

Application of Machine Learning in Restaurant Industry

by

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Chapter 1

INTRODUCTION

Anyone who works in the restaurant industry knows that it takes time and dedication to be successful. Even still, food industry in Canada has some of the lowest survival rates for new business [2]. For newly opened restaurants, 60% of them could survive beyond their second year and only 22% could survive beyond eight years [2]. This is why opening and maintaining a successful restaurant is not an easy task. It requires proof of concept, dedicated staffs, targeted marketing and realistic financial expectations. Moreover, with the average restaurant profit margins falling between 2.7-7.8% [3], it's vital to set the business up for success from the beginning by having a strategic plan. Without considering the financial aspect in this study, we will come up with a recommendation for a client who is looking to open a Chinese restaurant in York Region.

York Region is a regional municipality in Southern Ontario, Canada, and is part of the Greater Toronto Area. The 2016 census population in York Region was 1,109,909 with a growth rate of 7.5% from 2011 to 2016 [1]. The Government of Ontario expects its population to surpass 1.5 million residents by 2031 [4]. With this large number of potential customers, we need to find a location that is accessible. We should consider things like ease of parking, local events and nearby attractions. Although prime locations could mean higher costs and rent, it could also lead to higher anticipated sale volume. In this study, we will look at population and location data to find a location that is suitable for the client to open the Chinese restaurant. In addition, we should also look into the competitions at the location. This could be done using the location data to find out if there are opportunities for the client to provide something that is not yet available.

Chapter 2

DATA

The data used in this study consist of the 2016 census data from Statistics Canada and the location data from Foursquare. The 2016 Canadian Census is the most recent detailed enumeration of Canadian residents. The 2016 census reinstated the mandatory long-form census which collects information on the demographic. Three in four households (75%) received the short-form census questionnaire, while one in four households (25%) received the long-form questionnaire. With a response rate of 98.4%, this census is said to be the best one ever recorded.

The location data from Foursquare come from the Foursquare Places API which offers real-time access to Foursquare's global database. This allows us to perform geotagging and venue search. In addition, we could leverage the 900+ venue categories, sourced by the Foursquare consumer community, to find the location of interest for our client to open the restaurant.

2.1 Population Data

We will use the visible minority data from the census. Figure 2.1 illustrates the attributes in the census data. These data identify the dissemination areas in York Region and show information on the number of people who are identified as visible minority in each area of York Region, from which we could determine the city that has the largest Chinese community. As we have mentioned above, the demographic data were only collected from one out of four households. Therefore, we have to assume that the sample data were representative of the entire population in York Region. Moreover, the growth in each visible minority group is assumed to be the same, so the data are still relevant in 2020.

OBJECTID	DAVID	CSDUID	CSDNAME	TOT_VISIBLE_MINORITY_PVT_HH	TOT_VISIBLE_MINORITY_POP	SOUTH_ASIAN
CHINESE	BLACK	FILIPINO	LATIN_AMERICAN	ARAB	SOUTHEAST_ASIAN	WEST_ASIAN
KOREAN	JAPANESE	VISIBLE_MINORITY_NIE	MULTIPLE_VISIBLE_MINORITY	NOT_VISIBLE_MINORITY	SHAPE.STArea()	SHAPE.STLength()

Figure 2.1: Attributes in the visible minority data from 2016 census.

2.2 Foursquare Location Data

Depending on our findings from the census data, we will use the locations of malls and plazas in the city of interest to determine potential locations. We know that malls and plazas usually have large parking and commercial space, so it must be convenient for customers to access if our restaurant opens around them. Foursquare Places API utilizes the geographic coordinates to explore nearby venues. We could collect the geographic coordinates of the malls and plazas using GeoPy which is a geocoder service. With the latitude and longitude information, we could then use Foursquare to investigate Chinese restaurants and other deciding factors, such as local attractions and parks, around these places. This information will help us decide where the restaurant should be located and what type of food the restaurant should serve.

Chapter 3

METHODOLOGY

In this project, we will start with finding the city in York Region that has the largest Chinese community. Next we will look at the malls and plazas in the city of interest. We will find the location and type (category) of every restaurant within 1km radius from the center of each place. We will also identify other venues, such as parks, gyms and dessert in vicinity. Third step in our analysis will be exploration of venues. We will find the venue categories, and use hierarchical clustering to group the malls and plazas based these venue categories. These clusters should be a starting point for final 'street level' exploration and search for optimal venue location by our client. In the final step, we will focus on those promising areas. We will look into the type of Chinese cuisines served in these areas. This should give our client some ideas what food should be served.

