

# Capstone Project – The Battle of Neighborhood

## Opening a new restaurant in Manhattan

### Introduction

#### Background:

The restaurant industry is essential to New York City's social and economic fabric. From small, family-owned restaurants and food carts to four-star world-famous



establishments, the City abounds with restaurants that offer cuisines from every corner of the globe.

Restaurants lend vitality to each neighborhood and are integral to Manhattan's central business districts and the City's vibrant tourism industry, attracting millions of visitors each

year who spend a total of \$46 billion annually. The industry is the second largest component of tourism spending, behind lodging. Residents and tourists alike are drawn to live in and visit areas with thriving retail corridors anchored by restaurants. The industry contributed about 15 percent of total taxable sales citywide in 2019.

After a decade of job growth that was more than double the rate for local jobs overall, the restaurant industry reached its highest number of establishments and jobs ever in 2019. Despite relatively lower average wages, restaurants provide a steady source of jobs for many residents, particularly Hispanic and Asian minority populations and immigrants.

New York City's restaurant industry had 23,650 establishments in 2019, provided 317,800 jobs, paid \$10.7 billion in total wages citywide, and made nearly \$27 billion in taxable sales.

After a decade of job growth that was more than double the rate for local jobs overall, the restaurant industry reached its highest number of establishments and jobs ever in 2019. Despite relatively lower average wages, restaurants provide a steady source of jobs for many residents.

The New York City restaurant industry accounted for about 1 in 12 private sector jobs and establishments citywide in 2019 (8.1 percent of jobs and 8.7 percent of firms). Unless otherwise noted, all data on industry employment by place of work was made available through the New York State Department of Labor Quarterly Census of Employment and Wages (QCEW) According to the U.S. Bureau of Labor Statistics, nationally, the industry share is higher for jobs (9.5 percent) but lower for establishments (6.6 percent).

Most restaurants and bars are small and reflect great diversity. In New York City, 80 percent have fewer than 20 employees (less than 1 percent have 500 or more employees), yet they represent the cuisines of more than 150 different countries.

Citywide, 250,900 residents (both employed and self-employed) held occupations in the restaurant industry, with average annual earnings of \$30,500 in 2018 (the latest year for which this data is available). Additional employees commute from surrounding areas to work in the City's restaurants. All data on restaurants workers by place of residence use the U.S. Census American Community Survey, 2018 one-year estimates, unless otherwise noted.

More than half of the City's restaurant employment in 2019 (192,500 jobs) was located in Manhattan, with another 51,700 jobs in Brooklyn, 49,100 jobs in Queens, 15,900 jobs in the Bronx and 8,500 jobs in Staten Island. The industry had one of the lowest average salaries (\$33,700) among all private sector industries.

In Manhattan, most establishments and jobs are in Midtown and Lower Manhattan. The Chelsea/ Clinton/Midtown Business District, which includes the New York City Theater District, had the highest restaurant employment among all the City's 55 Census-defined neighborhoods (nearly one in four jobs citywide). Battery Park City/Greenwich Village/Soho had the second-highest restaurant employment.

Together, these two areas made up nearly 40 percent of the City's restaurant jobs. Restaurants as a share of establishments were highest in Chinatown/Lower East Side, at 20 percent. The restaurants and bars in these areas face special challenges due to the declines in tourism, office employees working on-site, and some residents relocating to second homes outside the City. According to the New York State Department of Taxation and Finance, the restaurant industry also contributed nearly \$26.9 billion in taxable sales from March 2019 through February 2020, about 15 percent of total taxable sales during that period, and grew 4.3 percent year over year.

### **Business problem**

The goal of this project is to analyze and decide where to open a new restaurant in Manhattan.

### **Data**

- Wikipedia scraping  
Manhattan postal codes, area and location names, Manhattan-based datasets.
- Venues data  
We will use the Foursquare API to collect venues based on the geographical coordinates of each postal code.
- Geographical coordinates  
Manhattan geographical coordinates, which is a consolidated csv file.

### **Methodology**

We will convert addresses into their equivalent latitude and longitude values. Afterwards will use the Foursquare API to explore neighborhoods in Manhattan, then the **explore** function to get the most common venue categories in each neighborhood, and then use this feature to group the neighborhoods into clusters. We will use the *k*-means clustering algorithm to complete this task. Finally, we will use the Folium library to visualize the neighborhoods in Manhattan and their emerging clusters.

