

What Restaurants Should You Open in the Proximity of Chinese Restaurants in the Toronto Area?

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Introduction: Business Problem

There are thousands of restaurants in Toronto, Canada. They offer many choices to the consumers in Toronto which is very diverse in terms of ethnic groups, religion, and cultural backgrounds. There are a lot of immigrants coming from the world. According to Toronto municipal statistics, 47% of the population in Toronto are immigrants. Based on Wikipedia, there are 631,050 Chinese in the Greater Toronto Area as of the 2016 census, second only to New York City for largest Chinese community in North America.

Chinese food is popular. Chinese restaurants are operating everywhere in the greater Toronto area. Therefore, there is fierce competition if a business owner wants to open a Chinese restaurant. It is natural for the business owner to consider other types of restaurants for Toronto area. Should the business owner open a fast food restaurant or Middle Eastern restaurant?

We will make recommendations based on the evidence from the data at the end of this study. This study is mainly an exploratory study of the data.

Data

Based on definition of our problem, there are many factors that will influence the decision of opening a restaurant in the Toronto area:

- What are the restaurants in the greater Toronto area and their categories (e.g., fast food, traditional American, Middle Eastern, Asian, Japanese, Vietnamese, etc.)
- What are the restaurants that are operating in proximity of Chinese restaurants?
- What is the demand for each restaurant category?

- What is the eating patterns or dining preferences of the consumers in the Toronto area?

It should be noted that this study has some limitations as certain important data is unavailable such as the consumers in the Toronto area and the sales of each restaurants, or the sales of each restaurant category.

The data retrieved by Foursquare API does not have all the data we need. A dataset of Toronto restaurants from Kaggle (see reference #2) will be used along with the data from Foursquare API.

Methodology

The methodology consists of five parts:

- I. Explore the dataset of Toronto restaurants from Kaggle;
- II. Identify all Chinese restaurants from the Kaggle dataset;
- III. Use **Foursquare API** to find out the restaurants within 500-meter radius of Chinese restaurants;
- IV. Find the most popular restaurant category in the proximity of Chinese restaurants
- V. Develop business recommendations using both datasets (Kaggle and Foursquare API)

The final data frame will contain the following information:

- Chinese restaurant's name, latitude, longitude;
- All the restaurants in the proximity of Chinese restaurants.

Analysis

Restaurants in Toronto

Below is a sample of the data from Kaggle. It has the information of 15,821 restaurants in the greater Toronto Area. It has nine columns including *Category*, *Restaurant Address*, *Restaurant Name*, *Restaurant Phone*, *Restaurant Price Range*, *Restaurant Website*, *Restaurant Yelp URL*, *Restaurant Latitude*, and *Restaurant Longitude*.

	Category	Restaurant Address	Restaurant Name	Restaurant Phone	Restaurant Price Range	Restaurant Website	Restaurant Yelp URL	Restaurant Latitude	Restaurant Longitude
0	Afghan	14 Prince Arthur Avenue\nToronto, ON M5R 1A9	The Host	(416) 962-4678	\$11-30	welcometohost.com	https://www.yelp.ca/adredir?ad_business_id=OFA...	43.669935	-79.395858
1	Afghan	259 Wellington St W\nToronto, ON M5V	Aanch Modernist Indian Cuisine	(647) 558-1508	\$11-30	aanch.ca	https://www.yelp.ca/adredir?ad_business_id=SZu...	43.644708	-79.390670
2	Afghan	736 Bay Street\nToronto, ON M5G 2J8	Silk Road Kabob House	NaN	Under \$10	NaN	https://www.yelp.ca/biz/silk-road-kabob-house-...	43.659816	-79.385591
3	Afghan	691 Yonge Street\nToronto, ON M4Y 2B2	Naan & Kabob	(416) 972-6623	\$11-30	naanandkabob.ca	https://www.yelp.ca/biz/naan-and-kabob-toronto-5	43.669058	-79.386100
4	Afghan	66 Overlea Boulevard\nUnit 62\nToronto, ON M4H...	Afghan Cuisine	(416) 422-5858	\$11-30	afghancuisinerestaurant.com	https://www.yelp.ca/biz/afghan-cuisine-toronto	43.708070	-79.341508
5	Afghan	119 Spadina Avenue\nUnit 101\nToronto, ON M5V 2L1	Pamier Kabob	(647) 352-2623	\$11-30	pamier-kabob.com	https://www.yelp.ca/biz/pamier-kabob-toronto	43.647210	-79.395473
6	Afghan	4205 Keele St\nToronto, ON M3J 2N8	Bamiyan Kabob	(416) 650-0111	\$11-30	bamiyankabob.com	https://www.yelp.ca/biz/bamiyan-kabob-toronto	43.773829	-79.492068
7	Afghan	2307 Markham Road\nToronto, ON M1B 2W3	Kandahar Kabab	(416) 609-8666	\$11-30	kandaharkabab.com	https://www.yelp.ca/biz/kandahar-kabab-toronto	43.812544	-79.242368
8	Afghan	707 Dundas Street W\nToronto, ON M5T 2W6	Mazar's Kitchen	(647) 868-4290	NaN	NaN	https://www.yelp.ca/biz/mazars-kitchen-toronto	43.651766	-79.404965
9	Afghan	2298A Islington Avenue\nToronto, ON M9W 3X2	Afghan Kebob Cuisine	(416) 546-4238	Under \$10	afghankebobcuisine.com	https://www.yelp.ca/biz/afghan-kebob-cuisine-t...	43.716049	-79.555686

