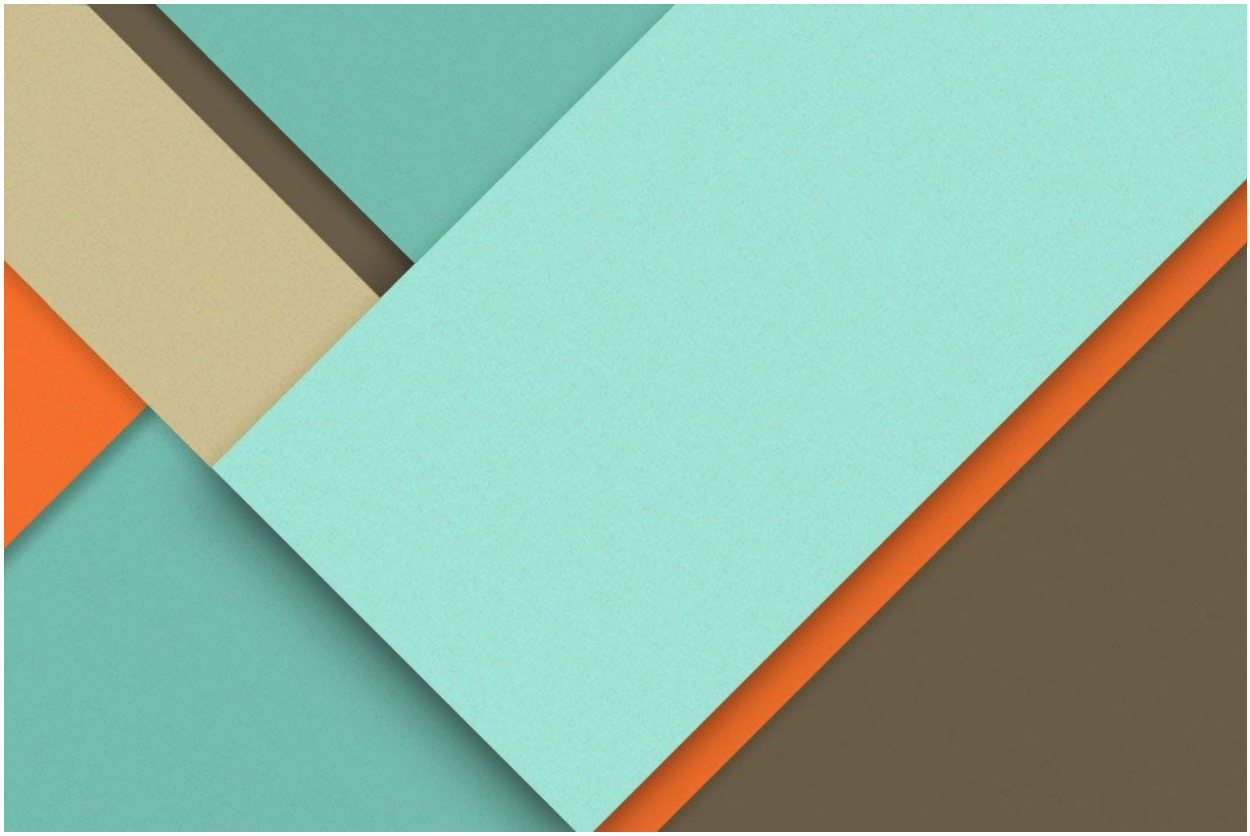


Finding Viable Food Waste Management Center Locations in San Francisco, CA USA

03.02.2020

Eugene Bible

IBM Applied Data Science Capstone

Final Project - Battle of the Neighborhoods

Introduction

The Problem - Food Waste

In the United States, food waste is estimated to be between 30–40 percent of the food supply. This loss is due to inefficiency at almost every level of the food retail and production chain and results in massive losses of money, energy, water, and labor, as well as the food that could be used to feed the hungry. In 2010 alone, based on the USDA's Economic Research Service, 31 percent food loss occured at the retail and consumer levels, corresponding to approximately 133 billion pounds and $161 billion worth of food. (1)

This wasted food is the largest category of material placed in landfills (2) and the rotting food waste contributes a large part to global greenhouse gas emissions resulting in global warming and climate change. By more efficiently managing our food supply chains and wasted foods, we can save money, water, and energy, mitigate climate change, and reduce our impact on the environment, all while feeding more people, reducing poverty, and improving impoverished communities.

Defining "Food Waste" and Examining Its Sources

Food "losses" are inefficiencies that occur before the food reaches the consumer (issues in the production, storage, processing, distribution, etc.) whereas food "waste" refers to food that is fit for consumption but consciously discarded at the retail or consumption phases. (3) This report will focus primarily on food waste.

