Optimal Location for Opening a Chinese Restaurant in Toronto

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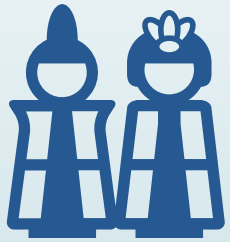
Finding optimal location is important before opening a restaurant

Toronto is where many entrepreneurs are willing to open a restaurant.



Chinese restaurant is in high demand all over the world, including in Toronto.

Our focus is to determine neighborhoods in Toronto where the demand for Chinese restaurant is the highest

Target audience

- The target audience of the project are listed below:
  - Local entrepreneurs planning to open a Chinese restaurant in Toronto
  - Chinese businessmen planning to open a Chinese restaurant in Toronto
  - Chinese restaurant owners willing to open their branch in Toronto

Data acquisition and cleaning

Data sources:

- a) I'm using "List of Postal code of Canada: M" (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M) wiki page to get all the information about the neighborhoods present in Toronto. This page has the postal code, borough & the name of all the neighborhoods present in Toronto.
- b) Then I'm using "https://cocl.us/Geospatial_data" csv file to get all the geographical coordinates of the neighborhoods.
- c) To get information about population size, population density and average income in each neighborhood of Toronto, I'm using "Demographics of Toronto neighborhoods" (https://en.wikipedia.org/wiki/Demographics_of_Toronto_neighbourhoods) wiki page.
- d) To extract number of Chinese restaurants in each neighborhood, I'm using Foursquare's explore API.

Data cleaning

- *Scraping Toronto Neighborhoods Table from Wikipedia and adding geographical coordinates to the neighborhoods*

	PostalCode	Borough	Neighbourhood	Latitude	Longitude
0	M3A	North York	Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Harbourfront	43.654260	-79.360636
3	M5A	Downtown Toronto	Regent Park	43.654260	-79.360636
4	M6A	North York	Lawrence Heights	43.718518	-79.464763
5	M6A	North York	Lawrence Manor	43.718518	-79.464763
6	M7A	Queen's Park	Not assigned	43.662301	-79.389494
7	M9A	Etobicoke	Islington Avenue	43.667856	-79.532242
8	M1B	Scarborough	Rouge	43.806686	-79.194353
9	M1B	Scarborough	Malvern	43.806686	-79.194353

Data cleaning

- *Scraping population size, population density and average income for each neighborhood of Toronto*

	Name	Population	Density (people/km2)	Average Income
0	Toronto CMA Average	5113149	866	40704
1	Agincourt	44577	3580	25750
2	Alderwood	11656	2360	35239
3	Alexandra Park	4355	13609	19687
4	Allenby	2513	4333	245592