3.1 City with the Largest Chinese Community

After cleaning the census data, we could analyze the number of people who are identified as visible minority in each dissemination area of York Region. Figure 3.1 shows the top five rows in the data. We could see the visible minority groups in Vaughan. If we group the data by city and aggregate the number in each group, we could then rank the city by number of Chinese.

	CITY	SOUTH_ASIAN	CHINESE	BLACK	FILIPINO	LATIN_AMERICAN	ARAB	SOUTHEAST_ASIAN	WEST_ASIAN	KOREAN	JAPANESE
0	Vaughan	55.0	130.0	15.0	70.0	0.0	0.0	10.0	25.0	125.0	0.0
1	Vaughan	95.0	210.0	0.0	35.0	0.0	0.0	0.0	45.0	45.0	0.0
2	Vaughan	925.0	505.0	225.0	335.0	105.0	120.0	85.0	135.0	45.0	20.0
3	Vaughan	280.0	70.0	35.0	15.0	0.0	0.0	20.0	10.0	0.0	0.0
4	Vaughan	70.0	0.0	0.0	0.0	15.0	0.0	10.0	10.0	0.0	0.0

Figure 3.1: Example data from visible minority census.

Figure 3.2 shows that Markham has the largest Chinese community. Furthermore, Markham

have large south Asian, Korean and Japanese community. Food culture from these countries have some similarities to that of the Chinese, so we will choose Markham as the city to explore potential locations for our restaurant.

	CHINESE	SOUTH_ASIAN	BLACK	FILIPINO	WEST_ASIAN	KOREAN	ARAB	SOUTHEAST_ASIAN	LATIN_AMERICAN	JAPANESE
CITY										
Markham	147710.0	58255.0	9700.0	8945.0	7940.0	4350.0	3240.0	2460.0	1730.0	1015.0
Richmond Hill	56970.0	14910.0	3850.0	3790.0	20120.0	5485.0	3565.0	1415.0	1580.0	625.0
Vaughan	20790.0	30655.0	8345.0	8645.0	8650.0	5360.0	4325.0	6840.0	7415.0	300.0
Whitchurch-Stouffville	5965.0	5625.0	995.0	1135.0	335.0	190.0	435.0	295.0	330.0	150.0
Aurora	5575.0	1840.0	1200.0	935.0	1870.0	595.0	575.0	300.0	670.0	195.0
Newmarket	5565.0	3265.0	2295.0	1835.0	1970.0	695.0	660.0	2275.0	1225.0	325.0
East Gwillimbury	690.0	470.0	335.0	165.0	255.0	90.0	85.0	70.0	100.0	60.0
Georgina	670.0	685.0	695.0	335.0	185.0	95.0	100.0	130.0	375.0	70.0
King	445.0	930.0	395.0	160.0	320.0	160.0	125.0	140.0	170.0	70.0
Chippewas of Georgina Island First Nation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 3.2: Number of each visible minority group in the cities of York Region, ranked by number of Chinese.

3.2 Exploration of Markham

To use Foursquare Places API, we need to find center points for our search. Most of the malls and plazas in Markham are located within walking distance from residential areas. In addition, malls and plazas have large parking and commercial spaces. Therefore, customers could easily access these malls and plazas, and using the locations of these places as center points for our Foursquare search is the most ideal. Figure 3.3 includes every mall and plaza located in Markham. The geographic coordinates of these places are obtained from GeoPy.

	CITY	NAME	ADDRESS	LATITUDE	LONGITUDE
0	Markham	Alderland Center	7102-7158 Warden Ave, Markham, ON	43.824235	-79.326603
1	Markham	CF Markville	5000 Hwy 7, Markham, ON	43.865694	-79.291642
2	Markham	First Markham Place	3255 Highway 7 East, Markham, ON	43.851747	-79.348356
3	Markham	J-Town	160 Steeles Ave E, Markham, ON	43.801437	-79.405085
4	Markham	King Square Shopping Mall	9390 Woodbine Ave, Markham, ON	43.872314	-79.365975
5	Markham	Langham Square	8339 Kennedy Rd, Markham, ON	43.857400	-79.303767
6	Markham	Markham Town Square	8601 Warden Ave, Markham, ON	43.857494	-79.331529
7	Markham	Market Village	4390 Steeles Avenue East, Markham, ON	43.824568	-79.303737
8	Markham	Metro Square	3636 Steeles Ave E, Markham, ON	43.817998	-79.331931
9	Markham	New Kennedy Square	8360 Kennedy Rd, Markham, ON	43.859604	-79.302949
10	Markham	Pacific Mall	4300 Steeles Ave E, Markham, ON	43.825488	-79.306128
11	Markham	Peachtree Center	8392 Kennedy Rd, Markham, ON	43.861031	-79.305318
12	Markham	The Shops on Steeles and 404	2900 Steeles Ave E, Markham, ON	43.813388	-79.357184
13	Markham	Thornhill Square Shopping Center	300 John St, Markham, ON	43.819444	-79.397679

Figure 3.3: Names and locations of malls and plazas in Markham with geographic coordinates.