There are multiple sources of food waste that each merit different kinds of management so it helps to define what they are and what their primary sources are:

- Residential (Homes, apartments, dwellings): Primarily rotten food and kitchen scraps
- Restaurant-based (Restaurants, cafes): Primarily rotten food and kitchen scraps
- Retail-based (Supermarkets, convenience stores): Primarily foods that are still viable for consumption, but near expiration date (which are mostly arbitrarily set)

Food Waste Solutions

There are many solutions to reducing food waste. They include:

- Composting to create fertilizer (On-site and/or mass composting via composting centers)
- Anaerobic digestion, which uses microorganisms to break down biodegradable material as opposed to dumping in landfills
- Using the food waste to create animal feed
- Recycling the food waste to use in creation of biofuels
- Selling still-viable food (fruits, vegetables, canned goods) to lower income people at a heavily discounted price or giving it away to homeless
- Selling cooked/prepared food made from no-cost still-viable food waste at low-cost

Solution: Food Waste Management Centers

At present, the US is not doing nearly enough to manage food waste. The optimal solution would be for individuals and companies to self-regulate their own waste, but this is a slow process that requires education and a cultural shift to more conscientious waste management practices.

Rather than trying to educate every individual and immediately enact change across business, if we were able to centralize the food waste, a few experts and specialists could manage the various types of food waste much more effectively and efficiently. Food Waste Management Centers could be placed throughout our most populated cities in the areas where the most food waste is created.

These centers can become integral parts of the community: supporting the lower income people and homeless with discount food, reducing food waste volume which will maintain a cleaner neighborhood, educating the community in reducing food waste, and reducing the waste disposal costs to businesses.

Analysis to be Performed - Food Waste Management Center Locations

Let's assume for this analysis that our Food Waste Management Center (FWMC) will perform the following functions:

- Receiving shipments of food waste from all nearby restaurants, supermarkets, residents, and food-service businesses
- Selling viable fresh food such as fruits and vegetables at a discount
- Selling lunch boxes made from recovered food at low-cost
- Packaging the rotting/unusable food scraps for shipping to a composting center or biofuel production facility
- Working with and educating the community on food waste reduction

A FWMC needs to be placed in a location optimized to receive shipments from each restaurant and business in the area. This means it needs to be placed in a central location where people can purchase discounted food (both prepared and fresh) as well as easily drop off their own food waste.

In this analysis, I plan to determine optimal locations for a Food Waste Management Center within the city of San Francisco, California, USA.

Why San Francisco, California?

I chose San Francisco because the state of California has the most densely populated cities in the USA, with San Francisco and Los Angeles having the densest populations in the country. Because of the extremely high population density, food waste is concentrated into small areas, meaning more food waste in a small area, meaning lower transportation costs and easier movement of food waste. It is also a state that is very green and environmentally conscious. This means people are more likely to welcome a food waste management center.

In California, food waste totals about 100 billion pounds per year, and 40\% of all food is thrown away or plowed over in farms. 5 billion pounds of prepared food from restaurants is also wasted. (4) Despite this, in California millions of people are hungry. Service organizations often want access to this wasted food, but there are some factors preventing it:

- Not knowing where excess food is
- Not having credentials to show their legitimacy
- Lacking resources to get excess food

By implementing food management centers, we could attack all 3 of these problems in one centralized location.

Target Audience

The target audience for this project is any government entity like the Environmental Protection Agency, the U.S. Department of Agriculture, or any business entrepreneur that may be looking to capitalize on food waste as an untapped resource.

Potential Benefits of a FWMC:

- Both state and local government entities can incorporate food waste prevention and education campaigns as part of a city-wide development effort.
- Having a centralized Food Waste Management Center means easier management and collection of waste data.
- Cost reductions across the entire spectrum of waste management (garbage collection decreases, less landfill space used, etc)
- Potential profitability in sales of composted fertilizer.
- Potential profitability in sales of food made from donated no-cost ingredients.
- Potential profitability in sales to facilities producing biofuels.

Data

Required Data and Data Sources

- https://en.wikipedia.org/wiki/List_of_neighborhoods_in_San_Francisco: San Francisco, CA location data
    - We will need to scrape data about the city of San Francisco, California so we can make the appropriate requests to Foursquare for venue data.
- Foursquare API: Retail/Restaurant/Food Service Venue data
    - In order to properly perform this analysis, we need to locate the high food waste production areas of San Francisco, California. This can be done using the FourSquare API to find high-density areas of restaurants, cafes, and supermarkets. We will assume for our analysis that areas with high densities of restaurants, cafes, and supermarkets are also commonly residential areas.

Methodology

1. First, we will scrape the necessary location data of San Francisco, California from the web using the JSON and BeautifulSoup Python packages. The data will be stored in a Pandas dataframe and visualized using Folium and Matplotlib.