Results

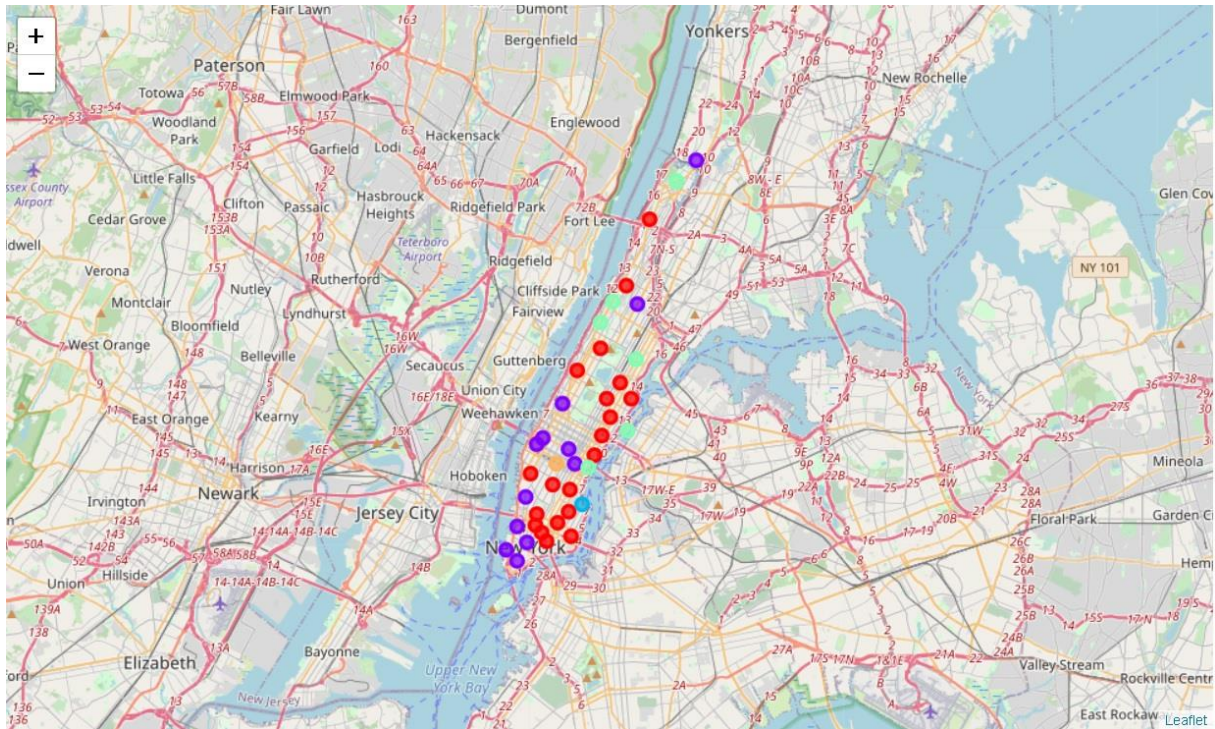
Manhattan venues:

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Battery Park City	86	86	86	86	86	86
Carnegie Hill	86	86	86	86	86	86
Central Harlem	45	45	45	45	45	45
Chelsea	100	100	100	100	100	100
Chinatown	100	100	100	100	100	100
Civic Center	100	100	100	100	100	100
Clinton	100	100	100	100	100	100
East Harlem	40	40	40	40	40	40
East Village	100	100	100	100	100	100
Financial District	100	100	100	100	100	100
Flatiron	100	100	100	100	100	100
Gramercy	94	94	94	94	94	94
Greenwich Village	100	100	100	100	100	100
Hamilton Heights	63	63	63	63	63	63
Hudson Yards	62	62	62	62	62	62
Inwood	56	56	56	56	56	56
Lenox Hill	100	100	100	100	100	100
Lincoln Square	92	92	92	92	92	92
Little Italy	100	100	100	100	100	100
Lower East Side	48	48	48	48	48	48
Manhattan Valley	49	49	49	49	49	49
Manhattanville	46	46	46	46	46	46
Marble Hill	22	22	22	22	22	22
Midtown	100	100	100	100	100	100
Midtown South	100	100	100	100	100	100