We could then use Foursquare to explore all the venues within 1km radius from every mall and plaza. Figure 3.4 shows number of venues returned from our Foursquare search. Besides Chinese restaurant, these venues includes other cuisines, dessert places and parks. Foursquare also distinguishes different types of Chinese food, but we will treat them all as Chinese restaurant at this stage.

	Mall/plaza	Venue
0	Alderland Center	48
1	CF Markville	66
2	First Markham Place	53
3	J-Town	10
4	King Square Shopping Mall	23
5	Langham Square	43
6	Markham Town Square	48
7	Market Village	59
8	Metro Square	66
9	New Kennedy Square	46
10	Pacific Mall	64
11	Peachtree Center	58
12	The Shops on Steeles and 404	29
13	Thornhill Square Shopping Center	14

Figure 3.4: Number of venues returned from Foursquare search.

3.3 Clustering of Potential Locations

In this study, we will use agglomerative hierarchical clustering to cluster these potential locations based on the venue categories at these locations. In order to use agglomerative clustering, we first apply one hot encoding on the venue categories which are categorical data, and then find the average occurrences of each venue category at every mall and plaza. Figure 3.5 illustrates the top 15 most common venue categories at each mall or plaza. Chinese restaurant is the most common venue category at most of the locations except for King Square and Thornhill Square. Places, such as Alderland Center and First Markham Place, have many venues like dessert places and other types of cuisines that could affect our decision. Figure 3.6 includes the cluster label of each mall and plaza. Unsurprisingly, we see that King Square and Thornhill Square do have different labels than others. Although Chinese restaurant is

	Mall/plaza	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	11th Most Common Venue	12th Most Common Venue	13th Most Common Venue	14th Most Common Venue	15th Most Common Venue
0	Alderland Center	Chinese Restaurant	Sandwich Place	Pizza Place	Tea Room	Bubble Tea Shop	Diner	Sporting Goods Shop	Ramen Restaurant	Furniture / Home Store	Shoe Store	Korean Restaurant	Coffee Shop	Food	Grocery Store	Supermarket
1	CF Markville	Chinese Restaurant	Coffee Shop	Restaurant	Clothing Store	Fast Food Restaurant	Cosmetics Shop	Tea Room	Electronics Store	Pizza Place	Toy / Game Store	Grocery Store	Food Court	Kids Store	Jewelry Store	Greek Restaurant
2	First Markham Place	Chinese Restaurant	Coffee Shop	Korean Restaurant	Dessert Shop	Sushi Restaurant	Furniture / Home Store	Thai Restaurant	Sandwich Place	Department Store	Portuguese Restaurant	Haiat Restaurant	Climbing Gym	Optical Shop	Yoga Studio	Mexican Restaurant
3	King Square Shopping Mall	Airport	Supermarket	Pizza Place	Field	Hookah Bar	Coffee Shop	Restaurant	Chinese Restaurant	Sporting Goods Shop	Bubble Tea Shop	Greek Restaurant	Gift Shop	Grocery Store	Gym / Fitness Center	Wings Joint
4	Langham Square	Chinese Restaurant	Bubble Tea Shop	Japanese Restaurant	Beer Store	Malay Restaurant	Cosmetics Shop	Fast Food Restaurant	Park	Caribbean Restaurant	Café	Restaurant	Sandwich Place	Seafood Restaurant	Breakfast Spot	Shopping Mall
5	Market Village	Chinese Restaurant	Bakery	Japanese Restaurant	Bubble Tea Shop	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	Tea Room	Snack Place	Pet Store	Miscellaneous Shop	Pizza Place	Park	Optical Shop	Korean Restaurant	Coffee Shop
6	Markham Town Square	Chinese Restaurant	Grocery Store	Bakery	Shopping Mall	Sporting Goods Shop	Liquor Store	Pizza Place	Pet Store	Night Market	Cosmetics Shop	Dessert Shop	Lounge	Diner	Pub	Electronics Store
7	Metro Square	Chinese Restaurant	Bubble Tea Shop	Coffee Shop	Pizza Place	Electronics Store	Supermarket	Tea Room	Sushi Restaurant	Fast Food Restaurant	Korean Restaurant	Sandwich Place	Shoe Store	Furniture / Home Store	Diner	Dessert Shop
8	New Kennedy Square	Chinese Restaurant	Bubble Tea Shop	Japanese Restaurant	Seafood Restaurant	Indian Restaurant	Dessert Shop	Cosmetics Shop	Fast Food Restaurant	New American Restaurant	Park	Caribbean Restaurant	Café	Restaurant	Sandwich Place	Vietnamese Restaurant
9	Pacific Mall	Chinese Restaurant	Bakery	Japanese Restaurant	Bubble Tea Shop	Vietnamese Restaurant	Food & Drink Shop	Tea Room	Snack Place	Pet Store	Pizza Place	Gym	Park	Optical Shop	Cosmetics Shop	Miscellaneous Shop
10	Peachtree Center	Chinese Restaurant	Bubble Tea Shop	Dessert Shop	Japanese Restaurant	Fast Food Restaurant	Mediterranean Restaurant	Cosmetics Shop	Coffee Shop	New American Restaurant	Medical Center	Park	Indian Restaurant	Malay Restaurant	Caribbean Restaurant	Ice Cream Shop
11	The Shops on Steeles and 404	Chinese Restaurant	Coffee Shop	Bakery	Park	Italian Restaurant	Spa	Gym / Fitness Center	Karaoke Bar	Mediterranean Restaurant	Diner	Pub	Caribbean Restaurant	Café	Hotel	Warehouse Store
12	Thornhill Square Shopping Center	Pizza Place	Italian Restaurant	Gym / Fitness Center	Coffee Shop	Food & Drink Shop	Café	Breakfast Spot	Supermarket	Greek Restaurant	Bagel Shop	Japanese Restaurant	Haiat Restaurant	Furniture / Home Store	Fast Food Restaurant	Field

