



CAPSTONE PROJECT

EXPANDING DESSERT BUSINESS TO ONE OR MORE DISTRICTS IN HONG KONG

By Priscilla Yip

1 Jun 2019

Background

- Hong Kong is named Gourmet Paradise for the variety of cuisines and numerous good restaurants.
- Competitions among restaurants are very intense.
- Location is of utmost importance to run a restaurant successfully in Hong Kong.
- Ground level location is usually preferred due to high footfall. However, this option is also the most expensive.

Problem Description

- Mr A, a culinary business owner, opened a dessert shop in Mong Kok (in Yau Tsim Mong District) two years back. The business is making profits lately.
- He would like to leverage on his success with this dessert shop to open more in other areas.
- He wants to open shops in areas with similar surrounding environment as Mong Kok.
- He is targeting ground level locations which are adjacent to other restaurants, shopping malls or other attractions with high footfall.
- Mr A is puzzling how to select the best locations based on these criteria.

Data Source

- Coordinates of the 18 districts:

Nominatim API

- Population by district

https://www.censtatd.gov.hk/hkstat/sub/sp150_tc.jsp?productCode=FA100096

- Area by district

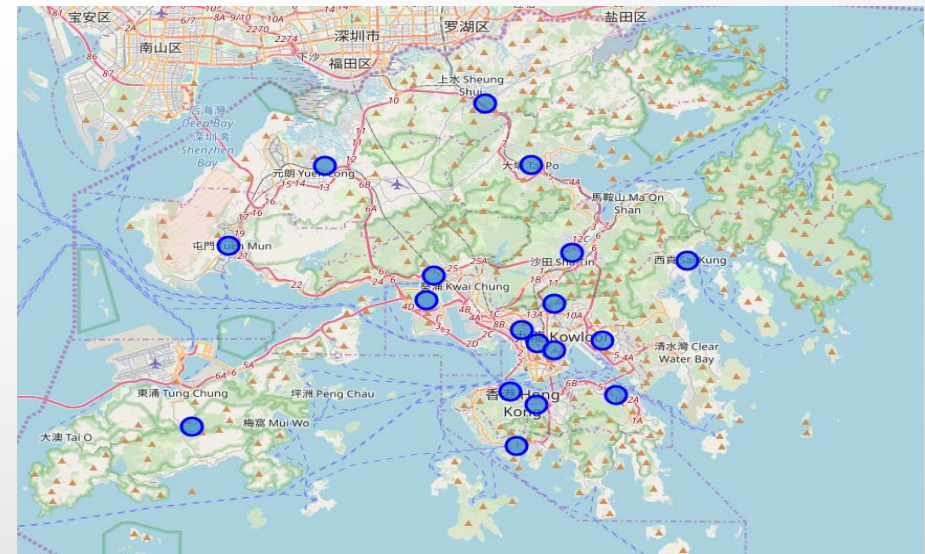
<https://zh.wikipedia.org/wiki/%E9%A6%99%E6%B8%AF%E8%A1%8C%E6%94%BF%E5%8D%80%E5%8A%83>