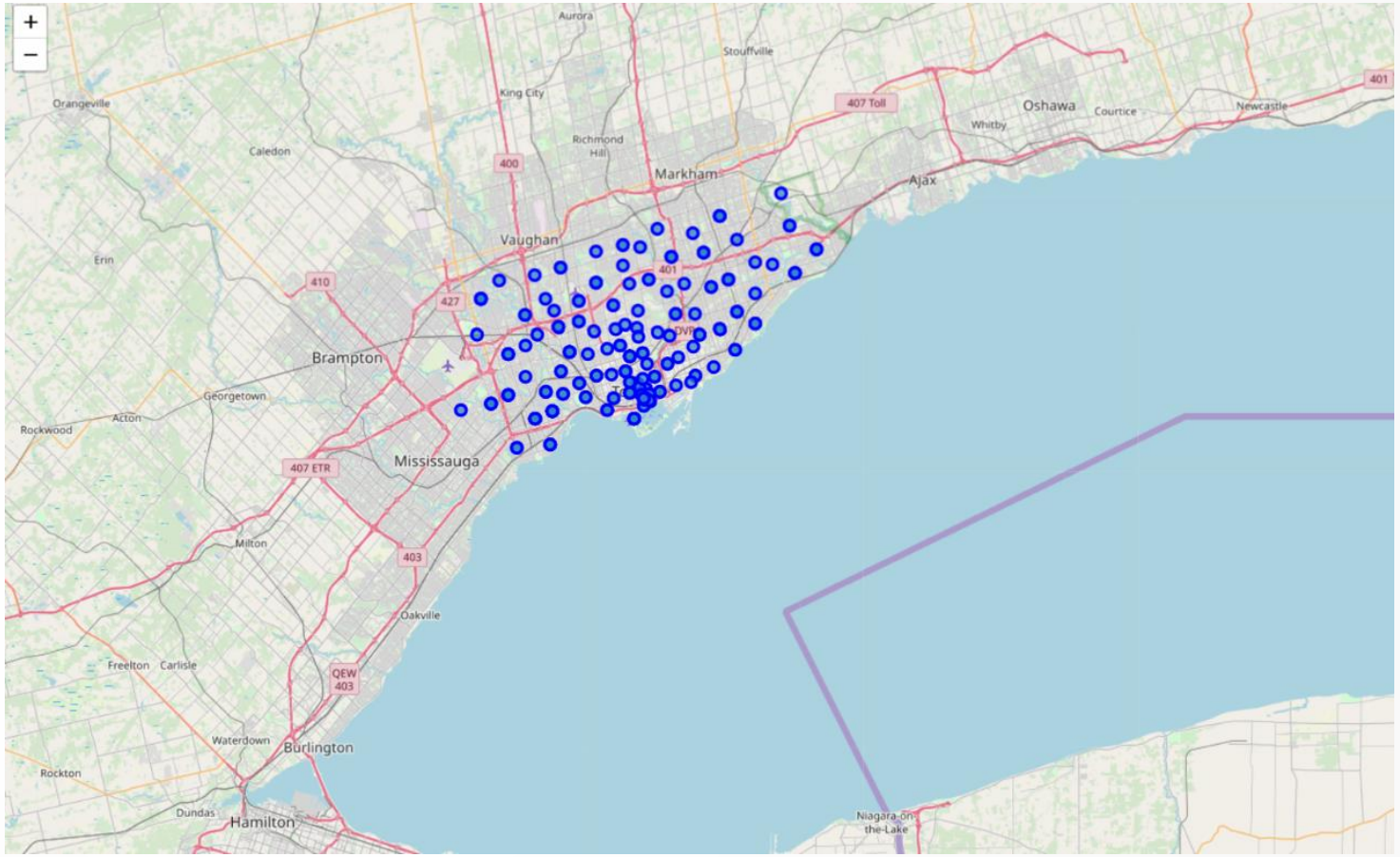
Data cleaning

- *Using* Foursquare's *explore API, acquire number of Chinese restaurants for each neighborhood.*

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Parkwoods	43.753259	-79.329656	Brookbanks Park	43.751976	-79.332140	Park
1	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop
2	Victoria Village	43.725882	-79.315572	Victoria Village Arena	43.723481	-79.315635	Hockey Arena
3	Victoria Village	43.725882	-79.315572	Tim Hortons	43.725517	-79.313103	Coffee Shop
4	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant

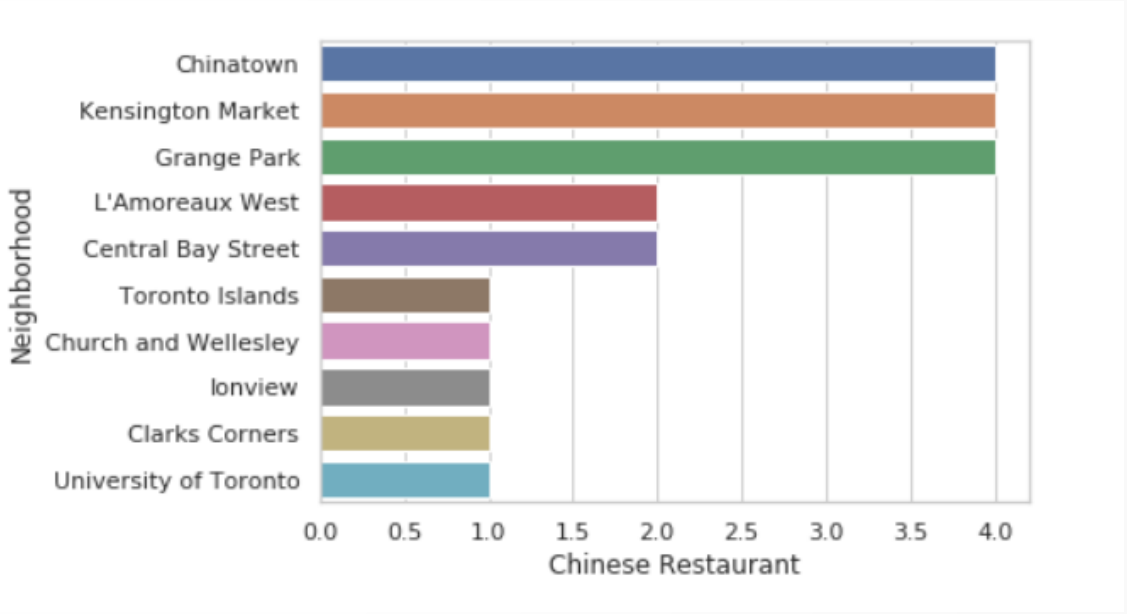
Visualize Toronto neighborhoods

- While some neighborhoods might not have many Chinese restaurants, if they are located near downtown, adjacent regions may drastically impact profitability of the restaurant.



