

Capstone 5 Project – E-Bike Delivery Services
A Full Report
By Nancy Currie

1. Introduction

1.1 Background

San Francisco is a densely developed, 47 square mile peninsula with a population of nearly 800 thousand people living in 315 thousand households. One of the most ethnically diverse places in the nation, San Francisco has no ethnic majority. The income range of city residents includes extremes of wealth and poverty, but on average, San Franciscans are richer than residents of most American cities. Average household income of 68,000 is well above the national average, but below the Bay Area average of 76,000. City residents also are better educated than most Americans, with 22% holding a bachelor's degree, and 13% holding a graduate or professional degree.

San Francisco is unique among California counties in that nearly half (46%) of its labor force is housed outside the city. The city's housing stock of 340 thousand units is relatively old, reflecting the age of the city and public policy that has restricted housing production over the last 30 years. Some 56% percent of housing units was constructed prior to 1940, and 81% prior to 1960. Single family units are less than one-third of the city's housing stock, compared with more than two-thirds in the metropolitan area outside the city. Roughly one-third of city residents own their homes, compared with two-thirds of metro area residents.

San Francisco's economy is intricately linked to regional, national, and international markets. Although many San Francisco jobs are in resident-serving businesses, the growth and development of the city's economy depends on industries oriented to external markets. These export industries form the city's economic base and drive growth in all segments of the local economy, including resident-serving businesses. The rate of economic growth in San Francisco depends on the rate of growth in larger economic venues, the number and type of jobs they create, and the share of these new jobs the city can capture. The city has no way to influence the rate of growth in the state or national economy. Its influence on local economic growth arises exclusively from its determination of factors that affect the location and expansion decisions of industries that form San Francisco's economic base.

New York City (NYC), often simply called New York, is the most populous city in the United States. With an estimated 2019 population of 8,336,817 distributed over about 302.6 square miles (784 km²), New York City is also the most densely populated major city in the United States. Located at the southern tip of the U.S. state of New York, the city is the center of the New York metropolitan area, the largest metropolitan area in the world by urban landmass. With almost 20 million people in its metropolitan statistical area and approximately 23 million in its combined statistical area, it is one of the world's most populous megacities. New York City has been described as the cultural, financial, and media capital of the world, significantly influencing commerce, entertainment, research, technology, education, politics, tourism, art, fashion, and sports. Home to the headquarters of the United Nations, New York is an important center for international diplomacy.

Situated on one of the world's largest natural harbors, New York City is composed of five boroughs, each of which is a county of the State of New York. The five boroughs—Brooklyn, Queens, Manhattan, the Bronx, and Staten Island—were consolidated into a single city in 1898. The city and its metropolitan area constitute the premier gateway for legal immigration to the United States. As many as 800 languages are spoken in New York, making it the most linguistically diverse city in the

world. New York is home to more than 3.2 million residents born outside the United States, the largest foreign-born population of any city in the world as of 2016. As of 2019, the New York metropolitan area is estimated to produce a gross metropolitan product (GMP) of \$2.0 trillion. If the New York metropolitan area were a sovereign state, it would have the eighth-largest economy in the world. New York is home to the highest number of billionaires of any city in the world

1.2 Problem Statement,

Starting a small business with E-Bikes services in phases. Trying to determine which city to start in phase 1? What city has the most homogenous venues to minimize startup costs? How do they compare? What type of cuisine and packages services do I focus on at the start to build a brand? I want to rank services. Where do I set up central offices to distribute services to increase efficiency and value to customers?

1.3 Scope of Study

- 1.3.1 The peninsula of San Francisco neighborhood will be area focus as well as New York City Neighborhoods, which covers multiple boroughs.

2.0 Data Sources

Wikipedia Canada Wikipedia are sourced from

https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M and

New York Districts are sourced from 'https://geo.nyu.edu/catalog/nyu_2451_34572.

Foursquare Developer API is sourced from <https://developer.foursquare.com/>

2.1 Geospatial Data- San Francisco

Utilizing Wikipedia lists with panda to create a dataframe and cross referencing the list using geolocator extract latitude and longitude.