There are 126 categories of restaurants in the Toronto area. The following figure shows the overall distribution of the restaurants.

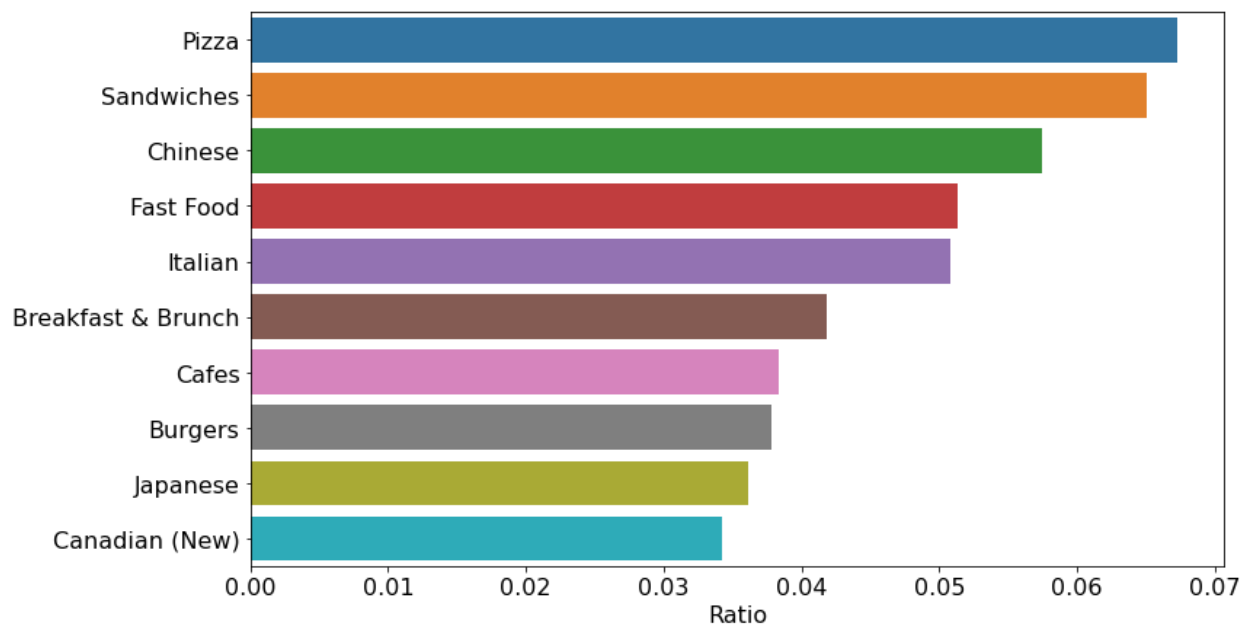
Out [92]:

	Category	Ratio
0	Pizza	0.067316
1	Sandwiches	0.065040
2	Chinese	0.057455
3	Fast Food	0.051324
4	Italian	0.050755
...
121	Burmese	0.000126
122	Slovakian	0.000126
123	Pop-Up Restaurants	0.000063
124	Hong Kong Style Cafe	0.000063
125	Mauritius	0.000063

126 rows × 2 columns

The most popular restaurant category is pizza which accounts for 6.73% of all the restaurants in Toronto. It is interesting to note that Chinese restaurants ranks the third in the list, following pizza and sandwiches.