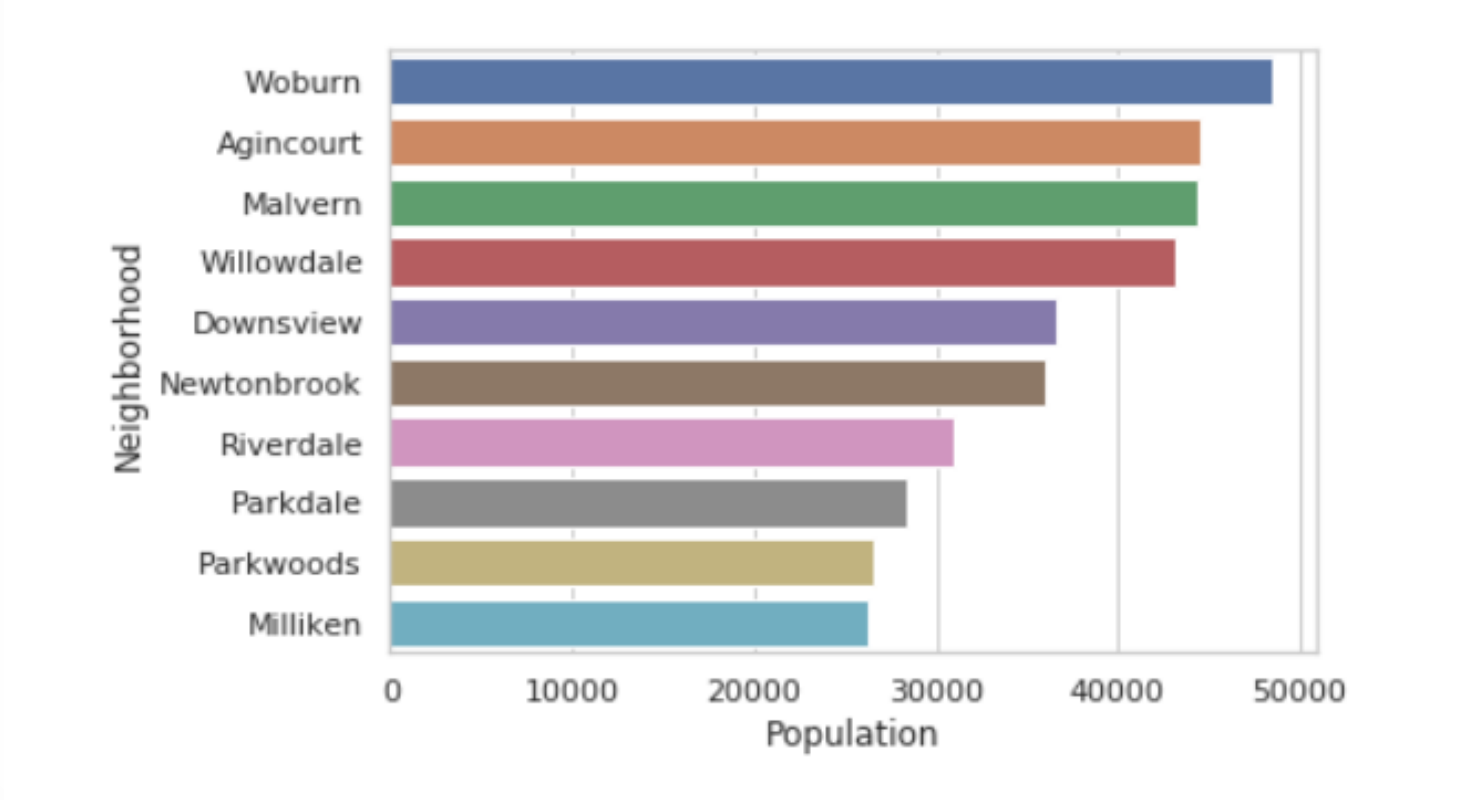
Exploratory analysis

- Neighborhoods with many Chinese restaurants are not suitable to open a new Chinese restaurant.