	Neighborhood	latitude	longitude
0	Alamo Square	37.776360	-122.434689
1	Bayview	40.772627	-124.183950
2	Bernal Heights	37.741001	-122.414214
3	Buena Vista	37.806532	-122.420648
5	Chinatown	37.794301	-122.406376
6	Civic Center	37.779026	-122.419906
7	Cole Valley	37.765813	-122.449962
8	Cow Hollow	37.797262	-122.436248
9	Crocker Amazon	37.709378	-122.438587
11	Dogpatch	37.760698	-122.389202

Spreadsheet 1 – San Francisco geospatial database quick view.

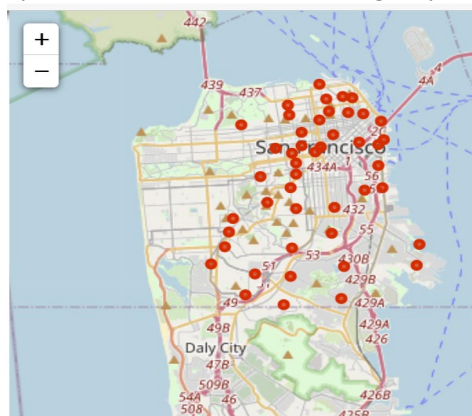


Figure 1 – San Francisco with Neighborhood locations, red dots.

2.2

Geospatial Data- New York District, New York

Utilizing a free dataset in json to format into a data frame then usse geolocator to determine latitude and longitude for mapping.

	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40.894705	-73.847201
1	Bronx	Co-op City	40.874294	-73.829939
2	Bronx	Eastchester	40.887556	-73.827806
3	Bronx	Fieldston	40.895437	-73.905643
4	Bronx	Riverdale	40.890834	-73.912585

Spreadsheet 2- New York, NY geospatial data quick review

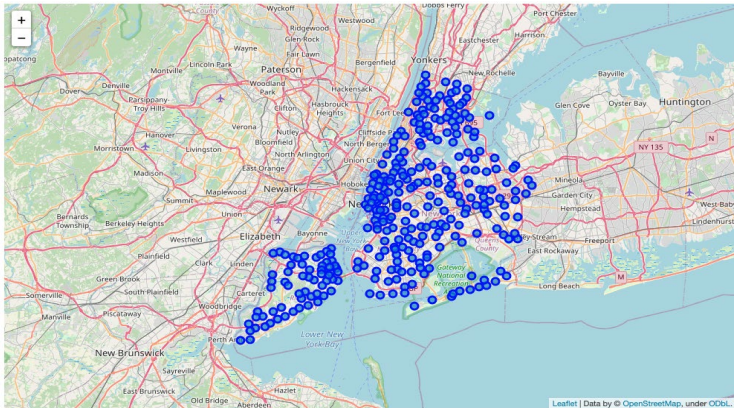


Figure 2- New York City, NY. With Neighborhoods locations, blue dots.

2.3 Geospatial Data of Restaurants

2.3.1 San Francisco data of Foursquare API

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Buena Vista	37.806532	-122.420648	Grandehe's Kamekyo II (Sushi)	37.806172	-122.420461	Sushi Restaurant
1	Chinatown	37.794301	-122.406376	Mister Jiu's	37.793790	-122.406615	Chinese Restaurant
2	Chinatown	37.794301	-122.406376	Eastern Bakery	37.793776	-122.406178	Bakery
3	Chinatown	37.794301	-122.406376	Golden Star Vietnamese Restaurant	37.794526	-122.405603	Vietnamese Restaurant
4	Chinatown	37.794301	-122.406376	Spicy King	37.794045	-122.406968	Chinese Restaurant
5	Chinatown	37.794301	-122.406376	Chef Hung's Restaurant	37.794199	-122.406692	Chinese Restaurant
6	Chinatown	37.794301	-122.406376	Capital Restaurant	37.794145	-122.407121	Chinese Restaurant
7	Chinatown	37.794301	-122.406376	Bow Hon Restaurant	37.795026	-122.406445	Chinese Restaurant
8	Civic Center	37.779026	-122.419906	City Hall Cafe	37.778828	-122.419780	Café
9	Cole Valley	37.765813	-122.449962	Beit Rima Carl Street	37.765841	-122.449755	Middle Eastern Restaurant

