Final Report

Introduction:

Problem: There are many people who have restrictions on what they can eat, the reasons for which are numerous. For example some people may be vegatarian, vegan, have religious restrictions, allergic to certain foods, etc and may need a specialty restaurant that can provide meals that satisfy their food requirements. This issue most prominently occurs when people visit a far away city, state or even a country whose food culture is vastly different from the one that they are use to. The problem that I am looking to solve is finding areas within a city that can best accomodate a person's food restrictions/diets/preferences.

Audience: One of the many variables that a person goes through when they are searching for a new home or apartment to live in is the food options available to them whether that is the nearby restaurants they can dine out at or grocery stores that carry the ingredients that they are looking for. And as mentioned earlier, this information can also be used by people who are visiting a city on vacation and may be worried that their food options will be limited or possibly non-existent. They can then use information like this to prepare and find other areas with restaurants or stores that can fulfill their food needs.

For this project I will focus on the city of San Francisco

Data:

The data that I need to solve the problem is the Name, location, and the category of the restaurant all of which can be gathered from FourSquare. I also used Yelp to help supplement my data.
By default the Nominatim Geolocator will pinpoint to Downtown San Francisco, but for my project I will need to get different lat,lng coordinates to be able to search different neighbourhoods and areas around San Francisco. Foursquare API has a 50 return limit on the search query. So in order to get the data I need I will have to tune the search query by changing the lat, lng coordinates, the radius of search, as well as the foursquare ID of the restaurant category(i.e. vegetarian) to get a better idea of the type of food coverage around the city
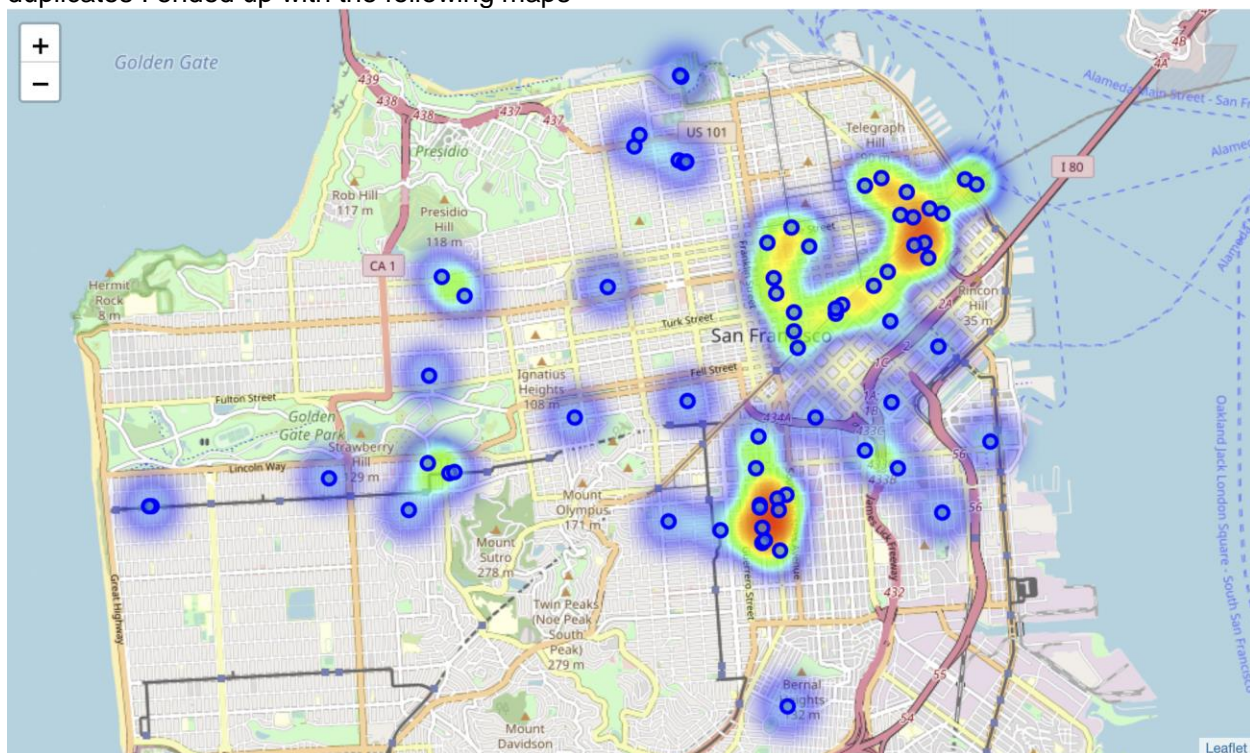Examples of the data retrieved for the restaurants can be seen in the images below

