

# Capstone Project -

## Finding an optimal location for a restaurant

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### 1.Introduction:Background & Problem Description

New York City, the most populous city in the United States, one of the greatest metropolises over the world, is a dream place for gourmet to seek delicious cuisine. Its food culture includes an array of international cuisines influenced by the city's immigrant history. Central and Eastern European immigrants, especially Jewish immigrants from those regions, brought bagels, cheesecake, hot dogs, knishes, and delicatessens (or delis) to the city. Italian immigrants brought New York-style pizza and Italian cuisine into the city, while Jewish immigrants and Irish immigrants brought pastrami and corned beef, respectively. Chinese and other Asian restaurants, sandwich joints, trattorias, diners, and coffeehouses are ubiquitous throughout the city. Some 4,000 mobile food vendors licensed by the city, many immigrant-owned, have made Middle Eastern foods such as falafel and kebabs examples of modern New York street food. The city is home to "nearly one thousand of the finest and most diverse haute cuisine restaurants in the world," according to Michelin. As of 2019, there were 27,043 restaurants in the city, up from 24,865 in 2017[1].

In this project, we will try to find an optimal restaurant location. The strengths of each region will then be clearly expressed so that stakeholders can choose the best final location... Because there are so many restaurants in New York, we're going to try to find places that aren't already full of restaurants. We are also particularly interested in areas where there are no Chinese restaurants nearby. We also want to be as close to the city centre as possible, provided the first two conditions are met.

### 2.Data Preparation

The data used in the analysis are as follows:

- getting the location data from 'newyork\_data.json' from IBM Watson

Studio.

- cleaning the data and reducing it to boroughs of NYC so that I can use it to find geological locations for further venue analysis.
- Using Foursquare API to get tcoordinate of the center of New York City (Manhattan) .
- Using Foursquare API to get the number of restaurants and their type and location in every neighborhood

### **3.Methodology**

In this project, we will look for low-density restaurant areas in Manhattan, especially areas with fewer Chinese restaurants.

First, we collected the data we needed: the location and type (category) of each restaurant in Manhattan. We found all the Chinese restaurants (according to Foursquare).

The second step will be to calculate the density of restaurants in different parts of Manhattan. We will use the "heat map" to identify some promising areas near downtown with few restaurants and no Chinese restaurants nearby.

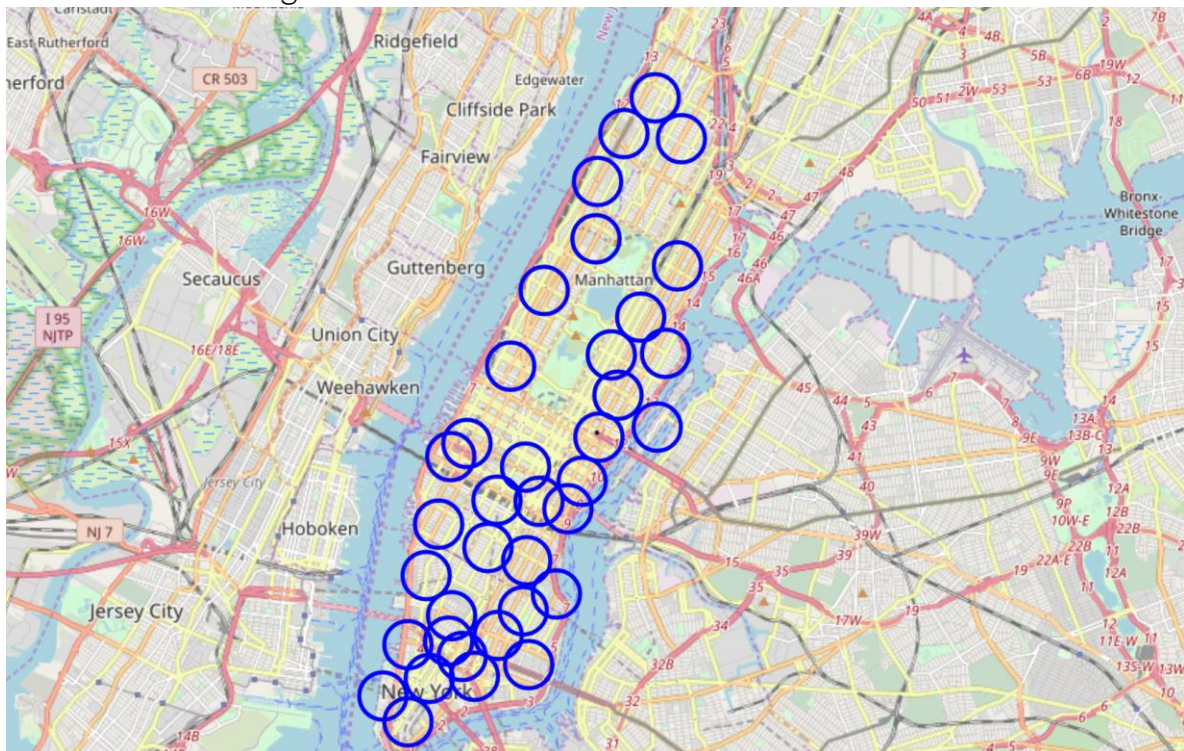
Third, we will focus on the most promising areas and create clusters of sites within these areas that meet some of the basic requirements: we will consider sites with a radius of no more than two restaurants within a radius of 250 meters, and no Chinese restaurants within a radius of 400 meters is best. We will use maps to show all locations.

