# Battle of the Neighborhoods

WHICH NEIGHBORHOOD IS BEST FOR BUILDING A NEW BBQ RESTAURANT IN MANHATTAN?

# 1. Introduction/Business Problem

**Background:** Round Cutz, an up and coming restaurant development company, is interested in expanding their business and is seeking to open a new American BBQ restaurant in the Manhattan borough of New York City.

**Problem:** Manhattan is one the most densely populated boroughs in New York City with one of the highest concentrations of restaurants (and restaurant closings) in the world. Therefore it is crucial for stakeholders and any other interested parties to carefully choose the right neighborhood for opening the new restaurant.

**Interest:** Stakeholders and investors need to obtain all necessary location data to determine which neighborhood has the lowest competition and market saturation in order to capitalize on their investment and maximizing its potential in such a big market.

# 2. Data Acquisition & Cleaning

**Data Acquisition:** The data required for this project is from a combination of 4 sources.

• The first dataset is a list of all of New York City's neighborhoods within its 5 boroughs, which is publicly viewable at this url (https://geo.nyu.edu/catalog/nyu_2451_34572).

• The second dataset is venue data, particularly data related to the number of barbecue restaurants in each neighborhood.

• The third data set is a data frame that shows all 698 barbecue (or similar) restaurants in Manhattan grouped by neighborhood.

• The fourth data set will be used within Foursquare's API function, which allows us to obtain venues and their location, category, etc.. So that we can determine how many BBQ restaurants are in each neighborhood, which provides all the information we need to determine the best location to build our new BBQ restaurant.

**Data Cleaning:** The data cleaning process was done separately for each of the four sources.

Our first dataset, we needed to only obtain a list of the neighborhoods in Manhattan. So we needed to drop all the other boroughs and their neighborhoods and make new pandas dataframe like so:

| | Borough | Neighborhood | Latitude | Longitude |
|---|---|---|---|---|
| 0 | Manhattan | Marble Hill | 40.876551 | -73.910660 |
| 1 | Manhattan | Chinatown | 40.715618 | -73.994279 |
| 2 | Manhattan | Washington Heights | 40.851903 | -73.936900 |
| 3 | Manhattan | Inwood | 40.867684 | -73.921210 |
| 4 | Manhattan | Hamilton Heights | 40.823604 | -73.949688 |

For our second dataset, we needed to obtain a list of the number of BBQ restaurants categorized as such by Foursquare in each of Manhattan's Neighborhoods.

| Neighborhood | # of Venues |
| --- | --- |
| Battery Park City | 15 |
| Carnegie Hill | 10 |
| Central Harlem | 7 |
| Chelsea | 23 |
| Chinatown | 18 |
| Civic Center | 21 |
| Clinton | 28 |
| East Harlem | 5 |
| East Village | 18 |

For our third data set, we needed to obtain a full list of all 698 BBQ restaurants in Manhattan, its associated neighborhood and its latitude and longitude coordinates. We will use this table later to cluster the neighborhoods, and perform k-means clustering to find the most suitable neighborhood.

| | Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 0 | Marble Hill | 40.876551 | -73.910660 | Sang's Barbecue Co | 40.868831 | -73.902634 | BBQ Joint |
| 1 | Chinatown | 40.715618 | -73.994279 | 友情客串bbq | 40.717550 | -73.995060 | Restaurant |
| 2 | Chinatown | 40.715618 | -73.994279 | Best Wingers | 40.717716 | -73.985140 | Wings Joint |
| 3 | Chinatown | 40.715618 | -73.994279 | Kimchi Smoke (Pop-up) | 40.720341 | -73.994049 | BBQ Joint |
| 4 | Chinatown | 40.715618 | -73.994279 | Pete's Smokehouse And Bbq | 40.723947 | -73.983926 | BBQ Joint |
| 5 | Chinatown | 40.715618 | -73.994279 | K&S BBQ Ramen | 40.718332 | -73.991525 | BBQ Joint |
| 6 | Chinatown | 40.715618 | -73.994279 | HNH BBQ | 40.718364 | -74.000785 | BBQ Joint |
| 7 | Chinatown | 40.715618 | -73.994279 | B&J BBQ | 40.724093 | -73.997439 | BBQ Joint |
| 8 | Chinatown | 40.715618 | -73.994279 | Flippin Chicken | 40.721366 | -74.005608 | Fried Chicken Joint |
| 9 | Chinatown | 40.715618 | -73.994279 | 99 Orchard Rooftop Grill | 40.718604 | -73.990227 | BBQ Joint |
| 10 | Chinatown | 40.715618 | -73.994279 | Kimchi Smoke | 40.720474 | -73.994363 | Korean Restaurant |

# 3. Methodology

From the dataframes generated in the previous slides, we will now cluster them into 5 different clusters using the k-means clustering algorithm. The proceeding slides will show each of the 5 clusters in list form, and then we will visualize the clusters onto a Folium map of Manhattan. The corresponding dataframes list the top 10 venues in each neighborhood.