- Location data

Foursquare API

Data Set

	District	Latitude	Longitude	Female	Male	Total Population	0-14	15-24	45-64	25-44	65+	Median age	Area (km2)	radius	Density
0	Central and Western	22.286660	114.15497	133900	107700	241600	23918	25368	76104	77554	38656	43	12.44	1.990423	19421.221865
1	Wan Chai	22.277020	114.17232	101100	78300	179400	17761	15608	57408	59561	29242	44	9.83	1.769343	18250.254323
2	Eastern	22.284110	114.22414	301600	244800	546400	63382	51908	167198	173755	90156	43	18.56	2.431219	29439.655172
3	Southern	22.247250	114.15884	145400	118500	263900	30612	25598	82073	84184	41432	43	38.85	3.517472	6792.792793
4	Yau Tsim Mong	22.321380	114.17260	179800	153800	333600	37363	36362	102749	108086	49373	42	6.99	1.492017	47725.321888
5	Sham Shui Po	22.330983	114.16224	215600	185000	400600	49274	40461	122984	125788	61692	42	9.35	1.725603	42844.919786
6	Kowloon City	22.316670	114.18333	225800	186100	411900	47780	41602	127277	132220	62609	43	10.02	1.786360	41107.784431
7	Wong Tai Sin	22.350000	114.18333	224800	195800	420600	44584	45004	119871	137116	74026	45	9.30	1.720983	45225.806452
8	Kwun Tong	22.323300	114.21540	355300	308800	664100	79028	67738	195245	208527	113561	43	11.27	1.894511	58926.353150
9	Kwai Tsing	22.352880	114.10004	270400	237200	507600	58882	53806	152280	159894	82739	43	23.34	2.726375	21748.071979
10	Tsuen Wan	22.370660	114.10479	169000	144600	313600	36064	32301	97216	102234	46099	43	61.71	4.433155	5081.834387
11	Tuen Mun	22.392110	113.97011	256200	224300	480500	54777	50933	142709	160007	71595	43	82.89	5.137907	5796.839184
12	Yuen Long	22.450000	114.03333	334800	290200	625000	75625	68750	196875	188750	94375	41	138.46	6.640447	4513.939044
13	North	22.494710	114.13812	165900	146900	312800	39413	32531	94778	98219	47858	42	136.61	6.595936	2289.729888
14	Tai Po	22.450070	114.16877	164200	139400	303600	35218	30360	92902	100492	44326	43	136.15	6.584821	2229.893500
15	Sha Tin	22.387150	114.19534	367800	309800	677600	78602	71148	196504	220898	110449	44	68.71	4.677838	9861.737738
16	Sai Kung	22.381430	114.27052	252600	211200	463800	52873	47771	143778	147488	71889	42	129.65	6.425715	3577.323563
17	Islands	22.261140	113.94608	88600	71700	160300	18114	17312	53220	47449	24045	41	175.12	7.467978	915.372316



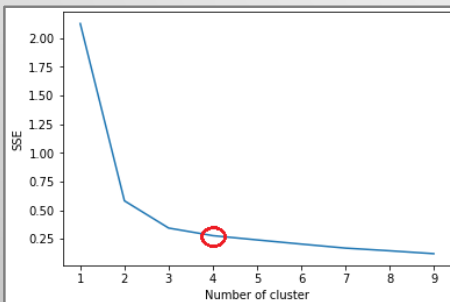
Data Set

District	
Central and Western	100
Eastern	100
Islands	100
Kowloon City	100
Kwai Tsing	77
Kwun Tong	100
North	100
Sai Kung	100
Sha Tin	100
Sham Shui Po	100
Southern	100
Tai Po	68
Tsuen Wan	69
Tuen Mun	61
Wan Chai	100
Wong Tai Sin	44
Yau Tsim Mong	100
Yuen Long	100
Name: Venue, dtype: int64	