New York Districts data of Foursquare API

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Kingsbridge	40.881687	-73.902818	Mr. Bagel	40.880833	-73.902452	Bagel Shop
1	Woodlawn	40.898273	-73.867315	Katonah Pizza and Pasta	40.898784	-73.867457	Pizza Place
2	Woodlawn	40.898273	-73.867315	Curry Spot	40.897625	-73.867147	Indian Restaurant
3	Woodlawn	40.898273	-73.867315	Sean's Quality Deli	40.897669	-73.867445	Deli / Bodega
4	Woodlawn	40.898273	-73.867315	Greenland Deli	40.898933	-73.867546	Deli / Bodega
5	Norwood	40.877224	-73.879391	Mar y Tierra Restaurant and Lounge	40.876705	-73.879532	Mexican Restaurant
6	City Island	40.847247	-73.786488	City Island Diner	40.847238	-73.786245	Diner
7	City Island	40.847247	-73.786488	Bistro SK	40.846387	-73.786262	French Restaurant
8	City Island	40.847247	-73.786488	Filomena's Pizza & Pasta	40.846746	-73.786189	Pizza Place
9	City Island	40.847247	-73.786488	Papa John's Deli	40.847668	-73.786681	Deli / Bodega
10	Fordham	40.860997	-73.896427	Subway	40.860731	-73.897528	Restaurant

3.0 Methodology

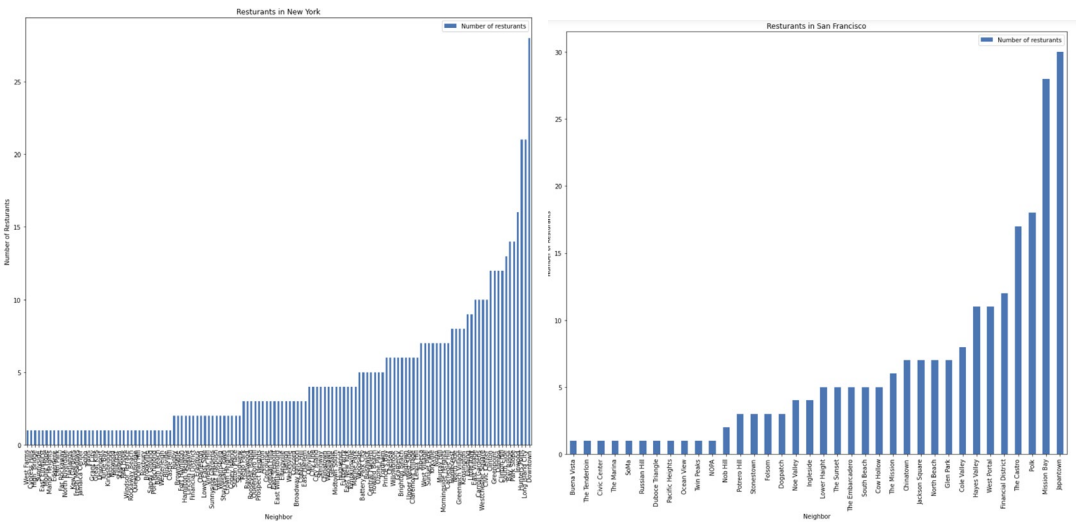
3.1 Compare total # of Restaurant in both locations

