Choose Neighborhoods in Toronto to Open a Sushi Restaurant

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Introduction

Many people would want to open a Sushi restaurant in Toronto. Indeed, when walking through the city Toronto, one can easily find many neighborhoods do not have Sushi restaurants yet. This appears to be a gap in the market. However, before opening a restaurant, we should consider some factors, for instance, the number of residents in the neighborhoods and residents' flavors. The residents' flavors could probably be driven by the neighborhood cultures. For example, many Asians could prefer to eat Sushi food. Overall, how to select a right neighborhood in Toronto to open a Sushi restaurant becomes an important business problem.

Data

As mentioned in section Introduction, how to select a right neighborhood in Toronto to open a Sushi restaurant becomes an important business problem. In order to address this problem, we can employ a data-driven approach. Many other North-American cities, for example, New York City, have already had Sushi restaurants. We can compare Toronto's neighborhoods with their counterparts in New York City. First, we can select neighborhoods in New York City in which Sushi restaurants became popular. Second, we can find similar neighborhoods in Toronto as those selected New York City neighborhoods other than Sushi restaurants. The resulting neighborhoods could become potential candidates for a Sushi restaurant.

Neighborhoods data

For Toronto, we can retrieve its neighborhoods data via wikipedia (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M).

It will contain neighborhoods and their geographical information, such as latitude and longitude.

See data sample below:

PostalCode	Borough	Neighborhood	Latitude	Longitude
M3A	North York	Parkwoods	43.7532586	-79.3296565

M4A	North York	Victoria Village	43.7258823	-79.3155716
M5A	Downtown Toronto	Regent Park, Harbourfront	43.6542599	-79.3606359

For New York City, we can get data from IBM Developer Skills Network (https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs/newyork_data.json). It will contain neighborhoods and their geographical information too.

Foursquare data

As long as neighborhoods' geographical information is available, we can further explore each neighborhood via Foursquare API. This API will return what venues are located in each neighborhood, such as parks, gyms and cafés.

Based on the venue data, we can then do clustering so that we can find which Toronto neighborhoods share the common venue patterns with their counterparts in New York City.

Methodology

Exploratory Analysis

As mentioned in Section Data, two data source is consolidated, namely geographical data and Foursquare data. Geographical data mainly provides longitude and latitude information. Foursquare data contains venues in neighborhoods.

First, I visualize neighborhoods in Toronto and New York City as shown in Figure 1 and Figure 2. Totally, 102 neighborhoods are found in Toronto while 302 neighborhoods are located in New York City.