2. Next, we will make the necessary requests for venue information from the Foursquare API. The data will be cleaned, stored, and sorted. We will need to group the venues into groups based on location (in our case, neighborhoods). Again, we will visualize the data using Folium.
3. Next, we will use the K-Means clustering algorithm to cluster the neighborhoods to determine which are the high-density food waste producer neighborhoods.
4. Based on our K-Means clustering analysis, we will examine and determine the best neighborhood for a Food Waste Management Center.

Data Collection and Preprocessing

Collecting Neighborhood and Geocoordinate Data

The data was collected by using web scraping techniques with the Python BeautifulSoup package.

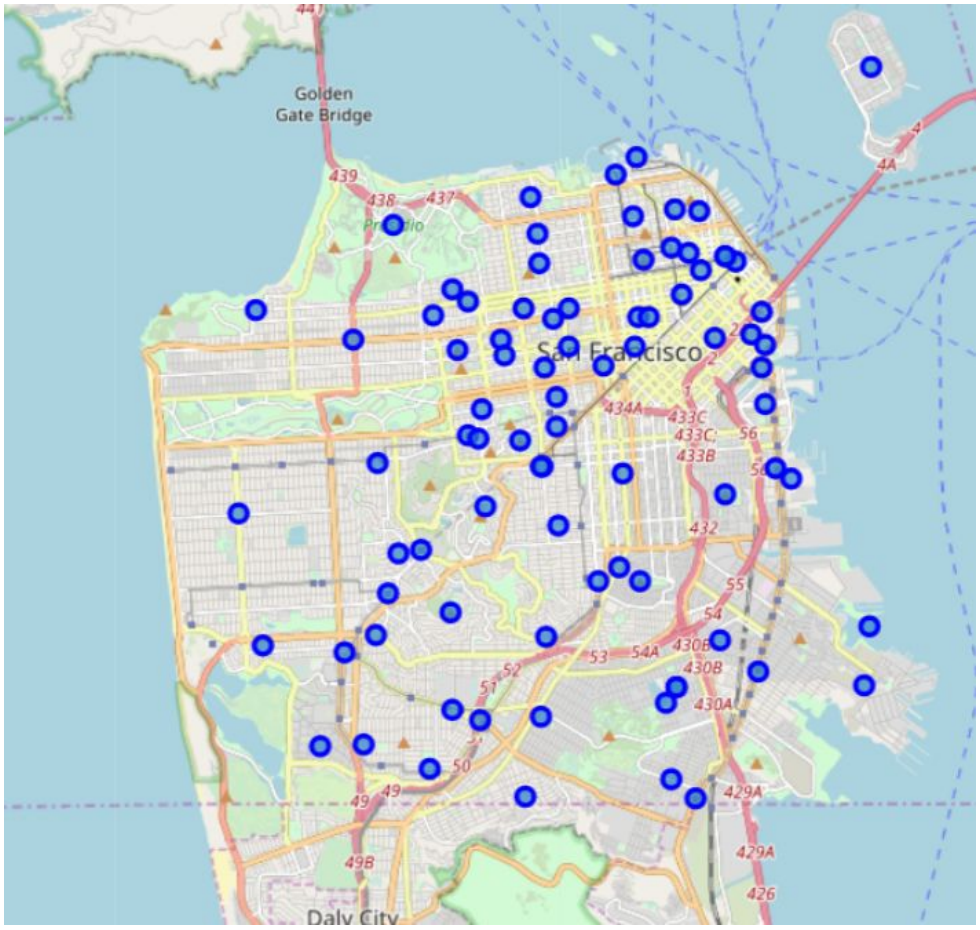
After scraping the data from Wikipedia, 119 neighborhoods were found, and using the Python Geocoder I was able to determine Latitude and Longitude values for 90 of the neighborhoods.

The neighborhoods that returned no values were ignored for the analysis.

	Neighborhood	Latitude	Longitude
0	Alamo Square	37.776360	-122.434689
1	Anza Vista	37.780836	-122.443149
2	Balboa Park	37.721427	-122.447547
3	Bayview	37.728889	-122.392500
4	Belden Place	37.791744	-122.403886
5	Bernal Heights	37.742986	-122.415804
6	Buena Vista	37.806532	-122.420648
7	Castro	37.760856	-122.434957
8	China Basin	37.776330	-122.391839
9	Chinatown	37.794301	-122.406376
10	Civic Center	37.779594	-122.416794
11	Cole Valley	37.765813	-122.449962
12	Corona Heights	37.764886	-122.439368
13	Cow Hollow	37.797262	-122.436248
14	Crocker-Amazon	37.709378	-122.438587
15	Dogpatch	37.760698	-122.389202
16	Dolores Heights	37.743038	-122.424248
17	Duboce Triangle	37.767138	-122.432230
18	Embarcadero	37.792864	-122.396912
19	Eureka Valley	37.760956	-122.435509
20	Excelsior	37.721794	-122.435382
21	Fillmore	37.784083	-122.433085
22	Financial District	37.793647	-122.398938
23	Financial District South	37.793647	-122.398938
24	Fisherman's Wharf	37.809167	-122.416599
25	Forest Hill	37.747431	-122.463583
26	Glen Park	37.734281	-122.434470
27	Haight-Ashbury	37.770015	-122.446952
28	Hayes Valley	37.776685	-122.422936
29	Hunters Point	37.726771	-122.371572

