



Battle of Neighborhoods

Best location for a new Chinese restaurant



which neighborhood can win

- The one which has large Chinese population
 - The one which has highest average income
 - The one which has not enough Chinese restaurants yet
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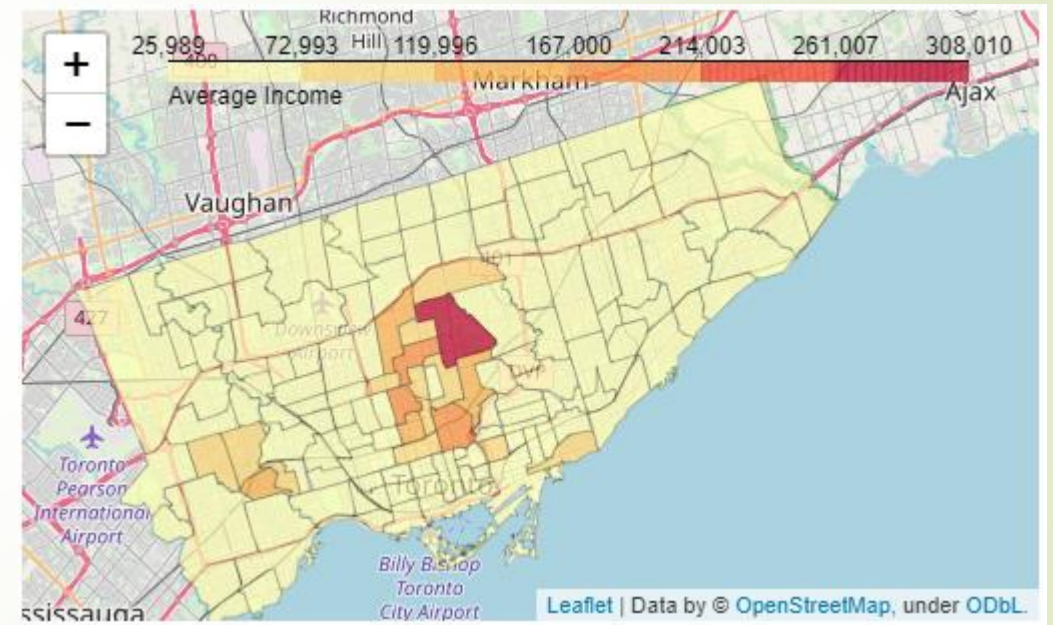


Data acquisition and cleaning

- Census data including Asian population, Chinese population, and average income is scraped from Toronto open data (<https://open.toronto.ca/dataset/neighbourhood-profiles/>)
- Postcode and neighbourhood is scrapped from Wikipedia (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)
- Toronto geospatial data including the latitude and longitude of each neighbourhood (https://cocl.us/Geospatial_data)
- Number of Chinese restaurant of each neighborhood (Foursquare API)

