

# The Battle of the Neighborhoods

Best Location for a New Fast-Food Restaurant in Toronto

# Opening a New Business (Fast-Food)

- ▶ Opening a new business requires thinking about a number of factors.
- ▶ The location of the business is an important factor that is crucial for the success and continuity of the business.
- ▶ Ability to predict the best location for a business given details of venues in a city is quite important.
- ▶ The goal of the project was to find the best neighborhood for a **fast-food restaurant in Toronto.**

# Data Acquisition

- ▶ Neighborhood data for Toronto was obtained by web scraping the Wikipedia page ([https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M))
- ▶ The coordinates of the neighbourhoods was merged by reading from a CSV file available online to obtain a data frame with 103 rows of neighbours and 5 columns of information about each of them.
- ▶ Use the coordinates to obtain venue data from Foursquare location service

# Data Acquisition

- We obtained a total of 2150 venues across Toronto.

	PostalCode	Borough	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	M3A	North York	Parkwoods	43.753259	-79.329656	Brookbanks Park	43.751976	-79.332140	Park
1	M3A	North York	Parkwoods	43.753259	-79.329656	KFC	43.754387	-79.333021	Fast Food Restaurant
2	M3A	North York	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop
3	M4A	North York	Victoria Village	43.725882	-79.315572	Victoria Village Arena	43.723481	-79.315635	Hockey Arena
4	M4A	North York	Victoria Village	43.725882	-79.315572	Tim Hortons	43.725517	-79.313103	Coffee Shop

# Venue Categories per Neighborhood

	PostalCode	Borough	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
Venue Category								
Accessories Store	1	1	1	1	1	1	1	1
Adult Boutique	1	1	1	1	1	1	1	1
Airport	2	2	2	2	2	2	2	2
Airport Food Court	1	1	1	1	1	1	1	1
Airport Gate	1	1	1	1	1	1	1	1
Airport Lounge	2	2	2	2	2	2	2	2
Airport Service	3	3	3	3	3	3	3	3
Airport Terminal	2	2	2	2	2	2	2	2
American Restaurant	21	21	21	21	21	21	21	21
Antique Shop	3	3	3	3	3	3	3	3

- We rename the category called **Neighborhood** to **Neighborhood Area** to avoid ambiguity.

# Venues Information

- ▶ There were 278 unique categories in the data set.
- ▶ 23 neighborhoods had at least one fast food restaurant while others do not.

# Venues Information

- There are 29 existing fast food restaurants.



# Using One-hot Encoding

- To identify how many of each venue category are in each neighborhood.

	Neighborhood	Accessories Store	Adult Boutique	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	Aquarium	Art Gallery	Art Museum
0	Parkwoods	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Parkwoods	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Parkwoods	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Victoria Village	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Victoria Village	0	0	0	0	0	0	0	0	0	0	0	0	0



# Using One-hot Encoding

- To identify how many of each venue category are in each neighborhood.

	Neighborhood	Accessories Store	Adult Boutique	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop	Aquarium	Art Gallery	Art Museum	Casino
0	Agincourt	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1	Alderwood, Long Branch	9	9	9	9	9	9	9	9	9	9	9	9	9	9
2	Bathurst Manor, Wilson Heights, Downsview North	24	24	24	24	24	24	24	24	24	24	24	24	24	24
3	Bayview Village	4	4	4	4	4	4	4	4	4	4	4	4	4	4
4	Bedford Park, Lawrence Manor East	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	Berczy Park	58	58	58	58	58	58	58	58	58	58	58	58	58	58