Visualizing San Francisco

The locations of each coordinate latitude/longitude pair were mapped onto a map of San Francisco. These are the neighborhoods to be clustered.



Collecting Venue Data from Foursquare

For each latitude/longitude pair, all venues within a 200m radius were requested and stored in a dataframe. 200m was selected because depending on the coordinates, some areas were considerably larger than others. In some of the closer pairs, there may be some overlap in restaurants, leading to some possible inaccuracy.

For the 5,536 venues found, there were 357 unique categories. Note also that 2 neighborhoods returned no venues.

	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	Fool's Errand	37.775512	-122.437961	Bar
6	Alamo Square	37.77636	-122.434689	Bar Crudo	37.775707	-122.438019	Seafood Restaurant
7	Alamo Square	37.77636	-122.434689	Nopa	37.774971	-122.437716	New American Restaurant
8	Alamo Square	37.77636	-122.434689	Rare Device	37.775052	-122.437762	Gift Shop
9	Alamo Square	37.77636	-122.434689	4505 Burgers & BBQ	37.776125	-122.438142	BBQ Joint
10	Alamo Square	37.77636	-122.434689	Bi-Rite Market	37.774796	-122.437739	Market
11	Alamo Square	37.77636	-122.434689	Bi-Rite Creamery	37.774735	-122.437689	Ice Cream Shop
12	Alamo Square	37.77636	-122.434689	Topo Designs	37.775674	-122.438006	Boutique
13	Alamo Square	37.77636	-122.434689	Souvla	37.774577	-122.437809	Souvlaki Shop
14	Alamo Square	37.77636	-122.434689	Boba Guys	37.777440	-122.438191	Bubble Tea Shop
15	Alamo Square	37.77636	-122.434689	Little Star Pizza	37.777489	-122.438281	Pizza Place
16	Alamo Square	37.77636	-122.434689	Horsefeather	37.774516	-122.437678	Cocktail Bar
17	Alamo Square	37.77636	-122.434689	jū-ni	37.776743	-122.438770	Sushi Restaurant
18	Alamo Square	37.77636	-122.434689	Originals Vinyl	37.775835	-122.431227	Record Shop
19	Alamo Square	37.77636	-122.434689	Divisadero Farmers' Market	37.775935	-122.438368	Farmers Market

Mathematical Analysis

One Hot Encoding to Determine Top Venue Types in Each Neighborhood

One hot encoding transforms categorical features into a format usable with classification and regression algorithms.

Using one hot encoding, we were able to determine the highest frequency venues in each neighborhood.

```
----Alamo Square----
              Venue  Freq
0               Bar  0.05
1       Coffee Shop  0.04
2       Record Shop  0.04
3  Sushi Restaurant  0.04
4          Dive Bar  0.03
```

```
----Balboa Park----
              Venue  Freq
0         Juice Bar  0.06
1   Asian Restaurant  0.06
2  College Cafeteria  0.06
3        College Gym  0.06
4       Flower Shop  0.06
```

```
----Anza Vista----
                    Venue  Freq
0                   Café  0.07
1  Health & Beauty Service  0.05
2           Grocery Store  0.05
3          Sandwich Place  0.05
4                     Bar  0.05
```

```
----Bayview----
                                Venue  Freq
0                             Bakery  0.09
1                Light Rail Station  0.09
2  Southern / Soul Food Restaurant  0.09
3                     Grocery Store  0.09
4                      Home Service  0.05
```

A list of each neighborhood's Top 10 Most Common Venues was produced with this data.