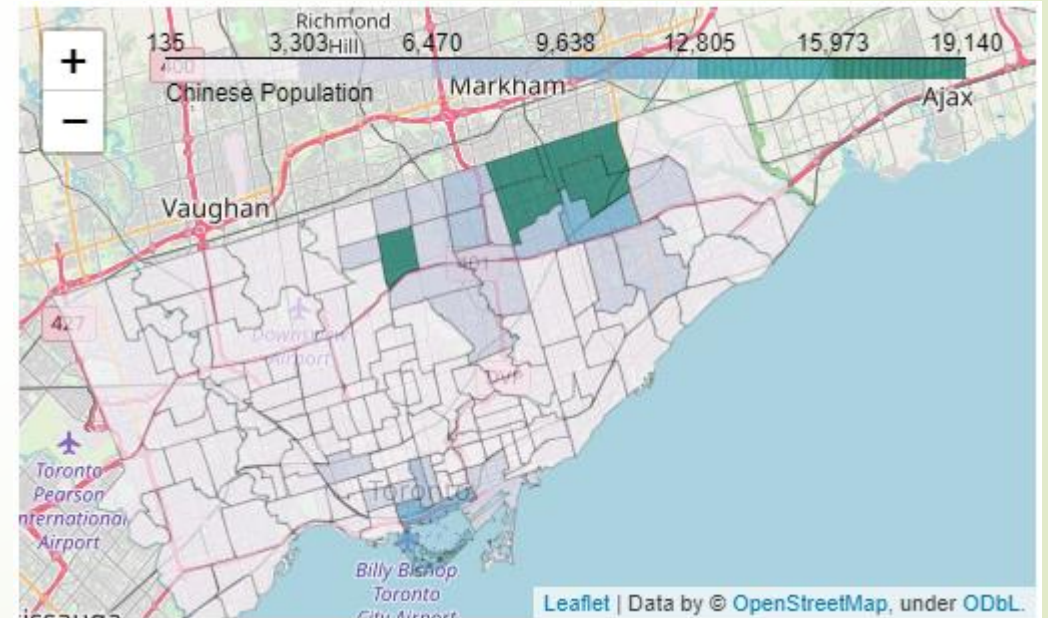
Average Income Distribution

index	Neighbourhood	Neighbourhood Number	Asian origins	Chinese	Total income: Average amount (\$)
16	Bridle Path-Sunnybrook-York Mills	41.0	3005.0	1445.0	308010.0
104	Rosedale-Moore Park	98.0	3485.0	1300.0	207903.0
44	Forest Hill South	101.0	1880.0	560.0	204521.0
69	Lawrence Park South	103.0	2510.0	935.0	169203.0
21	Casa Loma	96.0	1480.0	450.0	165047.0
64	Kingsway South	15.0	1085.0	335.0	144642.0
70	Leaside-Bennington	56.0	2740.0	1125.0	125564.0
9	Bedford Park-Nortown	39.0	5210.0	1185.0	123077.0
137	Yonge-St.Clair	97.0	2330.0	645.0	114174.0
3	Annex	95.0	6485.0	2400.0	112766.0



Chinese Population Distribution

index	Neighbourhood	Neighbourhood Number	Asian origins	Chinese	Total income: Average amount (\$)
76	Milliken	130.0	23750.0	19140.0	28085.0
112	Steeles	116.0	21160.0	17835.0	31786.0
129	Willowdale East	51.0	36920.0	17240.0	45326.0
0	Agincourt North	129.0	24305.0	16950.0	30414.0
66	L'Amoreaux	117.0	30785.0	16745.0	31826.0
1	Agincourt South-Malvern West	128.0	17955.0	11455.0	31825.0
122	Waterfront Communities-The Island	77.0	24810.0	9790.0	70600.0
114	Tam O'Shanter-Sullivan	118.0	17925.0	9070.0	34200.0
52	Hillcrest Village	48.0	12030.0	8265.0	40442.0
6	Bay Street Corridor	76.0	15040.0	7585.0	56526.0



Merge census data by Postcode

	Asian origins	Chinese	Total income: Average amount (\$)
Postcode			
M1B	57160.0	7120.0	34564.500000
M1C	7175.0	1195.0	40972.000000
M1E	21485.0	2965.0	39605.666667
M1G	32850.0	4385.0	30878.000000
M1J	8120.0	665.0	32913.000000
M1K	29645.0	4535.0	32863.000000
M1L	7305.0	825.0	26793.000000
M1M	9895.0	2530.0	49539.000000
M1P	33855.0	7880.0	32474.000000
M1S	17955.0	11455.0	31825.000000

Asian origins and Chinese Population is sum up for neighbourhoods with same postcode.

Total income is calculated mean value when merging several neighbourhoods.

