Project: Compare the Top Populated Cities in the USA

Introduction

I will view the top populated cities in the USA. I will cluster them into groups and visualize the result on a map. I will adjust the clusters from 2 to 5 and see the effect on the map.

One of the questions I want to see if I can answer is in the USA is there a difference or similar in certain areas of the USA? Example will we see a difference when we compare the West Coast, East Coast, and the Midwest. Also I will compare the very large cities with the smaller cities. Or is the US a "melting pot" and there is not much difference throughout the country when it comes to the types of venues located in the most populated cities in the US. I would like the compare the cities and determine how similar or dissimilar they are. Through this project I am expecting following people to benefit out of the findings.

- People moving to different cities for work
- Business Companies looking for new locations or to expand
- Restaurants to adjust their menu based on the people's likings and feedbacks

Data

The data I will be using will come from the following web site,

https://en.wikipedia.org/wiki/List_of_United_States_cities_by_population

2018 rank	City	State[c]	2018 estimate	2010 Census
1	*New York City*[d]	New York	8,398,748	8,175,133
2	*Los Angeles*	California	3,990,456	3,792,621
3	*Chicago*	Illinois	2,705,994	2,695,598
4	*Houston*[3]	Texas	2,325,502	2,100,263
5	***Phoenix***	Arizona	1,660,272	1,445,632
6	*Philadelphia*[e]	Pennsylvania	1,584,138	1,526,006
7	San Antonio	Texas	1,532,233	1,327,407
8	San Diego	California	1,425,976	1,307,402
9	Dallas	Texas	1,345,047	1,197,816
10	San Jose	California	1,030,119	945,942

I will use beautiful soap to read the tables from this website. I will have to do some data "cleaning" in python pandas to get the data into a correct dataframe, so that the table and data will be ready to be read by the Foursquare API program section on my Python program.

Methodology

After loading in the data from the website (https://en.wikipedia.org/wiki/List_of_United_States_cities_by_population)

I had to use Pandas to clean the data to get the following dataframe output with Rank, City, Latitude and Longitude.

Completed Cleaning the Data Table

```
[15]: new_data1.head()
```

[15]:

	rank	city	state	estimate	census	area mi	den mi	lat	long
0	1	New York City[d]	New York	8,398,748	8,175,133	301.5 sq mi	28,317/sq mi	40.6635	-73.9387
1	2	Los Angeles	California	3,990,456	3,792,621	468.7 sq mi	8,484/sq mi	34.0194	-118.4108
2	3	Chicago	Illinois	2,705,994	2,695,598	227.3 sq mi	11,900/sq mi	41.8376	-87.6818
3	4	Houston[3]	Texas	2,325,502	2,100,263	637.5 sq mi	3,613/sq mi	29.7866	-95.3909
4	5	Phoenix	Arizona	1,660,272	1,445,632	517.6 sq mi	3,120/sq mi	33.5722	-112.0901

```
[16]: new_data1.tail()
```

