



# Recommendation

- For opening new ramen restaurants in Toronto

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# Introduction & Motivation

It is summer time again! As the largest city in Canada, Toronto combines multi cultures, traditions and foods from all over the world. One of the most popular food you can find in the city is Japanese ramen. While walking on areas like downtown or North York, you will often see find some ramen places that are full of people line up outside, despite winter or summer.

For owners who wish to open a restaurant that offers Japanese ramen, they need to know where the other ramen places located. This is important because it provides owners an overall picture of where their competitors and customers will be mainly located. They also need to know what type of the restaurant should be opened in that area.



# Goal

This project analyzes all restaurants that serve ramen in Toronto's boroughs and neighborhoods, and groups similar kind of areas into a cluster, based on ramen places' rating, price tier and restaurant type, and eventually give owners a guideline of where and how the new ramen places can be located.

I smell Ramen!



# Data Exploring

For this project, we use data from:

1. Toronto postal code & neighborhood data – this dataset provides postal code, boroughs and neighborhoods for the entire city
2. Geospatial data – this dataset maps each postal code to latitude and longitude
3. Venue data returned from Foursquare API – this dataset is an addon based on neighborhood data. It provides venues info including location, reviews, likes, etc. In our case, we will focus mainly on restaurants that serve ramens within each neighborhood. We will also get ratings and price tier info of each restaurant/venue.



# Data Cleaning

We started with zip code, borough and neighborhood data that wikipedia provides us, and then attach latitude and longitude info into each neighborhood thanks to the geospatial data from City of Toronto.

We then use Foursquare API to load price tier, category and rating info for restaurants that offer Japanese ramen within each neighborhood.

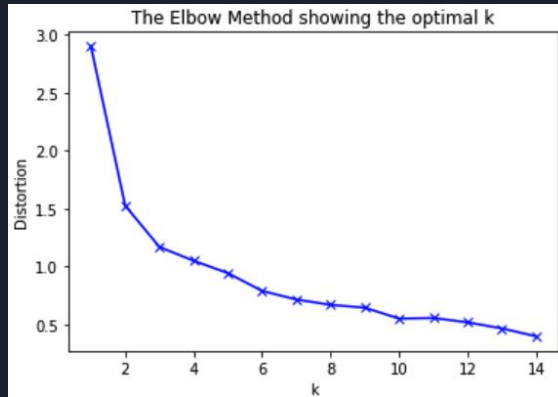
Then we use feature analysis and one hot encoding to flat the dataset into featuring dataset for model configuration.

# Complete Data with Foursquare API

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category	Price Tier	rating
0	L'Amoreaux West	43.799525	-79.318389	Yamamoto Japanese Cuisine 山本盛世	43.798589	-79.318558	Japanese Restaurant	2	5.5
1	Fairview, Henry Farm, Oriole	43.778517	-79.346556	Yoi	43.778244	-79.343010	Japanese Restaurant	2	0.0
2	Willowdale South	43.770120	-79.408493	KINTON RAMEN	43.769684	-79.413049	Ramen Restaurant	0	6.7
3	Willowdale South	43.770120	-79.408493	Ajisen Ramen 味千ラーメン	43.771444	-79.413139	Ramen Restaurant	0	6.7
4	Willowdale South	43.770120	-79.408493	Hakata Shoryuken Ramen	43.773519	-79.413872	Ramen Restaurant	0	7.0

# Modeling - K - Means Clustering

We use K - Means Clustering to find and group similar restaurant from each neighborhoods. In order to find out the best K value, an elbow plot is used for distortion vs K.



Based on the plot , we pick K = 6 which is the starting point of slow distortion drop rate