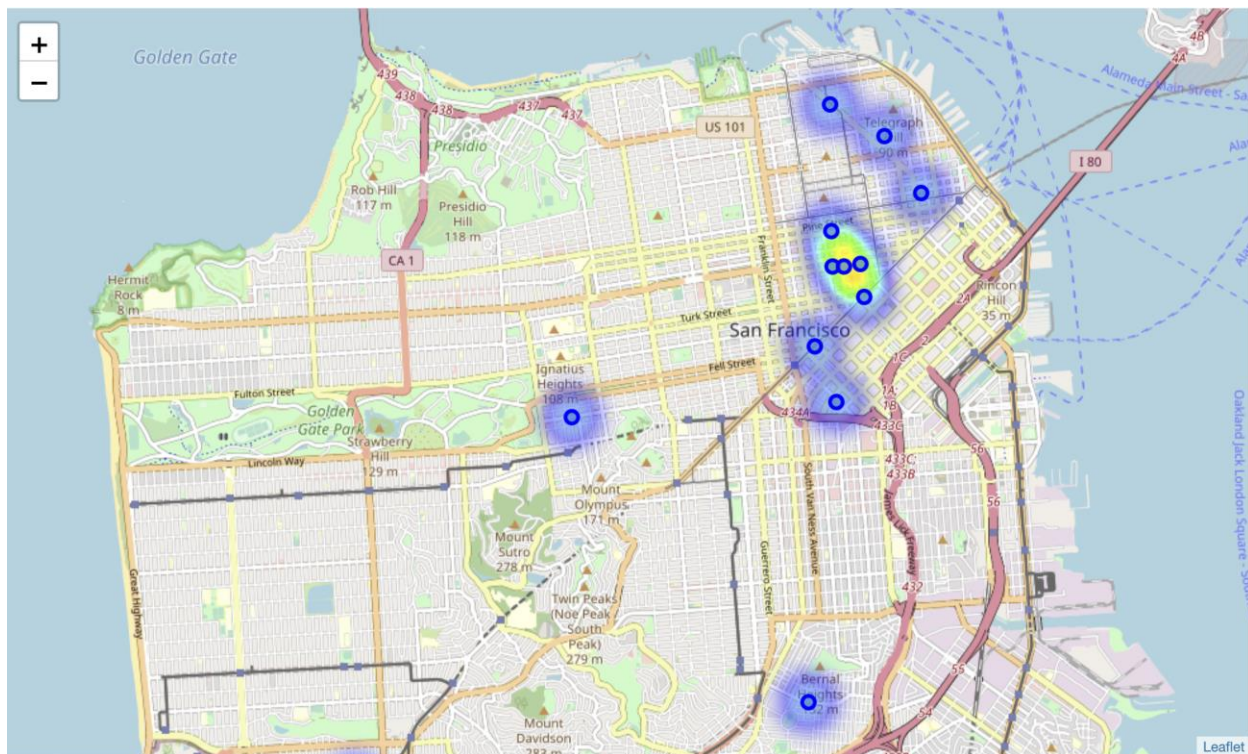|	Name	Category	Address	Latitude	Longitude
0	Mixt	Salad Place	560 Mission St	37.788844	-122.399149
1	sweetgreen	Salad Place	171 2nd St	37.787262	-122.398635
2	Wildseed	Vegetarian / Vegan Restaurant	2000 Union St	37.797676	-122.432420
3	Stirred, Not Shaken	Bakery	NaN	37.761962	-122.417972
4	The Plant Cafe Organic	Café	101 California St	37.792525	-122.398465
5	Mixt	Salad Place	901 Valencia St	37.758400	-122.421126
6	Gracias Madre	Mexican Restaurant	2211 Mission St	37.761484	-122.419144
7	Shizen	Sushi Restaurant	370 14th St	37.768190	-122.421627