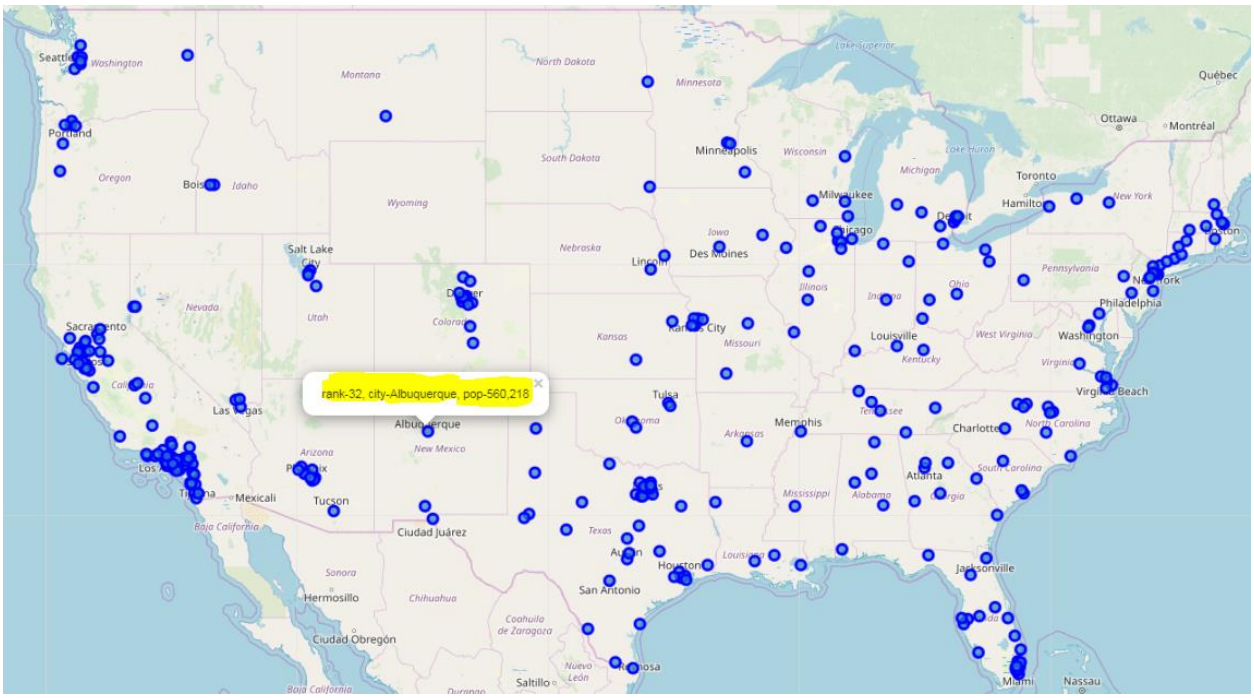
[16]:

	rank	city	state	estimate	census	area mi	den mi	lat	long
309	310	Edison[ad]	New Jersey	100,693	99,967	30.1 sq mi	3,389/sq mi	40.5040	-74.3494
310	311	Woodbridge[ad]	New Jersey	100,450	99,585	23.3 sq mi	4,351/sq mi	40.5607	-74.2927
311	312	San Angelo	Texas	100,215	93,200	59.9 sq mi	1,681/sq mi	31.4411	-100.4505
312	313	Kenosha	Wisconsin	100,164	99,218	28.0 sq mi	3,577/sq mi	42.5822	-87.8456
313	314	Vacaville	California	100,154	92,428	29.0 sq mi	3,449/sq mi	38.3539	-121.9728

```
[17]: new_data1.dtypes
```

```
[17]: rank         object
      city         object
      state        object
      estimate     object
      census       object
      area mi      object
      den mi       object
      lat         float64
      long        float64
      dtype: object
```

Because I am not a master at Pandas yet, it took me a number of steps to get the data into the right format. I then used the folium package to visualize the map of the US with displaying the popup label with Rank, City and Population. I did this step so that I know the data was "clean" and was displaying corredctly on the map.



I next used the Foursquare section of the program to explore the cities and venues.

I set the limits to 20 venues and with a radius of 1000 meters. This list is 4941 lines deep. So I know I did not get 20 venues for all of the 314 cities on the list. As you can see blow.

Charleston	15	15	15	15	15	15
Charlotte	20	20	20	20	20	20
Chattanooga	4	4	4	4	4	4
Chicago	20	20	20	20	20	20
Chula Vista	6	6	6	6	6	6
Cincinnati	20	20	20	20	20	20
Clarksville	2	2	2	2	2	2
Clearwater	7	7	7	7	7	7
Cleveland	20	20	20	20	20	20
Clinton[ae]	5	5	5	5	5	5
Clovis	20	20	20	20	20	20

In the picture below, you can see New York with 20 venues and then Los Angeles as the next city on the list.