### **4.Analysis**

We get the location data from [https://cocl.us/new\\_york\\_dataset](https://cocl.us/new_york_dataset), and Convert it to dataset, and we chose Manhattan as the analysis area of interest.

	Borough	Neighborhood	Latitude	Longitude	X	Y	Distance from center
0	Manhattan	Marble Hill	40.876551	-73.910660	-5.794205e+06	9.858099e+06	16020.661541
1	Manhattan	Chinatown	40.715618	-73.994279	-5.821760e+06	9.868103e+06	13309.592195
2	Manhattan	Washington Heights	40.851903	-73.936900	-5.798470e+06	9.861349e+06	10953.332666
3	Manhattan	Inwood	40.867684	-73.921210	-5.795743e+06	9.859410e+06	14122.055880
4	Manhattan	Hamilton Heights	40.823604	-73.949688	-5.803305e+06	9.862859e+06	5903.904961
5	Manhattan	Manhattanville	40.816934	-73.957385	-5.804461e+06	9.863817e+06	4637.678850
6	Manhattan	Central Harlem	40.815976	-73.943211	-5.804573e+06	9.861989e+06	4953.789819
7	Manhattan	East Harlem	40.792249	-73.944182	-5.808594e+06	9.862002e+06	2071.673110
8	Manhattan	Upper East Side	40.775639	-73.960508	-5.811466e+06	9.864025e+06	2371.412055
9	Manhattan	Yorkville	40.775930	-73.947118	-5.811369e+06	9.862302e+06	2845.043858

let's visualiza Manhattan the neighborhoods in it. We can get the distribution of neighborhood in Manhattan.