The top ten restaurant categories out of the 15,821 restaurants in the greater Toronto Area is shown below.

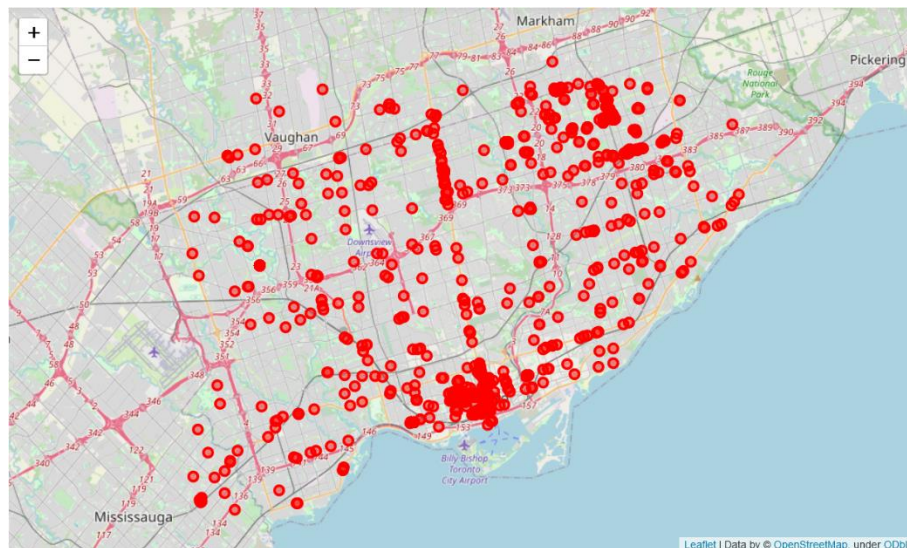


Restaurants Within 500-meter Radius of Chinese Restaurants

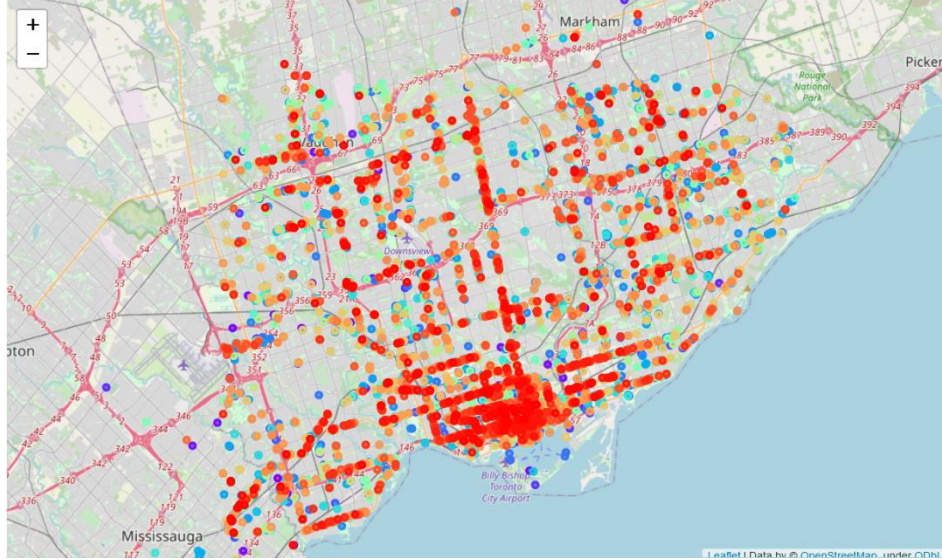
We can extract all the Chinese restaurants from the Kaggle dataset. See the figure below.