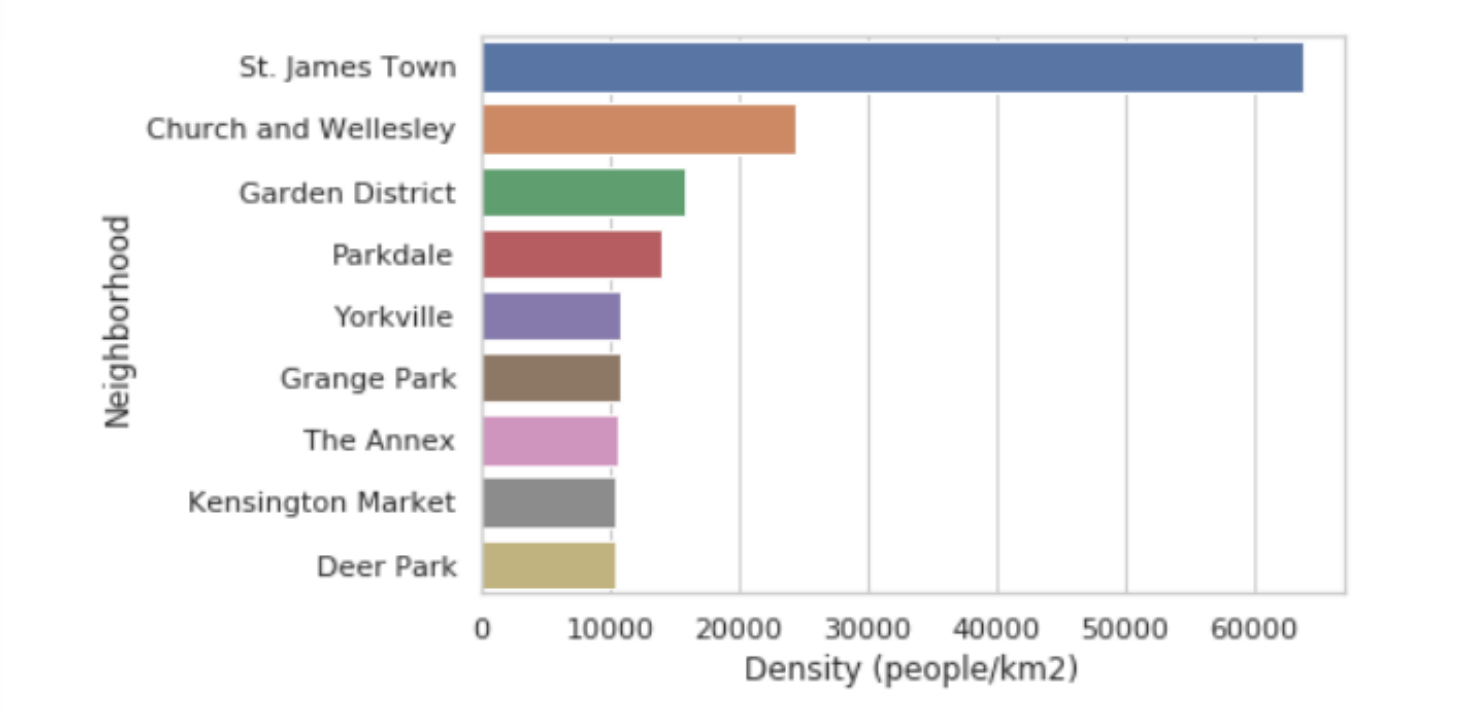
Exploratory analysis

- Neighborhoods with high population are ideal to open a new Chinese restaurant



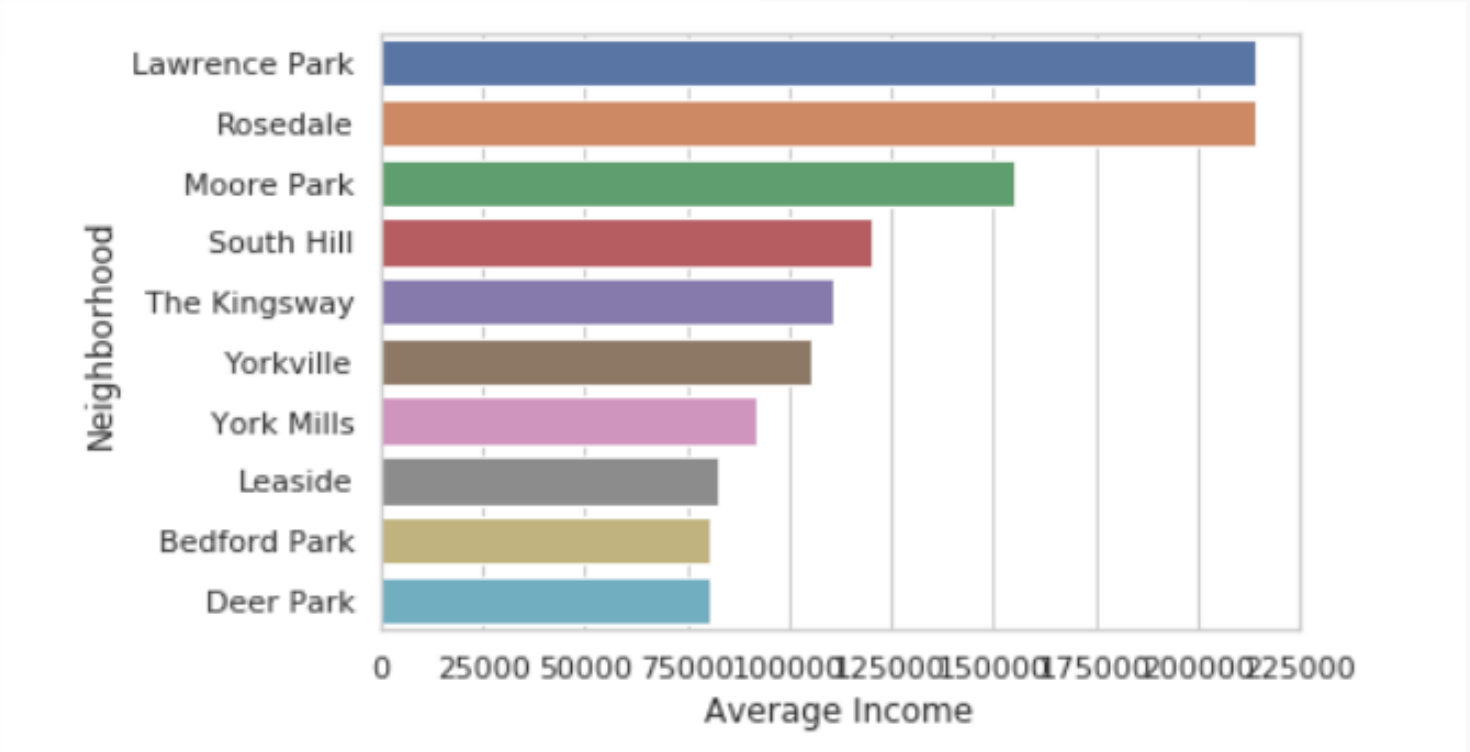
Exploratory analysis

- Demand for a new Chinese restaurant will be high in the neighborhoods with high population density.



Exploratory analysis

- It is always a good idea to open a new business in a rich neighborhood because in these neighborhoods spending power of population is high which means our business can make more profit.

