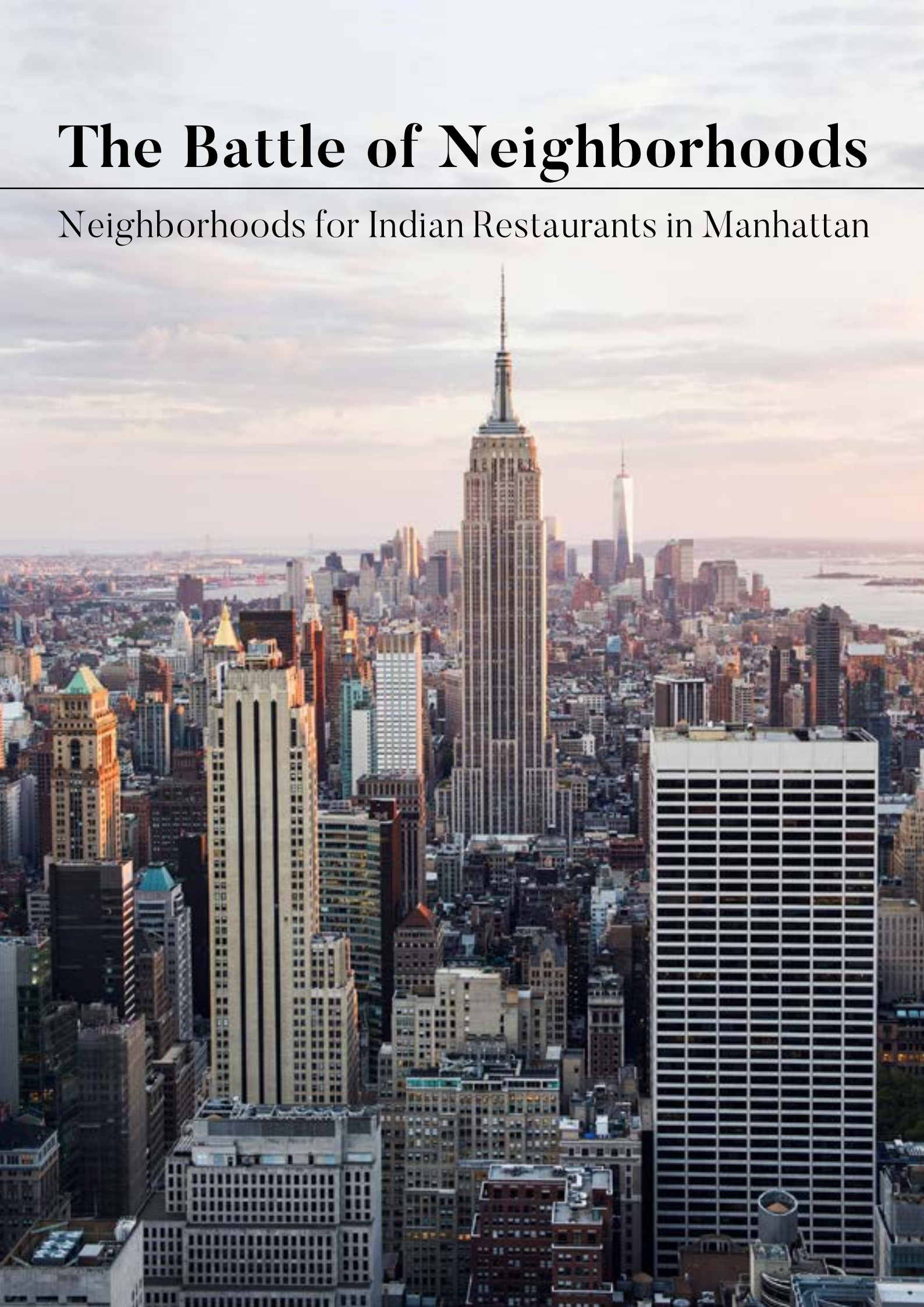
The Battle of Neighborhoods

Neighborhoods for Indian Restaurants in Manhattan



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Introduction

Background

Manhattan, borough of New York City, coextensive with New York county, in southeastern New York state, U.S. The borough, mainly on Manhattan Island, spills over into the Marble Hill section on the mainland and includes a number of islets in the East River. It is bounded by the Hudson River (west), Harlem River and Spuyten Duyvil Creek (northeast), East River (east), and Upper New York Bay (south). Manhattan is often mistakenly deemed synonymous with New York City.

