

An aerial photograph of a densely packed urban neighborhood, likely in Staten Island, New York. The image shows a grid of streets and numerous multi-story buildings. In the foreground, a sandy beach meets the ocean, with waves breaking onto the shore. The text "The Study of the Welcomed Restaurants at Staten Island" is overlaid on the upper portion of the image, enclosed in a blue rectangular border.

The Study of the Welcomed Restaurants at Staten Island

Coursera Capstone Assignment

The Final Report

- The Study of the Welcomed Restaurants at Staten Island

1. Introduction

1.1. Background

Staten Island is a beautiful attraction where you can enjoy the amazing scenery and museums, and looking at the exciting sports, especially in Richmond County and around. In this kind of place, to some degree, it is of great potential to open up a new restaurant both for the citizens in this island and the visitors. To simplify the question, we assume that a potential consulting client wants to start a new restaurant in Richmond County and around. I need to leveraged with the data power to figure out what type of restaurant is most welcomed, where to open it up and what are the recommended menus. Based on these problems, I decide to give my optimal answers with the help of the original New York dataset and Foursquare API.

1.2. Potential Client

It is targeted for people who want to open up a new restaurant at Richmond County, Staten Island but can not figure out where to choose the location and start what type of the restaurant, or study the cuisines of these restaurants.

2. Data

2.1. Data Overview

- Get geolocator lat and log coordinates for Staten Island
- Get a list of all venues in Richmond County and around
- Get venue IDs for each venue chosen
- Pull menu and count of likes for each venue

2.2. Data Required and Description

Data	Description	Acquired
● Borough	Locate the position of Staten Island	New York JSON file used in the last lab assignment
● Neighborhood	Filter the Richmond County and around	New York JSON file used in the last lab assignment

● Latitude	Locate the position and used in calling for Foursquare API	New York JSON file used in the last lab assignment
● Longitude	Locate the position and used in calling for Foursquare API	New York JSON file used in the last lab assignment
● Venue Name	Explore the venues about restaurant, that is my goal	Foursquare API -- Get Venue Recommendations
● Venue ID	Used for locating each venue especially calling for menu in the API	Foursquare API -- Get Venue Recommendations
● Venue Location	Locate each filtered venue	Foursquare API -- Get Venue Recommendations
● Venue Category	Filter unrelated venue and remain what we need	Foursquare API -- Get Venue Recommendations
● Count of Likes	To study the popularity of the restaurants	Foursquare API -- Get Users Who Liked a Venue
● Venue Menu	Get cuisines and their detailed descriptions	Foursquare API -- Get a Venue's Menu

3. Methodology

3.1. Method Required

- **Exploratory Analysis(Statistics)**
- **Clustering Method**

3.2. Analysis

- Step 1 Download the original New York dataset and deal with it into the dataframe.
- Step 2 Choose the Borough of Staten Island and count the total neighborhood of the Island, filter the neighborhoods with the key word of 'Richmond'. The number of unique neighborhoods at the Island is 63. The related is 3, which is showed below:

	Borough	Neighborhood	Latitude	Longitude
0	Staten Island	Port Richmond	40.633669	-74.129434
1	Staten Island	Richmond Town	40.569606	-74.134057
2	Staten Island	Richmond Valley	40.519541	-74.229571

- Step 3 Get 'Venue Name', 'Venue Latitude', 'Venue Longitude', 'Venue ID', 'Venue Category' from Foursquare API. According to Neighborhood to count the number of the venues, we get Port for 5, Town for 5 and Valley for 10.
- Step 4 Generate onehot table, and calculate the statistical mean of each category grouped by 3 neighborhood. And then the frequency analysis of each category in each neighborhood. We get:

----Port Richmond----

	venue	fre
0	Business Service	0.2
1	RentalCar Location	0.2
2	Donut Shop	0.2
3	Pizza Place	0.2
4	Martial Arts Dojo	0.2

----Richmond Town----

	venue	freq
0	Bagel Shop	0.2
1	Café	0.2
2	Spa	0.2
3	Italian Restaurant	0.2
4	History Museum	0.2

----Richmond Valley----

	venue	freq
0	Train Station	0.1
1	Mexican	0.1

	Restaurant	
2	Bubble Tea Shop	0.1
3	Smoothie	0.1
4	Construction&Landscaping	0.1

From the table, We can say the frequency of the each neighborhood is the same, however, the frequency of these categories in Valley is lower than in Town or in Port.

- Step 5 We sort the venues and get the most top 10 common venues in each neighborhood based on K-Means Method.

	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	Port Richmond	Donut Shop	Rental Car Location	Pizza Place	Business Service	Martial Arts Dojo	Train Station	Bank	Bubble Tea Shop	Café	Construction & Landscaping
1	Richmond Town	Bagel Shop	Café	Italian Restaurant	History Museum	Spa	Donut Shop	Bank	Bubble Tea Shop	Business Service	Construction & Landscaping
2	Richmond Valley	Train Station	Fast Food Restaurant	Bank	Bubble Tea Shop	Construction & Landscaping	Deli / Bodega	Food	Mexican Restaurant	Sandwich Place	Smoothie Shop

- Collect all the restaurant information in this table and filter others. Then call for Foursquare API used the venue id of these restaurant to get the data of likes and menus.