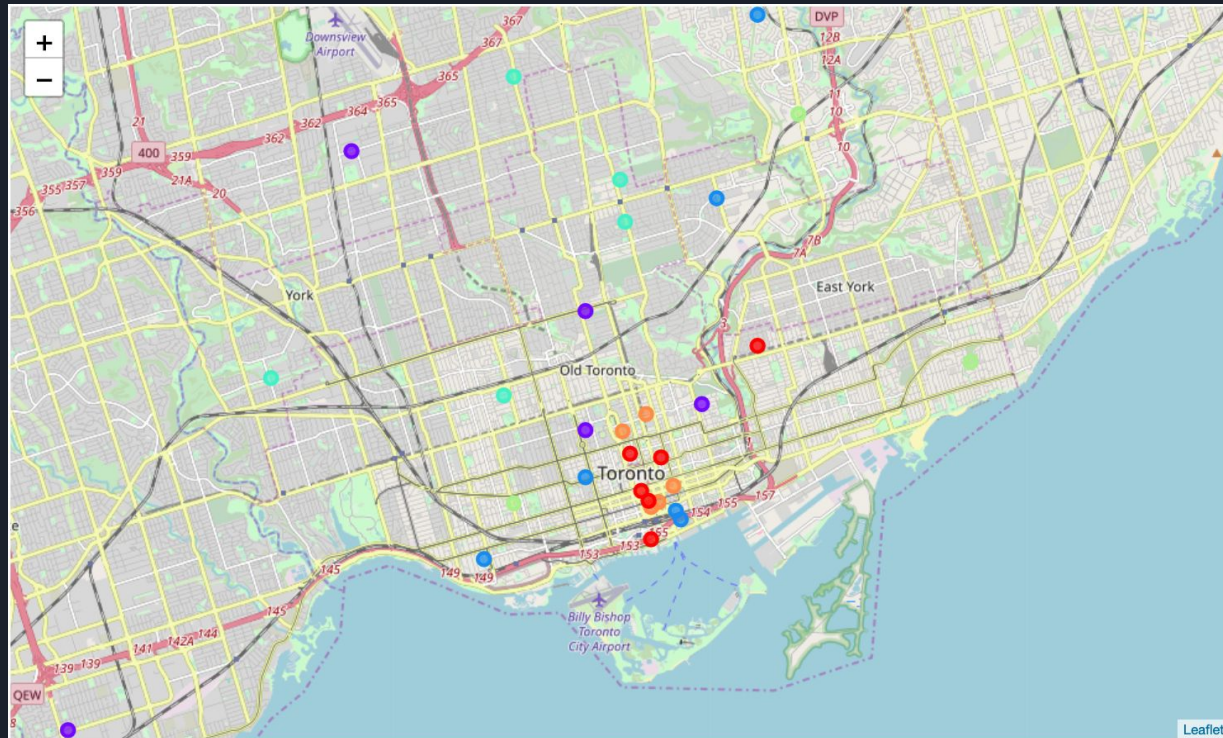
# Adding Label

Once the model is trained with input data, we now have labelled cluster for each row:

	Postal Code	Borough	Neighborhood	Latitude	Longitude	index	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	M1W	Scarborough	L'Amoreaux West	43.799525	-79.318389	21	5	Japanese Restaurant	Thai Restaurant	Bakery
1	M2J	North York	Fairview, Henry Farm, Oriole	43.778517	-79.346556	16	3	Japanese Restaurant	Thai Restaurant	Bakery
2	M2N	North York	Willowdale South	43.770120	-79.408493	32	5	Ramen Restaurant	Japanese Restaurant	Gift Shop
3	M3B	North York	Don Mills North	43.745906	-79.352188	15	2	Japanese Restaurant	Thai Restaurant	Bakery
4	M3C	North York	Flemington Park, Don Mills South	43.725900	-79.340923	18	4	General Entertainment	Theme Restaurant	Thai Restaurant



# Visualization





# Discovery & Discussion

1. Downtown area has all kinds of clusters, meaning there are all kind of ramen restaurant type, from bakery to Japanese restaurants, and from pure ramen place to food court.
2. In some neighborhoods, Japanese ramen has been served at other Asian restaurants including Thai and Chinese restaurants. This could either be an innovative idea from those venues, or it could be the incorrect info that user or Foursquare API provided.



# Summary

Based on the project, restaurant owners who wish to open a new ramen place can visually get the info that:

1. For each neighborhood, what kind of restaurant offer Japanese ramen that is most common.
2. Once the owner has decided the price tier of menu as well as restaurant type (e.g. sushi restaurant or pure ramen place), he will know which group of restaurants his new one might belong to.

Owners can also use the clustering model to find out:

1. What group of restaurants could owner's new venue belong to?
2. What are his potential competitor's ramen place's type and features?



Thank You!