Manhattan is considered one of the world's foremost commercial, financial, and cultural centres. It is renowned for its many points of interest. Among these are Broadway, one of the world's best-known streets; the financial district of Wall Street; skyscrapers such as the Empire State Building; Greenwich Village, Harlem, and Central Park; the United Nations headquarters; and various cultural and educational institutions, including the Metropolitan Museum of Art, the Metropolitan Opera House, the Museum of Modern Art, Columbia University, two branches of the City University of New York, and New York University. Pop. (2000) 1,537,295; (2010) 1,585,873.

Restaurant Industry

Based on a report by IBIS World, The Restaurants industry in New York has experienced steady growth over the five years to 2018, as convenient and affordable food remains popular with consumers. While the low price point of the industry's products typically places restaurants and coffee shops with a competitive advantage over other segments of the foodservices sector, rising consumer sentiment has increased competition overall. The approximately 31,061 restaurants have a market size of the New York Restaurant Industry is $17bn.

Indian Community in New York

Indians in the New York City metropolitan region constitute one of the largest and fastest growing ethnicities in the New York City metropolitan area of the United States. The New York City region is home to the largest Indian American population among metropolitan areas by a significant margin, enumerating 711,174 uniracial individuals by the 2013–2017 U.S. Census American Community Survey estimates. The Asian Indian population also represents the second-largest metropolitan Asian national diaspora both outside of Asia and within the New York City metropolitan area, following the also rapidly growing and hemisphere-leading population of the estimated 893,697 uniracial Chinese in the New York City metropolitan area in 2017. The U.S. state of New Jersey, most of whose population is situated within the New York City metropolitan region, has by a significant margin the highest proportional Indian population concentration of any U.S. state, with a Census-estimated 4.1% of New Jersey's population being an individual of Indian origin in 2017.

Real Estate Market in New York

New York City has the world's largest urban economy. As a result, New York City consistently ranks on top 10 lists as one of the world's most expensive cities to live in. Rents in the city are on their way to historic rates. The typical rent in New York is $3,400 - twice the typical national rent. Therefore for any commercial establishment rent affordability becomes one of the most important criterias.

Business Problem

In this project we will try to find an optimal location for a restaurant. Specifically, this report will be targeted to stakeholders interested in opening an **Indian restaurant in Manhattan, New York.**

Since there are lots of restaurants in Manhattan we will try to detect neighborhoods with no Indian restaurants in the vicinity. We would also prefer locations as close to cultural center of the Borough - Empire State Building. At the same time rent for the restaurant needs to be affordable.

We will use our data science powers to generate a few most promissing neighborhoods based on these criterias. Advantages of each area will then be clearly expressed so that best possible final location can be chosen by stakeholders.

Data

Based on definition of our problem, factors that will influence our decission are:

- number of Indian restaurants in the neighborhood.
- average rent in the neighborhood.
- distance of neighborhood from cultural center of Manhattan i.e Empire State Building.

Our neighborhoods names,latitudes and longitudes was obtained from the newyork .json file dataset.

Following data sources will be needed to extract/generate the required information:

- number of restaurants and their type and location in every neighborhood will be obtained using Foursquare API
- coordinate of Manhattan, neighborhood will be obtained using Google Maps API geocoding.
- An important part of the study is to also look at affordability. For this purpose I found a dataset with average rents for Manhattan here https://www.rentcafe.com/average-rent-market-trends/us/ny/manhattan/.

Rent Analysis in Manhattan

The most affordable neighborhoods in Manhattan are Marble Hill, where the average rent goes for $1,708/month, Washington Heights, where renters pay $2,284/mo on average, and Inwood, where the average rent goes for $2,375/mo. If you're looking for other great deals, check out the listings from Randalls and Wards Islands ($2,394), Harlem ($2,948), and East Harlem ($2,965), where the asking prices are below the average Manhattan rent of $4,208/mo.

The most expensive neighborhoods in Manhattan are Battery Park City ($5,605), Little Italy ($5,607) and TriBeCa ($5,607).

