

# Open a Restaurant in Vancouver

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## Introduction: Business Problem

Vancouver is a major city in western Canada, located in the Lower Mainland region of British Columbia. As one of the most populous city in Canada, the Greater Vancouver area had a population of 2463431 in 2016. Vancouver has the highest population density in Canada and it is one of the most ethnically and linguistically diverse cities in Canada. If a client would like to open a traditional Chinese restaurant in Vancouver, what areas are the best option to open the restaurant? For a Chinese/Asian restaurant, the location and competition are both determined by where the restaurant is opened. If there are too many Chinese restaurants in the same area, the profitability will be relatively decreased. On the other hand, open a restaurant in a location with higher income will have relatively higher profitability of business than in a poorer location. As a data scientist, we will do a cluster of Chinese/Asian restaurant in the Greater Vancouver neighbourhood, get the average price per customer spends and reviews and rates in those restaurants. We will use Foursquare - an API that provides most updated data regarding food junctions, places to visit, and schools or colleges in the Greater Vancouver area.

## Data

To answer the business problem, we will collect and use the following data:

- Population and ethnic distribution of each neighbourhood (Vancouver Census)
- Number of Chinese/Asian restaurants in each neighbourhood (Foursquare API)
- Number of restaurant in each neighbourhood (Foursquare API)
- Income distribution of each neighbourhood (Vancouver Census)

Reference: <https://opendata.vancouver.ca/explore/dataset/census-local-area-profiles-2016/information/>

## Methodology

1. Combine the Vancouver dataset, containing postal code, latitude and longitude for each postal code in Vancouver, borough, neighbourhood name, and the census dataset into a data frame.

	Borough	Census subdivision type	Postal Code	Neighbourhood	Latitude	Longitude
0	Vancouver	City	V6A	Downtown	49.267224	-123.086623
1	Vancouver	City	V6B	Downtown	49.278226	-123.105780
2	Vancouver	City	V6C	Downtown	49.291810	-123.115989
3	Vancouver	City	V6E	West End	49.287537	-123.120389
4	Vancouver	City	V6G	West End	49.299723	-123.137791
5	Vancouver	City	V6H	Fairview	49.257747	-123.132920
6	Vancouver	City	V6J	Kitsilano	49.261613	-123.145796
7	Vancouver	City	V5K	Hastings-Sunrise	49.282336	-123.040000
8	Vancouver	City	V6K	Kitsilano	49.269377	-123.165066
9	Vancouver	City	V5L	Grandview	49.278839	-123.066843
10	Vancouver	City	V6L	Arbutus Ridge	49.257545	-123.164338
11	Vancouver	City	V5M	Hastings-Sunrise	49.258053	-123.040160
12	Vancouver	City	V6M	Oakridge	49.235985	-123.145346
13	Vancouver	City	V5N	Grandview-Woodland	49.253451	-123.066314
14	Vancouver	City	V6N	Kerrisdale	49.219427	-123.190169
15	Vancouver	City	V5P	Victoria-Fraserview	49.222370	-123.068315
16	Vancouver	City	V6P	Kerrisdale	49.224650	-123.168739
17	Vancouver	City	V5R	Renfrew-Collingwood	49.240005	-123.041204
18	Vancouver	City	V6R	West Point Grey	49.267408	-123.196332
19	Vancouver	City	V5S	Killarney	49.215677	-123.041565
20	Vancouver	City	V5T	Mount Pleasant	49.261967	-123.091193
21	Vancouver	City	V5V	Kensington-Cedar Cottage	49.247634	-123.090621
22	Vancouver	City	V5W	Riley Park-Little Mountain	49.232961	-123.091285
23	Vancouver	City	V5X	Sunset	49.215172	-123.097003
24	Vancouver	City	V7X	Downtown	49.287537	-123.120389
25	Vancouver	City	V5Y	Mount Pleasant	49.229201	-123.116383
26	Vancouver	City	V7Y	Downtown	49.282453	-123.119162
27	Vancouver	City	V5Z	South Cambie	49.240630	-123.118206
28	Vancouver	City	V6Z	Downtown	49.278043	-123.127778

Table 1. Latitude and Longitude of each postal code within Vancouver.