3.1.1 Bar Charts/ Spreadsheet of total number

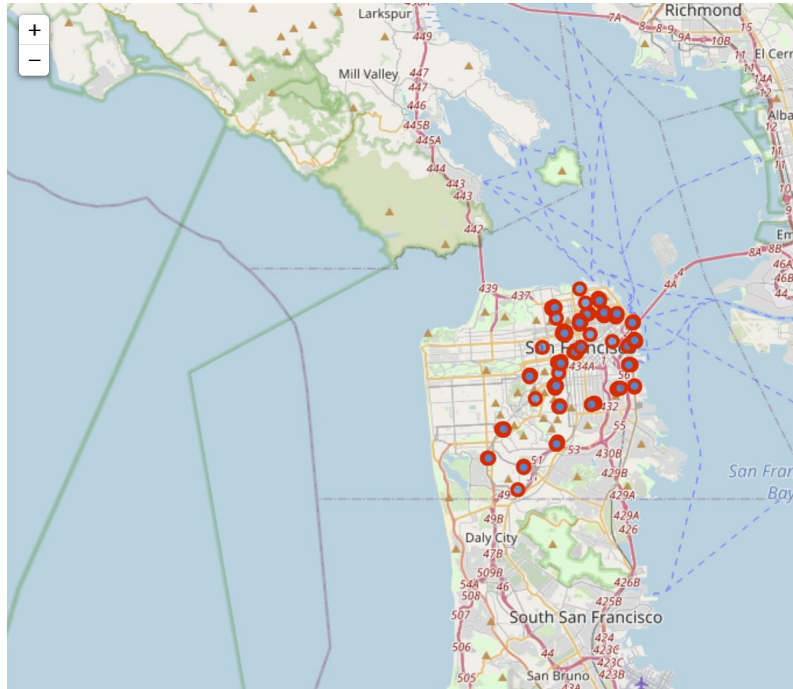
Matplotlib library was used to create bar charts of both San Francisco and New York data sets.

Top 3 Neighborhoods for San Francisco are Japantown, Mission Bay and Polk

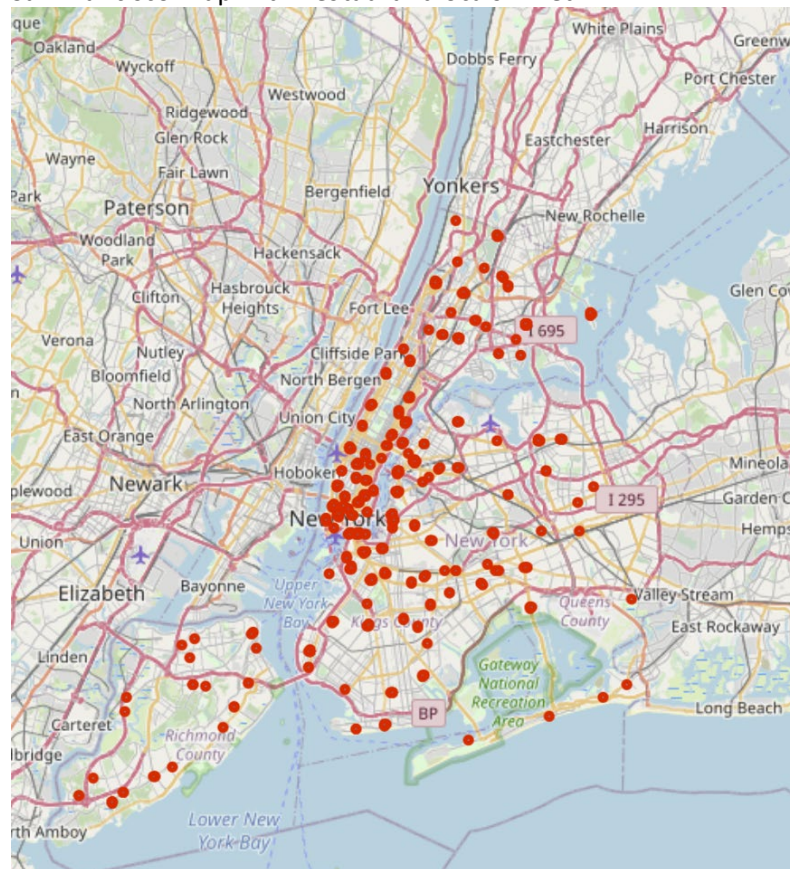
Top 3 Neighborhoods for New York are Downtown, Hunters Point, and Inwood.



3.2 Compare geospatial distribution per Restaurants in both locations



San Francisco Map with Restaurant locals in red.