The most popular neighborhood in Manhattan is East Village, where there are 34 verified RENTCafé listings with an average rent of $4,320. Next up is Greenwich Village, where apartments go for $4,378/month, followed by Harlem with $2,948 If you're looking to rent in Manhattan's most popular neighborhoods, make sure to also check out Yorkville, where renters pay $4,458 on average, and Clinton - Hell's Kitchen, where the average monthly rent is $4,053.

S. No	Neighborhood	Average Rent
01	Marble Hill	$1,708
02	Washington Heights	$2,284
03	Inwood	$2,375
04	Randalls and Wards Islands	$2,394
05	Harlem	$2,948
06	East Harlem	$2,965
07	Roosevelt Island	$3,416
08	Stuyvesant Town	$3,611
09	Liberty Island	$3,648
10	Governors Island	$3,648
11	Ellis Island	$3,648
12	Tudor City	$3,808
13	Turtle Bay	$3,906
14	Sutton Place	$3,941
15	Central Midtown	$4,022
16	Central Park South	$4,038

S. No	Neighborhood	Average Rent
17	Theatre District - Times Square	$4,059
18	Financial District	$4,142
19	Murray Hill	$4,143
20	Peter Cooper Village	$4,154
21	Kips Bay	$4,172
22	Lenox Hill	$4,231
23	NoMad	$4,243
24	Gramercy Park	$4,275
25	Koreatown, Garment District, Flatiron District	$4,276
28	East Village	$4,320
29	Meatpacking District	$4,363
30	Chelsea	$4,370
31	Greenwich Village	$4,378
32	Morningside Heights	$4,388
33	NoHo	$4,394
34	Hudson Yards	$4,416

S. No	Neighborhood	Average Rent
35	Yorkville	$4,458
36	Carnegie Hill	$4,458
37	Civic Center	$4,489
38	Two Bridges	$4,544
39	West Village	$4,598
40	Upper West Side	$4,668
41	Lower East Side	$4,676
42	Manhattan Valley	$4,711
43	Lincoln Square	$4,795
44	Hudson Square	$5,055
45	Chinatown	$5,116
46	SoHo	$5,301
47	NoLIta	$5,301
48	TriBeCa	$5,607
49	Little Italy	$5,607

Methodology

In this project we will direct our efforts on detecting neighborhoods of Manhattan with low number of Indian restaurants. We will then look for the most affordable neighborhoods closest to the centre of Manhattan.

In first step we have collected the required data: distance of each neighborhood from the centre of Manhattan. We have also identified Indian restaurants (using Foursquare API). In order to understand the affordable neighborhoods we found the Rental Market Trends data.

Second step in our analysis will be calculation ‘restaurant density’ across different neighborhoods of Manhattan - we will use ‘heatmaps’ to identify a few promising areas close to center with low number of Indian Restaurants and focus our attention on those areas.

