

CAPSTONE PROJECT

Opening a Vietnamese restaurant in Manhattan

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Abstract: We determine the ideal place to open a new Vietnamese restaurant in Manhattan based on the data from Foursquare api. More precisely we look for a neighborhood with popular venues and many restaurants but no Vietnamese restaurant up-to-date. We find that West Village is the best neighborhood that satisfies these criteria.

Date: 16 December 2019

1 Description of the problem

The purpose of this project is to answer the following question: *where is the best place to open a new Vietnamese restaurant in Manhattan?*

This project aims at helping investors in the bar/restaurant domain. Our project is of great interest for them for many reasons:

- Manhattan is one of the biggest tourist attractions in the world. Needless to say, owning a well-positioned restaurant would bring a great financial gain for the investors.
- Vietnamese cuisine is one of the most highly appreciated cuisines in the world. It is healthy with fresh herbs, lots of vegetables and seafood, and cooking techniques that use water or broth instead of oils. It is easy to eat and easy to make. A good Vietnamese restaurant will keep customers coming anytime around the year.
- The number of Vietnamese restaurants in Manhattan is relatively small compared to that of other cuisines, for instance Italian, Mexican,... As a consequent it is rather easy for a new Vietnamese restaurant to attract attention.

In order to answer the above question, we need to collect the data of other Vietnamese restaurants in the area. In particular we will look at their position and rating from Foursquare api in order to decide the best neighborhood to put our new restaurant. We discuss the process of data collection and data analysis in the next section

2 Description of the data

The position of our new restaurant must satisfy three conditions:

- It belongs to a restaurant-friendly neighborhood i.e. a neighborhood with large number of restaurants
- It is surrounded by popular venues so that we can attract the maximum amount of customers
- On the other hand, it should not be surrounded by too many other Vietnamese restaurants. This will lead to an excess in competitors as well as confusion in new customers.

We address these criteria by analyzing the data from Foursquare as follows:

- We count the number of restaurants in each neighborhood. We compute the mean value and we define restaurant-friendly neighborhoods as those which have higher than average number of restaurants
- We measure the popularity of a neighborhood by averaging the ratings of its venues. More precisely we will skim through the venues in the radius of 500 meters of each neighborhood and extract their rating. Their mean value will give us an idea of how popular the neighborhood is.
- We also count the number of Vietnamese restaurants in the radius of 500 meters of each neighborhood. We then sort the neighborhoods according to its number of Vietnamese restaurants.

By looking at the obtained data, we can choose an ideal neighborhood to place our restaurant in. If two neighborhoods happen to be equally popular and have similar number of Vietnamese restaurants we can look for further data to compare them. For instance we can look at the most popular venue categories in these neighborhoods to decide which one is more suitable for opening a restaurant.

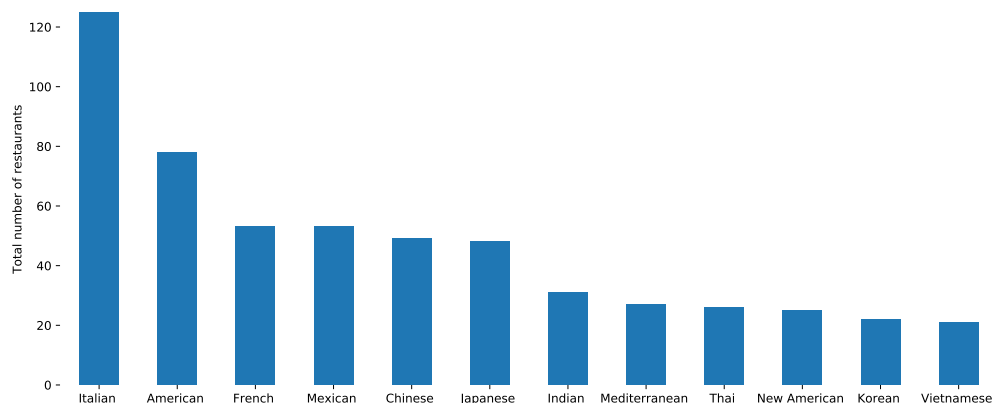
3 Methodology

- We use a bar plot to show the total number of restaurants in Manhattan for each type of cuisine. This data visualization directly shows that Vietnamese restaurants are under-presented and a new restaurant is much needed.
- We use a box plot to present the distribution of the number of restaurants per neighborhood. We can then obtain the average number of restaurant and extract restaurant-friendly neighborhoods
- To show that our choice of data is not redundant, we use linear regression to find the correlation between the number of restaurants in a neighborhood and its average venues rating

4 Result

4.1 The necessity of a new Vietnamese restaurant

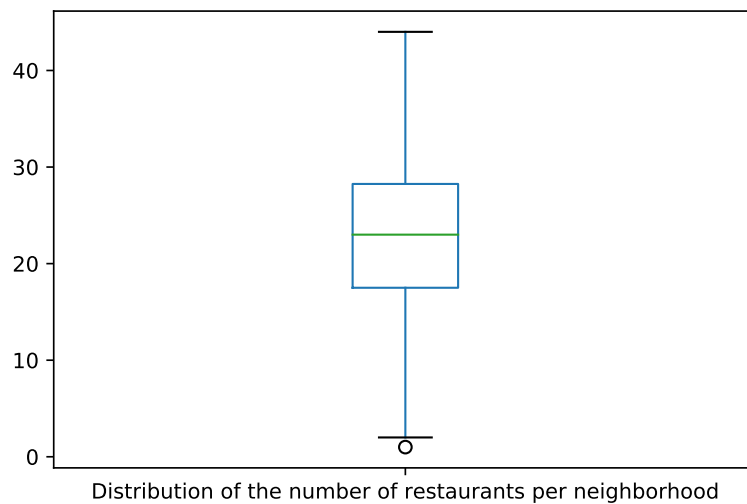
According to our data analysis, there are currently 21 Vietnamese restaurants in a total of 919 restaurants in total.



