

# THE BEST LOCATION FOR NEW KUMON LEARNING CENTRE IN TORONTO

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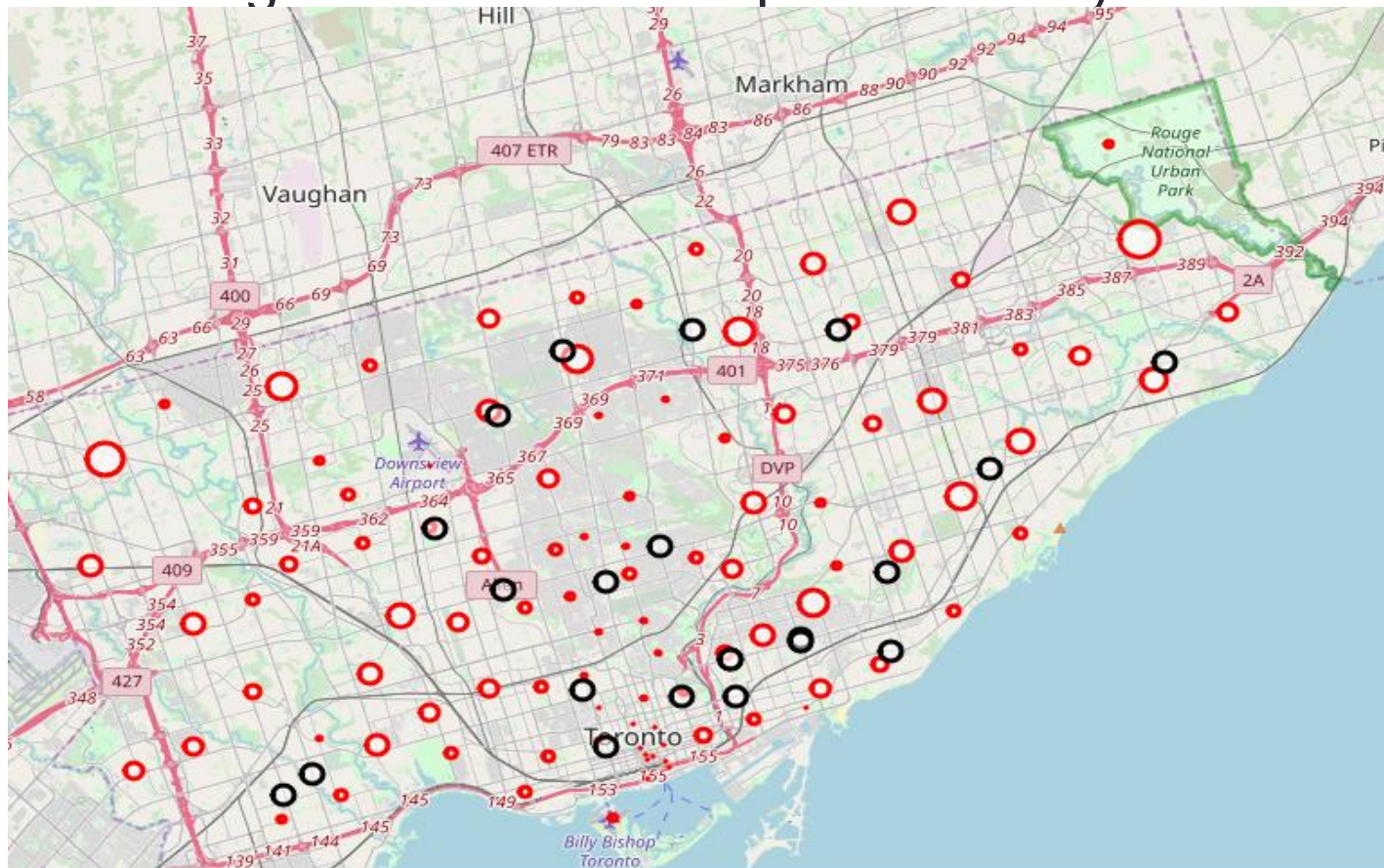
23 October, 2018

# Problem to Solve

- Kumon is a popular training organization. Where is the potential ideal location to open a new Kumon centre in Toronto Canada?
- Audience: Kumon business operator or someone interested in this franchise business in Toronto, Canada.