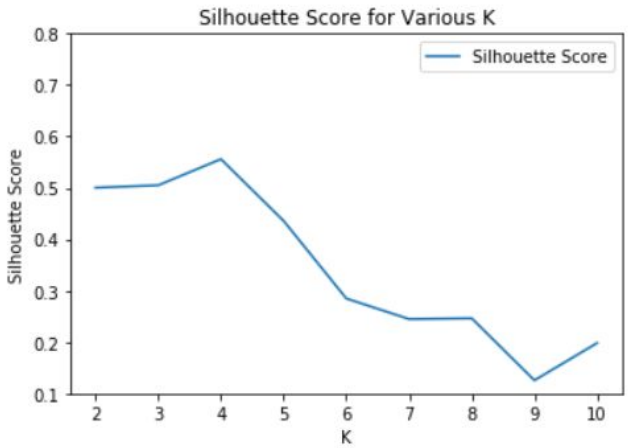
	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Alamo Square	Bar	Coffee Shop	Sushi Restaurant	Record Shop	Pizza Place
1	Anza Vista	Café	Grocery Store	Liquor Store	Sandwich Place	Health & Beauty Service
2	Balboa Park	Gas Station	Light Rail Station	Public Art	Poke Place	College Gym
3	Bayview	Bakery	Light Rail Station	Southern / Soul Food Restaurant	Grocery Store	Garden
4	Belden Place	Coffee Shop	Gym	French Restaurant	Sushi Restaurant	Men's Store
5	Bernal Heights	Coffee Shop	Mexican Restaurant	Park	Cocktail Bar	Playground
6	Buena Vista	Seafood Restaurant	Park	Historic Site	Ice Cream Shop	Chocolate Shop
7	Castro	Gay Bar	Coffee Shop	Thai Restaurant	New American Restaurant	Juice Bar
8	China Basin	Baseball Stadium	Coffee Shop	New American Restaurant	Wine Bar	Athletics & Sports
9	Chinatown	Coffee Shop	Chinese Restaurant	Bakery	Men's Store	New American Restaurant

Machine Learning: K-Means Clustering

Silhouette Method to Determine K

The silhouette value measures how similar a point is to its own cluster (cohesion) compared to other clusters (separation). The range of the Silhouette value is between +1 and -1. A high value is desirable and indicates that the point is placed in the correct cluster. If many points have a negative Silhouette value, it may indicate that we have created too many or too few clusters. (5)

For K-Values of 1 to 10, the silhouette score was calculated and results graphed.



From our Silhouette Scores graph, we can see that there is little point in having a K value above 4.