	Name	Category	Address	Latitude	Longitude
0	Torshi	Halal Restaurant	Leidesdorff Alley, 343 Sansome St	37.793609	-122.402095
1	golden gate halal food	Halal Restaurant	979 Market St	37.782475	-122.409757
2	The Halal Guys	Halal Restaurant	340 O'Farrell St	37.786111	-122.410421
3	Marhaba Indian & Pakistani Halal Cuisine	Halal Restaurant	485 Ofarrell St	37.785743	-122.412633
4	Eden Silk Road	Chinese Restaurant	575 Ofarrell St	37.785731	-122.414099
5	The Halal Guys	Halal Restaurant	1022 Bush St	37.789591	-122.414238
6	Hella Halal	Halal Restaurant	320 11th	37.771313	-122.413594
7	SF Gyro	Food Stand	NaN	37.777250	-122.416502
8	Curry Leaf Restaurant	Indian Restaurant	943 Columbus Ave	37.803183	-122.414413

Methodology:

I input a search query on each neighborhood in San Francisco and retrieved the lists of restaurants returned by each of them. I combined all of them into one list and after cleaning and removing all duplicates I ended up with the following maps

I then added a heatmap to help indicate which area's had the highest concentrate of restaurants that we are looking for in the Vegetarian Map above and the Halal map below
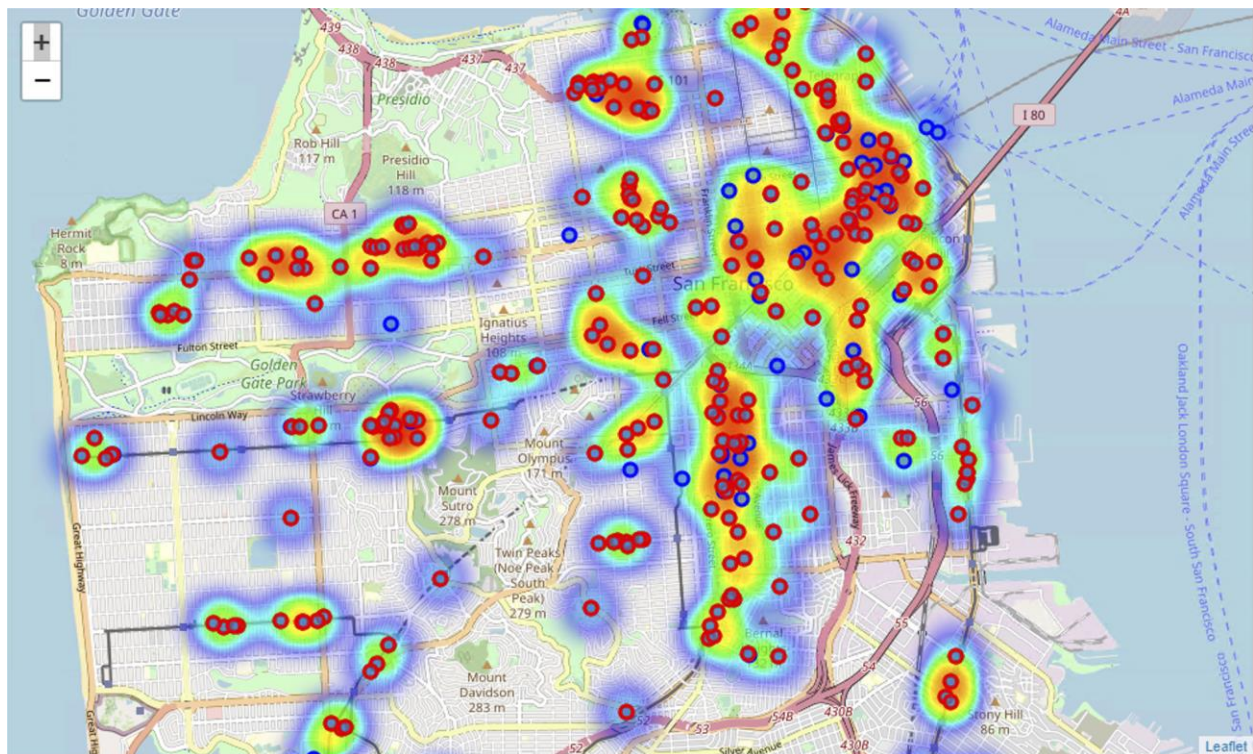