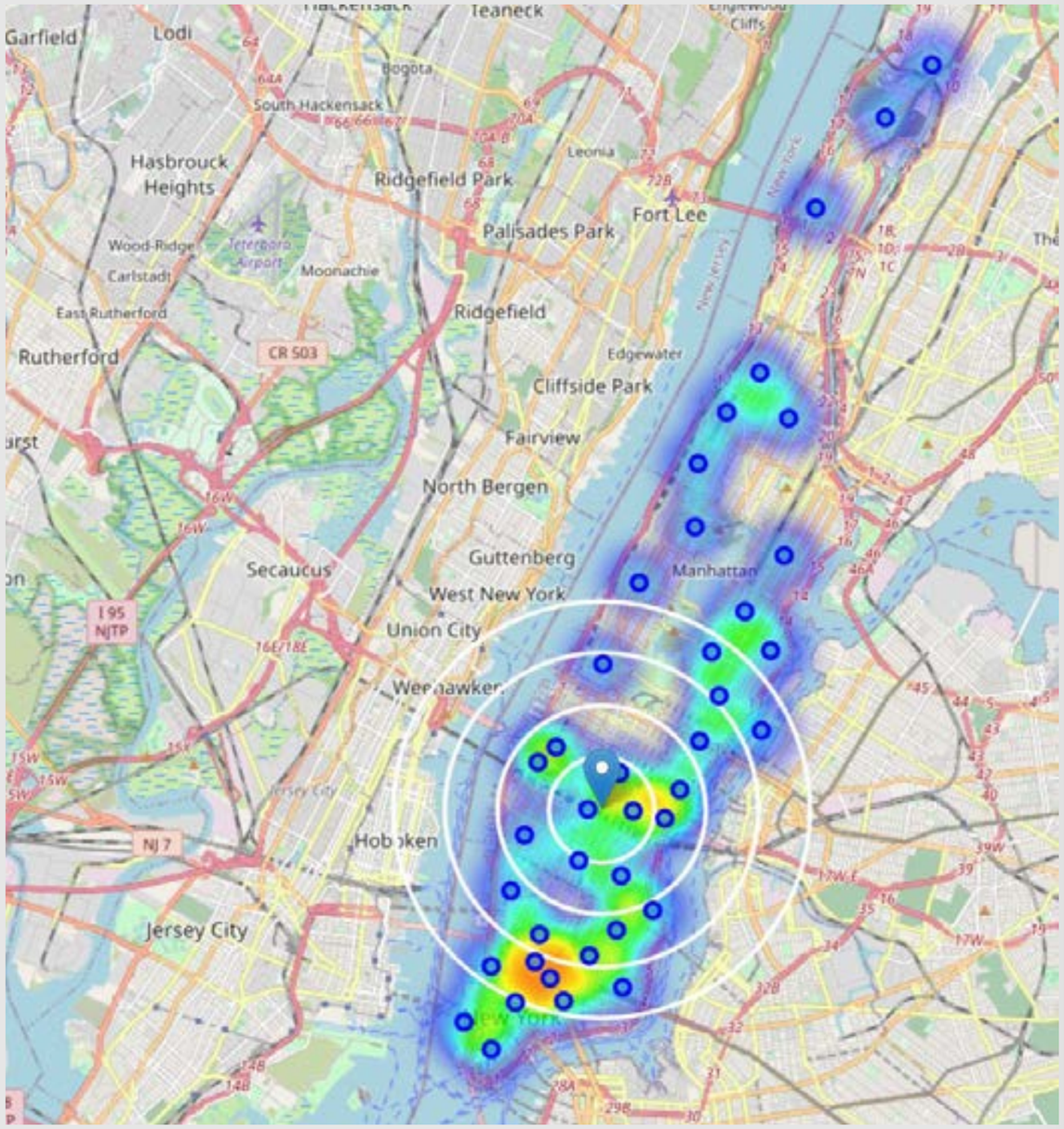
In third and final step we will focus on most promising areas and within those create ‘clusters of locations that meet some basic requirements’ established in discussion with stakeholders: we will take into consideration locations with ‘lesser than 2 Indian Restaurants’, and we want locations ‘most affordable rent’, and ‘closest to the cultural centre of Manhattan’. We will present map of all such locations but also create clusters (using ‘k-means clustering’) of those locations to identify neighborhoods which should be a starting point for final ‘street level’ exploration and search for optimal venue location by stakeholders.

Analysis

Let’s perform some basic explanatory data analysis and derive some additional info from our raw data. First let’s count the number of Indian Restaurants in every neighborhood (the neighborhoods not mentioned in this list have ‘0 Indian Restaurants):

S. No	Neighborhood	No_of_Venues
01	Noho	11
02	Midtown	10
03	Sutton Place	09
04	East Village	08
05	Civic Center, Greenwich Village	06
06	Midtown South	05
07	Gramercy	04
08	Upper West Side, Little Italy, Lenox Hill, Turtle Bay, Murray Hill, Financial District	03
09	Chinatown, Soho, Washington Heights, Manhattan Valley, East Harlem, Tribeca, Yorkville, Flatiron	02
10	Marble Hill, Carnegie Hill, Hamilton Heights, Hudson Yards, Morningside Heights, Lower East Side, West Village, Tudor City, Battery Park City, Manhattanville, Central Harlem, Upper East Side	01

This heatmap gives us a broader idea of the density of the distribution of Indian Restaurants in the neighborhood. Particularly neighborhoods such as 'Clinton, Flatiron, Tudor City, Lincoln Square, Chelsea, West Village, Hudson Yards, Stuyvesant Town' look promising. https://adbifm4nnrs8kukj8pnqog-on.drv.tw/www.heatmap_indianrestaurants.com/heat_map.html