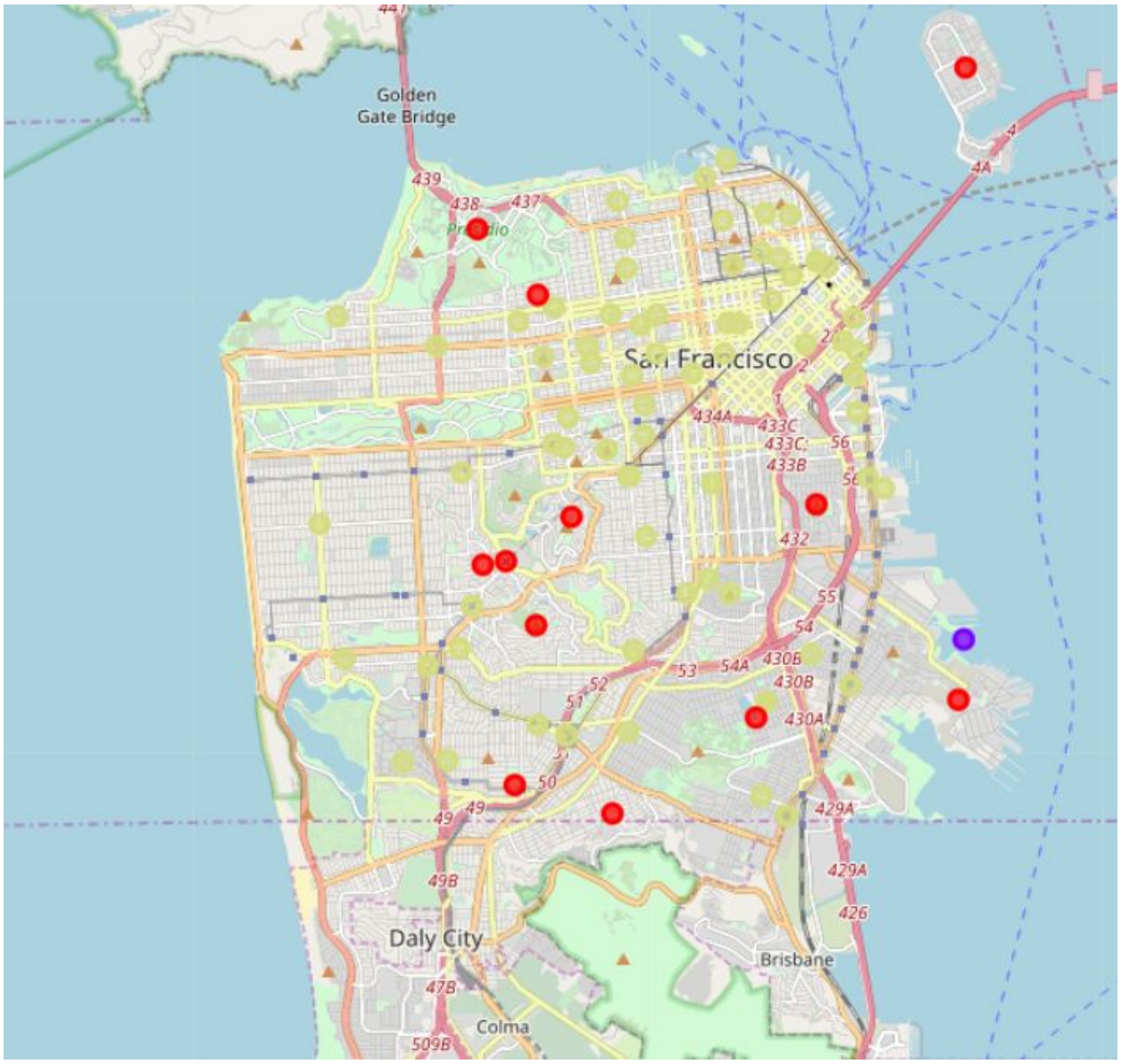
K-Means Clustering

Using a K of 4, and a Randomization State of 1, the machine learning algorithm grouped each neighborhood into one of 4 categories.

	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
0	Alamo Square	37.776360	-122.434689	3	Bar	Coffee Shop	Sushi Restaurant	Record Shop	Pizza Place
1	Anza Vista	37.780836	-122.443149	3	Café	Grocery Store	Liquor Store	Sandwich Place	Health & Beauty Service
2	Balboa Park	37.721427	-122.447547	3	Gas Station	Light Rail Station	Public Art	Poke Place	College Gym
3	Bayview	37.728889	-122.392500	3	Bakery	Light Rail Station	Southern / Soul Food Restaurant	Grocery Store	Garden
4	Belden Place	37.791744	-122.403886	3	Coffee Shop	Gym	French Restaurant	Sushi Restaurant	Men's Store
5	Bernal Heights	37.742986	-122.415804	3	Coffee Shop	Mexican Restaurant	Park	Cocktail Bar	Playground
6	Buena Vista	37.806532	-122.420648	3	Seafood Restaurant	Park	Historic Site	Ice Cream Shop	Chocolate Shop
7	Castro	37.760856	-122.434957	3	Gay Bar	Coffee Shop	Thai Restaurant	New American Restaurant	Juice Bar
8	China Basin	37.776330	-122.391839	3	Baseball Stadium	Coffee Shop	New American Restaurant	Wine Bar	Athletics & Sports
9	Chinatown	37.794301	-122.406376	3	Coffee Shop	Chinese Restaurant	Bakery	Men's Store	New American Restaurant

Visualizing The Clusters

By coloring the neighborhood coordinates, we can group each neighborhood into a category. But to determine *why* each neighborhood fits into a category we need to examine the venues in each category.



Analysis

Unfortunately, by examination of the K-Means clustering results, we can see that variety of venue types in San Francisco is quite uniform across each neighborhood. After many attempts to further divide the neighborhoods into more clusters through varied K values

and random states, K-Means seems to be unable to differentiate the neighborhoods much. Let's examine what small variation there is and whether each cluster would be suitable for a FWMC.

Cluster Cluster 1 (Yellow): Restaurants and People

These areas were the areas most highly populated by restaurants, and therefore by people. We can see that these neighborhoods by FAR contain the most restaurants, bars, cafes, and other food services. Because San Francisco is so densely packed, there are other businesses, services, and tourist spots dotting the area, restaurants and living space dominate these areas.

FWMC Viability: Excellent. These are the areas of highest food waste production.

	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
0	Alamo Square	Bar	Coffee Shop	Sushi Restaurant	Record Shop	Pizza Place	Dive Bar	Boutique
1	Anza Vista	Café	Grocery Store	Liquor Store	Sandwich Place	Health & Beauty Service	Bar	Coffee Shop
2	Balboa Park	Gas Station	Light Rail Station	Public Art	Poke Place	College Gym	College Cafeteria	Coffee Shop
3	Bayview	Bakery	Light Rail Station	Southern / Soul Food Restaurant	Grocery Store	Garden	Food Truck	Mexican Restaurant
4	Belden Place	Coffee Shop	Gym	French Restaurant	Sushi Restaurant	Men's Store	Japanese Restaurant	Tea Room
5	Bernal Heights	Coffee Shop	Mexican Restaurant	Park	Cocktail Bar	Playground	Italian Restaurant	Yoga Studio
6	Buena Vista	Seafood Restaurant	Park	Historic Site	Ice Cream Shop	Chocolate Shop	Boat or Ferry	Bike Rental / Bike Share
7	Castro	Gay Bar	Coffee Shop	Thai Restaurant	New American Restaurant	Juice Bar	Pet Store	Gym
8	China Basin	Baseball Stadium	Coffee Shop	New American Restaurant	Wine Bar	Athletics & Sports	Gym / Fitness Center	Bar
9	Chinatown	Coffee Shop	Chinese Restaurant	Bakery	Men's Store	New American Restaurant	Dive Bar	Tea Room
10	Civic Center	Vietnamese Restaurant	Coffee Shop	Beer Bar	Theater	Performing Arts Venue	Marijuana Dispensary	Cocktail Bar

