1. Capstone Project - Introduction

1.1. Business Problem Statement

Imagine you are business man that is looking to start a new business in a given city. One of the first things you need to do is to identify the best location to establish your business. In order to do that, you need to study the current market and demand for the particular kind of business you are interested in establishing on the city. This task may represent a real challenge, specially if you are new to the city and you are not familiar with the different neighborhoods and their distribution around in the city.

1.2. Proposed Solution

We proposed to create a tool to assist the users to analyze a given city's blueprint in regards of a particular kind of business. This is achived by generating a map of the city and pin-pointing the most popular venues of the kind of business in scope. The map, in turn, gives the users a city-wide overview of the venues distribution, which may be used to identify areas with no venues or areas with too many venues. This information results very usefull to decide on the best location to establish a new business venue.

This project is intended to be a free-source project to assist any person interested in starting a new business and needs to find the best location to establish the venue.

2. Capstone Project - Data Description

We will use the Foursquare location data to solve this problem. You can find below a description of the different data types used.

2.1. Venue categories

We pull all the different venue categories available in Foursquare using the categories endpoint and re-arragen them into a dataframe in a parent-child fashion.

```
In [17]: subcategories_df[subcategories_df['CategoryName']=='Shop & Service'].head(10)
```

Out[17]:

	CategoryId	CategoryName	SubCategoryId	SubCategoryName	
726	4d4b7105d754a06378d81259	Shop & Service	52f2ab2ebcbc57f1066b8b56	ATM	
727	4d4b7105d754a06378d81259	Shop & Service	5267e446e4b0ec79466e48c4	Adult Boutique	
728	4d4b7105d754a06378d81259	Shop & Service	4bf58dd8d48988d116951735	Antique Shop	
729	4d4b7105d754a06378d81259	Shop & Service	4bf58dd8d48988d127951735	Arts & Crafts Store	
730	4d4b7105d754a06378d81259	Shop & Service	52f2ab2ebcbc57f1066b8b43	Astrologer	
731	4d4b7105d754a06378d81259	Shop & Service	4eb1c1623b7b52c0e1adc2ec	Auto Dealership	
734	4d4b7105d754a06378d81259	Shop & Service	52f2ab2ebcbc57f1066b8b44	Auto Garage	
735	4d4b7105d754a06378d81259	Shop & Service	56aa371be4b08b9a8d5734d3	Auto Workshop	
736	4d4b7105d754a06378d81259	Shop & Service	4bf58dd8d48988d124951735	Automotive Shop	
737	4d4b7105d754a06378d81259	Shop & Service	52f2ab2ebcbc57f1066b8b32	Baby Store	

2.2. Venue data

Once the user has selected a city and a venue category, we search for venues with the given category in the bounds of the geocode of the city. Note that the search endpoint will also retrieve venues for subcategories of the given category. The sample data below is using *'Salt Lake City'* as city and *'Sporting Goods Shop'* as venue category.

In [18]: venues_df

Out[18]:

	Venue	Latitude	Longitude	Category	Address
0	Wasatch Touring	40.766880	-111.870517	Sporting Goods Shop	702 E 100 S (700 E), Salt Lake City, UT 84102,...
1	Tribal West Lacrosse	40.571475	-111.873055	Sporting Goods Shop	9860 S 700 E (Suite 6), Sandy, UT 84070, Unite...
2	Silver Star Ski & Sport	40.656898	-111.514320	Ski Shop	1825 Three Kings Dr, Park City, UT 84060, Unit...
3	Salt Lake Running Company	40.739520	-111.827082	Sporting Goods Shop	1356 S Foothill Dr, Salt Lake City, UT 84108, ...
4	Big 5 Sporting Goods	40.722434	-111.855884	Sporting Goods Shop	2236 S 1300 E, Salt Lake City, UT 84106, Unite...
5	Switchback Sports	40.659505	-111.501886	Sporting Goods Shop	1685 Bonanza Dr (Kerns), Park City, UT 84060, ...
6	Play It Again Sports - Highland Drive	40.625800	-111.835609	Sporting Goods Shop	6910 S Highland Dr #3, Cottonwood Heights, UT ...
7	Cabela's	40.986458	-111.912017	Sporting Goods Shop	391 N Cabelas Dr, Farmington, UT 84025, United...
8	Christy Sports	40.728428	-111.548347	Business Service	6622 N Landmark Dr B-110, Park City, UT 84098,...
9	Oakley Vault	40.729051	-111.550073	Accessories Store	6699 N Landmark Dr Ste A110, Park City, UT 840...
10	Oakley Store	40.635906	-111.886081	Accessories Store	6191 S State St Ste 1470, Murray, UT 84107, Un...
11	Foot Locker	40.562678	-111.895534	Shoe Store	10450 S State St Ste 1400 (at Shops at South T...
12	Sportsman's Warehouse	40.560838	-111.972812	Sporting Goods Shop	10462 S River Heights Dr, South Jordan, UT 840...
13	Foot Locker	40.635224	-111.884938	Shoe Store	6191 S State St Ste 329, Murray, UT 84107, Uni...
14	DICK'S Sporting Goods	40.611437	-111.982311	Sporting Goods Shop	7682 South Campus Drive, West Jordan, UT 84084...
15	International Mountain Equipment	40.700512	-111.801561	Sporting Goods Shop	Salt Lake City, UT 84109, United States
16	Gear Express Climbing Gear	40.710306	-111.977656	Sporting Goods Shop	2702 South Suite E (3600 West), Salt Lake City...
17	Wilde Arrow Archery	40.922427	-111.894566	Sporting Goods Shop	470 N 1100 W, Centerville, UT 84014, United St...
18	AJ Motions Sports Outlet	40.580029	-111.874062	Sporting Goods Shop	9432 S Union Sq, Sandy, UT 84070, United States
19	Deboer's Running Store	40.887967	-111.880291	Sporting Goods Shop	135 S Main St, Bountiful, UT 84010, United States
20	Christy Sports	40.686357	-111.794911	Sporting Goods Shop	3939 South Wasatch Boulevard Suite 16 (at Jupi...
21	pool n patio	40.700058	-111.828309	Sporting Goods Shop	Utah, United States
22	Wave Products	40.725279	-111.894872	Sporting Goods Shop	125 W 2100 S, Salt Lake City, UT 84115, United...