## Manhattan merged datas:

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
19	Lower East Side	0.000000	0	Manhattan	40.717807	-73.980890
37	Washington Heights	0.011905	0	Manhattan	40.851903	-73.936900
36	Upper West Side	0.020408	0	Manhattan	40.787658	-73.977059
35	Upper East Side	0.000000	0	Manhattan	40.775639	-73.960508
34	Turtle Bay	0.010000	0	Manhattan	40.752042	-73.967708
31	Sutton Place	0.000000	0	Manhattan	40.760280	-73.963556
29	Soho	0.000000	0	Manhattan	40.722184	-74.000657
27	Noho	0.000000	0	Manhattan	40.723259	-73.988434
20	Manhattan Valley	0.000000	0	Manhattan	40.797307	-73.964286
18	Little Italy	0.000000	0	Manhattan	40.719324	-73.997305
16	Lenox Hill	0.010000	0	Manhattan	40.768113	-73.958860
13	Hamilton Heights	0.000000	0	Manhattan	40.823604	-73.949688
39	Yorkville	0.000000	0	Manhattan	40.775930	-73.947118
11	Gramercy	0.010638	0	Manhattan	40.737210	-73.981376
1	Carnegie Hill	0.011628	0	Manhattan	40.782683	-73.953256
10	Flatiron	0.000000	0	Manhattan	40.739673	-73.990947
3	Chelsea	0.000000	0	Manhattan	40.744035	-74.003116
4	Chinatown	0.000000	0	Manhattan	40.715618	-73.994279
8	East Village	0.000000	0	Manhattan	40.727847	-73.982226
12	Greenwich Village	0.010000	0	Manhattan	40.726933	-73.999914
2	Central Harlem	0.000000	1	Manhattan	40.815976	-73.943211
32	Tribeca	0.000000	1	Manhattan	40.721522	-74.010683
5	Civic Center	0.000000	1	Manhattan	40.715229	-74.005415
6	Clinton	0.020000	1	Manhattan	40.759101	-73.996119
26	Murray Hill	0.030000	1	Manhattan	40.748303	-73.978332
23	Midtown	0.000000	1	Manhattan	40.754691	-73.981669

## Clusters map of Manhattan



## Cluster 1

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
19	Lower East Side	0.000000	0	Manhattan	40.717807	-73.980890
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4	Chinatown	0.000000	0	Manhattan	40.715618	-73.994279
8	East Village	0.000000	0	Manhattan	40.727847	-73.982226
12	Greenwich Village	0.010000	0	Manhattan	40.726933	-73.999914



## Cluster 2

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
2	Central Harlem	0.000000	1	Manhattan	40.815976	-73.943211
32	Tribeca	0.000000	1	Manhattan	40.721522	-74.010683
5	Civic Center	0.000000	1	Manhattan	40.715229	-74.005415
6	Clinton	0.020000	1	Manhattan	40.759101	-73.996119
26	Murray Hill	0.030000	1	Manhattan	40.748303	-73.978332
23	Midtown	0.000000	1	Manhattan	40.754691	-73.981669
22	Marble Hill	0.000000	1	Manhattan	40.876551	-73.910660
38	West Village	0.000000	1	Manhattan	40.734434	-74.006180
9	Financial District	0.010000	1	Manhattan	40.707107	-74.010665
17	Lincoln Square	0.000000	1	Manhattan	40.773529	-73.985338
14	Hudson Yards	0.016129	1	Manhattan	40.756658	-74.000111
0	Battery Park City	0.000000	1	Manhattan	40.711932	-74.016869

## Cluster 3

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
30	Stuyvesant Town	0.0	2	Manhattan	40.731	-73.974052

## Cluster 4

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
25	Morningside Heights	0.000000	3	Manhattan	40.808000	-73.963896
7	East Harlem	0.025000	3	Manhattan	40.792249	-73.944182
28	Roosevelt Island	0.038462	3	Manhattan	40.762160	-73.949168
21	Manhattanville	0.000000	3	Manhattan	40.816934	-73.957385
33	Tudor City	0.024691	3	Manhattan	40.746917	-73.971219
15	Inwood	0.053571	3	Manhattan	40.867684	-73.921210

## Cluster 5

	Neighborhood	Restaurant	Cluster Labels	Borough	Latitude	Longitude
24	Midtown South	0.0	4	Manhattan	40.74851	-73.988713



## **Results and discussion**

New York City's restaurant industry had 23,650 establishments and most of it concentrated in Manhattan. By accessing the total number and distributions of restaurants we can see that the data trends of each distinctive boroughs/districts for restaurants is not equally distributed for Manhattan. The analyzed data obtained via exploratory data analysis has given us the findings that the total numbers of restaurants in Manhattan is significantly outweighs Lower Manhattan, Hell's Kitchen, Upper East Side or Upper West Side then Midtown Manhattan or Peter Cooper Village.

## **Conclusion**

Most of restaurants are concentrated in the lower and central area of Manhattan, in the cluster 0 and cluster 1. On the other hand, cluster 2 and cluster 4 has few restaurants at all. This represents a great opportunity and high potential areas to open new restaurants anywhere in cluster 2 and 4, as there is little competition from existing restaurants. Meanwhile, restaurants in cluster 0 and cluster 1 are likely suffering from intense competition due to oversupply and high concentration of restaurants. From another perspective, this also shows that the oversupply of restaurants mostly happened in the central area of the city. Therefore, this project recommends property developers to capitalize on these findings to open new restaurants in neighborhoods in cluster 2 or cluster 4 with little competition.