Figure 3.5: top 15 most common venue categories around each mall or plaza.

	Mall/plaza	CITY	ADDRESS	LATITUDE	LONGITUDE	Cluster Labels	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	11th Most Common Venue	12th Most Common Venue	13th Most Common Venue	14th Most Common Venue	15th Most Common Venue
0	Alderland Center	Markham	7102-7158 Warden Ave, Markham, ON	43.824235	-79.328603	0	Chinese Restaurant	Sandwich Place	Pizza Place	Tea Room	Bubble Tea Shop	Diner	Sporting Goods Shop	Ramen Restaurant	Furniture / Home Store	Shoe Store	Korean Restaurant	Coffee Shop	Food	Grocery Store	Supermarket
1	First Markham Place	Markham	3255 Highway 7 East, Markham, ON	43.851747	-79.348356	0	Chinese Restaurant	Coffee Shop	Korean Restaurant	Dessert Shop	Sushi Restaurant	Furniture / Home Store	Thai Restaurant	Sandwich Place	Department Store	Portuguese Restaurant	Haiat Restaurant	Climbing Gym	Optical Shop	Yoga Studio	Mexican Restaurant
2	Langham Square	Markham	8339 Kennedy Rd, Markham, ON	43.857400	-79.303767	0	Chinese Restaurant	Bubble Tea Shop	Japanese Restaurant	Beer Store	Malay Restaurant	Cosmetics Shop	Fast Food Restaurant	Park	Caribbean Restaurant	Café	Restaurant	Sandwich Place	Seafood Restaurant	Breakfast Spot	Shopping Mall
3	Market Village	Markham	4390 Steeles Avenue East, Markham, ON	43.824568	-79.303737	0	Chinese Restaurant	Bakery	Japanese Restaurant	Bubble Tea Shop	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	Tea Room	Snack Place	Pet Store	Miscellaneous Shop	Pizza Place	Park	Optical Shop	Korean Restaurant	Coffee Shop
4	Metro Square	Markham	3636 Steeles Ave E, Markham, ON	43.817998	-79.331931	0	Chinese Restaurant	Bubble Tea Shop	Coffee Shop	Pizza Place	Electronics Store	Supermarket	Tea Room	Sushi Restaurant	Fast Food Restaurant	Korean Restaurant	Sandwich Place	Shoe Store	Furniture / Home Store	Diner	Dessert Shop
5	New Kennedy Square	Markham	8360 Kennedy Rd, Markham, ON	43.859604	-79.302949	0	Chinese Restaurant	Bubble Tea Shop	Japanese Restaurant	Seafood Restaurant	Indian Restaurant	Dessert Shop	Cosmetics Shop	Fast Food Restaurant	New American Restaurant	Park	Caribbean Restaurant	Café	Restaurant	Sandwich Place	Vietnamese Restaurant
6	Pacific Mall	Markham	4300 Steeles Ave E, Markham, ON	43.825488	-79.305128	0	Chinese Restaurant	Bakery	Japanese Restaurant	Bubble Tea Shop	Vietnamese Restaurant	Food & Drink Shop	Tea Room	Snack Place	Pet Store	Pizza Place	Gym	Park	Optical Shop	Cosmetics Shop	Miscellaneous Shop
7	Peachtree Center	Markham	8362 Kennedy Rd, Markham, ON	43.861031	-79.305318	0	Chinese Restaurant	Bubble Tea Shop	Dessert Shop	Japanese Restaurant	Fast Food Restaurant	Mediterranean Restaurant	Cosmetics Shop	Coffee Shop	New American Restaurant	Medical Center	Park	Indian Restaurant	Malay Restaurant	Caribbean Restaurant	Ice Cream Shop