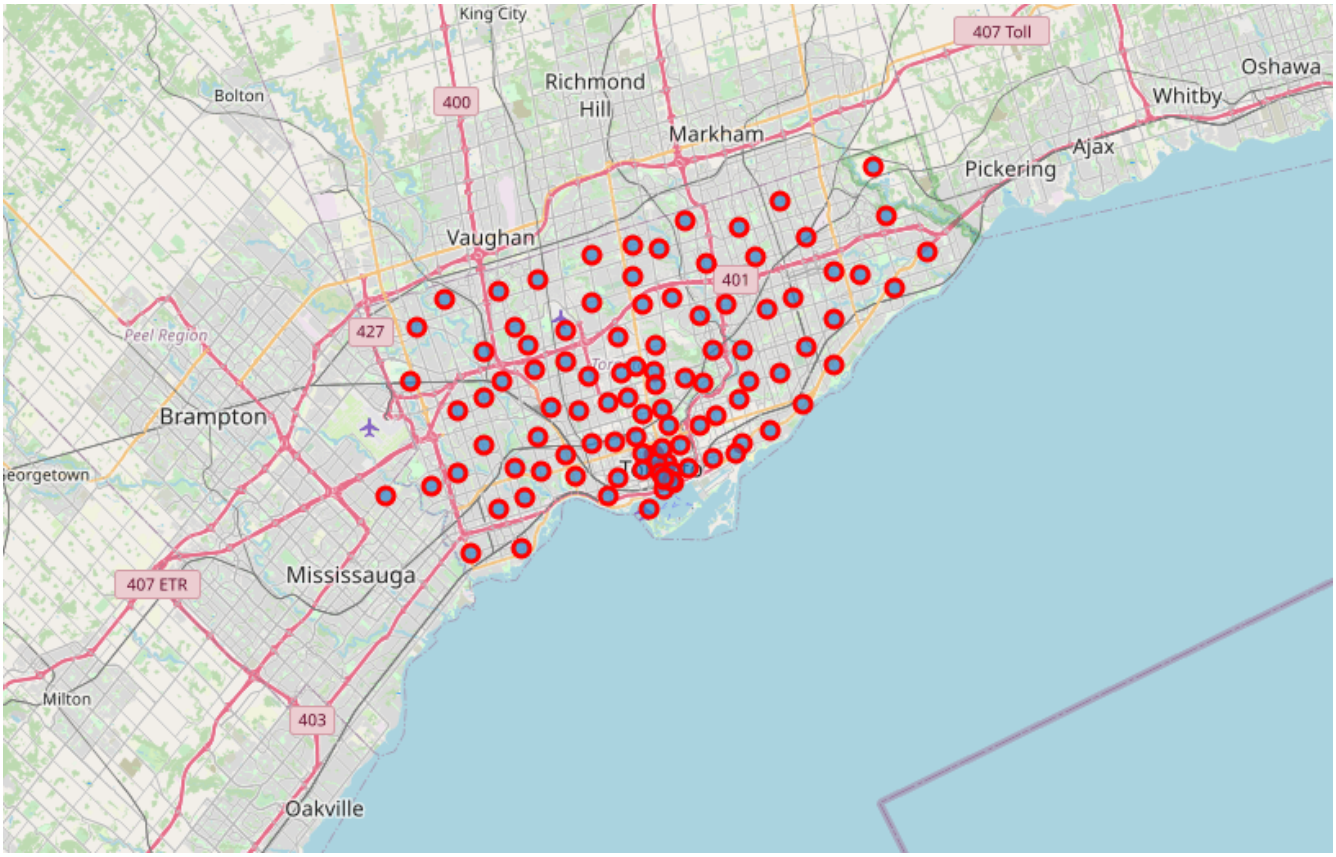

Figure 1: Toronto neighborhoods on map

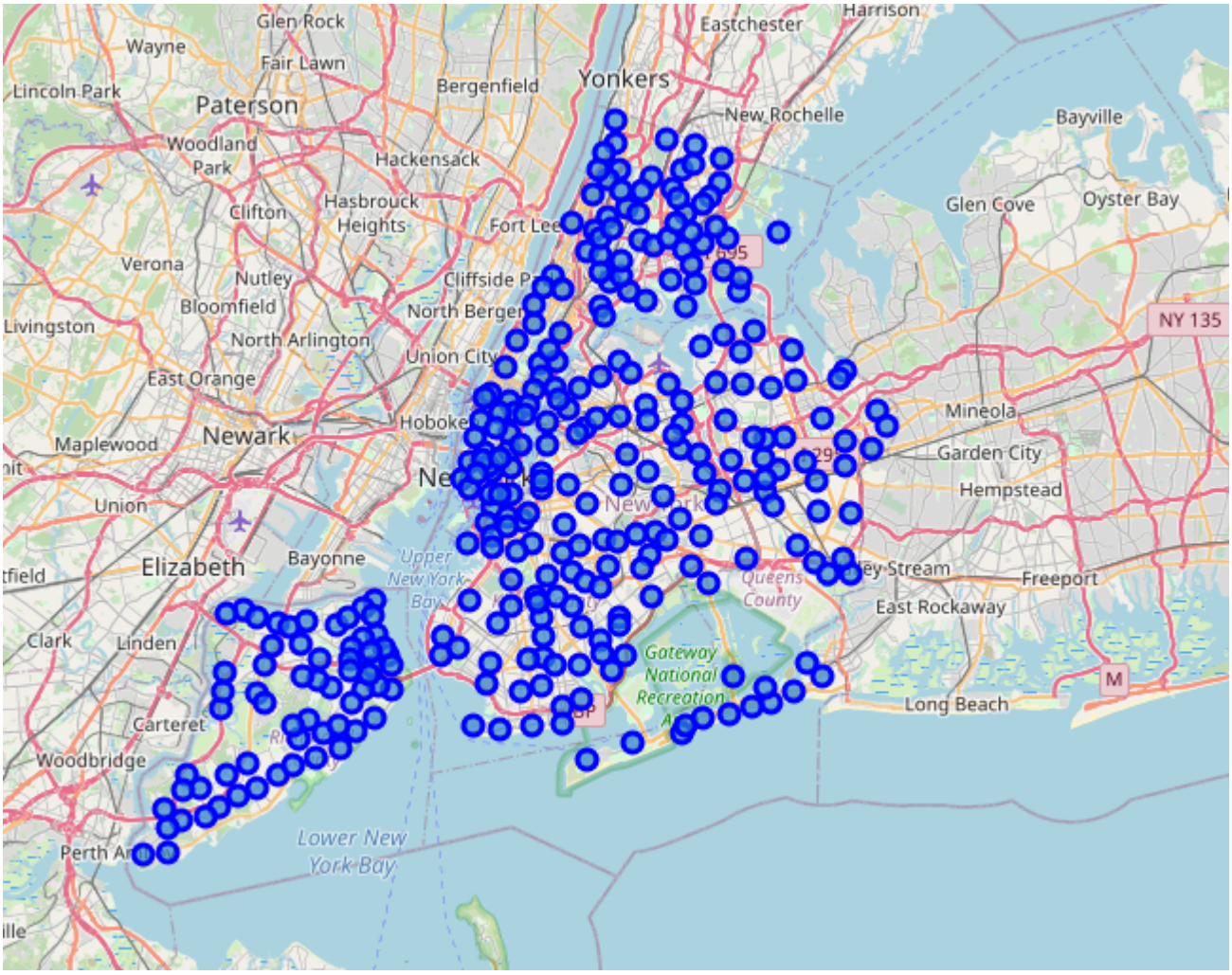

Figure 2: New York City neighborhoods on map

Second, I sort out venues across the neighborhoods in Toronto and New York City respectively (see Figure 3 and Figure 4)

	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	Chinese Restaurant	Shopping Mall	Caribbean Restaurant	Pizza Place	Bakery	Supermarket	Discount Store	Clothing Store	Lounge	Malay Restaurant
1	Alderwood, Long Branch	Discount Store	Pizza Place	Park	Playground	Shopping Mall	Garden Center	Gas Station	Liquor Store	Sandwich Place	Moroccan Restaurant
2	Bathurst Manor, Wilson Heights, Downsview North	Bank	Pizza Place	Park	Coffee Shop	Ski Area	Bridal Shop	Fried Chicken Joint	Frozen Yogurt Shop	Restaurant	Shopping Mall
3	Bayview Village	Bank	Gas Station	Grocery Store	Intersection	Japanese Restaurant	Restaurant	Trail	Playground	Chinese Restaurant	Skating Rink
4	Bedford Park, Lawrence Manor East	Coffee Shop	Sandwich Place	Bank	Restaurant	Fast Food Restaurant	Sushi Restaurant	Pizza Place	Greek Restaurant	Grocery Store	Liquor Store

