Location recommendation for a new vegetarian restaurant in San Francisco, California

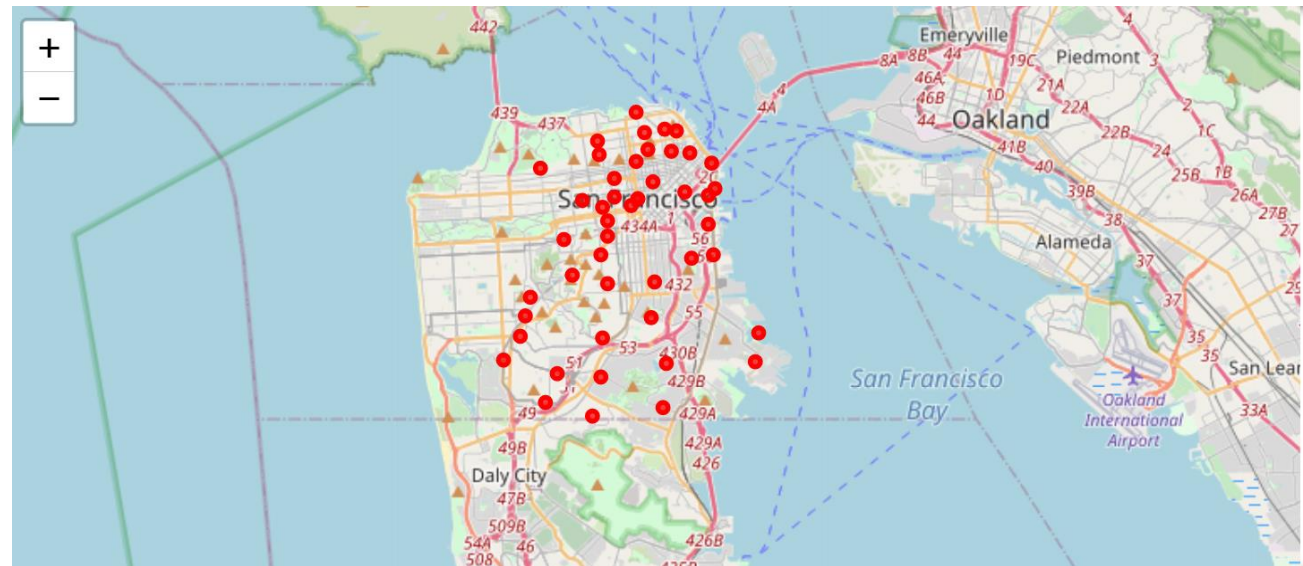## Nov. 2020

1 Business Problem and Background

Restaurants are one of the most important business in the world. The main factor of having a restaurant business successful is the location of the business. It is more likely to fail if your business is very close to the old strong competitors. The business plan is to open a new vegetarian restaurant in the City of San Francisco, California and the following are the very important questions to be answered properly before starting the business:

- The locations of vegetarian restaurants in san Francisco.
- Comparing vegetarian places to the total number of restaurants.
- Where is the densest area for restaurants?
- Where is the densest neighborhood for vegetarian restaurants?
- What is the rating of the Vegetarian restaurants?
- What is the percentages of vegetarian population in the area? (if possible)

2 Data Source and Description

- San Francisco 51 neighborhood data: https://localwiki.org/sf/Neighborhoods

- Location data: www.foursquare.com API

- Geographical Coordinates: geopy python library

	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

3 Methodology

The following tasks need to be performed:

1. Find the neighborhoods
2. Obtain the geographical coordinates
3. Get location data from foursquare API
4. Clean the data and create data frame
5. Explore the neighborhoods
6. Identify the number of all types of restaurants locations
7. Identify the number of vegetarian restaurants locations
8. Analyze each neighborhood per restaurants
9. Make a data frame for vegetarian restaurant
10. Group by neighborhood and restaurant types
11. Clustering Neighborhoods using K-means clustering per resturants
12. Visualization
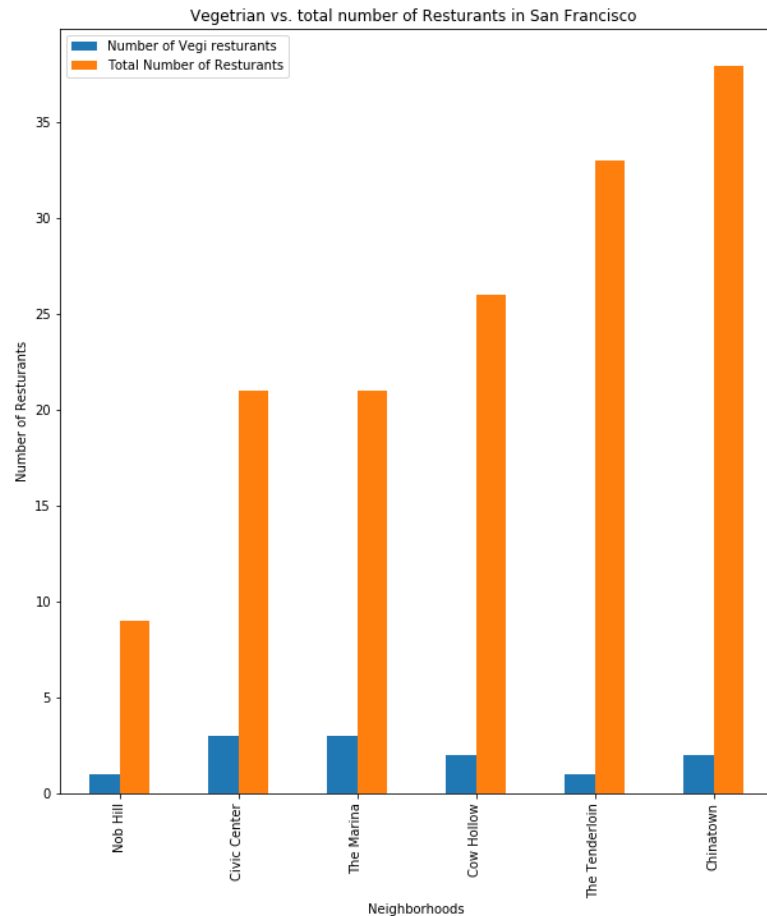
4   Exploring the neighborhoods

- Data set for all venues in SF neighbors

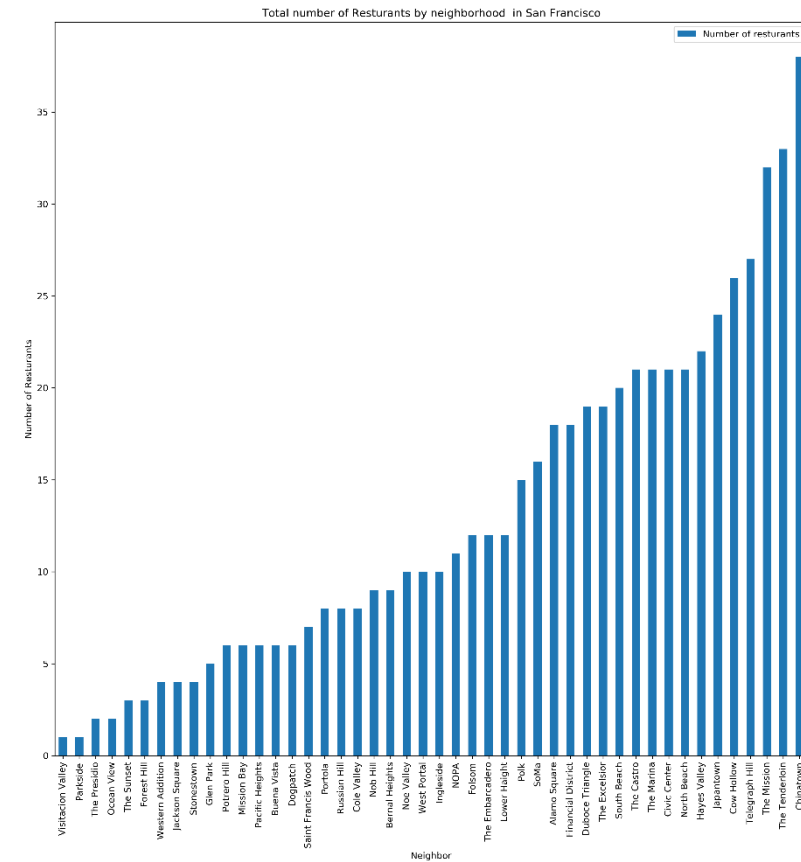|	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Alamo Square	37.77636	-122.434689	Alamo Square	37.776045	-122.434363	Park
1	Alamo Square	37.77636	-122.434689	Alamo Square Dog Park	37.775878	-122.435740	Dog Run
2	Alamo Square	37.77636	-122.434689	Painted Ladies	37.776120	-122.433389	Historic Site
3	Alamo Square	37.77636	-122.434689	The Independent	37.775573	-122.437835	Rock Club
4	Alamo Square	37.77636	-122.434689	The Mill	37.776425	-122.437970	Bakery
5	Alamo Square	37.77636	-122.434689	Bar Crudo	37.775707	-122.438019	Seafood Restaurant
6	Alamo Square	37.77636	-122.434689	Fool's Errand	37.775512	-122.437961	Bar
7	Alamo Square	37.77636	-122.434689	Nopa	37.774888	-122.437532	New American Restaurant
8	Alamo Square	37.77636	-122.434689	Rare Device	37.775052	-122.437762	Gift Shop