8	The Shops on Steeles and 404	Markham	2900 Steeles Ave E, Markham, ON	43.813388	-79.357184	0	Chinese Restaurant	Coffee Shop	Bakery	Park	Italian Restaurant	Spa	Gym / Fitness Center	Karaoke Bar	Mediterranean Restaurant	Diner	Pub	Caribbean Restaurant	Café	Hotel	Warehouse Store
9	Thornhill Square Shopping Center	Markham	300 John St, Markham, ON	43.819444	-79.397679	1	Pizza Place	Italian Restaurant	Gym / Fitness Center	Coffee Shop	Food & Drink Shop	Café	Breakfast Spot	Supermarket	Greek Restaurant	Bagel Shop	Japanese Restaurant	Haiat Restaurant	Furniture / Home Store	Fast Food Restaurant	Field
10	CF Markville	Markham	5000 Hwy 7, Markham, ON	43.865894	-79.291642	2	Chinese Restaurant	Coffee Shop	Restaurant	Clothing Store	Fast Food Restaurant	Cosmetics Shop	Tea Room	Electronics Store	Pizza Place	Toy / Game Store	Grocery Store	Food Court	Kids Store	Jewelry Store	Greek Restaurant
11	King Square Shopping Mall	Markham	9380 Woodbine Ave, Markham, ON	43.872314	-79.385975	3	Airport	Supermarket	Pizza Place	Field	Hookah Bar	Coffee Shop	Restaurant	Chinese Restaurant	Sporting Goods Shop	Bubble Tea Shop	Greek Restaurant	Gift Shop	Grocery Store	Gym / Fitness Center	Wings Joint
12	Markham Town Square	Markham	8601 Warden Ave, Markham, ON	43.857494	-79.331529	4	Chinese Restaurant	Grocery Store	Bakery	Shopping Mall	Sporting Goods Shop	Liquor Store	Pizza Place	Pet Store	Night Market	Cosmetics Shop	Dessert Shop	Lounge	Diner	Pub	Electronics Store

Figure 3.6: top 15 most common venue categories around each mall or plaza with assigned cluster labels.

the most common at label 2 and 4, other cuisines are not common there. Therefore, we will only keep label 0 as our final candidates. Label 0 has variety of cuisines, and there are also dessert places. Other venues, such as stores, gyms and parks, are common as well.

3.4 Types of Chinese Cuisines

As we have narrowed down the potential locations, we will look at the Chinese cuisines served at the restaurants in these potential areas. This information will help our client make decision on what Chinese food should be served.

Chapter 4

RESULTS

Figure 4.1 and 4.2 illustrate the results of our analysis. We have determined a list of nine potential areas for the restaurant. Final decision will be made by our client depending the availability of space and prices at these locations. We also have collected information regarding the types of Chinese cuisines at these locations. Although some data from Foursquare are not accurate, and our client might need to look into the menus served at these restaurants, there is adequate information to make a decision on the type of Chinese food that will be served.