# Area division in Toronto

- Kumon learning centers are marked by black circles and Toronto neighborhoods are represented by red circles



# Toronto district data

- Postal codes combined with geospatial coordinates.
- Data source: wiki

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M5A	Downtown Toronto	Harbourfront,Regent Park	43.654260	-79.360636
1	M5B	Downtown Toronto	Ryerson,Garden District	43.657162	-79.378937
2	M5C	Downtown Toronto	St. James Town	43.651494	-79.375418
3	M4E	East Toronto	The Beaches	43.676357	-79.293031
4	M5E	Downtown Toronto	Berczy Park	43.644771	-79.373306

# Toronto district data preparation and clean up

Data cleaning, remove null records and replace missing value of Neighbourhood by Borough

	PostalCode	Borough	Neighborhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Harbourfront,Regent Park
3	M6A	North York	Lawrence Heights,Lawrence Manor
4	M7A	Queen's Park	Not assigned

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df3.shape
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(103, 3)
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# Current Kumon Learning Centres in Toronto

- This data is from Foursquare search engine, find out current Kumon location in Toronto

name	categories	address	cc	city	country	crossStreet	distance	formattedAddress	labeledLatLngs	lat	lng
Kumon Chinatown	School	222 Spadina	CA	Toronto	Canada	NaN	885	['222 Spadina', 'Toronto ON', 'Canada']	[{'label': 'display', 'lat': 43.65121499425781...	43.651215	-79.397518
kumon	Student Center	NaN	CA	NaN	Canada	NaN	2238	['Canada']	[{'label': 'display', 'lat': 43.66840744018555...	43.668407	-79.406548
Kumon Math & Reading Centre	Office	543A Parliament St	CA	Toronto	Canada	NaN	2035	['543A Parliament St', 'Toronto ON M4X 1P7', '...]	[{'label': 'display', 'lat': 43.66628839598942...	43.666288	-79.368539
Leaside Kumon Centre	General College & University	660 Eglinton Ave. E	CA	Toronto	Canada	At Bayview	6585	['660 Eglinton Ave. E (At Bayview)', 'Toronto ...]	[{'label': 'display', 'lat': 43.71265519621539...	43.712655	-79.376916
kumon	Student Center	NaN	CA	Toronto	Canada	NaN	5345	['Toronto ON', 'Canada']	[{'label': 'display', 'lat': 43.701421, 'lng':...	43.701421	-79.397362

# Canada Demographic Data

- Data source: Toronto Statistics website
- That dataset was raw and need to be processed for further use

GEO_CODE (POR)	GEO_LEVEL	GEO_NAME	GNR	GNR_LF	DATA_QUALITY_FLAG	ALT_GEO_CODE	DIM: Profile of Forward Sortation Areas (2247)	Member ID: Profile of Forward Sortation Areas (2247)	Notes: Profile of Forward Sortation Areas (2247)	Dim: Sex (3): Member ID: [1]: Total - Sex
01	0	Canada	4.0	5.1	20000	01	0 to 14 years	9	NaN	5839565
A0A	2	A0A	4.2	9.1	0	01A0A	0 to 14 years	9	NaN	6685
A0B	2	A0B	4.1	10.1	10	01A0B	0 to 14 years	9	NaN	2090
A0C	2	A0C	4.1	8.6	0	01A0C	0 to 14 years	9	NaN	1405
A0E	2	A0E	4.2	8.1	0	01A0E	0 to 14 years	9	NaN	2745

# Processing Child Population data of Toronto

- That raw dataset was filtered, selected, aggregated further to below dataset

	Postcode	Borough	Neighbourhood	Child age 0-14 Pop Size
0	M1B	Scarborough	Rouge,Malvern	11535
1	M1C	Scarborough	Highland Creek,Rouge Hill,Port Union	5245
2	M1E	Scarborough	Guildwood,Morningside,West Hill	7570
3	M1G	Scarborough	Woburn	5590
4	M1H	Scarborough	Cedarbrae	3870



