

# Decision making for opening a restaurant

Yonglok Kim

March 5, 2020

## 1. Introduction / Business Problem

### 1.1 Background

Now I am making a decision of opening a restaurant in whether New York city or Toronto city. Also I have to make a decision of which location in particular city. Foursquare is one of the best location dataset companies. in this decision making I uses very happily this company API for my capstone assignment. By sufficient justification of why I think what I want to do or solve, I am going to explain my choice to a client or a group of people be interested in my project.

### 1.2 Problem

There are many problem to solve this project. That is obtaining my statistic data to compare with two cities, New York city or Toronto city. Also there are not sufficient datum of boroughs and neighborhoods in particular city. But I obtain and use possibly wikipedia data by internet.

### 1.3 Interest

First of all I am interested in population, density and GDP to do and solve my porject because of its economic incomes. So I depend on thises parameters to choise my particular city, New York or Toronto. After that I am going to study venues with Fouresquere API's support. Because the number of venues is so important and many people come and go, it is the best place to open the restaurant.

## 2. Data acquisition and cleaning

### 2.1 2.1 Data sources

Now I am making a decision of opening a restaurant in whether New York city or Toronto city. Overall, I used wikipedia to compare two cities, New York and Toronto, to determine which cities are more economically rich by comparing their population, population density and GDP.

In order to decision making for opening a restaurant, I will decide in the following order, first choose one of two cities, New York and Toronto, then a borough of that city and a neighborhood in particular borough.

Overall, I used wikipedia to compare two cities, New York and Toronto, to determine which cities are more economically rich by comparing their population, population density and GDP.

Also I select one city, New York and Toronto, then analyze and examine the boroughs of each city, examine the size of each borough neighborhoods, and select a borough in that city. I then use Foursquare API to examine the number of venues in the neighborhood and then select the neighborhood with the largest number of venues as the final candidate.

Because the number of venues is so important and many people come and go, it is the best place to open the restaurant.

In addition, we want to find out the venues related to food using Foursquare among various venues

in the selected neighborhood and search for example korean food restaurant.

### 2.1 Data cleaning

First of all, the historical poputations of New York and Toronto cities are very different about two aspects. First the historical poputations of New York come from 1700, but The historical poputations of Toronto come from 1900 in wikipedia data. Second among the data provided by wikipedia, each city had a different year. For example, New York had a population of 2010, while Toronto had a population of 2011. In this case, the data was cleaned using pandas' fillna (method = 'ffill', limit = 1) method. Using these two data cleanings, the population data of the two cities were merged.

Using these two data cleanings, the population data of the two cities were summed. The final decision was made using the density and gross domestic product (GDP) provided by wikipedia.

### 3. Methodology

The methodology I used to create Decision making for opening a restaurant was to first compare the population, population density and GDP per capita of the two cities.

The most important thing in opening a restaurant was, above all, the floating population and economic income. After choosing a city, New York city, one borough out of five boroughs and one neighborhood out of the selected boroughs were determined based on the number of venues provided by Foursquare.

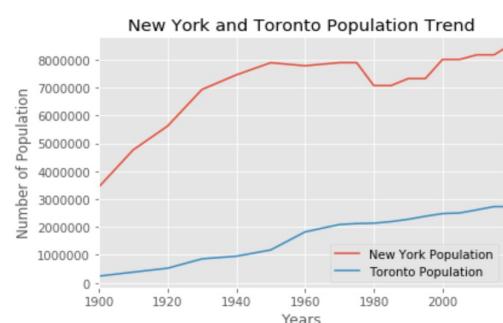
The number of venues is very important factor of 'Decision making for opening a restaurant' project because I think this is a reflection of the floating population.

## 4. Results

### 4.1 First choice of city : New York city

Overall, I used wikipedia to compare two cities, New York and Toronto, to determine which cities are more economically rich by comparing their population, population density and GDP. The findings of the three indicators of the two cities are as follows.

item	New York	Toronto
Population	8,175,133	2,954,024
Population Density (/sq mi)	27,751	12,140
GDP (US\$ billion)	842.3 (2018)	276.3 (2014)



As shown in this table, New York city has a population of 2.8 times,

a population density of 2.3 times, and a GDP of about 3.1 times higher than Toronto. So finally, I decided to choose New York City as my project city to open a restaurant.

#### 4.2 Second choice of borough : Manhattan

It is very exciting to open a restaurant at one of the world's bestt and most economically rich cities, New York. However New York city is a very large city and consists of five boroughs: The Bronx, Brooklyn, Manhattan, Queens and Staten Island.

As shown in the following table, considering the the highest in population, population density, and per capita GDP from the data provided by wikipedia, the best choice is Manhattan.

	Borough	County	Population	Gross Domestic Product (billions US\$)	Gross Domestic Product (per capita US\$)	Land area (square miles)	Land area (square km)	Density (persons / sq. mi)	Density (persons / sq. km)
0	The Bronx	Bronx	1,432,132	42.695	29,200	42.10	109.04	34,653	13,231
1	Brooklyn	Kings	2,582,830	91.559	34,600	70.82	183.42	37,137	14,649
2	Manhattan	New York	1,628,701	600.244	360,600	22.83	59.13	72,033	27,826
3	Queens	Queens	2,278,906	93.310	39,600	108.53	281.09	21,460	8,354
4	Staten Island	Richmond	476,179	14.514	30,300	58.37	151.18	8,112	3,132
5	City of New York		8,398,748	842.343	97,700	302.64	783.83	28,188	10,947
6	State of New York		19,745,289	1,701.399	85,700	47,214	122,284	416.4	159

#### 4.3 Thrid choice of neighborhood : Midtown

The Manhattan borough consists of five downtowns: Lower Manhattan, Midtown, West Side, East Side and Upper Manhattan.