Figure 3: Toronto venues across the neighborhoods

	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	Allerton	Pizza Place	Supermarket	Deli / Bodega	Discount Store	Spa	Chinese Restaurant	Check Cashing Service	Grocery Store	Gas Station	Fried Chicken Joint
1	Annadale	Dance Studio	Train Station	Pharmacy	Liquor Store	Pizza Place	Cosmetics Shop	Bakery	Sushi Restaurant	Diner	Restaurant
2	Arden Heights	Deli / Bodega	Playground	Coffee Shop	Pizza Place	Pharmacy	Other Nightlife	Performing Arts Venue	Pet Store	Pet Service	Optical Shop
3	Arlington	Bus Stop	Deli / Bodega	Intersection	Paella Restaurant	Pet Store	Pet Service	Pet Café	Peruvian Restaurant	Persian Restaurant	Perfume Shop
4	Arrochar	Bus Stop	Italian Restaurant	Deli / Bodega	Food Truck	Middle Eastern Restaurant	Mediterranean Restaurant	Pizza Place	Hotel	Sandwich Place	Nail Salon

Figure 4: New York City venues across the neighborhoods

Next, I select the neighborhoods in Toronto that does not have a Sushi restaurant yet and their counterparts in New York City where Sushi restaurants have become their top 10 popular venues. In total, I find 59 target neighborhoods in Toronto and 22 targets in New York City.