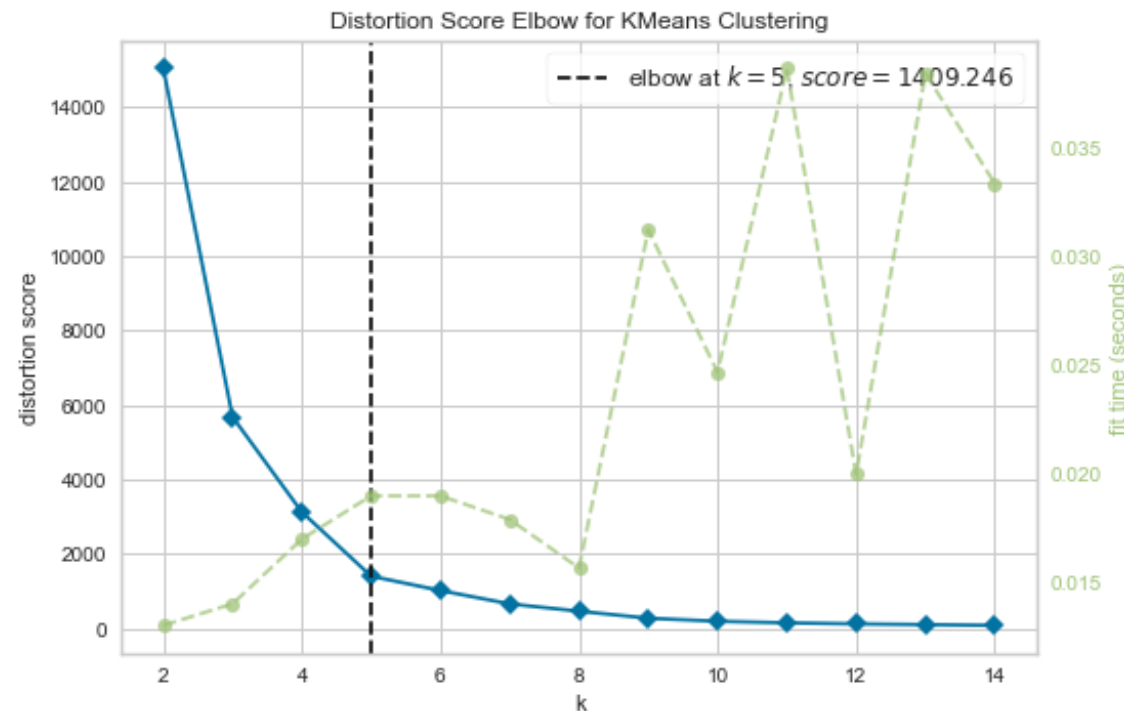
# Most common Venues in a Neighborhood

- This gives an indication of what the neighborhood may look like.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Agincourt	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore	Eastern European Restaurant	Field
1	Alderwood, Long Branch	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore	Eastern European Restaurant	Field
2	Bathurst Manor, Wilson Heights, Downsview North	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore	Eastern European Restaurant	Field
3	Bayview Village	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore	Eastern European Restaurant	Field
4	Bedford Park, Lawrence Manor East	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore	Eastern European Restaurant	Field