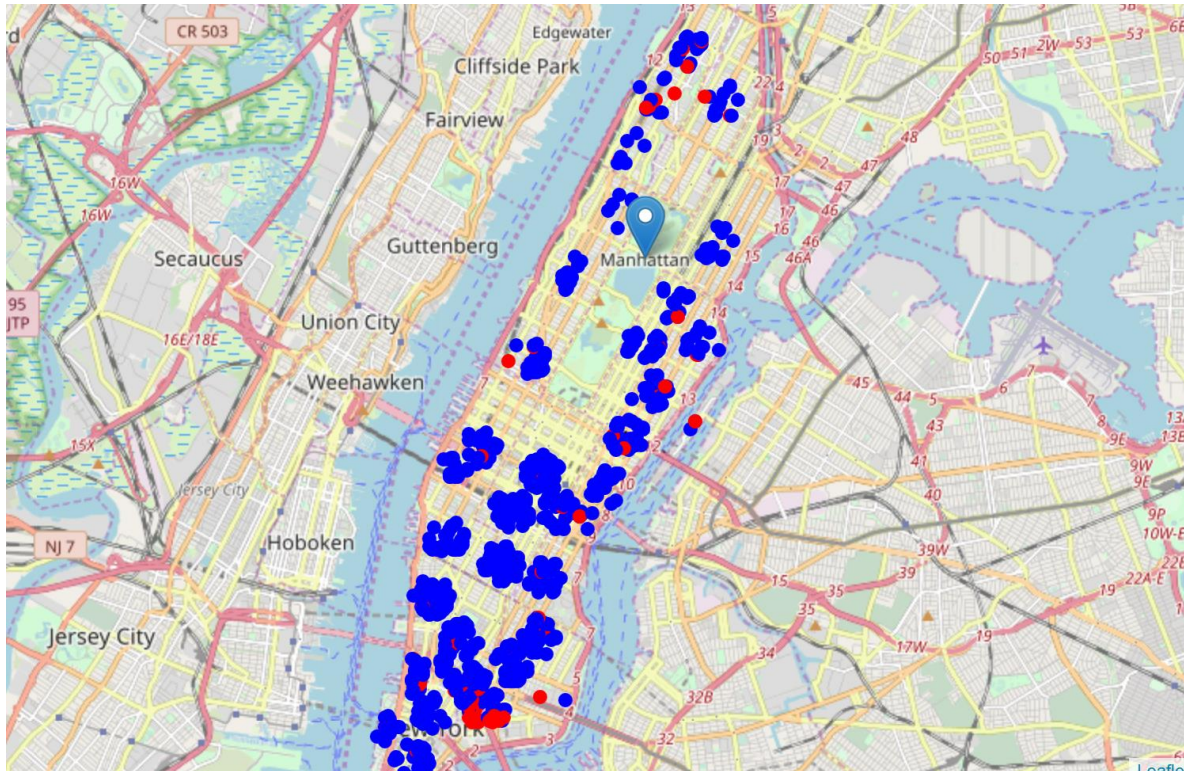


Then,we use Foursquare API to get info on restaurants in each neighborhood. The count result of restaurants are as follows:

```
Total number of restaurants: 1128
Total number of chinese restaurants: 93
Percentage of chinese restaurants: 8.24%
Average number of restaurants in neighborhood: 20.875
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Let's now see all the collected restaurants in our area of interest on map, and let's also show Chinese restaurants in different color.



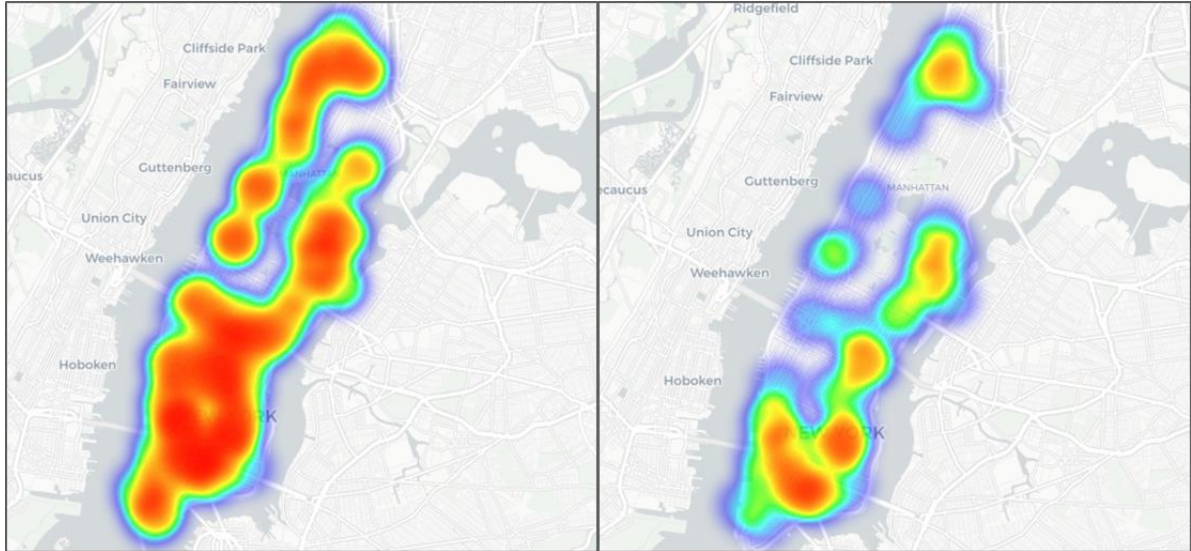


now we have all the restaurants in area, and we know which ones are Chinese restaurants! We also know which restaurants exactly are in vicinity of every neighborhood candidate center.

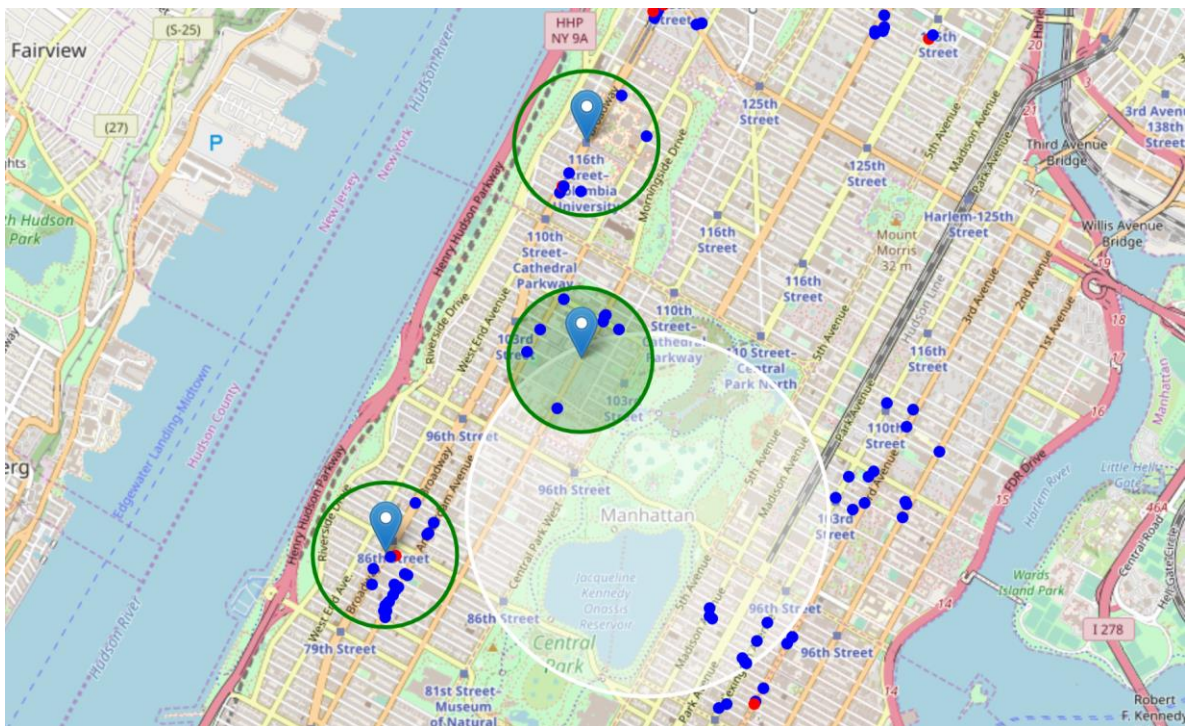
We calculated the number of restaurants in each area and the distance from the city center. Data are as follows.

	Borough	Neighborhood	Latitude	Longitude	X	Y	Distance from center	Restaurants in area	Distance to Chinese restaurant
0	Manhattan	Marble Hill	40.876551	-73.910660	-5.794205e+06	9.858099e+06	16020.661541	3	373.027265
1	Manhattan	Chinatown	40.715618	-73.994279	-5.821760e+06	9.868103e+06	13309.592195	40	255.197513
2	Manhattan	Washington Heights	40.851903	-73.936900	-5.798470e+06	9.861349e+06	10953.332666	16	255.971806
3	Manhattan	Inwood	40.867684	-73.921210	-5.795743e+06	9.859410e+06	14122.055880	15	52.482328
4	Manhattan	Hamilton Heights	40.823604	-73.949688	-5.803305e+06	9.862859e+06	5903.904961	20	274.653363
5	Manhattan	Manhattanville	40.816934	-73.957385	-5.804461e+06	9.863817e+06	4637.678850	7	162.870594
6	Manhattan	Central Harlem	40.815976	-73.943211	-5.804573e+06	9.861989e+06	4953.789819	10	482.295374
7	Manhattan	East Harlem	40.792249	-73.944182	-5.808594e+06	9.862002e+06	2071.673110	8	2322.160621
8	Manhattan	Upper East Side	40.775639	-73.960508	-5.811466e+06	9.864025e+06	2371.412055	13	473.750470
9	Manhattan	Yorkville	40.775930	-73.947118	-5.811369e+06	9.862302e+06	2845.043858	13	348.758893

Let's create a map that shows the density of all restaurants(left) and Chinese restaurants(right), then try to extract some meaningful information from it.