	city	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	New York City[d]	40.6635	-73.9387	Izzy's Brooklyn Smokehouse	40.664869	-73.937023	BBQ Joint
1	New York City[d]	40.6635	-73.9387	Ali's Roti Shop	40.666436	-73.931346	Caribbean Restaurant
2	New York City[d]	40.6635	-73.9387	Sweet Expressions	40.668382	-73.942337	Candy Store
3	New York City[d]	40.6635	-73.9387	Bodega	40.668388	-73.932366	Deli / Bodega
4	New York City[d]	40.6635	-73.9387	The Market Place	40.662153	-73.943010	Grocery Store
5	New York City[d]	40.6635	-73.9387	Mama Louisa's Hero Shoppe	40.659496	-73.947519	Sandwich Place
6	New York City[d]	40.6635	-73.9387	Conrad's Famous Bakery, III, Inc.	40.667942	-73.931033	Bakery
7	New York City[d]	40.6635	-73.9387	Calabria	40.670420	-73.942230	Pizza Place
8	New York City[d]	40.6635	-73.9387	Crunch Fitness - Crown Heights	40.663335	-73.932808	Gym / Fitness Center
9	New York City[d]	40.6635	-73.9387	Jewish Children's Museum	40.669017	-73.942086	Museum
10	New York City[d]	40.6635	-73.9387	Sushi Spot	40.664320	-73.942705	Japanese Restaurant
11	New York City[d]	40.6635	-73.9387	Blink Fitness Crown Heights	40.669828	-73.931352	Gym
12	New York City[d]	40.6635	-73.9387	Fish N Chips (Soul of the Sea)	40.661951	-73.940055	Fish & Chips Shop
13	New York City[d]	40.6635	-73.9387	Kings County Nurseries	40.659171	-73.947301	Garden Center
14	New York City[d]	40.6635	-73.9387	Old Boys High Field	40.658667	-73.938427	Field
15	New York City[d]	40.6635	-73.9387	Three Star Juice Lounge	40.661465	-73.931672	Juice Bar
16	New York City[d]	40.6635	-73.9387	Family Dollar	40.662678	-73.933558	Discount Store
17	New York City[d]	40.6635	-73.9387	White Castle	40.663357	-73.932238	Fast Food Restaurant
18	New York City[d]	40.6635	-73.9387	Rite Aid	40.661066	-73.931816	Pharmacy
19	New York City[d]	40.6635	-73.9387	Bakerie	40.672013	-73.939183	Café
20	Los Angeles	34.0194	-118.4108	Oldfield's Liquor Room	34.016286	-118.411881	Cocktail Bar
21	Los Angeles	34.0194	-118.4108	Yogurtland	34.017710	-118.407116	Frozen Yogurt Shop
22	Los Angeles	34.0194	-118.4108	Pampas Grill Culver City	34.016929	-118.406503	Brazilian Restaurant
23	Los Angeles	34.0194	-118.4108	Bella Vista Brazilian Gourmet Pizza	34.016824	-118.409644	Pizza Place
24	Los Angeles	34.0194	-118.4108	Robeks Fresh Juices & Smoothies	34.017295	-118.406101	Smoothie Shop
25	Los Angeles	34.0194	-118.4108	Kogi Taqueria	34.024653	-118.411534	Taco Place

When I looked at all of the Venue Catagories, I had a total of 379.

	city	ATM	Accessories Store	Adult Boutique	Advertising Agency	Afghan Restaurant	African Restaurant	Airport	Airport Gate	Airport Service	Airport Terminal	American Restaurant
0	Abilene	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.200000
1	Akron	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.050000
2	Albuquerque	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.000000
3	Alexandria[m]	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.000000
4	Allen	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.000000
5	Allentown	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.050000
6	Amarillo	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.00	0.000000	0.000000	0.000000