# K-means Clustering

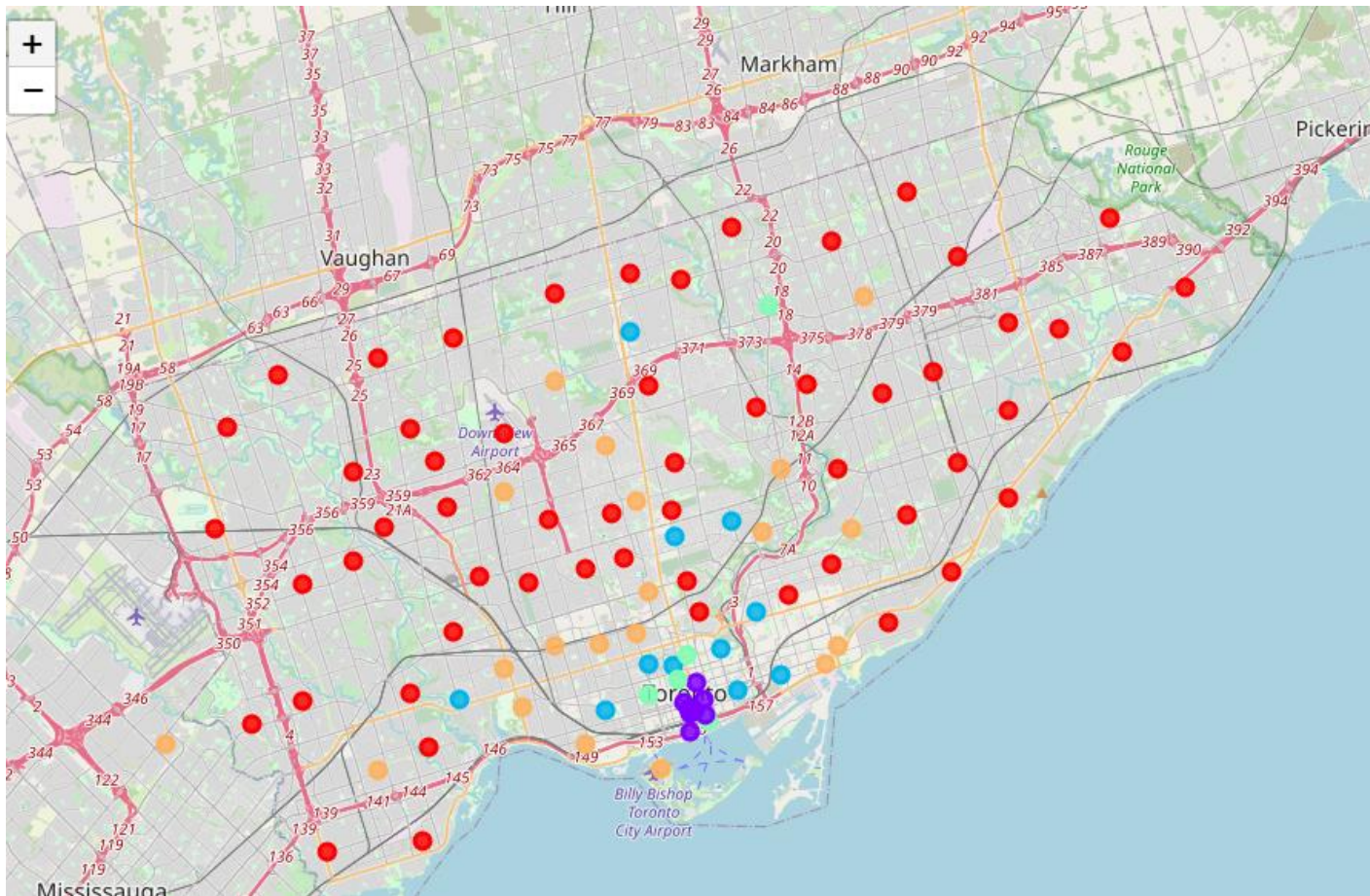
- ▶ The aim is to find neighborhoods that are similar
- ▶ We use Elbow method to find the best value of k to use.