K-Means Clustering

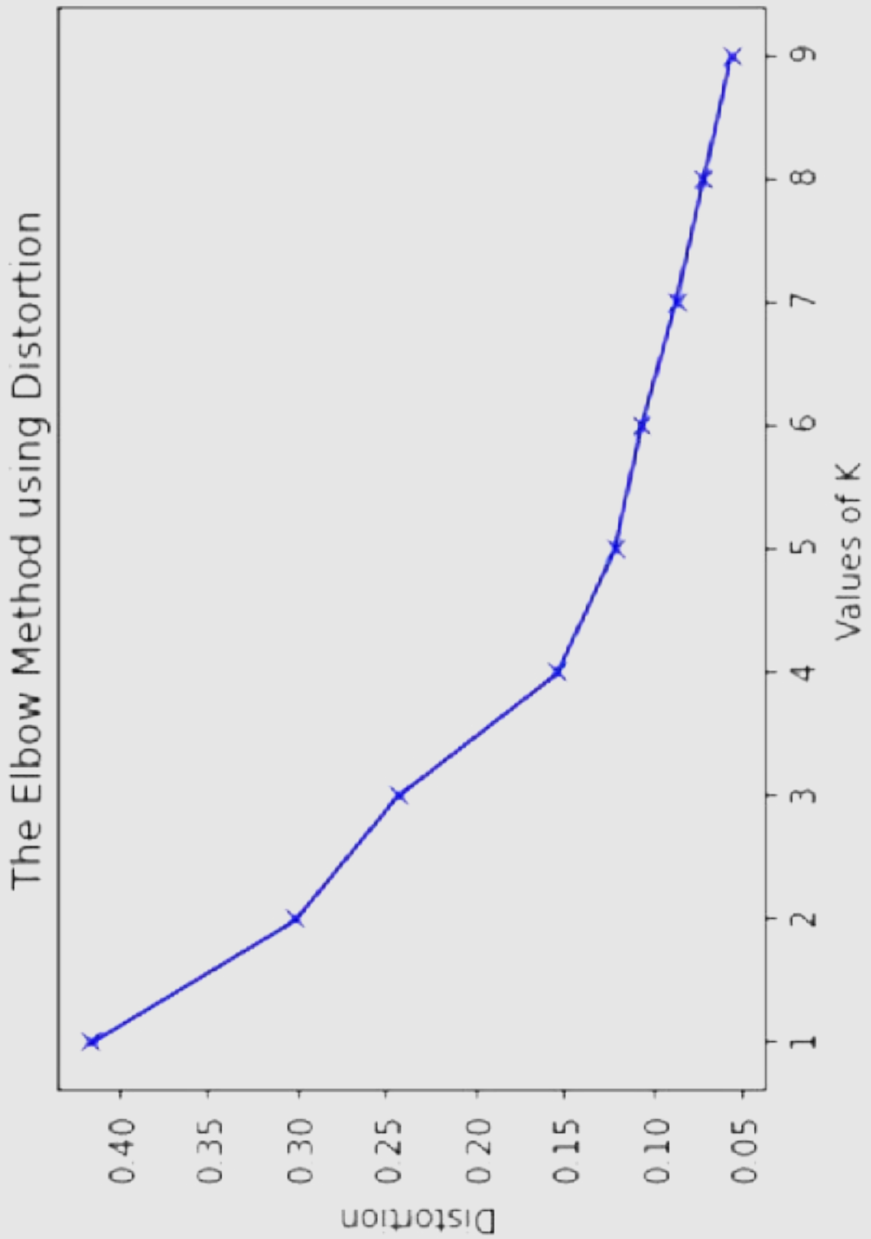
As shown previously we have neighborhood dataset with no of Indian Restaurants and Average Rent. We need to normalize the values to perform K-Means Clustering Analysis. Here's what the normalized data looks like (this dataset only includes neighborhoods with less than "2 Indian Restaurants'.