- All type of Restaurants in SF neighborhoods

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
5	Alamo Square	37.77636	-122.434689	Bar Crudo	37.775707	-122.438019	Seafood Restaurant
7	Alamo Square	37.77636	-122.434689	Nopa	37.774888	-122.437532	New American Restaurant
19	Alamo Square	37.77636	-122.434689	jū-ni	37.776743	-122.438770	Sushi Restaurant
21	Alamo Square	37.77636	-122.434689	Tsunami	37.776869	-122.438486	Sushi Restaurant
27	Alamo Square	37.77636	-122.434689	Brenda's Meat & Three	37.778265	-122.438584	Southern / Soul Food Restaurant
30	Alamo Square	37.77636	-122.434689	Zaytoon	37.775185	-122.437896	Mediterranean Restaurant
32	Alamo Square	37.77636	-122.434689	Kung Food	37.777778	-122.438698	Hunan Restaurant
34	Alamo Square	37.77636	-122.434689	Namu Stonepot	37.774763	-122.437780	Korean Restaurant
39	Alamo Square	37.77636	-122.434689	Che Fico	37.777435	-122.438149	Italian Restaurant
41	Alamo Square	37.77636	-122.434689	Saffron Grill	37.776848	-122.437816	Indian Restaurant

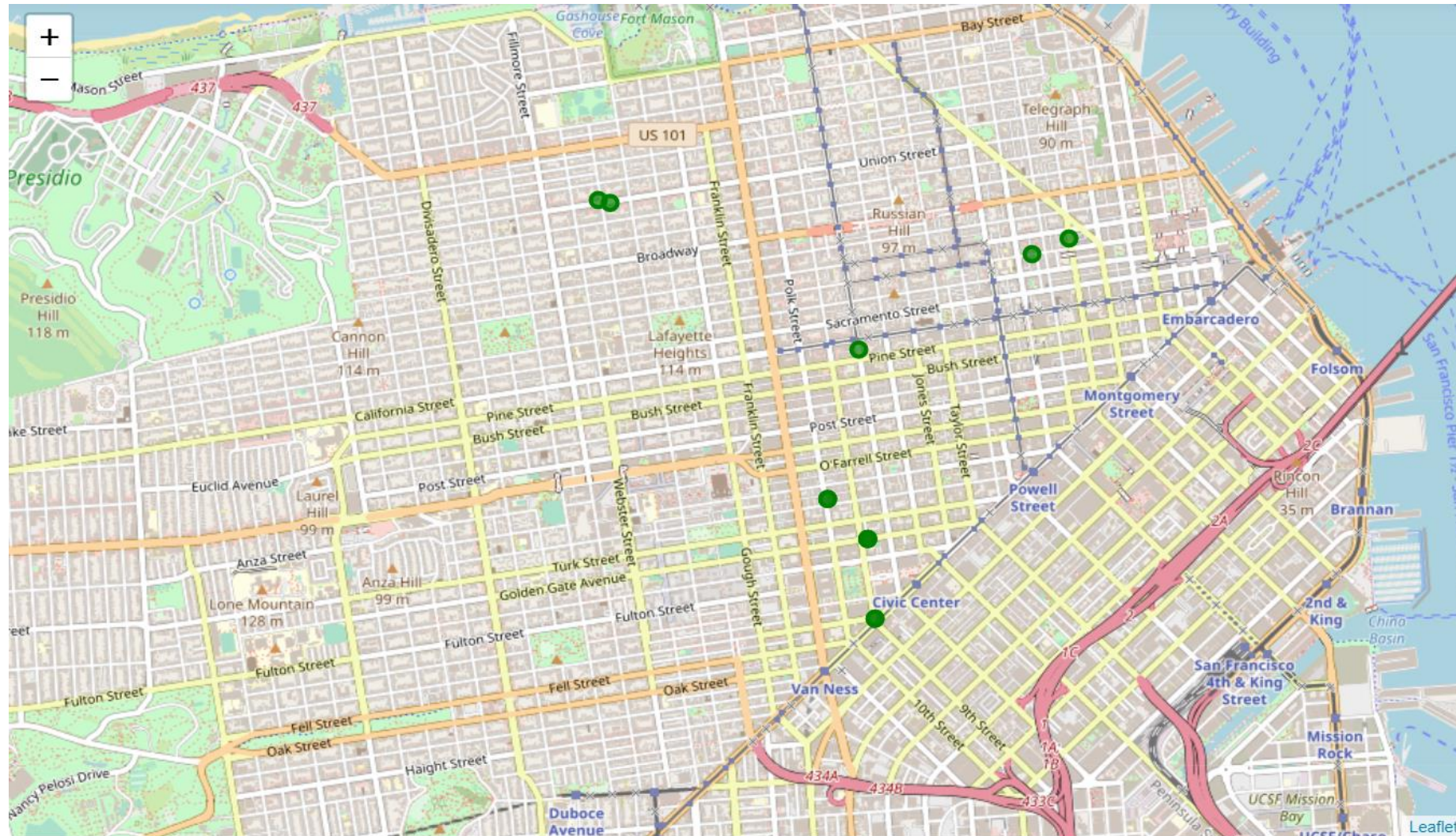# Vegetarian VS Total number of restaurants