2. Visualize the location of different postal codes in Vancouver to obtain the general understanding of the location.

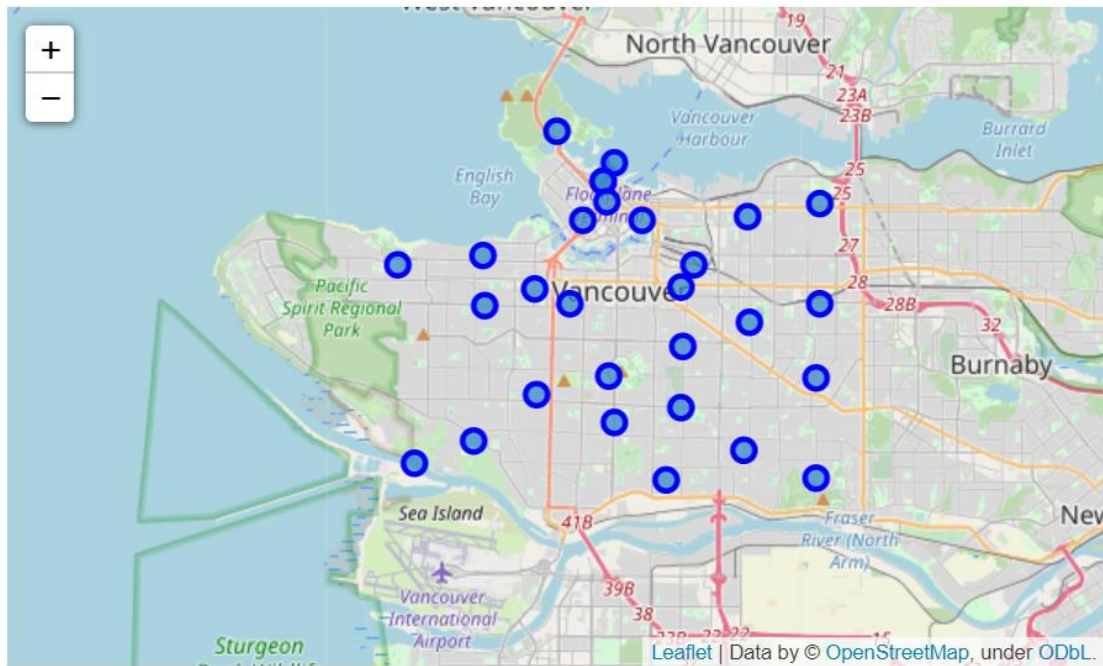


Figure 1. Location of each postal code within Vancouver.

3. After the regions being visualized, the Foursquare API can be used to explore each neighbourhood and return the top 200 venues within 4000 meters of the latitude and longitude for each postal codes.

	name	categories	lat	lng
0	Peaceful Restaurant 和平飯店	[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	49.263086	-123.115808
1	Congee Noodle House 粥麵館 (Congee Noodle House)	[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	49.263029	-123.102105
2	Lin's Chinese Cuisine and Tea House	[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	49.263776	-123.139698
3	Sun Sui Wah	[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	49.250589	-123.100805
4	Long's Noodle House 小龍記麵家	[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	49.241244	-123.101591

Table 5. Latitude and Longitude of Chinese/Asian restaurants within Vancouver (first five rows).

	name	categories	lat	lng
0	Lemonade Gluten Free Bakery	[{"id": "4bf58dd8d48988d16a941735", "name": "B...", "categories": "Bakery", "lat": 49.255158, "lng": -123.115276}]	49.255158	-123.115276
1	Corduroy Pie Company	[{"id": "4bf58dd8d48988d1ca941735", "name": "P...", "categories": "Pie", "lat": 49.257053, "lng": -123.121265}]	49.257053	-123.121265
2	Vij's	[{"id": "4bf58dd8d48988d10f941735", "name": "I...", "categories": "Indian", "lat": 49.257525, "lng": -123.115083}]	49.257525	-123.115083
3	Seasons in the Park	[{"id": "4bf58dd8d48988d1ce941735", "name": "S...", "categories": "Seasons", "lat": 49.242021, "lng": -123.112055}]	49.242021	-123.112055
4	Indian Roti Kitchen	[{"id": "4bf58dd8d48988d10f941735", "name": "I...", "categories": "Indian", "lat": 49.258950, "lng": -123.115087}]	49.258950	-123.115087

Table 6. Latitude and Longitude of restaurants within Vancouver (first five rows).