Next I took onoy the top 10 venue catagoies for each city, see picuter below , where some cities did not have a percenagte for all 10 catagoies.

```
----Oxnard----
                  venue  freq
0    Mexican Restaurant  0.15
1      Airport Terminal  0.15
2              Pharmacy  0.15
3          Optical Shop  0.08
4       Doctor's Office  0.08
5  Fast Food Restaurant  0.08
6     Fish & Chips Shop  0.08
7     Convenience Store  0.08
8               Airport  0.08
9   Rental Car Location  0.08


----Palm Bay----
                         venue  freq
0                 Home Service   0.2
1                Ice Cream Shop   0.2
2            Chinese Restaurant   0.2
3                   Pizza Place   0.2
4                   Golf Course   0.2
5                  Music School   0.0
6                        Office   0.0
7                          Park   0.0
8  Paper / Office Supplies Store   0.0
9              Paella Restaurant   0.0
```

Show table here and merge table here

	name	categories	lat	lng
0	Büyükada Tepesi	Mountain	40.861107	29.117418
1	Eski Rum Yetimhanesi	Historic Site	40.861705	29.123323
2	Büyükada Bisiklet Parkuru	Bike Trail	40.865000	29.116861
3	Büyükada Lale köşkü	Bed & Breakfast	40.865657	29.125223
4	Nizam Butik Otel & Bistro	Bed & Breakfast	40.863322	29.116257

In summary of this data **43** venues were returned by Foursquare. Here is a merged table of boroughs and venues.

	Borough	Borough Latitude	Borough Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Adalar	40.8619	29.1208	Büyükada Tepesi	40.861107	29.117418	Mountain
1	Adalar	40.8619	29.1208	Eski Rum Yetimhanesi	40.861705	29.123323	Historic Site
2	Adalar	40.8619	29.1208	Nizam Butik Otel & Bistro	40.863322	29.116257	Bed & Breakfast
3	Adalar	40.8619	29.1208	Büyükada Bisiklet Parkuru	40.865000	29.116861	Bike Trail
4	Adalar	40.8619	29.1208	Asiklar Cay Bahcesi	40.860402	29.116640	Café

Methodology section which represents the main component of the report where you discuss and

describe any exploratory data analysis that you did, any inferential statistical testing that you performed, and what machine learnings were used and why.

Results

ere you discuss the results.

	city	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Abilene	American Restaurant	Convention Center	Seafood Restaurant	Bakery	Candy Store
1	Akron	Performing Arts Venue	Bar	Food & Drink Shop	Café	Italian Restaurant
2	Albuquerque	Brewery	Mexican Restaurant	Discount Store	Burger Joint	Pawn Shop
3	Alexandria[m]	Park	Rental Car Location	Coffee Shop	Flower Shop	Ice Cream Shop
4	Allen	Fast Food Restaurant	Café	BBQ Joint	Mexican Restaurant	Donut Shop