**K = 5**

# K-means Clustering

- 5 clusters in color



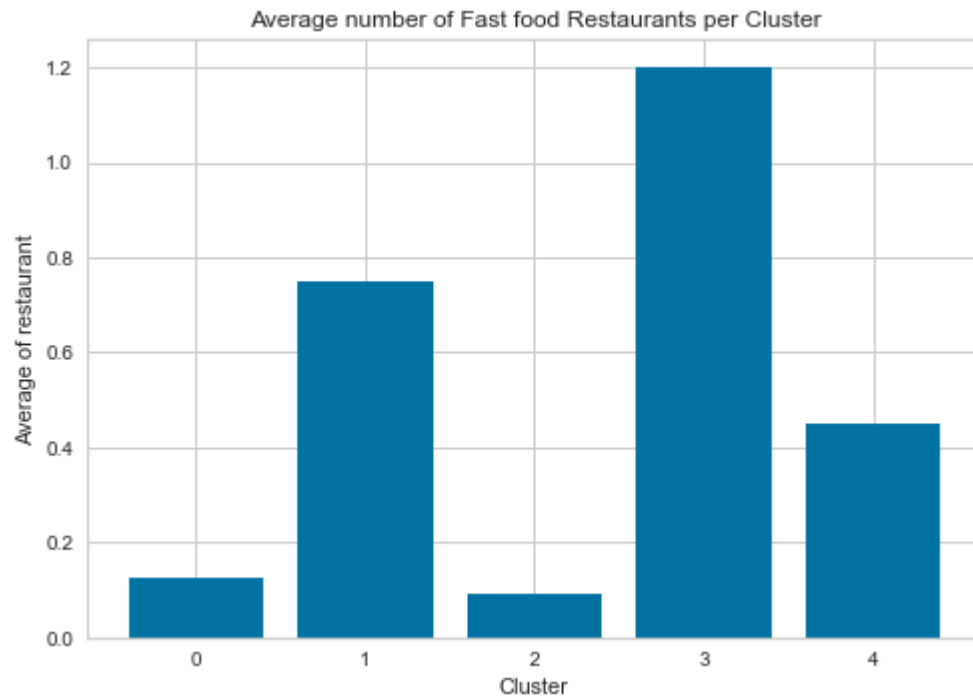
# K-means Clustering

► For example, Cluster 3

	PostalCode	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
19	M5E	Downtown Toronto	Berczy Park	43.644771	-79.373306	3	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore
23	M5G	Downtown Toronto	Central Bay Street	43.657952	-79.387383	3	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore
32	M2J	North York	Fairview, Henry Farm, Oriole	43.778517	-79.346556	3	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore
82	M5T	Downtown Toronto	Kensington Market, Chinatown, Grange Park	43.653206	-79.400049	3	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore
96	M4Y	Downtown Toronto	Church and Wellesley	43.665860	-79.383160	3	Yoga Studio	Dumpling Restaurant	Discount Store	Distribution Center	Dog Run	Doner Restaurant	Donut Shop	Drugstore

# Best Cluster for new FF Restaurant

- ▶ Calculated average number of restaurants in each cluster.
- ▶ Having higher number of restaurant implies there is demand for fast food in the cluster.



Best cluster = Cluster 3  
Second-best cluster = Cluster 1

# Best Neighborhoods in Identified Clusters

- ▶ We want to limit the amount of competition for the new business.
- ▶ Create a distance matrix to neighborhoods with an existing fast food restaurant
- ▶ We want to find neighborhood with the maximum distance to existing fast food restaurant but in the identified clusters.



# Using Distance matrix

## ► Find maximum average across

Neighborhood	Fairview, Henry Farm, Oriole	Church and Wellesley	Garden District, Ryerson	Richmond, Adelaide, King	Toronto Dominion Centre, Design Exchange	Commerce Court, Victoria Hotel	Enclave of M5E
Berczy Park	0.545583	0.046555	0.027221	0.012667	0.008613	0.007358	0.002267
Central Bay Street	0.509161	0.017929	0.016965	0.007900	0.012240	0.012344	0.017024
Kensington Market, Chinatown, Grange Park	0.545008	0.042208	0.042959	0.015704	0.019432	0.020843	0.026097
St. James Town	0.521045	0.032639	0.013343	0.009196	0.007521	0.005496	0.005091
Harbourfront East, Union Station, Toronto Islands	0.568515	0.050167	0.033174	0.010154	0.006364	0.007632	0.008904
First Canadian Place, Underground city	0.539618	0.034906	0.018701	0.003134	0.001437	0.002474	0.007697

Best neighborhood: Kensington Market, Chinatown, Grange Park in Cluster 3  
2nd-best neighborhood: Harbourfront East, Union Station, Toronto Islands in Cluster 1



# Conclusion

- ▶ Objective to find the best neighborhood for a new fast food restaurant was achieved.
- ▶ Conclusion is based on location data alone. Other factors may be further explored as necessary.
- ▶ Approach can be used for any business.