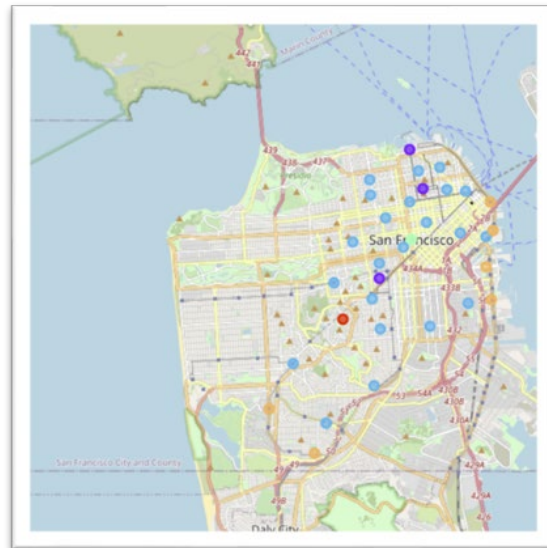


New York Map with Restaurant locals in red.

2.1 K-means of Restaurants to determine rank of services in neighborhoods in both locations

	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
3	Buena Vista	37.806532	-122.420648	1.0	Sushi Restaurant	Wings Joint	Creperie	French Restaurant	Food Truck	Food	Ethiopian Restaurant	Empanada Restaurant	Donut Shop	
5	Chinatown	37.794301	-122.406376	2.0	Chinese Restaurant	Vietnamese Restaurant	Bakery	Cuban Restaurant	German Restaurant	French Restaurant	Food Truck	Food	Ethiopian Restaurant	Empanada Restaurant
6	Civic Center	37.779026	-122.419906	3.0	Café	Wings Joint	Creperie	French Restaurant	Food Truck	Food	Ethiopian Restaurant	Empanada Restaurant	Donut Shop	
7	Cole Valley	37.765813	-122.449962	2.0	Breakfast Spot	Sushi Restaurant	Italian Restaurant	Restaurant	Café	Mexican Restaurant	Middle Eastern Restaurant	Wings Joint	Cuban Restaurant	
8	Cow Hollow	37.797262	-122.436248	2.0	American Restaurant	Sandwich Place	Italian Restaurant	French Restaurant	Thai Restaurant	BBQ Joint	Cuban Restaurant	Food Truck	Food	Empanada Restaurant
11	Dogpatch	37.760698	-122.389202	4.0	Creperie	Food Truck	Sandwich Place	Wings Joint	French Restaurant	Food	Ethiopian Restaurant	Empanada Restaurant	Donut Shop	
12	Duboce Triangle	37.767138	-122.432230	1.0	Sushi Restaurant	Wings Joint	Creperie	French Restaurant	Food Truck	Food	Ethiopian Restaurant	Empanada Restaurant	Donut Shop	
14	Financial District	37.793647	-122.398938	2.0	Sandwich Place	Italian Restaurant	American Restaurant	Food Truck	Japanese Restaurant	Deli / Bodega	Café	German Restaurant	Seafood Restaurant	Br
15	Folsom	37.790452	-122.389567	4.0	Food Truck	Steakhouse	Seafood Restaurant	Wings Joint	Chinese Restaurant	Food	Ethiopian Restaurant	Empanada Restaurant	Donut Shop	
17	Glen Park	37.734281	-122.434470	2.0	Pizza Place	Sushi Restaurant	Italian Restaurant	Breakfast Spot	Café	Mexican Restaurant	Chinese Restaurant	Cuban Restaurant	Food	Empanada Restaurant