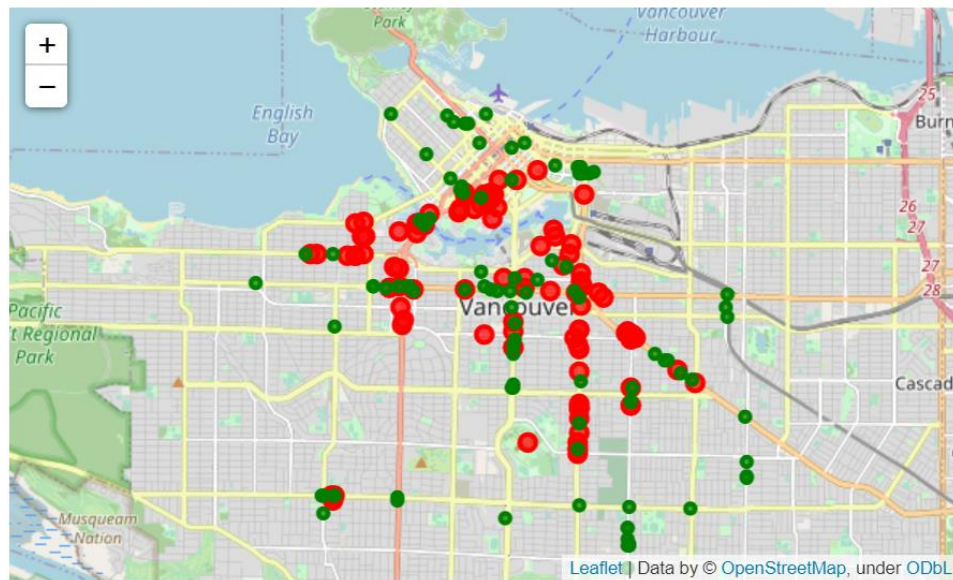


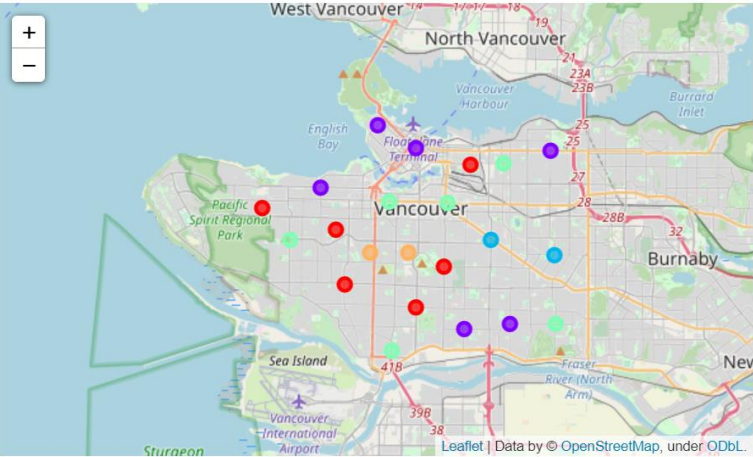
Figure 2. Location of restaurants.(Green:Chinese restaurants, red: other restaurants)

4. Using the income distribution of each neighbourhood, the purchasing power of each area was calculated using median of each category weighted by the number of people in that income category, which represents the overall capital of each area.

	Neighbourhood	Population	Purchasing Power	Latitude	Longitude
0	Arbutus-Ridge	15295	0.643215	49.2534	-123.1604
1	Downtown	62030	1.550014	49.2820	-123.1171
2	Dunbar-Southlands	21425	0.801924	49.2500	-123.1852
3	Fairview	33620	0.858485	49.2635	-123.1313
4	Grandview-Woodland	29175	0.886697	49.2767	-123.0695

Table 7. Purchasing power of each neighbourhood within Vancouver (first five rows).

Then use the population, purchasing power, to train KMeans clustering.



Cluster	Purchasing Power
0	Yellow 0-0.3
1	Red 0.3-0.7
2	Green 0.7-1.1
3	Purple 1.1-1.6
4	Blue 1.6-2

Table 8. Indication of the purchasing power.