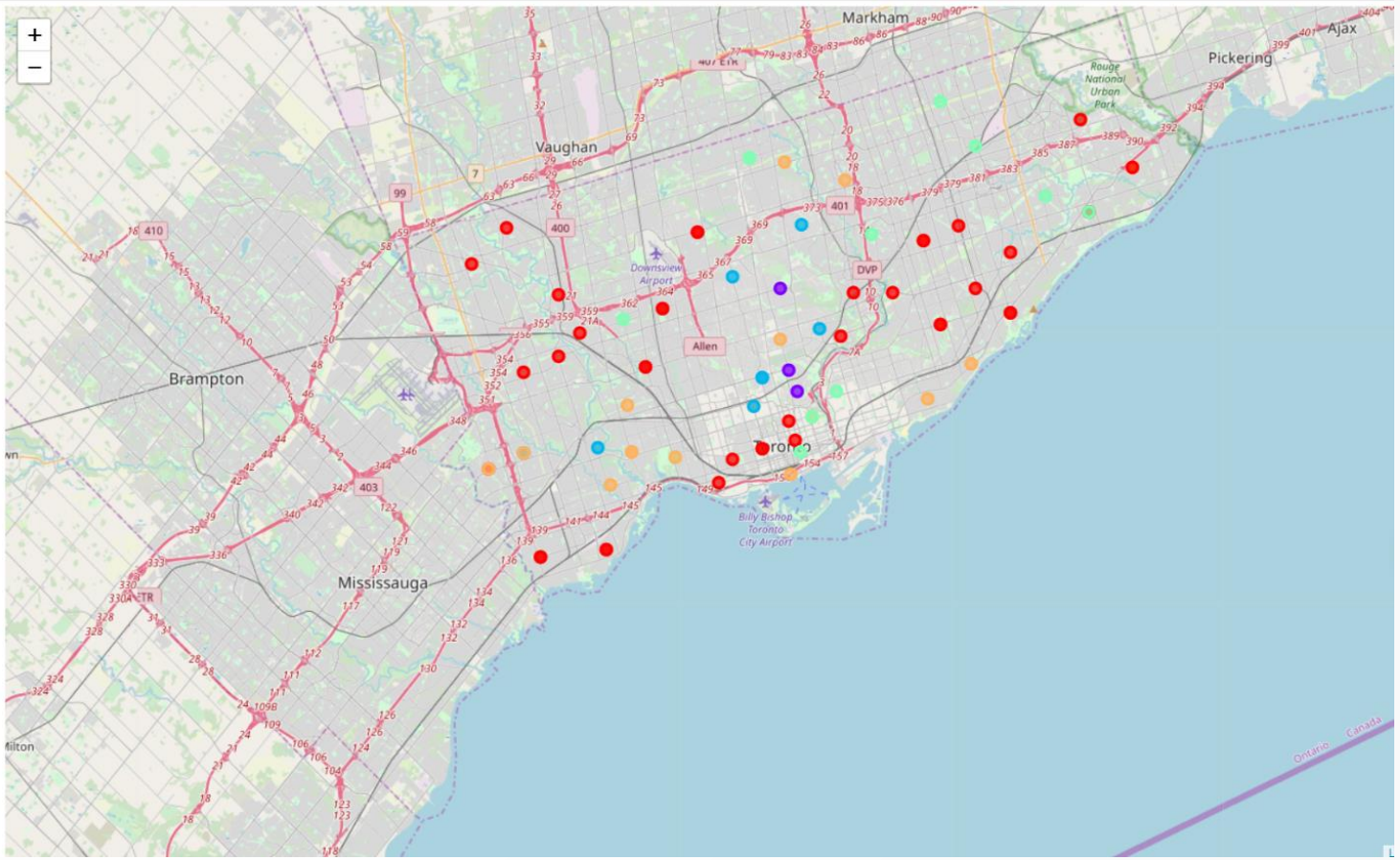


Modelling

- To find ideal neighborhoods to open Chinese restaurant in Toronto, we will be using K-means clustering, one of the most commonly used form of unsupervised machine learning.
- The reason to conduct K-means clustering is to reveal a bunch of similar neighborhoods that are densely populated, rich and doesn't have any Chinese restaurants.

Results

- Each cluster is color coded for the ease of presentation. We can observe that majority of neighborhoods fall into red cluster which is Cluster one and only three of the neighborhoods fall into blue cluster which is Cluster two. Some neighborhoods in the same cluster are densely populated while others are quite separate from one another.



Conclusion

- Cluster two are the best choice for opening a new Chinese restaurant. The main factors considered in choosing cluster 2 are number of existing Chinese restaurants, average income and population density. Firstly, none of the three restaurants in cluster two, to name Lawrence Park, Moore Park and Rosedale have any Chinese restaurants. It implies that we will not suffer competition in these neighborhoods. Secondly, cluster two are the only cluster among 5, with neighborhoods that all have 6-digit average income. So, it is the best idea to open a new restaurant in one of these richest neighborhoods. Thirdly, all three neighborhoods are moderately densely populated meaning that we can expect enough number of customers.

Cluster 2

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In [71]: toronto_final.loc[toronto_final['Cluster Labels'] == 1]
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Out[71]:

	Cluster Labels	Neighborhood	Population	Density (people/km2)	Average Income	Chinese Restaurant	PostalCode	Borough	Latitude	Longitude
31	1	Lawrence Park	6653	1828	214110	0	M4N	Central Toronto	43.728020	-79.388790
39	1	Moore Park	4474	3959	154825	0	M4T	Central Toronto	43.689574	-79.383160
51	1	Rosedale	7672	2821	213941	0	M4W	Downtown Toronto	43.679563	-79.377529