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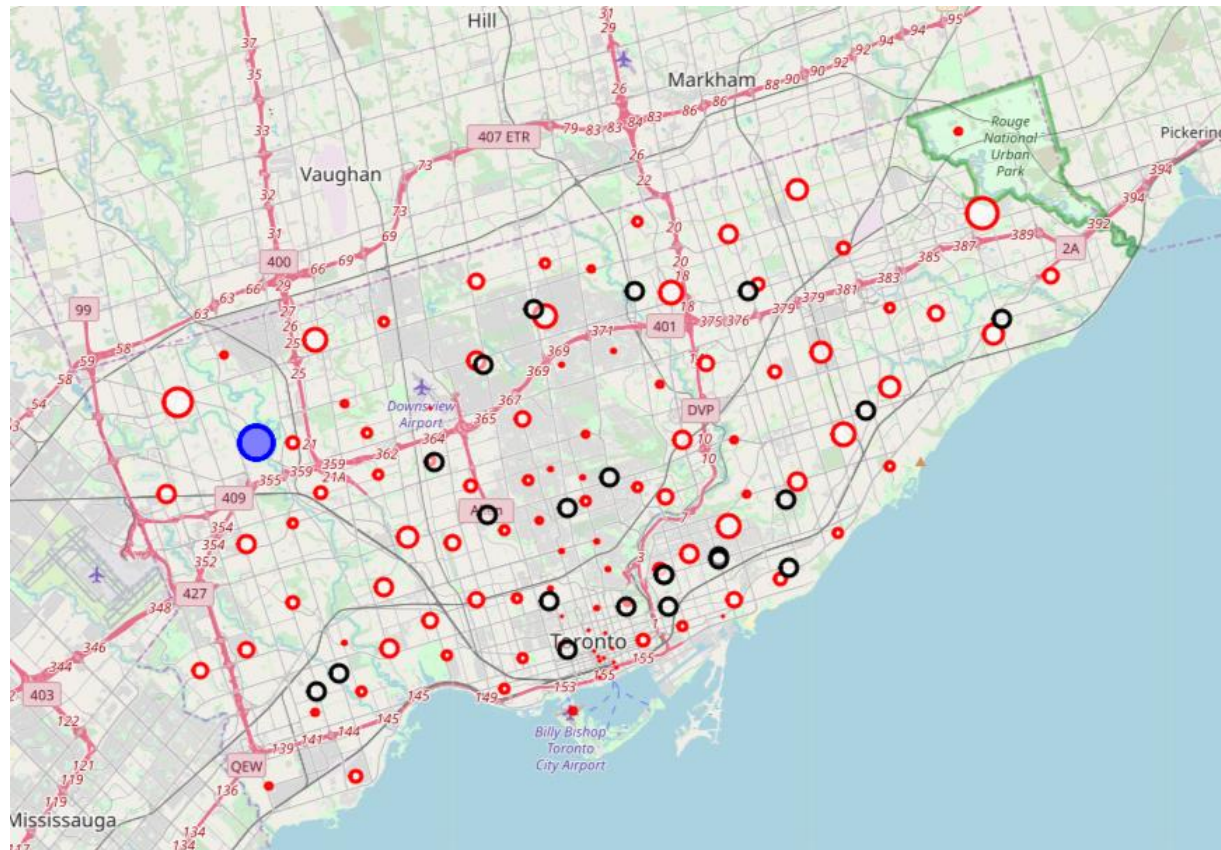
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# Methodology

- Brute-force method is used. The idea is to try to sampling new locations from entire Toronto area and to find the one that minimize the sum of population weighted distance.
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- Sum of weighted nearest distance =  
$$\sum_{i,j=0}^{m,n} (\text{Number of children}) * (\text{Distance to nestest Kuman})$$
- 
- Where  $m$  = Number of Toronto neighborhoods,  $n$  = Number of existing Kumons+1

# Conclusion

The new center should be placed at [43.72501224557055, -79.55011423863259]. North-west area has no any Kumon centres and the student population nearby is quite large.



# Discussion

- This research consider only child population and Neighborhood to Kumon distance two factors to new Kumon location
- In real world, there are a lot of more factors need to be considered (house hold income, parent education level, transportation, and location availability, etc. )