The Vietnamese cuisine currently ranks 12th among the most popular cuisines in Manhattan

4.2 Determining restaurant-friendly neighborhoods

We want to avoid neighborhoods with less than average number of restaurants. These neighborhoods are not well known to tourists and local people.



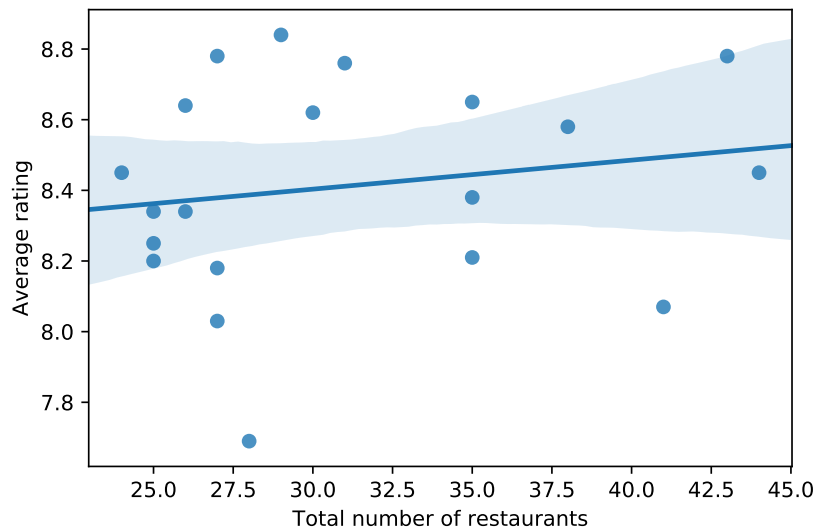
The average number of restaurants per neighborhood is 22.98. Chinatown has the largest number of restaurants of 44 while Stuyvesant Town has only 1 restaurant. The standard deviation among neighborhoods is 10.47. The following table shows all restaurant-friendly neighborhoods along with their respective number of Vietnamese restaurants as well as their average venue rating

Neighborhood	No of Viet restaurants	Total no of restaurants	Average rating
Midtown South	0	30	8.62
Sutton Place	0	26	8.25
West Village	0	35	8.65
Lenox Hill	0	27	8.18
Noho	0	31	8.76
Turtle Bay	0	41	8.07
Flatiron	0	28	8.84
Upper East Side	0	25	8.34
Clinton	0	25	8.2
Civic Center	0	24	8.45
Upper West Side	0	35	8.21
Chelsea	0	26	8.64
Tudor City	1	28	7.69
Tribeca	1	26	8.34
Little Italy	1	27	8.78
Murray Hill	1	35	8.38
Greenwich Village	2	43	8.78
East Village	2	38	8.58
Yorkville	2	27	8.03
Chinatown	4	44	8.45

4.3 Correlation between the total number of restaurants and average rating

Let us determine the correlation between the total number of restaurants in a neighborhood and its average venues rating. This will show whether our choice of data is pertinent

or not



We see that there is no correlation at all between the two variables. There are neighborhoods with many restaurants and low rating and vice-versa.

4.4 Determining neighborhoods with good rating

We observe that there is quite a variation in the average venues rating among restaurant-friendly neighborhoods: the lowest is 7.69 for Tudor City and the highest is 8.84 for Flatiron. The mean value is 8.41. After dropping neighborhoods whose average venues rating is below this threshold and removing neighborhoods with existing Vietnamese restaurants we are left with six choices

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Noho	0	31	8.76
Flatiron	0	28	8.84
Civic Center	0	24	8.45
Chelsea	0	26	8.64

4.5 Final selection

We see that there are three neighborhoods with large number of restaurants and high average venues rating: West Village, Noho and Flatiron. In order to make the final decision, we compare the three neighborhoods by looking at their most popular venue categories.

West village			Noho		
rank	venue	frequency	rank	venue	frequency
1	Italian restaurant	0.1	1	Italian restaurant	0.05
2	New American restaurant	0.06	2	French restaurant	0.05
3	Cocktail bar	0.04	3	Cocktail bar	0.04
4	Cosmetic shop	0.04	4	Art gallery	0.04
5	American restaurant	0.04	5	Gift shop	0.04

Flatiron		
rank	venue	frequency
1	Yoga studio	0.04
2	Cafe	0.04
3	Japanese restaurant	0.04
4	Spa	0.04
5	Clothing store	0.04

Evidently, West village is the ideal choice: 4 out of 5 most frequent venues belong to the restaurant/bar category, it has the biggest number of restaurant of 35 and high rating of 8.65 too.

5 Discussion

We find it astonishing that some neighborhoods have a very low number of restaurants, for instance Stuyvesant Town , Marble Hill, Roosevelt Island, Battery Park City. It would be interesting to find out why using the data from Foursquare api. On another direction, we also want to understand the absent of Vietnamese restaurants in most neighborhoods. More broadly we want to answer the following question: "Is it possible to figure out the cultural background of a neighborhood from its venues data?" We leave these issues for future investigation.

6 Conclusion

In this project we collect data from Foursquare api to choose the best neighborhood in Manhattan to open a new Vietnamese restaurant. We found that West village has highly rated venues, has a large number of restaurants and yet no Vietnamese restaurant at this point. It is a perfect place to open our new restaurant.