Figure 2. Result of the clustering algorithm.

Results

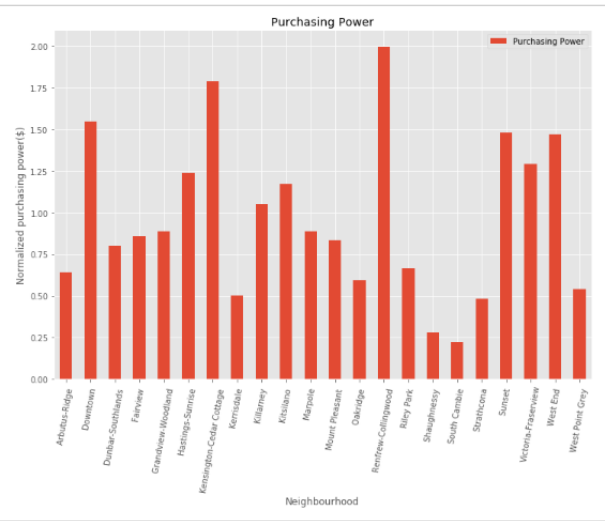


Figure 3. A bar graph shows the purchasing power of each neighbourhood within Vancouver.

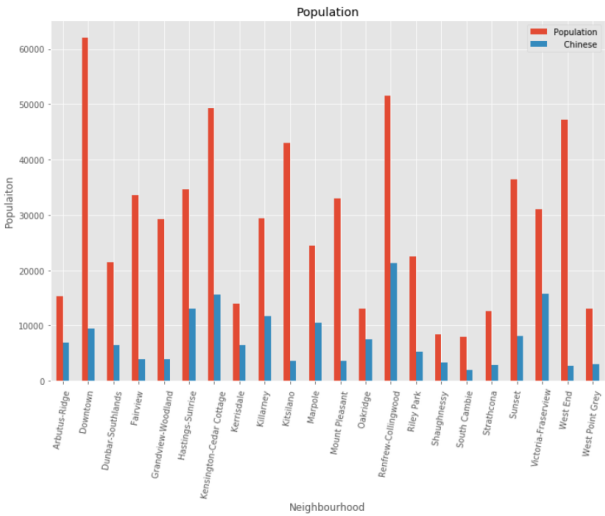


Figure 4. A bar graph shows the populaiton and Chinese population from each neighbourhood within Vancouver.

By joining the dataframe of minority population in Vancouver and dataframe of purchasing power I get Table 9:

	Neighbourhood	South Asian	Chinese	Black	Filipino	Latin American	Arab	Southeast Asian	West Asian	Korean	Japanese	Population	Purchasing Power	Latitude	Longitude
0	Arbutus-Ridge	290	6970	45	105	75	35	100	190	495	220	15295	0.643215	49.2534	-123.1604
1	Downtown	2610	9490	655	1105	1585	855	875	3620	2275	1460	62030	1.550014	49.2820	-123.1171
2	Dunbar-Southlands	400	6525	120	165	175	55	115	85	195	235	21425	0.801924	49.2500	-123.1852
3	Fairview	885	3865	380	645	485	140	220	425	420	585	33620	0.858485	49.2635	-123.1313
4	Grandview-Woodland	545	3885	505	875	455	90	670	130	135	440	29175	0.886697	49.2767	-123.0695

Table 9. Minority population distribution from each neighbourhood within Vancouver (first five rows).

## Discussion

From the results of clustering (Figure 2), it was determined that the neighbourhoods corresponding to clusters in blue (Renfrew-Collingwood, Kensington-Cedar Cottage) were the best choices for opening an Chinese restaurant based on the normalized purchasing power. Based on the bar graph of population and Chinese population distribution(Figure 4), it was determined that Renfrew-Collingwood and Kensington-Cedar Cottage were the best choices for opening a Chinese restaurant. In the Kensington-Cedar Cottage neighbourhood, there are relative less Chinese restaurant competitors.

## Conclusion

Opening a restaurant or starting a business is a difficult and complex task, especially Canada is a multicultural country and Vancouver is a very diverse city. Thus, given the above analysis and results, I will recommend the client to open the Chinese restaurant in Kensington-Cedar Cottage or Renfrew-Collingwood area.