	Category	Restaurant Address	Restaurant Name	Restaurant Phone	Restaurant Price Range	Restaurant Website	Restaurant Yelp URL	Restaurant Latitude	Restaurant Longitude
0	Chinese	309 Spadina Avenue Toronto, ON M5T 2E6	Swatow Restaurant	(416) 977-0601	\$11-30	NaN	https://www.yelp.ca/biz/swatow-restaurant-toronto	43.653836	-79.398109
1	Chinese	66 Edward Street Toronto, ON M5H 1C9	GB Hand-pulled Noodles	NaN	\$11-30	NaN	https://www.yelp.ca/biz/gb-hand-pulled-noodles-...	43.656641	-79.383747
2	Chinese	214 King Street W Toronto, ON M5G 3S6	Lee Chen Asian Bistro	(416) 519-8688	\$11-30	leechenbistro.com	https://www.yelp.ca/biz/lee-chen-asian-bistro-...	43.647369	-79.386763
3	Chinese	328 Spadina Avenue Toronto, ON M5T 2E7	Dumpling House Restaurant	(416) 596-8898	Under \$10	NaN	https://www.yelp.ca/biz/dumpling-house-restaur-...	43.653790	-79.398698
4	Chinese	503 College Street Toronto, ON M6G 1A5	DaiLo	(647) 341-8882	\$31-60	dailoto.com	https://www.yelp.ca/biz/dailo-toronto	43.655808	-79.409905
5	Chinese	2181 Bloor Street W Toronto, ON M6S 1N2	Delights of China	(416) 762-2888	Under \$10	NaN	https://www.yelp.ca/biz/delights-of-china-toronto	43.651263	-79.474637
6	Chinese	DoubleTree by Hilton	Lai Wah Heen	(416) 977-9899	\$31-60	laiwahheen.com	https://www.yelp.ca/biz/lai-wah-heen-toronto	43.654671	-79.386172
7	Chinese	472 Dundas Street W Toronto, ON M5T 1G8	Hong Kong Bistro Cafe	(416) 598-9188	Under \$10	NaN	https://www.yelp.ca/biz/hong-kong-bistro-cafe-...	43.653312	-79.396844
8	Chinese	263 Spadina Avenue Toronto, ON M5T 2E3	Homemade Ramen	(647) 352-6068	Under \$10	NaN	https://www.yelp.ca/biz/homemade-ramen-toronto	43.652390	-79.397391
9	Chinese	123 Queen Street W Toronto, ON M5H 3M9	Noodle King	(416) 861-9398	Under \$10	NaN	https://www.yelp.ca/biz/noodle-king-toronto	43.651181	-79.384465

The following map shows the distribution of all the Chinese restaurants. A consumer can easily find a Chinese restaurant in Toronto because there are almost a thousand Chinese restaurants.



We can add all other restaurants in the same map with marker size and color adjusted.



With the latitude values and the longitude values of Chinese restaurants, we can send search queries using [Foursquare API](#) and obtain the restaurants within 500-meter of each Chinese restaurants.

The following figure shows a sample of the dataset of restaurants within the specified radius of Chinese restaurants. The “Venue Category” shows the type of restaurant.

	Chinese Restaurant	CR Latitude	CR Longitude	Nearby Restaurant	Venue Latitude	Venue Longitude	Venue Category
0	Swatow Restaurant	43.653836	-79.398109	Banh Mi Nguyen Huong	43.653628	-79.398376	Vietnamese Restaurant
1	Swatow Restaurant	43.653836	-79.398109	Seven Lives - Tacos y Mariscos	43.654418	-79.400545	Mexican Restaurant
2	Swatow Restaurant	43.653836	-79.398109	Xam Yu	43.655108	-79.398882	Chinese Restaurant
3	Swatow Restaurant	43.653836	-79.398109	Thai Noodle	43.655030	-79.399456	Thai Restaurant
4	Swatow Restaurant	43.653836	-79.398109	FILM CAFE	43.655109	-79.402342	Comfort Food Restaurant
5	Swatow Restaurant	43.653836	-79.398109	Thai Country Kitchen	43.656159	-79.399423	Thai Restaurant
6	Swatow Restaurant	43.653836	-79.398109	Wafels and More	43.654651	-79.401977	Belgian Restaurant
7	Swatow Restaurant	43.653836	-79.398109	Hibiscus	43.655454	-79.402439	Vegetarian / Vegan Restaurant
8	Swatow Restaurant	43.653836	-79.398109	Urban Herbivore	43.656193	-79.402673	Vegetarian / Vegan Restaurant
9	Swatow Restaurant	43.653836	-79.398109	Vegetarian Haven	43.656016	-79.392758	Vegetarian / Vegan Restaurant
10	Swatow Restaurant	43.653836	-79.398109	El Trompo	43.655832	-79.402561	Mexican Restaurant
11	Swatow Restaurant	43.653836	-79.398109	Buddha's Vegetarian	43.651904	-79.403312	Vegetarian / Vegan Restaurant
12	Swatow Restaurant	43.653836	-79.398109	Otto's Berlin Döner	43.656387	-79.402788	Doner Restaurant