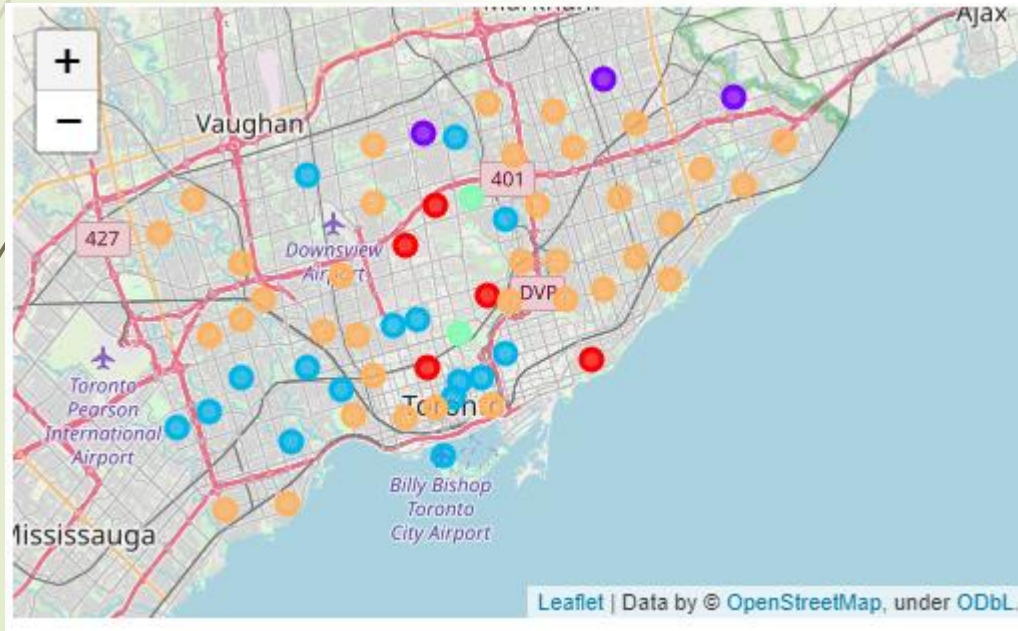
Use Foursquare API to find Chinese restaurants

	Neighbourhood	Chinese Restaurant Count
13	Church and Wellesley	100
50	The Annex, North Midtown, Yorkville	100
41	Little Portugal, Trinity	100
28	Harbourfront, Regent Park	100
9	Cabbagetown, St. James Town	100
11	Central Bay Street	100
12	Chinatown, Grange Park, Kensington Market	100
38	L'Amoreaux West	93
1	Agincourt North, L'Amoreaux East, Milliken, St...	89
8	CN Tower, Bathurst Quay, Island airport, Harbo...	85

Combined all data together

	Cluster Labels	Postcode	Borough	Neighbourhood	Latitude	Longitude	Asian origins	Chinese	Total income: Average amount (\$)	Chinese Restaurant Count
0	0	M1V	Scarborough	Agincourt North, L'Amoreaux East, Milliken, St...	43.815252	-79.284577	107920.0	75150.0	33871.4	89
1	0	M2M	North York	Newtonbrook, Willowdale	43.789053	-79.408493	62290.0	24790.0	41814.0	18
2	3	M1S	Scarborough	Agincourt	43.794200	-79.262029	17955.0	11455.0	31825.0	80
3	1	M4K	East Toronto	The Danforth West, Riverdale	43.679557	-79.352188	20830.0	10760.0	61487.2	25
4	3	M2J	North York	Fairview, Henry Farm, Oriole	43.778517	-79.346556	28930.0	10755.0	36869.0	28
5	1	M5P	Central Toronto	Forest Hill North, Forest Hill West	43.696948	-79.411307	28080.0	10175.0	77849.5	12
6	3	M1T	Scarborough	Clarks Corners, Sullivan, Tam O'Shanter	43.781638	-79.304302	17925.0	9070.0	34200.0	68
7	3	M2H	North York	Hillcrest Village	43.803762	-79.363452	12030.0	8265.0	40442.0	26
8	3	M1P	Scarborough	Dorset Park, Scarborough Town Centre, Wexford ...	43.757410	-79.273304	33855.0	7880.0	32474.0	16
9	1	M5G	Downtown Toronto	Central Bay Street	43.657952	-79.387383	15040.0	7585.0	56526.0	100