To the right, you will find cluster 1:

| | Neighborhood | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Lincoln Square | BBQ Joint | Hotpot Restaurant | Southern / Soul Food Restaurant | Brazilian Restaurant | Salad Place | Food Truck | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop |
| 14 | Clinton | BBQ Joint | Southern / Soul Food Restaurant | Hotpot Restaurant | Fast Food Restaurant | Brazilian Restaurant | Salad Place | Mexican Restaurant | Japanese Restaurant | Sushi Restaurant | Fried Chicken Joint |
| 21 | Tribeca | BBQ Joint | Food Truck | Steakhouse | Snack Place | Restaurant | Fried Chicken Joint | Wings Joint | Food Stand | Brazilian Restaurant | Brewery |
| 24 | West Village | BBQ Joint | Food Truck | Steakhouse | Mexican Restaurant | Wings Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop |
| 39 | Hudson Yards | BBQ Joint | Southern / Soul Food Restaurant | Mexican Restaurant | Japanese Restaurant | Sushi Restaurant | Fried Chicken Joint | Fast Food Restaurant | Wings Joint | Food Stand | Brazilian Restaurant |

# Cluster 2:

| | Neighborhood | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Chinatown | BBQ Joint | Wings Joint | Restaurant | Korean Restaurant | Fried Chicken Joint | Food Truck | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar |
| 6 | Central Harlem | BBQ Joint | Restaurant | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant |
| 7 | East Harlem | BBQ Joint | Steakhouse | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant |
| 8 | Upper East Side | BBQ Joint | American Restaurant | Pizza Place | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant |
| 9 | Yorkville | BBQ Joint | American Restaurant | Pizza Place | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant |
| 12 | Upper West Side | BBQ Joint | Burger Joint | Food Truck | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Cocktail Bar | Cupcake Shop | Fast Food Restaurant |

## Cluster 3:

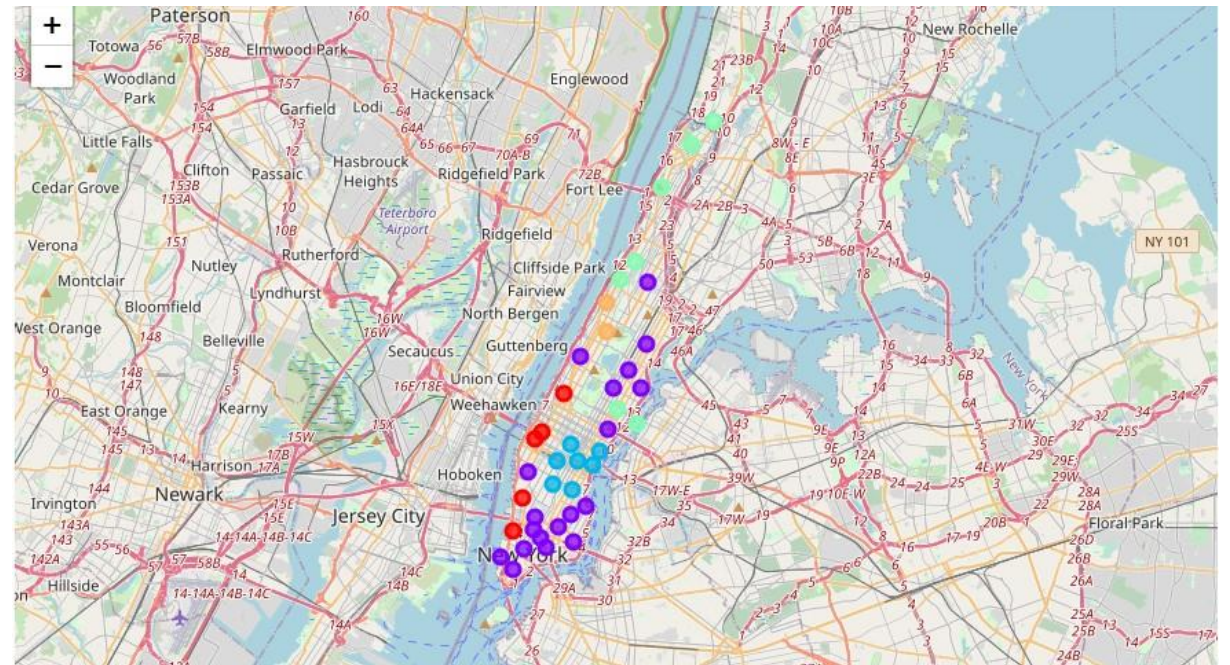| | Neighborhood | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Midtown | BBQ Joint | Korean Restaurant | Japanese Restaurant | Southern / Soul Food Restaurant | Food Truck | Hotpot Restaurant | Brazilian Restaurant | Salad Place | Mexican Restaurant | Sushi Restaurant |
| 16 | Murray Hill | BBQ Joint | Korean Restaurant | Mexican Restaurant | Japanese Restaurant | Wings Joint | Fast Food Restaurant | Southern / Soul Food Restaurant | Fried Chicken Joint | Food Truck | Food Stand |
| 27 | Gramercy | BBQ Joint | Korean Restaurant | Wings Joint | Steakhouse | Brewery | Mexican Restaurant | Cupcake Shop | Food Truck | Brazilian Restaurant | Burger Joint |
| 33 | Midtown South | BBQ Joint | Korean Restaurant | Mexican Restaurant | Fast Food Restaurant | Southern / Soul Food Restaurant | Brewery | Japanese Restaurant | Sushi Restaurant | Fried Chicken Joint | Cupcake Shop |
| 35 | Turtle Bay | BBQ Joint | Wings Joint | Korean Restaurant | Japanese Restaurant | Food Truck | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop |
| 36 | Tudor City | BBQ Joint | Korean Restaurant | Wings Joint | Japanese Restaurant | Food Truck | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop |
| 38 | Flatiron | BBQ Joint | Korean Restaurant | Mexican Restaurant | Steakhouse | Brewery | Japanese Restaurant | Cupcake Shop | Wings Joint | Food Stand | Brazilian Restaurant |