	Mall/plaza	CITY	ADDRESS	LATITUDE	LONGITUDE
0	Alderland Center	Markham	7102-7158 Warden Ave, Markham, ON	43.824235	-79.326603
1	First Markham Place	Markham	3255 Highway 7 East, Markham, ON	43.851747	-79.348356
2	Langham Square	Markham	8339 Kennedy Rd, Markham, ON	43.857400	-79.303767
3	Market Village	Markham	4390 Steeles Avenue East, Markham, ON	43.824568	-79.303737
4	Metro Square	Markham	3636 Steeles Ave E, Markham, ON	43.817998	-79.331931
5	New Kennedy Square	Markham	8360 Kennedy Rd, Markham, ON	43.859604	-79.302949
6	Pacific Mall	Markham	4300 Steeles Ave E, Markham, ON	43.825488	-79.306128
7	Peachtree Center	Markham	8392 Kennedy Rd, Markham, ON	43.861031	-79.305318
8	The Shops on Steeles and 404	Markham	2900 Steeles Ave E, Markham, ON	43.813388	-79.357184

Figure 4.1: Potential locations to open a restaurant.

	Alderland Center	First Markham Place	Langham Square	Market Village	Metro Square	New Kennedy Square	Pacific Mall	Peachtree Center	The Shops on Steeles and 404
Chinese Restaurant	8	1	4	7	10	4	7	4	2
Szechuan Restaurant	1	0	0	0	1	0	0	0	0
Asian Restaurant	1	1	0	2	3	0	4	0	1
Hong Kong Restaurant	1	1	1	3	1	1	3	1	0
Dim Sum Restaurant	1	0	1	1	1	1	1	1	0
Xinjiang Restaurant	1	0	0	0	1	0	0	0	0
Dumpling Restaurant	1	0	0	1	1	0	1	0	0
Hotpot Restaurant	1	0	1	0	1	1	0	1	0
Noodle House	1	1	2	1	0	2	1	2	0
BBQ Joint	0	1	0	0	1	0	0	0	1
Shanghai Restaurant	0	3	1	0	0	1	0	1	0
Taiwanese Restaurant	0	1	0	1	0	0	1	0	0
Cha Chaan Teng	0	1	0	0	0	0	0	0	0
Cantonese Restaurant	0	0	1	3	0	1	3	1	1

Figure 4.2: Types of Chinese cuisines served at potential locations.

Chapter 5

DISCUSSION

Our analysis shows that Markham has the largest Chinese community in York Region. With this large potential customer base, it is unsurprising that there are various types of Chinese restaurant opened in the city. With Foursquare search and clustering, we will select from one of nine locations to open the restaurant. As shown above, Chinese restaurant is the most common venue category at these locations. Although Chinese restaurants are common, other restaurants would actually help with the business even though the customers are initially attracted by these restaurants. In addition, there are also stores, parks and dessert places in vicinity, which also attracts customers. Lastly, these locations are either a mall or a plaza, and they are close to major roads. So customers could easily visit there by different means. Even with driving, there is large parking space. Malls and plazas also have large commercial spaces, which is an important aspect for opening a restaurant.

Our analysis also shows that there are many different Chinese cuisines served at these potential locations. Unfortunately, many restaurants are labelled as "Chinese Restaurant", and our client will have to look into the menus to determine the actual cuisines served at these places. Nevertheless, our analysis provides insights about the cuisine our client should serve. For example, we see that there are only two restaurants in the potential locations that serve Szechuan cuisine. There are also other type of Chinese cuisines that are not common in the areas. This means that There is an opportunity for our client that is worth considering.

The purpose of this analysis is to only provide information on areas that are close to residential areas and other venues like parks. Recommended locations should therefore be considered only as a starting point for more detailed analysis which could eventually result in a location that satisfies more specific requirements. Locations like the commercial spaces in a condo could also be worth considering, but there might be more limits, such as noise level and smaller space. This is something for our client to consider.

Chapter 6

CONCLUSION

This study identify locations that are suitable for opening a Chinese Restaurant in York Region of Ontario, Canada. The results will aid our client in narrowing down the search for an optimal location. By evaluating the demographic data of York Region, we identify Markham as the city of interest. Using locations of malls and plazas as the center points for Foursquare search save us time from collecting neighborhood information in Markham because malls and plazas are located close to residential areas. The Foursquare data generate an extensive collection of venues, and clustering based on these venues creates a list of potential locations. Furthermore, information regarding types of Chinese cuisines is collected and could be used as starting points for final exploration by our client.

Final decision on an optimal restaurant location will be made by our client based on specific requirements, such as finance. We have taken into consideration factors, such as ease of parking, proximity to residential areas and parks. Our client should evaluate real estate availability, prices, social and economic dynamics of every potential location before making a final decision.

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