K-Mean Clustering to analyze neighbourhoods



$K = 5$

Limit = 500

Radius = 3000m

Query using Chinese restaurant categoryId

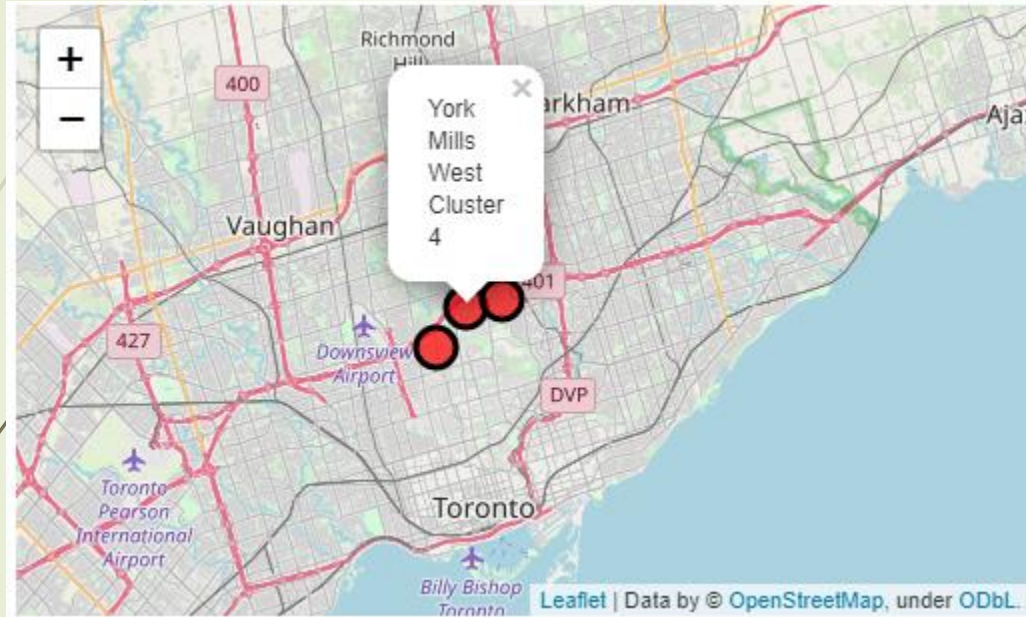
	Cluster	Meaning	Color
0	cluster 0	low income, high population	Purple
1	cluster 1	middle income	Blue
2	cluster 2	high income, middle low population	Turquoise
3	cluster 3	low income	Orange
4	cluster 4	middle high income, middle population	Red

Calculate Chinese Restaurant Density

Investigate cluster 2 and cluster 4 for the reason of high income and relatively high Chinese population. Chinese restaurant density is calculated by Chinese restaurants counts/Chinese Population.

	Cluster Labels	Postcode	Borough	Neighbourhood	Latitude	Longitude	Asian origins	Chinese	Total income: Average amount (\$)	Chinese Restaurant Count	Restaurant/Person
20	4	M2P	North York	York Mills West	43.752758	-79.400049	8615.0	3890.0	100516.0	11	0.002828
38	4	M5M	North York	Bedford Park, Lawrence Manor East	43.733283	-79.419750	5210.0	1185.0	123077.0	7	0.005907
33	2	M2L	North York	Silver Hills, York Mills	43.757490	-79.374714	3005.0	1445.0	308010.0	9	0.006228
39	4	M4G	East York	Leaside	43.709060	-79.363452	2740.0	1125.0	125564.0	10	0.008889
47	4	M4E	East Toronto	The Beaches	43.676357	-79.293031	2680.0	765.0	92580.0	9	0.011765
34	2	M4T	Central Toronto	Moore Park, Summerhill East	43.689574	-79.383160	3485.0	1300.0	207903.0	23	0.017692
27	4	M5R	Central Toronto	The Annex, North Midtown, Yorkville	43.672710	-79.405678	6485.0	2400.0	112766.0	100	0.041667

Conclusion



The next two neighbourhoods are "Bedford Park, Lawrence Manor East" and "Silver Hills, York Mills". The next two neighbourhoods are "Bedford Park, Lawrence Manor East" and "Silver Hills, York Mills".