	District	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	Density
0	Central and Western	Coffee Shop	Bar	Gym / Fitness Center	Hotel	Yoga Studio	Japanese Restaurant	Café	Cantonese Restaurant	Italian Restaurant	Indian Restaurant	19421.221865
1	Eastern	Park	Chinese Restaurant	Japanese Restaurant	Department Store	Seafood Restaurant	Mountain	Noodle House	Dim Sum Restaurant	Cantonese Restaurant	Coffee Shop	29439.655172
2	Islands	Airport Lounge	Coffee Shop	Bakery	Beach	Trail	Hotel	Gift Shop	Mountain	Seafood Restaurant	Market	915.372316
3	Kowloon City	Dessert Shop	Chinese Restaurant	Hotel	Coffee Shop	Shopping Mall	Noodle House	Toy / Game Store	Beer Bar	Sporting Goods Shop	Snack Place	41107.784431
4	Kwai Tsing	Chinese Restaurant	Park	Shopping Mall	Sushi Restaurant	Japanese Restaurant	Cha Chaan Teng	Market	Coffee Shop	Noodle House	Dessert Shop	21748.071979
5	Kwun Tong	Chinese Restaurant	Coffee Shop	Shopping Mall	Café	Fast Food Restaurant	Hong Kong Restaurant	Multiplex	Sushi Restaurant	Park	Department Store	58926.353150
6	North	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Hotel	Shopping Mall	Café	Noodle House	Dessert Shop	Cha Chaan Teng	Burger Joint	2289.729888
7	Sai Kung	Café	Fast Food Restaurant	Seafood Restaurant	Coffee Shop	Pub	Thai Restaurant	Campground	Chinese Restaurant	Train Station	Beach	3577.323563
8	Sha Tin	Chinese Restaurant	Café	Fast Food Restaurant	Coffee Shop	Train Station	Cantonese Restaurant	Shopping Mall	Park	Hotel	Dessert Shop	9861.737738
9	Sham Shui Po	Noodle House	Chinese Restaurant	Dessert Shop	Dim Sum Restaurant	Coffee Shop	Dumpling Restaurant	Cha Chaan Teng	Shopping Mall	Japanese Restaurant	Cantonese Restaurant	42844.919786
10	Southern	Theme Park Ride / Attraction	Hotel	Café	Fast Food Restaurant	Coffee Shop	Aquarium	Furniture / Home Store	Clothing Store	Shopping Mall	Scenic Lookout	6792.792793
11	Tai Po	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Noodle House	Café	Restaurant	Bakery	Trail	Plaza	Hong Kong Restaurant	2229.893500
12	Tsuen Wan	Chinese Restaurant	Coffee Shop	Park	Hotel	Japanese Restaurant	Dessert Shop	Noodle House	Cantonese Restaurant	Mountain	Cha Chaan Teng	5081.834387
13	Tuen Mun	Seafood Restaurant	Shopping Mall	Fast Food Restaurant	Chinese Restaurant	Coffee Shop	Hong Kong Restaurant	Cantonese Restaurant	Train Station	Italian Restaurant	Park	5796.839184

Methodology

- Clustering model: K-means
- Features: occurrence frequency of venue categories and normalized population density
- Run K-means from $k = 1$ to 10 and plot a line chart with SSE vs number



----Central and Western----			----Eastern----			----Islands----		
	venue	freq		venue	freq		venue	freq
0	Coffee Shop	0.06	0	Park	0.06	0	Airport Lounge	0.09
1	Bar	0.04	1	Chinese Restaurant	0.05	1	Beach	0.06
2	Hotel	0.04	2	Department Store	0.04	2	Coffee Shop	0.05
3	Gym / Fitness Center	0.04	3	Seafood Restaurant	0.04	3	Bakery	0.05
4	Yoga Studio	0.04	4	Japanese Restaurant	0.04	4	Seafood Restaurant	0.03
5	Japanese Restaurant	0.04	5	Fast Food Restaurant	0.03	5	Gift Shop	0.03
6	Italian Restaurant	0.03	6	Mountain	0.03	6	Hotel	0.03
7	French Restaurant	0.03	7	Coffee Shop	0.03	7	Dessert Shop	0.02
8	Ice Cream Shop	0.03	8	Noodle House	0.03	8	Chinese Restaurant	0.02
9	Café	0.03	9	Shopping Mall	0.03	9	Japanese Restaurant	0.02

Results

Cluster 0 : Districts close to airport, or where tourists like to stay and visit

	District	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	Density
0	Central and Western	Coffee Shop	Bar	Gym / Fitness Center	Hotel	Yoga Studio	Japanese Restaurant	Café	Cantonese Restaurant	Italian Restaurant	Indian Restaurant	19421.221865
1	Wan Chai	Hotel	Café	Italian Restaurant	Hotel Bar	Bar	Coffee Shop	Steakhouse	Chinese Restaurant	Szechuan Restaurant	Cantonese Restaurant	18250.254323
3	Southern	Theme Park Ride / Attraction	Hotel	Café	Fast Food Restaurant	Coffee Shop	Aquarium	Furniture / Home Store	Clothing Store	Shopping Mall	Scenic Lookout	6792.792793
17	Islands	Airport Lounge	Coffee Shop	Bakery	Beach	Trail	Hotel	Gift Shop	Mountain	Seafood Restaurant	Market	915.372316