Cluster 2 (Red): Parks and Recreation

We can see this cluster is composed mainly of outdoors areas: parks, playgrounds, trees, hills, baseball fields, fields, and zoos. There are some cafes and restaurants sprinkled through the area, signifying that these are probably areas where people come to socialize.

FWMC Viability: Average. Some restaurants, but not enough to be a called a "high density" area. Parks and outdoor recreation means most likely NOT good areas for FWMCs.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
14	Crocker-Amazon	Bus Stop	Dog Run	Gastropub	Playground	Scenic Lookout
25	Forest Hill	Park	Hotpot Restaurant	Japanese Restaurant	French Restaurant	Playground
29	Hunters Point	Art Gallery	Recording Studio	Harbor / Marina	Grocery Store	Spa
37	Laguna Honda	Park	Hotpot Restaurant	Playground	Trail	French Restaurant
52	Mount Davidson	Bus Stop	Park	Mountain	Monument / Landmark	Tree
57	Oceanview	Playground	Intersection	Thai Restaurant	Liquor Store	Coffee Shop
65	Potrero Hill	Park	Deli / Bodega	Hill	Cosmetics Shop	Coffee Shop
66	Presidio	Food Truck	Asian Restaurant	Playground	Mexican Restaurant	Outdoor Sculpture
67	Presidio Heights	Park	American Restaurant	Playground	Cosmetics Shop	Baseball Field
78	Sunnyside	Park	Restaurant	Sandwich Place	Optical Shop	Bookstore
82	Treasure Island	Food Truck	Park	Athletics & Sports	Music Venue	Baseball Field
83	Twin Peaks	Trail	Scenic Lookout	Garden	Bus Station	Speakeasy
85	University Mound	Recreation Center	Shopping Mall	Playground	Library	Baseball Field

Cluster 3 (Purple): Too small to be considered.

This neighborhood is a high-tourist area. It consists of a mix of event and tourist-oriented activity spaces. There are some restaurants in the area. It was most likely singled out because of this. Most likely an outlier that doesn't need to be considered in this analysis.

FWMC Viability: Below-Average. Some food waste production, but mostly a tourist area.

	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
30	India Basin	Park	Home Service	Food	Eye Doctor	Farmers Market	Fast Food Restaurant	Field	Filipino Restaurant

Cluster 4: Residential

Vista del Mar is a coastal, mostly-residential area with some restaurants and shops to serve the beach-goers. An average to low food waste would be created from this kind of area. It could potentially be grouped together with Cluster 1.

FWMC Viability: Average. Restaurants of any kind are a good sign of food waste production, but the businesses/event spaces/recreational spaces do not independently contribute significantly to food waste.

	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
87	Vista del Mar	Event Service	BBQ Joint	Soccer Stadium	Flower Shop	Eye Doctor	Farmers Market	Fast Food Restaurant

