronto)	0	2	43.64814	-79.3804
9	Exchange Tower	0	2	43.66473	-79.3983
11	Financial District, Toronto	0	2	43.64595	-79.3814
15	King station (Toronto)	0	2	43.64869	-79.3854
16	Maple Leaf Square	0	2	43.77202	-79.1864
17	Metro Hall	0	2	43.71225	-79.4906
23	Ryerson University	0	2	43.65777	-79.3804
32	Toronto City Hall	0	2	43.65341	-79.3839
33	Toronto Coach Terminal	0	2	43.65617	-79.3844
34	Toronto Eaton Centre	0	2	43.65367	-79.3801
38	Yonge–Dundas Square	0	2	43.65589	-79.3797

Which is already mentioned in cluster # 2

- b. What would be the most appropriate location (based on this study) to open a Gym?

Given the above data, findings and results, the following buildings are the most appropriate ones to open a Gym, given that there are less competitors around their area, and almost no competitor at the chosen buildings, also given their closer to subways stations to provide more competitive advantage than others:

- 10 Dundas East
- Atrium on Bay
- Bay Adelaide Centre
- Exchange Tower
- Metro Hall
- Maple Leaf Square
- Ryerson University
- Toronto City Hall
- Toronto Coach Terminal
- Toronto Eaton Centre
- Yonge–Dundas Square

CONCLUSION:

In conclusion, given the above data, facts, findings and results, we conclude that PATH Toronto, Ontario – Canada, is a very unique spot to establish a lot of businesses, given the numbers of gyms offered in the PATH buildings and area, and the importance impact of the gym, establishing a gym within the given building might be a good opportunity and a competitive advantage for any investor.