4. Result

4.1. K-Means

Seen as above.

4.2. Popularity Index

We use count of likes called from Foursquare as the popularity index to measure the restaurants. However, we can only get the two restaurants in the total of 5.

This 5 restaurant info is shown as below:

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue ID	Venue Category
0	Port Richmond	40.633669	-74.129434	Val's Pizza	40.637111	-74.127500	4c6969f13bad2d7f46c0afee	Pizza Place
1	Richmond Town	40.569606	-74.134057	Casa verde	40.573251	-74.136378	5079ccdc4b065f1dd8155ad	Italian Restaurant
2	Richmond Valley	40.519541	-74.229571	Qdoba Mexican Grill	40.516974	-74.234161	52aa599011d250326f249f53	Mexican Restaurant
3	Richmond Valley	40.519541	-74.229571	SUBWAY	40.516739	-74.233441	4be9ab1161aca59345d58200	Sandwich Place
4	Richmond Valley	40.519541	-74.229571	McDonald's	40.517720	-74.234751	4c5a2399ec2520a16bfc5012	Fast Food Restaurant

The count of likes in the two accessible restaurants is:

- 4 for the Mexican Restaurant in Richmond Valley
- 9 for the Fast Food Restaurant in Richmond Valley

Therefore, we can only get the information in Richmond Valley.

4.3. Menu

Odoba Mexican Grill

	Name	Content
0	Fan Favorites	Flavor Favoritos! Craveable Fan Favorites Tha...
1	New & Lto Items	Come in Today to Try Our New Exciting Menu It...
2	Lunchtime, Dinnertime & Anytime	So Many Delicious Different Flavor Combinatio...
3	Quesos	Crave-Worthy Quesos So Packed with Flavor You...
4	To Share	Bring Your Family, Co-Worker and Best Amigo t...
5	Customizable Entrees	Build Your Own Mexican Dish - Nachos, Tacos, ...
6	Signature Eats	Chef-Inspired Mashups That Will Change the Wa...
7	Vegetarian Eats	Vegetarians Welcome! Our Fresh Cut Produce, A...
8	Kids Meal	a Mini Mexican Feast for Your Little Ones (Ni...
9	Chips & Dips	What Goes Better with Chips Than Dips?!? Dunk...
10	Desserts	You Deserve Something Sweet! Our Desserts Are...
11	Salsas	More Flavors Than Just Your Typical Hot, Medi...
12	Drinks	More Ways to Quench Your Thirst - the Choice ...
13	Knockout Tacos	Chef-Inspired Tacos Made From Our Favorite Fl...
14	Fire Roasted Shrimp Entrees	Brighten Up Your Summer with Tasty Fire Roast...
15	Burrito (Wrapped Or Bowl)	Build Your Own Mission-Style Burrito - Choose...

	Name	Content
16	3-Cheese Nachos	Freshly Made Chips Piled High with Our Signat...
17	Loaded Tortilla Soup	Not Your Average Soup! This Unique Offering I...
18	Grilled Quesadilla	a Warm Grilled Tortilla Filled with a Blend o...
19	Taco Salad (Shell Or Bowl)	Tasty Taco Salad with a Twist! Ours Comes Ful...

McDonald's

	Name	Content
0	Burgers	When It Comes to Our Burgers, We Mean Busines...
1	Chicken & Sandwiches	Irresistible Flavors Come to the Table. Enjoy...
2	Breakfast	Meals Include Hash Browns and Small Coffee Or...
3	Snacks & Sides	Grab Somethin' for Your Snacks & Sides. We Kn...
4	Desserts & Shakes	Our Cool Options Don't Disappoint.
5	Happy Meal	You Want the Best for Your Family. So Do We. ...
6	Salads	Get Your Greens with Our Freshly-Prepared Sal...
7	Mccafé®	None
8	Beverages	Hit Refresh When You Sip Our Drinks. Satisfy ...

5. Discussion and Recommendations

According to our result, we can only have access to the information in Richmond Valley. So, the optimal location is the Richmond Valley with the radius of 10000 meters. However, from the frequency analysis, the restaurants here is lower than the Town or the Port, so if our client choose to open up a restaurant here, it seems to be not so competitive. That may be a good choice. As our final result of the popularity, we can see the fast food is more welcomed than the mexican food in Richmond Valley. So, it also may be a wise choice to choose the fast food restaurant other than

McDonald's.

6. Conclusion

Because of the limit of the accessible data, we only get a small sample of our processing target, to some degree, it causes deviation and inaccuracy. We can revise it by remaining more neighborhoods in Staten Island and then get the data of likes and menu. By the way, we can also use deep learning method to analyze the text of the content of the menu, from which we can find more useful information.