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	Venue	Latitude	Longitude	Category	Address
23	RunGr8 Running Center	40.522864	-111.955323	Sporting Goods Shop	2608 West 12600 South, Riverton, UT 84065, Uni...
24	Salt Lake Running Company	40.527821	-111.858139	Sporting Goods Shop	1132 E Draper Pkwy, Draper, UT 84020, United S...
25	Nike Factory Store	40.622394	-111.979784	Sporting Goods Shop	3736 W Center Park Dr Ste 120 (at Jordan Landi...
26	Salt Lake Running Company	40.717681	-111.871720	Sporting Goods Shop	2454 S 700 E (at I-80), Salt Lake City, UT 841...
27	REI	40.700694	-111.801223	Sporting Goods Shop	3285 E 3300 S (Valley St), Salt Lake City, UT ...
28	Cabela's	40.437689	-111.888870	Sporting Goods Shop	2502 W Cabelas Blvd, Lehi, UT 84043, United St...
29	Nike Factory Store	40.434596	-111.884012	Sporting Goods Shop	3700 N Cabelas Blvd Ste 301 (at Outlets at Tra...
30	REI	40.564169	-111.898474	Sporting Goods Shop	230 W 10600 S, Ste 1700 (at South Towne Mall),...
31	Nike Factory Store	40.725898	-111.552567	Sporting Goods Shop	6699 N Landmark Dr Ste L100, Park City, UT 840...
32	9 Dragons Fight Shop	40.713793	-111.887813	Sporting Goods Shop	2607 S State St Ste D, South Salt Lake, UT 841...
33	Soccer Plus	40.558418	-111.937899	Sporting Goods Shop	1645 W Towne Center Dr, South Jordan, UT 84095...
34	Academy Sports Utah	40.623344	-111.854550	Sporting Goods Shop	7035 S 1300 E, Midvale, UT 84047, United States
35	Ski Butlers Ski Rental Delivery	40.663820	-111.497620	Sporting Goods Shop	1821 Sidewinder Dr, Park City, UT 84060, Unite...
36	Sportsman's Warehouse	40.619291	-111.896042	Sporting Goods Shop	165 W 7200 S (at S 185 W), Midvale, UT 84047, ...
37	DICK'S Sporting Goods	40.621096	-111.861725	Sporting Goods Shop	7170 S 1000 E, Midvale, UT 84047, United States
38	Patagonia Outlet	40.720938	-111.858306	Clothing Store	2292 S Highland Dr, Salt Lake City, UT 84106, ...
39	Eaglewood Golf Course	40.835462	-111.885946	Golf Course	1110 E Eaglewood Dr, North Salt Lake, UT 84054...
40	Park City Ski Swap	40.723785	-111.537155	Sporting Goods Shop	1388 Center Dr (at Basin Rec Field House), Par...
41	Jans Mountain Outfitters	40.657009	-111.506273	Sporting Goods Shop	1600 Park Ave, Park City, UT 84060, United States
42	Scheels	40.546621	-111.893186	Sporting Goods Shop	11282 S State St (at Auto Mall Drive), Sandy, ...
43	Backcountry.com Retail Store	40.712617	-111.966724	Sporting Goods Shop	2607 S 3200 W #A, Salt Lake City, UT 84119, Un...
44	Universal Athletics	40.622216	-111.870867	Sporting Goods Shop	735 E Fort Union Blvd, Midvale, UT 84047, Unit...
45	Poco Loco	40.702496	-111.852531	Sporting Goods Shop	3142 S Highland Dr, Salt Lake City, UT 84106, ...