Table of San Francisco Data Frame

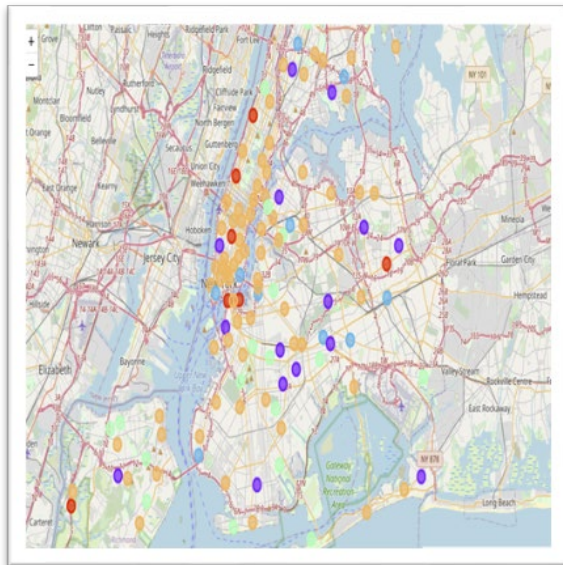


- 1. Asia
- 2. Food Truck
- 3. Sushi
- 4. Cafe
- 5. Caribbean

Map of Clusters in San Francisco

	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
5	Bronx	Kingsbridge	40.881687	-73.902818	4.0	Bagel Shop	Wings Joint	Food Stand	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Fish & Chips Shop	F
7	Bronx	Woodlawn	40.898273	-73.867315	3.0	Deli / Bodega	Indian Restaurant	Pizza Place	Food Court	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Filipino Restaurant
8	Bronx	Norwood	40.877224	-73.879391	4.0	Mexican Restaurant	Wings Joint	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Fish & Chips Shop	Food	F
12	Bronx	City Island	40.847247	-73.786488	4.0	Deli / Bodega	Pizza Place	French Restaurant	Diner	Food	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
16	Bronx	Fordham	40.860997	-73.896427	3.0	Deli / Bodega	Restaurant	Fast Food Restaurant	Food Court	Donut Shop	Dumpling Restaurant	Falafel Restaurant	Filipino Restaurant	Filipino Restaurant
17	Bronx	East Tremont	40.842696	-73.887356	4.0	Pizza Place	Café	Food	Wings Joint	Diner	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
18	Bronx	West Farms	40.839475	-73.877745	4.0	Diner	Food Court	Donut Shop	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Fish & Chips Shop	F
19	Bronx	High Bridge	40.836623	-73.926102	4.0	Asian Restaurant	Wings Joint	Food Stand	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Fish & Chips Shop	F
26	Bronx	Soundview	40.821012	-73.865746	1.0	Chinese Restaurant	Pizza Place	Wings Joint	Diner	Dumpling Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	Filipino Restaurant
31	Bronx	Westchester Square	40.840619	-73.842194	4.0	Restaurant	American Restaurant	Fried Chicken Joint	Latin American Restaurant	Fast Food Restaurant	Pizza Place	Donut Shop	Deli / Bodega	American Restaurant

Table of New York data frame



- 1. Mixed Cuisine
- 2. Deli Food
- 3. Pizza
- 4. Chinese
- 5. Food Trucks

New York Map of Clusters using K-means

2.1.1 Maps to determine new office location



San Francisco map showing key neighborhood for potential central office location in The Mission neighborhood.



New York map showing key neighborhood for potential central office location in Long Island City neighborhood.

3.0 Results and Discussion

3.1 What city to start?

Based upon the number restaurants in San Francisco at 227 has few venues than New York city having 587.

3.2 What services to focus on?

By utilizing clustering analysis of restaurant venues in neighborhoods it allows the user to compare in a ranked order. If the company started in New York city then most neighborhoods have mixed cuisines, but the Deli's make up the second most restaurant scatter across New York and would be a focus customer base to be more efficient rather than trying to serve complex food varieties. In San Francisco the Asian restaurants would be the main focus followed by serving food trucks.

3.3 Where do I open an office?

When determining the best central location multiple attributes need to be considered. E-bike need recharging service and employees need to have a location to distribution items. Locations were picked base upon the number of restaurants in a geographic high-density area. New York's Long Island City had the most restaurants and The Mission neighborhood had the most restaurants in San Francisco geographic neighborhoods in San Francisco and New York

4.0 Conclusion

Utilizing this data science workflow in python to cross reference Foursquare venue data with geographic positioning of neighborhoods allows a startup business like E-Bike to determine potential customers to focus on and determine what services they can focus on like Deli's in New York and Asia cuisines in San Francisco. The project also demonstrated a workflow to determine optimal central business locations for a business to maximize distribution of services to its customers.

End of Report