Clustering

The task of this project is to find candidate neighborhoods in Toronto in which we can open a Sushi restaurant. Now that we know in which New York City neighborhoods Sushi restaurants have become popular and in which Toronto neighborhoods Sushi restaurants are still missing, we can combine this two parts of data and do clustering. If neighborhoods in Toronto look very similar as their counterparts in New York City, it most likely implies that we should also open a Sushi restaurant in those neighborhoods too.

The selected clustering algorithm is K-means. I set the parameter k (indicating the number of resulting clusters) to 6.

Results

The results tell that there is only one cluster that contains Toronto neighborhoods and New York City neighborhoods and most importantly, the New York City neighborhoods take the majority, as shown in Figure 7.

	City	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
23	Toronto	Little Portugal, Trinity	Restaurant	Italian Restaurant	Café	Vegetarian / Vegan Restaurant	Bar	Bakery	Cocktail Bar	Coffee Shop	Pizza Place	Asian Restaurant
59	NY	North Riverdale	Pizza Place	Italian Restaurant	Bank	Bagel Shop	Grocery Store	Mexican Restaurant	Mobile Phone Shop	Donut Shop	Sandwich Place	Coffee Shop
60	NY	Bensonhurst	Chinese Restaurant	Italian Restaurant	Sushi Restaurant	Pizza Place	Donut Shop	Ice Cream Shop	Dessert Shop	Cha Chaan Teng	Supermarket	Smoke Shop
61	NY	Brighton Beach	Russian Restaurant	Beach	Restaurant	Mobile Phone Shop	Bank	Eastern European Restaurant	Pharmacy	Sushi Restaurant	Donut Shop	Gourmet Shop
62	NY	Prospect Lefferts Gardens	Café	Pizza Place	Caribbean Restaurant	Chinese Restaurant	Sushi Restaurant	Supermarket	Bakery	Indian Restaurant	Garden	Grocery Store
63	NY	North Side	Coffee Shop	Pizza Place	Yoga Studio	Bakery	Wine Bar	Vegetarian / Vegan Restaurant	Sushi Restaurant	Shoe Store	Salon / Barbershop	Juice Bar
64	NY	South Side	Bar	Coffee Shop	American Restaurant	Pizza Place	Wine Bar	Yoga Studio	South American Restaurant	Caribbean Restaurant	Cycle Studio	Grocery Store
65	NY	Yorkville	Italian Restaurant	Coffee Shop	Sushi Restaurant	Gym	Japanese Restaurant	Bar	Diner	Deli / Bodega	Ice Cream Shop	Pizza Place
66	NY	Lenox Hill	Italian Restaurant	Café	Pizza Place	Sushi Restaurant	Bank	Gym / Fitness Center	Burger Joint	Cocktail Bar	Coffee Shop	Gym
67	NY	Midtown	Clothing Store	Hotel	Spa	Theater	Food Truck	Coffee Shop	Sushi Restaurant	Bakery	Bookstore	Pizza Place
68	NY	Greenwich Village	Italian Restaurant	Clothing Store	Sushi Restaurant	Dessert Shop	Indian Restaurant	Café	Coffee Shop	Seafood Restaurant	Boutique	Gym
69	NY	Ridgewood	Mobile Phone Shop	Café	Sushi Restaurant	Bank	Pizza Place	Grocery Store	Bakery	German Restaurant	Mexican Restaurant	Greek Restaurant

Figure 7: Clustering results

Figure 7 indicates that the Toronto neighborhood Little Portugal, Trinity should be selected as a candidate to open a new Sushi restaurant. Because it shares the common venues with their counterparts in New York City, for instance, Pizza place and Asian restaurants.

Discussion

This approach is tailored to select candidate neighborhoods for opening a Sushi restaurant. However it can be easily adapted to make decisions for other business plan, for instance, opening a grocery or even pharmacy.

Conclusions

This report demonstrates a data-driven approach to select Toronto neighborhoods to open Sushi restaurants. Based on Foursqaure venue data, it employs the K-means clustering algorithm to find the Toronto neighborhoods similar as their counterparts in New York City where Sushi restaurants have become popular. As discussed, this approach can be applied to make other business decisions as well.