## Cluster 4:

| | Neighborhood | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Marble Hill | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 2 | Washington Heights | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 3 | Inwood | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 4 | Hamilton Heights | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 5 | Manhattanville | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 10 | Lenox Hill | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |

## Cluster 5:

| | Neighborhood | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | Manhattan Valley | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |
| 26 | Morningside Heights | BBQ Joint | Wings Joint | Fried Chicken Joint | Brazilian Restaurant | Brewery | Burger Joint | Cocktail Bar | Cupcake Shop | Fast Food Restaurant | Food Stand |

Here's a map showing all 5 clusters on a Folium map of Manhattan,

- Cluster 1 is in red

- Cluster 2 is in purple

- Cluster 3 is in blue

- Cluster 4 is in mint green

- Cluster 5 is in light orange

# 4. Results

Let's summarize each cluster, which will help us determine which neighborhood is best for building Round Cutz' new BBQ restaurant.

- Cluster 1: High frequency of BBQ joints, but a much lower frequency of wings joints

- Cluster 2: Much higher frequency of BBQ joints with a moderate amount of wings joints

- Cluster 3: Not as high frequency of BBQ joints as cluster 2, but still quite high, with a moderate amount of wings joints

- Clusters 4 & 5: High frequencies of both BBQ joints and wings joints

# 5. Discussion

**Decision to focus on cluster 1:**

- All 5 clusters had high volumes of BBQ restaurants to the point where it was the 1st most popular restaurant venue category.

- Cluster 1 stands out in that chicken wings joints are very few and far between compared to the other clusters.

- The neighborhoods represented in cluster 1 are Lincoln Square, Clinton, Tribeca, West Village, and Hudson Yards

- Of those 5 neighborhoods, Lincoln Square is the neighborhood with the fewest BBQ restaurants (12), and wings joints aren't even in its top 10 most venues.

# 6. Conclusion

**Which neighborhood in Manhattan, New York City, NY is best suited for opening a new BBQ restaurant?**

Using location data only, the best suited neighborhood in Manhattan for Round Cutz and of its interested parties we concluded is Lincoln Square.

Also due to the high volume of BBQ restaurants in Manhattan, and a lot lower volume of wings joints, we recommend that Round Cutz sell wings as its main product given low competition in the neighborhood.

However, we recommend further research on the neighborhood demographic and socioeconomic information such as average income, housing prices, etc...

If Lincoln Square shows that it has an active community with decent disposable income, then we recommend pursuing development on the new BBQ restaurant in that neighborhood

*Your best quote that reflects your approach... "It's one small step for man, one giant leap for mankind."*

- NEIL ARMSTRONG