Conclusion and Recommendations

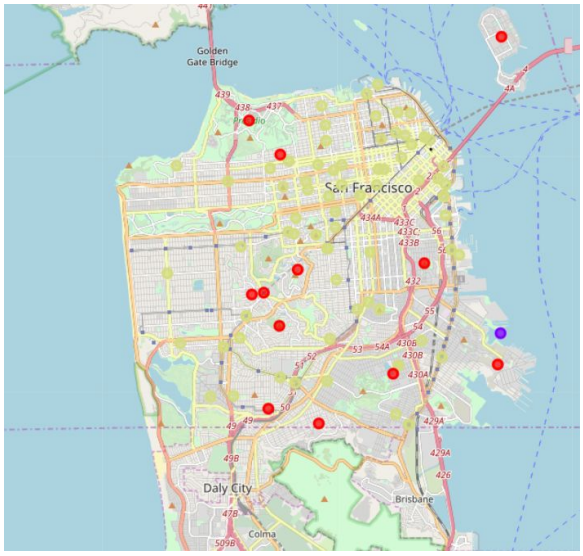
Analysis Conclusion and Assumptions

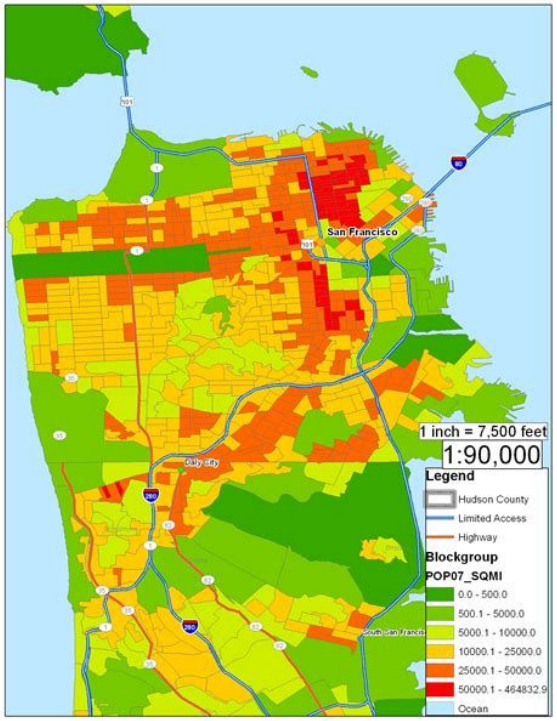
Based on our analysis, we can see that San Francisco is relatively uniform in its food waste producer density. Restaurants and living space are both spread across the entire city. However, in our analysis, we did narrow down the number of neighborhoods that could be potential high-food-waste-production. Taking into account those neighborhoods, the next factor to examine would be the population density to determine which neighborhoods within the high-production areas would be best.

Note that in our analysis, we are making some very broad assumptions:

- Land in San Francisco is of equal value in any neighborhood. San Francisco is one of the most expensive cities in America. In practice, it would most likely not be realistic to place a large food waste management center within the city limits.
- Without a proper cost-benefit analysis, we cannot know whether a food waste management center could actually produce profit. But with a large low-income and homeless population, the societal benefits could be profound.

Examining Population to Support a Recommendation





Examining population density, we can see that the highest population densities are in the north-eastern corner of San Francisco, which represents the financial districts and downtown area, which are very highly populated with high-rise apartment buildings and flush with restaurants to support the financial businesses. Second to this would be the Mission Districts, shown in the darkest red.

Recommendation: North-Eastern Downtown Region (Financial District)

Based on our analysis, the most optimal location for a Food Waste Management Center (FWMC) would be in the north-eastern neighborhoods of San Francisco. They present excellent locations based on the following:

- This area is the most heavily populated, having an extremely high number of people, restaurants, and businesses.
- It lies along the Highway 101, a primary artery in and out of San Francisco, meaning that any transportation of food waste in and out of the city to possible composting/animal feed production facilities would be facilitated.

- Homeless and low-income areas exist in these areas and an FWMC would be best suited to assist the local communities.

Secondary Recommendation: Mission District

Based on our analysis and population density, we can see that another good choice for a Food Waste Management Center would be the mission district: it has a very high population and high density of restaurants. Not only that, the Mission district is not nearly as populated by high-rise buildings of the financial district, meaning securing space would be cheaper and more viable. It also has easy access to the main 101 highway.

Thank You

Thank you for viewing my project, and thank you to IBM and the teachers/staff for your informative course. I enjoyed it immensely and learned a lot. I look forward to using this knowledge in my future work. -EB

References

1. U.S. Food and Drug Administration, "Food Waste and Loss", https://www.fda.gov/food/consumers/food-waste-and-loss
2. Jean C. Buzby, Hodan F. Wells, and Jeffrey Hyman (United States Department of Agriculture), "The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States", https://www.ers.usda.gov/webdocs/publications/43833/43680_eib121.pdf
3. Harvard T.H. Chan School of Public Health, "Food Waste: The Big Picture", https://www.hsph.harvard.edu/nutritionsource/sustainability/food-waste/
4. WasteNoFood.org, "Food Facts", http://wastenofood.org/food-facts
5. Wikipedia, "Silhouette (clustering)", https://en.wikipedia.org/wiki/Silhouette_%28clustering%29

This Project Across the Web

This project can be found around the web at the following links:

Report:
https://docs.google.com/document/d/1O--SM4SMb6uCQYVVulrAyM7nRB1JhJZPQQUvwURnt3k/edit?usp=sharing

Presentation:
https://docs.google.com/presentation/d/1zmBikl6vjaCyr7OqsK90qvDrEPHJvbeKRZVdEmSogh4/edit?usp=sharing

IBM Watson Studio:
https://jp-tok.dataplatform.cloud.ibm.com/analytics/notebooks/v2/cc31f32a-f0ad-43e4-a474-79f89ad0d697?projectid=0e052036-fd3e-4893-a04b-46349d1af3d9&context=analytics

Github:
https://github.com/Glitch852/Coursera_Capstone/blob/master/IBM%20Data%20Science%20Capstone%20-%20Final.ipynb