S. No	Neighborhood	No_of_Venues	Average Rent
00	Marble Hill	0.5	0.000000
01	Chinatown	1.0	0.874070
02	Washington Heights	1.0	0.147730
03	Inwood	0.0	0.171070
04	Hamilton Heights	0.5	0.073609
05	Manhattanville	0.5	0.315978
06	Central Harlem	0.5	0.318030
07	East Harlem	1.0	0.322390
08	Upper East Side	0.5	0.761221
09	Yorkville	1.0	0.705309
10	Roosevelt Island	0.0	0.438061
11	Lincoln Square	0.0	0.791741
12	Clinton	0.0	0.601436

S. No	Neighborhood	No_of_Venues	Average Rent
13	Chelsea	0.0	0.682739
14	Lower East Side	0.5	0.400359
15	Tribeca	1.0	1.000000
16	Soho	1.0	0.921518
17	West Village	0.5	0.741216
18	Manhattan Valley	1.0	0.770197
19	Morningside Heights	0.5	0.687356
20	Battery Park City	0.5	0.999487
21	Carnegie Hill	0.5	0.705309
22	Tudor City	1.0	0.538600
23	Stuyvesant Town	0.0	0.488074
24	Flatiron	1.0	0.658630
25	Hudson Yards	0.5	0.694537

The Elbow Method (to find Ideal k value)

We need to find the optimal value of k for k-means clustering. We'l do this by using the elbow method. We can conclude that the optimal number of clusters for this data is **k = 4**



Cluster Labels

Cluster_Label	Neighborhood	No_of_Venues	Average Rent	Distance_Centre
0	Marble Hill	1	$1708	23747.69
2	Chinatown	2	5116	5677.99
0	Washington Heights	2	2284	18617.88
3	Inwood	0	2375	21835.01
0	Hamilton Heights	0.5	1995	13553.82
0	Manhattanville	0.5	2940	12165.80
0	Central Harlem	0.5	2948	12684.71
0	East Harlem	1.0	2965	9150.11
1	Upper East Side	0.5	4676	5637.25
2	Yorkville	0.5	4458	6812.51
3	Roosevelt Island	1.0	3416	5249.39
3	Lincoln Square	0.0	4795	4253.71
3	Clinton	0.0	4053	2255.00
3	Chelsea	0.0	4370	2371.85
0	Lower East Side	0.5	3269	5233.11

Cluster Labels

Cluster_Label	Neighborhood	No_of_Venues	Average Rent	Distance_Centre
2	Tribeca	0.5	5607	5592.29
2	Soho	1.0	5301	4856.01
1	West Village	1.0	4598	3556.54
2	Manhattan Valley	0.0	4711	8729.06
1	Morningside Heights	0.5	4388	10476.71
1	Battery Park City	0.5	5605	7387.87
1	Carnegie Hill	0.5	4458	7151.61
1	Tudor City	1.0	3808	1880.85
3	Stuyvesant Town	0.5	3611	3316.04
2	Flatiron	0.5	4276	1635.77
1	Hudson Yards	1.0	4416	2326.48

Results and Discussion

Our analysis shows that although there are 34 neighborhoods in Manhattan with Indian Restaurants we could still find the most affordable neighborhoods with less than 2 Indian **Restaurants within a 4km radius from the Empire State building**.

For the purpose of this study we assumed the Empire State Building as the cultural center of the Borough. The idea is to find the neighborhood closest to the cultural center as this will be most desirable. According to our analysis **West Village,Tudor City,Hudson Yards** should be explored by the concerned stakeholders.

Its entirely possible that the neighborhoods have lesser Indian Restaurants for a variety of reasons. The population of the Indian American community might be lesser than in other neighborhoods. Or there might be other safety factors, land usage bye-laws of New York that prevent Restaurants from opening here. Therefore, this study should only be used as a starting point for a more detailed analysis.

Conclusion

Purpose of this project was to identify neighborhoods close to the cultural center of Manhattan with low number of Indian restaurants in order to aid stakeholders in narrowing down the search for optimal location for a new Indian restaurant. We then used the Foursquare Data to calculate density of Indian Restaurants in each neighborhood. We then performed further analysis by looking at this data through an affordability lens. Finally we were able to narrow down to three neighborhoods for further inspection namely, **West Village,Tudor City,Hudson Yards.**
https://adbifm4nnrs8kukj8pnqog-on.drv.tw/www.map_ideal_neighborhoods.com/map_ideal_neighborhoods.html

Final decission on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.