On the west side of Manhattan's central park, it seems possible to find places with a low density of restaurants. As can be seen in the figure on the right, the density of Chinese restaurants in the western part of Manhattan's central park is lower.



We choose the streets called Upper West Side, Manhattan Valley and Morningside Heights as the focused object. And Manhattan Valley is the closest to the city center, and there's no Chinese restaurant within 400 metres.

## 5. Results and Discussion

The analysis shows that while Manhattan has a large number of



restaurants (about 1,200), there are also some low-density areas close to downtown. The south Manhattan area has the highest density of restaurants, so we focused on the lower density in the northwest, so we chose the 'Upper West Side', 'Manhattan Valley' and 'Morningside Heights' street areas, which are popular with tourists, close to downtown, and have a strong socioeconomic dynamic.

Through the visual images in this paper, it can be concluded that Manhattan Valley has the lowest density from the nearest area, and there are no Chinese restaurants within 400 meters. The optimal location can be found in this area. However, the proposed area should only be considered as a starting point for more detailed analysis, and the final site should take into account not only the competitive relationship but also other factors.

## **6.Conclusion**

The objective of the project was to identify the number of restaurants and Chinese restaurants in the vicinity of midtown Manhattan to help stakeholders narrow down the number of Chinese restaurants in the best location. By calculating the restaurant density distribution from the Foursquare data, we first determined the distribution of all areas, then identified the target area, and finally found the location set that meets the basic requirements of existing nearby restaurants. The ultimate best restaurant location will be determined by stakeholders based on the characteristics and location of specific communities in each recommended area, taking into account additional factors.

## **7. Reference**

[1] New York City—Wikipedia,  
[https://en.wikipedia.org/wiki/New\\_York\\_City](https://en.wikipedia.org/wiki/New_York_City)

[2] Notebook: [https://cocl.us/coursera\\_capstone\\_notebook](https://cocl.us/coursera_capstone_notebook)