# Capstone Project - The Battle of Neighborhoods (Week 2)

## 1. Business Problem section

How could we provide support to a client to purchase a suitable place for his new restaurant in Manhattan, NY,USA in this uncertain economic and financial scenario? Currently he is doing a profitable Indian restaurant in Tampa FL and he is planning to start a new restaurant in Manhattan, NY.

Since he currently runs a profitable business in Tampa he is expecting a similar neighborhood in Manhattan, NY also.

To solve this business problem, we are going to cluster Manhattan, NY neighborhoods in order to most common recommend venues. While selecting the place there are key points to consider like he needs to check out how many Indian restaurants are there in that specific location? If incase there are already two Indian restaurants which have good ratings, will it be risky to open new one near these restaurants? What all factors will help him to run his business above average?

### Discussion

Let's discuss the above mentioned problem statements. Firstly he needs to choose a suitable location for the restaurant. Let's say he wants to open a new Indian Restaurant in Manhattan, NY. Manhattan, NY real estate is very costly. So assuming that he wants to rent a place for his new restaurant. And now he needs to figure out how many restaurants are there in say neighborhood A, B, C,etc. If there are more than two Indian restaurants in a neighborhood then that would be a great risk to open new restaurant of same cuisine in that neighborhood. Selecting a place where there is less or no restaurant would be of great choice, considering the rent of neighborhood too. Why I'm emphasizing that there should be less restaurants is, so that he will face less competition with same cuisine restaurants. He needs to look for a place where many people frequently visit so that his business is above average. Places like Downtown, Movie theatre, Malls & Gas stations would help his business running. Restaurants ratings, checking of customers might help in deciding location crowd. I would also suggest that since he currently runs a profitable business in Tampa he should find a similar type of neighborhood in Manhattan, NY also.

## 2. Data Section:

### **Description of the data and its sources that will be used to solve the problem**

My client currently reside in the neighborhood of 'Tampa,FL' in USA. I use Foursquare to identify the venues around the area of residence which are then shown in the map shown in methodology and execution in section 3.0. It serves as a reference for comparison with the desired future location in Manhattan NY.

In order to make a good choice of a similar restaurant in Manhattan NY, the following data is required: List/Information on neighborhoods form Manhattan with their Geodata ( latitude and longitude. List/Information about the subway metro stations in Manhattan with geodata. Venues and amenities in the Manhattan neighborhoods (e.g. top 10) is worked out during lab exercise during the course. The clustering of neighborhoods and mapping will be shown in methodology. Foursquare is used to find the avenues at Manhattan neighborhoods in general and a cluster is created to later be able to search for the venues depending of the location shown.

### How the data will be used to solve the problem

The data will be used as follows: Use Foursquare and geopy data to map top 10 venues for all Manhattan neighborhoods and clustered in groups ( as per Course LAB) Use foursquare and geopy data to map the location of subway metro stations , separately and on top of the above clustered map in order to be able to identify the venues and amenities near each metro station, or explore each subway location separately use Foursquare and geopy data to map the location of rental places, in some form, linked to the subway locations. I use Foursquare to identify the venues around the area of Tampa, FL and compare those venues with clustered groups in Manhattan, NY.

# 3. Methodology

This section represents the main component of the report where the data is gathered, prepared for analysis.

## Tampa,FL Map - Current residence and venues in neighborhood

|  | **name** | **categories** | **lat** | **lng** |
| --- | --- | --- | --- | --- |
| **0** | Eddie and Sam's Pizza | Pizza Place | 27.949044 | -82.459184 |
| **1** | HOTEL BAR | American Restaurant | 27.946245 | -82.458302 |
| **2** | Gin Joint | Speakeasy | 27.949345 | -82.458486 |
| **3** | SoFresh | Restaurant | 27.949004 | -82.458581 |
| **4** | First Watch | Breakfast Spot | 27.948712 | -82.459507 |
| **5** | The Anchor Bar Downtown | Bar | 27.949115 | -82.458899 |
| **6** | Pita Pit | Sandwich Place | 27.949119 | -82.458979 |
| **7** | Bamboozle Cafe | Vietnamese Restaurant | 27.948543 | -82.459354 |
| **8** | Starbucks | Coffee Shop | 27.946399 | -82.457884 |
| **9** | European Wax Center Downtown Tampa | Health & Beauty Service | 27.946602 | -82.458795 |

Map of Florida residence place with venues in Neighborhood - for reference

# MANHATTAN NEIGHBORHOODS - DATA AND MAPPING

|  | **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 |

Now, let's get the top 100 venues that are in Marble Hill within a radius of 500 meters.