Results and Discussion

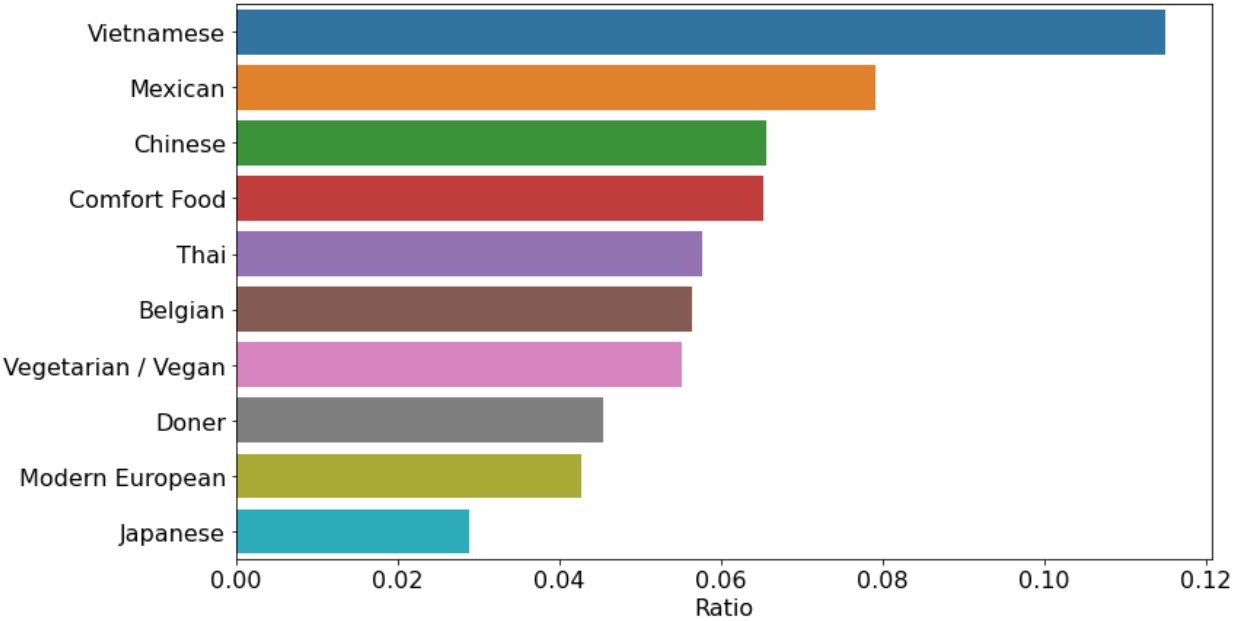
Extracting the column “Venue Category” from the data frame, we can understand what are the popular restaurants in the proximity of Chinese restaurants. Before this study, it is natural to think the most popular restaurants in the proximity of a Chinese restaurant should still be a Chinese restaurant. It is not the case in

Toronto. The following two figures show the distribution of the restaurant categories within the specified distance from Chinese restaurants.