Number of Vegetarian restaurants in SF Neighborhoods

Number of restaurants in each Neighborhood
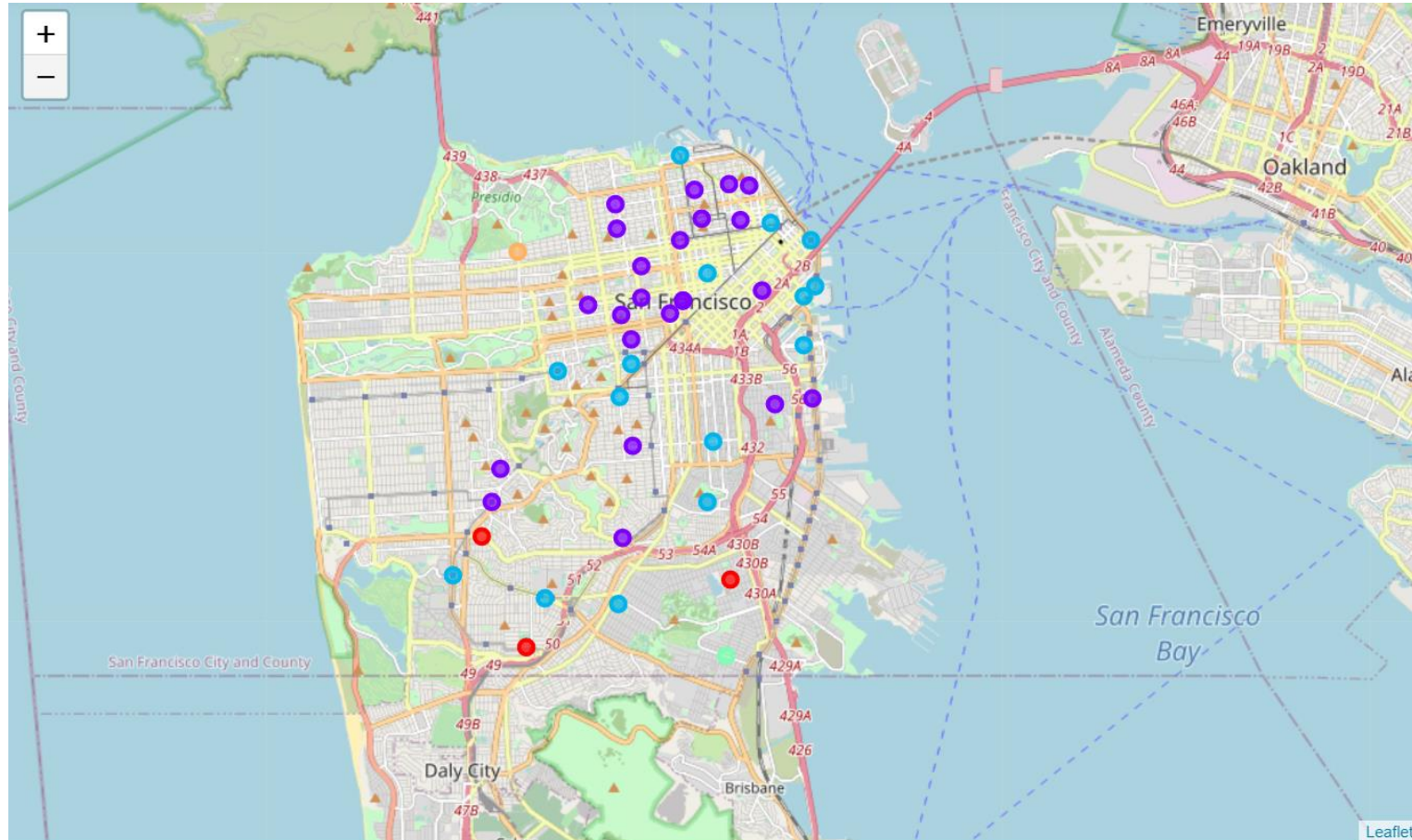
vegetarian restaurant locations