|  | **name** | **categories** | **lat** | **lng** |
| --- | --- | --- | --- | --- |
| **0** | Arturo's | Pizza Place | 40.874412 | -73.910271 |
| **1** | Bikram Yoga | Yoga Studio | 40.876844 | -73.906204 |
| **2** | Tibbett Diner | Diner | 40.880404 | -73.908937 |
| **3** | Dunkin' | Donut Shop | 40.877136 | -73.906666 |
| **4** | Starbucks | Coffee Shop | 40.877531 | -73.905582 |

|  | **Neighborhood** | **Neighborhood Latitude** | **Neighborhood Longitude** | **Venue** | **Venue Latitude** | **Venue Longitude** | **Venue Category** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | Marble Hill | 40.876551 | -73.91066 | Arturo's | 40.874412 | -73.910271 | Pizza Place |
| **1** | Marble Hill | 40.876551 | -73.91066 | Bikram Yoga | 40.876844 | -73.906204 | Yoga Studio |
| **2** | Marble Hill | 40.876551 | -73.91066 | Tibbett Diner | 40.880404 | -73.908937 | Diner |
| **3** | Marble Hill | 40.876551 | -73.91066 | Dunkin' | 40.877136 | -73.906666 | Donut Shop |
| **4** | Marble Hill | 40.876551 | -73.91066 | Starbucks | 40.877531 | -73.905582 | Coffee Shop |

**Most Common venue’s in Manhattan**

|  | **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** | Battery Park City | Park | Coffee Shop | Hotel | Gym | Wine Shop | Italian Restaurant | Clothing Store | Plaza | Memorial Site | Burger Joint |
| **1** | Carnegie Hill | Pizza Place | Coffee Shop | Café | Cosmetics Shop | Grocery Store | Bar | Spa | French Restaurant | Japanese Restaurant | Yoga Studio |
| **2** | Central Harlem | African Restaurant | Public Art | Cosmetics Shop | French Restaurant | Chinese Restaurant | Seafood Restaurant | Gym / Fitness Center | American Restaurant | Park | Southern / Soul Food Restaurant |
| **3** | Chelsea | Coffee Shop | Italian Restaurant | Ice Cream Shop | Nightclub | Bakery | American Restaurant | Hotel | Seafood Restaurant | Theater | Tapas Restaurant |
| **4** | Chinatown | Chinese Restaurant | Cocktail Bar | American Restaurant | Vietnamese Restaurant | Bubble Tea Shop | Noodle House | Bar | Dumpling Restaurant | Ice Cream Shop | Hotpot Restaurant |

## Let's create a new data frame that includes the cluster as well as the top 10 venues for each neighborhood.

|  | **Borough** | **Neighborhood** | **Latitude** | **Longitude** | **Cluster Labels** | **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** | Manhattan | Marble Hill | 40.876551 | -73.910660 | 4 | Discount Store | Coffee Shop | Yoga Studio | Seafood Restaurant | Gym | Tennis Stadium | Big Box Store | Supplement Shop | Steakhouse | Shoe Store |
| **1** | Manhattan | Chinatown | 40.715618 | -73.994279 | 1 | Chinese Restaurant | Cocktail Bar | American Restaurant | Vietnamese Restaurant | Bubble Tea Shop | Noodle House | Bar | Dumpling Restaurant | Ice Cream Shop | Hotpot Restaurant |
| **2** | Manhattan | Washington Heights | 40.851903 | -73.936900 | 4 | Café | Bakery | Mobile Phone Shop | Grocery Store | Pizza Place | Chinese Restaurant | Latin American Restaurant | Mexican Restaurant | Tapas Restaurant | Shoe Store |
| **3** | Manhattan | Inwood | 40.867684 | -73.921210 | 4 | Lounge | Mexican Restaurant | Café | Pizza Place | Wine Bar | Deli / Bodega | Park | American Restaurant | Frozen Yogurt Shop | Chinese Restaurant |
| **4** | Manhattan | Hamilton Heights | 40.823604 | -73.949688 | 4 | Mexican Restaurant | Café | Coffee Shop | Pizza Place | Yoga Studio | Sushi Restaurant | Caribbean Restaurant | Chinese Restaurant | School | Bakery |