Out[91]:

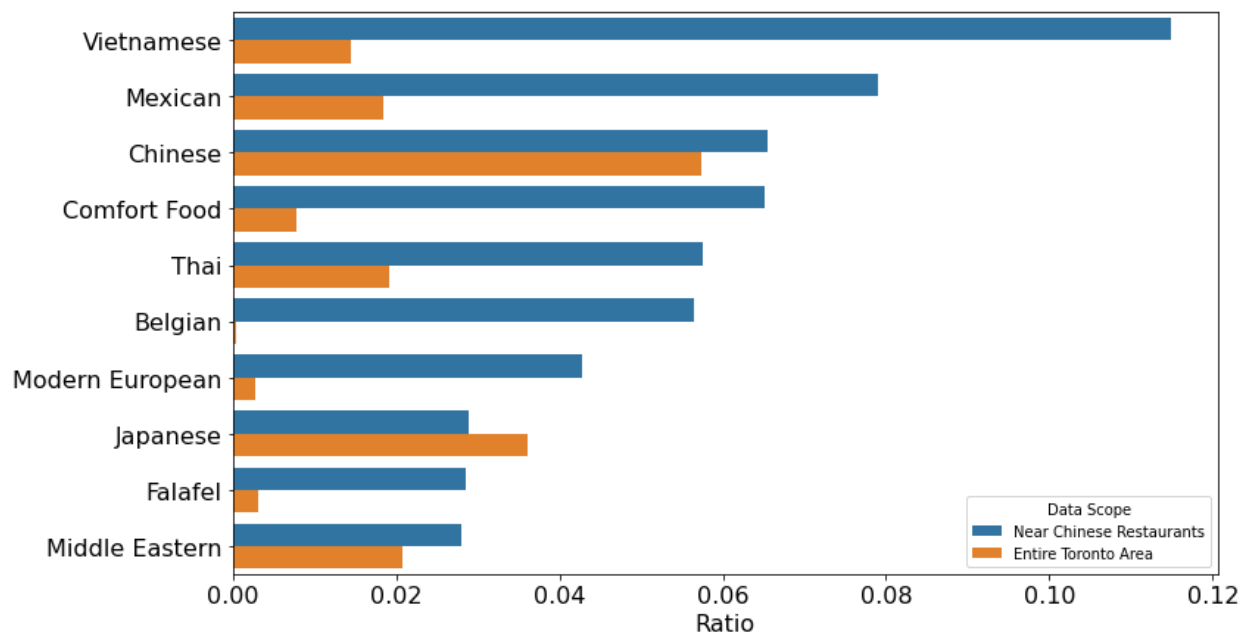
	Category	Ratio-cn
0	Vietnamese	0.124383
1	Mexican	0.076505
2	Chinese	0.065030
3	Thai	0.064042
4	Comfort Food	0.058983
...
71	Burmese	0.000123
72	Kebab	0.000123
73	Hakka	0.000123
74	Szechuan	0.000123
75	Swiss	0.000123

76 rows × 2 columns



The bar chart above shows that the most **common** restaurant category is Vietnamese (12.4%) followed by Mexican (7.7%). Vietnamese restaurant is the clear winner in terms of quantity in the proximity of Chinese restaurant in the Toronto area. Note that Vietnamese restaurants accounts for just 1.4% of the restaurants for the entire Toronto area. However, within 500-meter radius of Chinese restaurants, Vietnamese restaurants’ proportion increases to 12.4%, far exceeding the second category.

The following figure shows the changes, when we compare the restaurants of Toronto and the ones in the proximity of Chinese restaurants.



Conclusion

1. The most common restaurant of the entire Toronto area is pizza.
2. Although there are numerous categories of restaurants operating in the proximity of Chinese restaurants, it is clear that the restaurants within 500-meter radius of Chinese restaurants are showing a different distribution from the entire Toronto area. That means the consumers for Chinese restaurants may have different dining preferences. The top ten restaurant categories within 500-meter radius of Chinese restaurants are noticeably different, compared with the Toronto area.
3. Based on the data pattern, the top three choices of opening a restaurant near Chinese restaurants in Toronto area are: Vietnamese, Mexican, and Chinese.

References

1. Toronto population: <https://en.wikipedia.org/wiki/Toronto#Population>
2. Toronto restaurant dataset from Kaggle: <https://www.kaggle.com/kevinbi/toronto-restaurants/version/1>