5   Neighborhood clustering: K-Mean (K=5)

Most common restaurants and identified clustering per neighborhood data frame

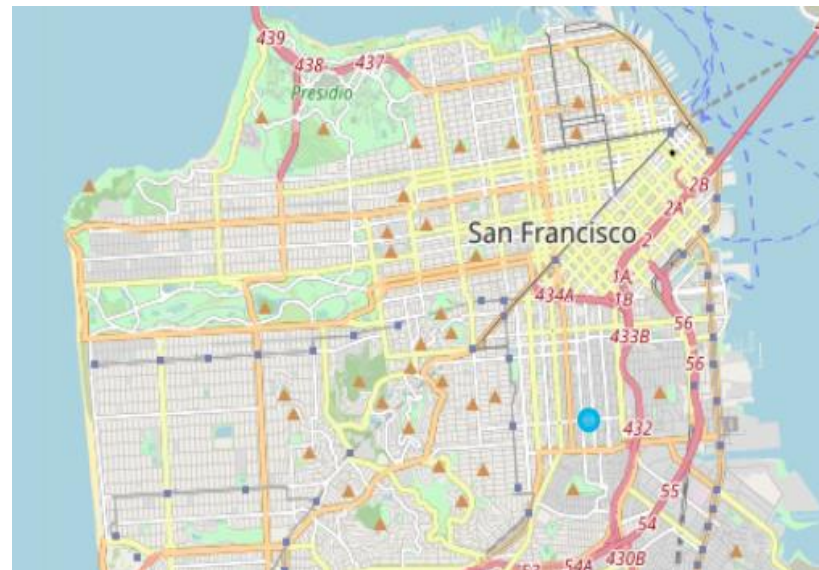| Neighborhood	latitude	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
Alamo Square	37.776360	-122.434689	1.0	Indian Restaurant	Seafood Restaurant	Ethiopian Restaurant	Sushi Restaurant	Hunan Restaurant	Mediterranean Restaurant	Mexican Restaurant	New American Restaurant
Bernal Heights	37.741001	-122.414214	2.0	Italian Restaurant	American Restaurant	Asian Restaurant	Mexican Restaurant	Indian Restaurant	Caribbean Restaurant	New American Restaurant	Peruvian Restaurant
Buena Vista	37.806532	-122.420648	2.0	Seafood Restaurant	Brazilian Restaurant	Fast Food Restaurant	Cantonese Restaurant	Korean Restaurant	Austrian Restaurant	Filipino Restaurant	Japanese Restaurant
Chinatown	37.794301	-122.406376	1.0	Chinese Restaurant	New American Restaurant	Italian Restaurant	Vietnamese Restaurant	Restaurant	Dim Sum Restaurant	Sushi Restaurant	Szechuan Restaurant
Civic Center	37.779026	-122.419906	1.0	Vegetarian / Vegan Restaurant	French Restaurant	Sushi Restaurant	Restaurant	Vietnamese Restaurant	Southern / Soul Food Restaurant	Mediterranean Restaurant	Mexican Restaurant
Cole Valley	37.765813	-122.449962	2.0	Vietnamese Restaurant	Thai Restaurant	Caribbean Restaurant	Mexican Restaurant	Tapas Restaurant	Middle Eastern Restaurant	Mediterranean Restaurant	Indian Restaurant
Cow Hollow	37.797262	-122.436248	1.0	Italian Restaurant	Mexican Restaurant	French Restaurant	American Restaurant	Vegetarian / Vegan Restaurant	Thai Restaurant	Sushi Restaurant	Caribbean Restaurant
Dogpatch	37.760698	-122.389202	1.0	Restaurant	Latin American Restaurant	Italian Restaurant	Southern / Soul Food Restaurant	Sushi Restaurant	Vietnamese Restaurant	Greek Restaurant	Filipino Restaurant
Duboce Triangle	37.767138	-122.432230	2.0	New American Restaurant	Seafood Restaurant	Mexican Restaurant	Sushi Restaurant	Vietnamese Restaurant	Indian Restaurant	Mediterranean Restaurant	Middle Eastern Restaurant
Financial District	37.793647	-122.398938	2.0	Restaurant	Japanese Restaurant	Mediterranean Restaurant	New American Restaurant	Dim Sum Restaurant	Latin American Restaurant	Mexican Restaurant	Middle Eastern Restaurant

Clusters location on map

Class of clusters location on map (similar colors represent similar clusters)

6 Results and Discussion

- Only 7 neighborhoods have vegetarian restaurants available.

- Opening a new vegetarian restaurant, at the neighborhood that has many restaurants types except vegetarian is recommended.

- "The Mission" neighborhood is recommended to open a Vegetarian restaurant.

- There are more factors to consider to get better recommendations, however, it is out of scope of this article.

7   Conclusion

- For a businessman, the most important factor is choosing a right place to start the business. This is more crucial for restaurant business. This article tries to recommend a good location at the city of San Francisco, California for a vegetarian eating place.

- After analyzing all the neighborhoods and exploring the available restaurant and, in specific, vegetarian / vegan   eating places, the 'The Mission' neighborhood is recommended for opening new restaurant for vegetarians. Based on location data analyses, this neighborhood is the dense area of eating places, where, however, there is no single vegetarian restaurant in this region. Therefore, makes it a perfect place for opening a new restaurant for vegetarians. The neighborhoods are also classified based on the frequency of restaurants available in the area using K-Means clustering methodology. This could be used for further analyses which is out of this articles scope.

8   Future works

This project could be well extended for many other types of business and sectors. There are a few tides that can be taken into exploration:

1.   Where to open a fast-food restaurant

2.   Where to open coffee shop

3.   Where a police station might be needed to open

4.   To spot the locations with higher crime rates

Jupyter notebook (.ipynb format):

https://github.com/yasser64b/Coursera_Capstone/blob/master/Coursera%20Capstone%20Project_Final.ipynb