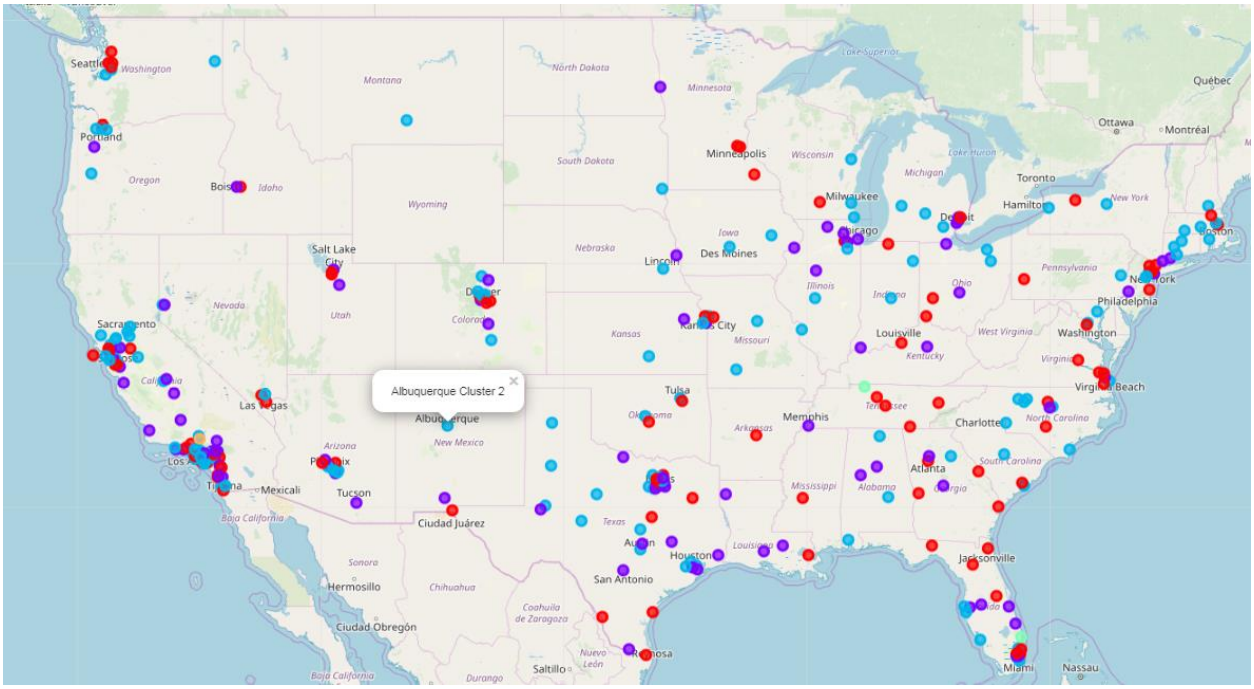
In summary of this graph **256** unique categories were returned by Foursquare, then I created a table which shows list of top 10 venue category for each borough in below table.

	Borough	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	Adalar	Café	Bed & Breakfast	Garden Center	Mountain	BBQ Joint	Hotel	Road	History Museum	Historic Site	Tea Room
1	Arnavutkoy	Arcade	Pharmacy	Restaurant	Kofte Place	Diner	Leather Goods Store	Convenience Store	Farmers Market	Electronics Store	Entertainment Service
2	Atasehir	Café	Restaurant	Pool	Spa	Clothing Store	Çöp Şiş Place	Farmers Market	Soccer Stadium	Park	Hotel
3	Avcilar	Café	Fast Food Restaurant	Turkish Restaurant	Restaurant	Coffee Shop	Shoe Store	Donut Shop	Mobile Phone Shop	Modern European Restaurant	Molecular Gastronomy Restaurant
4	Bagcilar	Café	Gym	Turkish Restaurant	Snack Place	Men's Store	Dessert Shop	Tennis Court	Tea Room	Fried Chicken Joint	Restaurant

	rank	city	state	estimate	census	area mi	den mi	lat	long	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	1	New York City[d]	New York	8,398,748	8,175,133	301.5 sq mi	28,317/sq mi	40.6635	-73.9387	1.0	BBQ Joint	Grocery Store	Field	Fast Food Restaurant	Museum
1	2	Los Angeles	California	3,990,456	3,792,621	468.7 sq mi	8,484/sq mi	34.0194	-118.4108	2.0	Pizza Place	Indian Restaurant	Café	Brazilian Restaurant	Mediterranean Restaurant
2	3	Chicago	Illinois	2,705,994	2,695,598	227.3 sq mi	11,900/sq mi	41.8376	-87.6818	1.0	Fast Food Restaurant	Diner	Coffee Shop	Video Game Store	Intersection
3	4	Houston[3]	Texas	2,325,502	2,100,263	637.5 sq mi	3,613/sq mi	29.7866	-95.3909	2.0	Café	Cajun / Creole Restaurant	Italian Restaurant	Beer Store	Coffee Shop
4	5	Phoenix	Arizona	1,660,272	1,445,632	517.6 sq mi	3,120/sq mi	33.5722	-112.0901	1.0	Fast Food Restaurant	Storage Facility	Video Store	Pharmacy	Sandwich Place