## Examine Clusters

## Cluster label 0

|  | **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** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **8** | Upper East Side | Italian Restaurant | Exhibit | Coffee Shop | Gym / Fitness Center | Bakery | Art Gallery | Juice Bar | Spa | Hotel | Cocktail Bar |
| **13** | Lincoln Square | Gym / Fitness Center | Theater | Café | Concert Hall | Plaza | Italian Restaurant | Opera House | Performing Arts Venue | French Restaurant | Indie Movie Theater |
| **14** | Clinton | Theater | Gym / Fitness Center | American Restaurant | Italian Restaurant | Hotel | Wine Shop | Cocktail Bar | Spa | Food Court | Lounge |
| **18** | Greenwich Village | Italian Restaurant | Sushi Restaurant | French Restaurant | Clothing Store | Seafood Restaurant | Indian Restaurant | Café | Gourmet Shop | Cosmetics Shop | Bakery |
| **21** | Tribeca | Park | Italian Restaurant | Café | Spa | American Restaurant | Boutique | Wine Shop | Wine Bar | Gym | Coffee Shop |
| **24** | West Village | Italian Restaurant | Cosmetics Shop | New American Restaurant | Gastropub | Wine Bar | Jazz Club | American Restaurant | Bakery | French Restaurant | Park |
| **27** | Gramercy | Italian Restaurant | Bagel Shop | Bar | Thrift / Vintage Store | Pizza Place | Cocktail Bar | Hotel | American Restaurant | Mexican Restaurant | Thai Restaurant |
| **31** | Noho | Italian Restaurant | Cocktail Bar | French Restaurant | Boutique | Grocery Store | Art Gallery | Gift Shop | Hotel | Rock Club | Coffee Shop |
| **32** | Civic Center | Italian Restaurant | Gym / Fitness Center | French Restaurant | Sandwich Place | Coffee Shop | Bakery | Yoga Studio | Spa | Cocktail Bar | Park |
| **35** | Turtle Bay | Italian Restaurant | Sushi Restaurant | Hotel | Steakhouse | Wine Bar | Coffee Shop | French Restaurant | Park | Café | Japanese Restaurant |
| **39** | Hudson Yards | American Restaurant | Coffee Shop | Italian Restaurant | Gym / Fitness Center | Theater | Café | Hotel | Dog Run | Gym | Park |

## Cluster label 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** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | Chinatown | Chinese Restaurant | Cocktail Bar | American Restaurant | Vietnamese Restaurant | Bubble Tea Shop | Noodle House | Bar | Dumpling Restaurant | Ice Cream Shop | Hotpot Restaurant |
| **6** | Central Harlem | African Restaurant | Public Art | Cosmetics Shop | French Restaurant | Chinese Restaurant | Seafood Restaurant | Gym / Fitness Center | American Restaurant | Park | Southern / Soul Food Restaurant |
| **10** | Lenox Hill | Coffee Shop | Italian Restaurant | Sushi Restaurant | Gym / Fitness Center | Pizza Place | Burger Joint | Gym | Sporting Goods Shop | Salad Place | Turkish Restaurant |
| **12** | Upper West Side | Italian Restaurant | Bar | Wine Bar | Coffee Shop | Mediterranean Restaurant | Vegetarian / Vegan Restaurant | Burger Joint | Indian Restaurant | Bakery | Bookstore |
| **15** | Midtown | Hotel | Clothing Store | Steakhouse | Theater | Cocktail Bar | Food Truck | Spa | American Restaurant | Bookstore | Japanese Restaurant |
| **16** | Murray Hill | Sandwich Place | Japanese Restaurant | Coffee Shop | Hotel | French Restaurant | Gym | Bar | Italian Restaurant | Jewish Restaurant | Juice Bar |
| **19** | East Village | Bar | Wine Bar | Chinese Restaurant | Mexican Restaurant | Ice Cream Shop | Ramen Restaurant | Coffee Shop | Cocktail Bar | Vegetarian / Vegan Restaurant | Pizza Place |
| **22** | Little Italy | Bakery | Café | Clothing Store | Italian Restaurant | Sandwich Place | Mediterranean Restaurant | Ice Cream Shop | Seafood Restaurant | Salon / Barbershop | Massage Studio |
| **23** | Soho | Clothing Store | Boutique | Women's Store | Shoe Store | Men's Store | Art Gallery | Mediterranean Restaurant | Italian Restaurant | Furniture / Home Store | Yoga Studio |
| **30** | Carnegie Hill | Pizza Place | Coffee Shop | Café | Cosmetics Shop | Grocery Store | Bar | Spa | French Restaurant | Japanese Restaurant | Yoga Studio |
| **33** | Midtown South | Korean Restaurant | Hotel | Hotel Bar | Coffee Shop | Japanese Restaurant | Cosmetics Shop | Italian Restaurant | Gym / Fitness Center | Bakery | Cocktail Bar |
| **34** | Sutton Place | Gym / Fitness Center | Italian Restaurant | Indian Restaurant | Furniture / Home Store | American Restaurant | Gym | Juice Bar | Dessert Shop | Yoga Studio | Cupcake Shop |
| **38** | Flatiron | Yoga Studio | Japanese Restaurant | Gym | Gym / Fitness Center | American Restaurant | Cosmetics Shop | Clothing Store | New American Restaurant | Salon / Barbershop | Sporting Goods Shop |