Upon first glance at the two maps I had, I thought that the amount of restaurants for both the Vegetarian/Vegan map and the Halal map was extremely low. A quick Google Maps lookup backed up my suspicions as there were plenty of listed restaurants in Google Maps that I could not find within my list of data retrieved from FourSquare.

Then I did a quick search on Yelp as well to see If there were any more restaurants that either FourSquare or Google missed. I was able to find more restaurants as well as more data such as more accurate categories they belong to on the Yelp Website. Because of that I signed up for Yelp and was able to use their API to retrieve a list of data on all the restaurants in the city.

Upon looking at the two datasets I found that FourSquare returned restaurants explicitly categorized as a Vegan / Vegetarian Restaurants whereas Yelp would return any restaurant that offers a Vegetarian / Vegan dish. I then combined the FourSquare and Yelp data together removing any duplicates by using their Address. Removing duplicates by name would result in chain restaurants being removed so I could not use that. I also found that the latitude and longitude values between FourSquare and Yelp differed very slightly which would result in no duplicates being found if dropping duplicates through coordinates

Using this newer dataset I replotted all the data onto the map as shown below where blue circles are FourSquare data and Red Circles are Yelp Data

Vegetarian/Vegan Map with both Yelp and FourSquare data.

Halal Restaurant Map with both Yelp and FourSquare data

Result

Vegetarian Results - All of the major restaurant hubs around the city are well equipped to serve Vegetarians/Vegans. In particular Market Street, the Financial District, and Mission Street are the biggest hot spots for such restaurants. It is only in the southern area around Excelsior/Visitation Valley/ Bayshore Heights where vegetarian restaurant coverage becomes rare.

Halal Results - The biggest cluster of Halal restaurants can be found in the area around Powell and Jones St crossing. The second biggest cluster can be found in the Financial District. Elsewhere around the city, Halal restaurants are spread out without much concentration except for Outer Sunset and the Excelsior/Visitation Valley/Bayshore Heights areas where there is nearly no Halal restaurants found.

Discussion

It is interesting looking at the locations of where the restaurants are located and in the case of both Vegetarian/Vegan and Halal restaurants, both follow the same pattern of having intense hotspots located in the downtown area and then becoming more spreadout the further you move away from there. This would make sense as the downtown area is the area with the most traffic on any given day.

One thing to keep in mind is that for a person to have a preference for a Restaurant to commit to the specialty instead of being a restaurant that dabbles in multiple things as evidenced by the FourSquare vs Yelp data. There is some thought to be had about whether a vegetarian would avoid restaurants that have both vegetarian and meat options or they would go to restaurants that are purely Vegetarian only.

One more source of data that I could not find a source for was a list of all the Food Trucks that operate in San Francisco (or any other parts of the bay area for that matter). Food Trucks have become increasingly more common but since it is a mobile operation there is no reliable way to track them down the same way you can track down Restaurants that have a set location.

The accuracy of FourSquare and Yelp data is pretty good but because they are both crowd sourced data there are many inconsistent results for any given restaurant data. I feel that this is not the fault of FourSquare or Yelp in itself but it is the effect of crowd sourcing your data as you have many different people who report a restaurant possibly inaccurately, without enough information, or just differently from other users

Conclusion

The combination of Foursquare and Yelp data provided a much better and more accurate picture of all the restaurants that support the category that a person is looking for. In my research I have found that San Francisco is very friendly towards Vegetarians and Vegans all over the city. While there are far less Halal restaurants in San Francisco, there is still plenty of restaurants around the city that can take care of any visitor to the city exploring the more touristy neighborhoods.