Discussion se

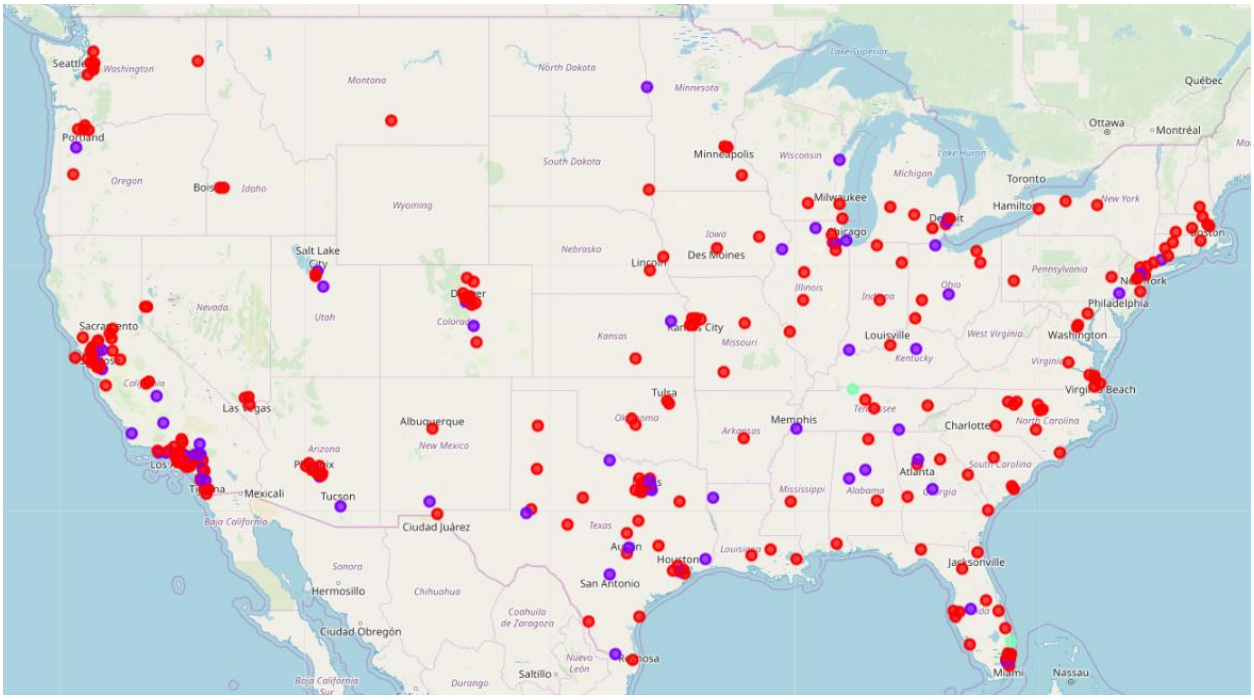
When looking at the maps of the US, I did not see a major difference in the type of venues when comparing East Coast, West Cost and the Mid West. We do see a slight diffenece in the largeste cities with the smaller cities somewhat.



When I had the clusters set to 5, there was a great drop of for cuklsters 4 and cluster 5

Cluster 4 = 2 cities

Cluster 5 = 1 ciity



Cluster 3 has 2 city

So I adjusted my cluster to 3 and rerun my program.

I think ttrying to compare over 300 cities was not a good project for a 1st project for me. I think comparing 2 to 3 cities would have been more meaningful and easy to anaylyz.

Conclusion section

In this study, I analyzed the lraest citues on the US to see if there is a large diffentece in the vanuea in the courty. When I cluster the groups from 2 to 5. I did not see a large difference in the map. It seems the veneues in the US are very concsistancte no matter where you go .

During my travels throughout the US, this conclusion seems correct. When we go from city to city or state to state in the very large cities in the US, it does seem very simlair.

This is my 1st project using Pyhton Pandas, FourSquare and Mapping visualization and felt a learned a great deal about the tools, Next I need to futrhter this project study with more indeft detailed analiysis.