## Cluster label 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** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **37** | Stuyvesant Town | Bar | Park | Playground | German Restaurant | Basketball Court | Baseball Field | Fountain | Harbor / Marina | Cocktail Bar | Coffee Shop |

## Cluster label 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** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **5** | Manhattanville | Coffee Shop | Mexican Restaurant | Italian Restaurant | Park | Chinese Restaurant | Seafood Restaurant | Dumpling Restaurant | Bar | Bus Station | Burger Joint |
| **17** | Chelsea | Coffee Shop | Italian Restaurant | Ice Cream Shop | Nightclub | Bakery | American Restaurant | Hotel | Seafood Restaurant | Theater | Tapas Restaurant |
| **26** | Morningside Heights | Coffee Shop | American Restaurant | Park | Bookstore | Café | Food Truck | Deli / Bodega | Burger Joint | New American Restaurant | Tennis Court |
| **28** | Battery Park City | Park | Coffee Shop | Hotel | Gym | Wine Shop | Italian Restaurant | Clothing Store | Plaza | Memorial Site | Burger Joint |
| **29** | Financial District | Coffee Shop | Gym | Wine Shop | Hotel | Steakhouse | Pizza Place | Café | Bar | American Restaurant | Park |

## Cluster label 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 | Discount Store | Coffee Shop | Yoga Studio | Seafood Restaurant | Gym | Tennis Stadium | Big Box Store | Supplement Shop | Steakhouse | Shoe Store |
| **2** | Washington Heights | Café | Bakery | Mobile Phone Shop | Grocery Store | Pizza Place | Chinese Restaurant | Latin American Restaurant | Mexican Restaurant | Tapas Restaurant | Shoe Store |
| **3** | Inwood | Lounge | Mexican Restaurant | Café | Pizza Place | Wine Bar | Deli / Bodega | Park | American Restaurant | Frozen Yogurt Shop | Chinese Restaurant |
| **4** | Hamilton Heights | Mexican Restaurant | Café | Coffee Shop | Pizza Place | Yoga Studio | Sushi Restaurant | Caribbean Restaurant | Chinese Restaurant | School | Bakery |
| **7** | East Harlem | Mexican Restaurant | Bakery | Latin American Restaurant | Deli / Bodega | Thai Restaurant | Convenience Store | Café | Taco Place | Street Art | Steakhouse |
| **9** | Yorkville | Gym | Italian Restaurant | Bar | Coffee Shop | Pizza Place | Sushi Restaurant | Deli / Bodega | Japanese Restaurant | Ice Cream Shop | Diner |
| **11** | Roosevelt Island | Sandwich Place | Deli / Bodega | Coffee Shop | Dog Run | Café | Farmers Market | Supermarket | Metro Station | Outdoors & Recreation | Dry Cleaner |
| **20** | Lower East Side | Café | Chinese Restaurant | Coffee Shop | Ramen Restaurant | Japanese Restaurant | Cocktail Bar | Shoe Store | Bakery | Art Gallery | Sandwich Place |
| **25** | Manhattan Valley | Indian Restaurant | Coffee Shop | Pizza Place | Yoga Studio | Playground | Spa | Café | Mexican Restaurant | Deli / Bodega | Bar |
| **36** | Tudor City | Park | Mexican Restaurant | Greek Restaurant | Café | Sushi Restaurant | Deli / Bodega | Pizza Place | Hotel | Dog Run | Asian Restaurant |

**4. DISCUSSION**

**Examine a particular Cluster**

After examining several cluster data, I concluded that cluster # 4 resembles closer the Tampa, FL. Therefore providing guidance as to where to look for the future restaurant in Manhattan, NY. In cluster 4 we have 9 neighborhoods and these neighborhoods suits most with top ten neighborhoods in current business place.

**5. Conclusion**

I feel this Capstone project presented me a great opportunity to practice and apply the Data Science tools and methodologies learned. This project has shown me a practical application to resolve a real situation that has impacting personal and financial impact using Data Science tools.