Choosing one from these five downtowns will take into account a number of variables, including floating population, rental costs, restaurants, and traffic, but it should review limited and available data.

However, we thought that the number of venues provided by Foursquare was important factor in that it uses all available resources. The problem is that if I want to know the number of venues using Foursquare, I have to subdivide again into neighborhoods. Therefore, first, we surveyed the number of venues

in neighborhood units, sum them up, calculate the total for each downtown, and then find the average number of venues. The data derived through this process are as follows.

	Manhattan downtown	Neighborhoods Numbers		Neighborhoods	Venue numbers	Venue per Neighborhoods
0	Lower Manhattan	25	[Alphabet City, Battery Park City, Bowery, Chi...		2768	111
1	Midtown	11	[Columbus Circle, Diamond District, Flatiron D...		1356	123
2	West Side	12	[Chelsea, Hell's Kitchen, Hudson Yards, develo...		1242	104
3	East Side	16	[Carnegie Hill, Gramercy Park, Kips Bay, Lenox...		1561	98
4	Upper Manhattan	14	[Astor Row, East Harlem, Hamilton Heights, Har...		1228	88

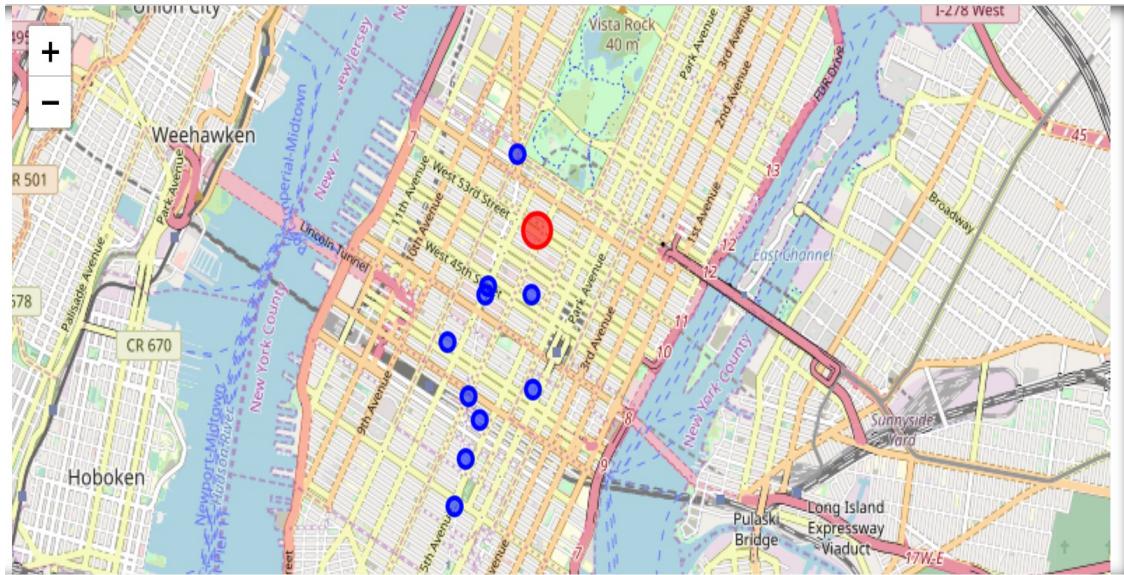
As you can see from the table, out of the five boroughs the highest number of average venues per neighborhood is Midtown, Manhattan. Therefore, since the average number of venues per neighborhood is 123, select Midtown.

#### 4.4 Fourth choice of neighborhood : Flatiron District

Finally, Flatiron district was chosen as the neighborhood with the largest number of venues provided by Foursquare.

	Midtown	latitude	longitude	Venue numbers
0	Columbus Circle	40.7681	-73.9819	118
1	Diamond District	40.7572	-73.9801	128
2	Flatiron District	40.7411	-73.9897	133
3	Garment District	40.7537	-73.9905	125
4	Herald Square	40.7495	-73.988	120
5	Koreatown	40.7476	-73.9865	128
6	Madison Square	42.8759	-75.6803	121
7	NoMad	40.7447	-73.9883	119
8	Silicon Alley			119
9	Theater District	40.758	-73.9855	123
10	Times Square	40.7573	-73.9859	122

A map of 11 neighborhoods near Midtown looks like this:



Also, map the venues related to korean food near Midtown as follows.



## 5. Discussion

Lastly, I wanted to reflect the cost of renting the building as a factor to consider when opening the restaurant. Therefore, I would like to discuss what data this will reflect.

## 6. Conclusion

The project decided to open a restaurant in New York city, Manhattan borough, Midtown downtown, and the Flatiron District neighborhood, reflecting its own grounds.

In the project, I learned a lot about Data Science and on the other hand, a lot of regrets.

I promise to work harder to become a great data scientist.

Thank you.