	Venue	Latitude	Longitude	Category	Address
46	Columbia Factory Store	40.728196	-111.551865	Clothing Store	6699 North Landmark Dr, Park City, UT 84098, U...

3. Capstone Project - Methodology

On this section we will discuss and describe the exploratory data analysis performed and the machine learning method used.

We are able to implement a K-mean clustering algorithm using the venues location data extracted from Foursquare to map how these venues are distributed throughout the city and identify areas with no venues or areas with too many venues.

We use sklearn.cluster.KMeans module to perform the clustering processing and folium for map rendering.

The input for the analysis is a location (i.e. a city name) and a venue category. The venue category can be also extracted from Foursquare database. For presenting the results on this document we have use two experiments with different inputs. Please refer to the section Results for further details.

4. Capstone Project - Results

4.1. Results for 'Salt Lake City, UT' and 'Sporting Goods Shop'

The first experiment is performed using location as Salt Lake City, UT and venue category as Sporting Goods Shop. These inputs were decided considering that Salt Lake City is a city surounded by mountains and outdoor sports are very popular among Salt Lake city inhabitants.

The venue data extracted from Foursquare for location 'Salt Lake City, UT' and venue category 'Sporting Goods Shop' is displayed below. We have also added the cluster_id column to idenfity to which cluster each venue belongs.

In [9]: `venues_df`

Out[9]:

	Venue	Latitude	Longitude	Category	Address	cluster_id
0	Wasatch Touring	40.766880	-111.870517	Sporting Goods Shop	702 E 100 S (700 E), Salt Lake City, UT 84102,...	2
1	Oakley Vault	40.729051	-111.550073	Accessories Store	6699 N Landmark Dr Ste A110, Park City, UT 840...	0
2	Tribal West Lacrosse	40.571475	-111.873055	Sporting Goods Shop	9860 S 700 E (Suite 6), Sandy, UT 84070, Unite...	1
3	Big 5 Sporting Goods	40.722434	-111.855884	Sporting Goods Shop	2236 S 1300 E, Salt Lake City, UT 84106, Unite...	2
4	Silver Star Ski & Sport	40.656898	-111.514320	Ski Shop	1825 Three Kings Dr, Park City, UT 84060, Unit...	0
5	Sportsman's Warehouse	40.560838	-111.972812	Sporting Goods Shop	10462 S River Heights Dr, South Jordan, UT 840...	1
6	Salt Lake Running Company	40.739520	-111.827082	Sporting Goods Shop	1356 S Foothill Dr, Salt Lake City, UT 84108, ...	2
7	Cabela's	40.986458	-111.912017	Sporting Goods Shop	391 N Cabelas Dr, Farmington, UT 84025, United...	3
8	Play It Again Sports - Highland Drive	40.625800	-111.835609	Sporting Goods Shop	6910 S Highland Dr #3, Cottonwood Heights, UT ...	4
9	Switchback Sports	40.659505	-111.501886	Sporting Goods Shop	1685 Bonanza Dr (Kerns), Park City, UT 84060, ...	0
10	DICK'S Sporting Goods	40.611437	-111.982311	Sporting Goods Shop	7682 South Campus Drive, West Jordan, UT 84084...	4
11	Christy Sports	40.728428	-111.548347	Business Service	6622 N Landmark Dr B-110, Park City, UT 84098,...	0
12	Oakley Store	40.635906	-111.886081	Accessories Store	6191 S State St Ste 1470, Murray, UT 84107, Un...	4
13	Foot Locker	40.562678	-111.895534	Shoe Store	10450 S State St Ste 1400 (at Shops at South T...	1
14	Foot Locker	40.635224	-111.884938	Shoe Store	6191 S State St Ste 329, Murray, UT 84107, Uni...	4
15	Deboer's Running Store	40.887967	-111.880291	Sporting Goods Shop	135 S Main St, Bountiful, UT 84010, United States	3
16	AJ Motions Sports Outlet	40.580029	-111.874062	Sporting Goods Shop	9432 S Union Sq, Sandy, UT 84070, United States	1

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	Venue	Latitude	Longitude	Category	Address	cluster_id
17	pool n patio	40.700058	-111.828309	Sporting Goods Shop	Utah, United States	2
18	Christy Sports	40.686357	-111.794911	Sporting Goods Shop	3939 South Wasatch Boulevard Suite 16 (at Jupi...	2
19	Wilde Arrow Archery	40.922427	-111.894566	Sporting Goods Shop	470 N 1100 W, Centerville, UT 84014, United St...	3
20	Gear Express Climbing Gear	40.710306	-111.977656	Sporting Goods Shop	2702 South Suite E (3600 West), Salt Lake City...	4
21	International Mountain Equipment	40.700512	-111.801561	Sporting Goods Shop	Salt Lake City, UT 84109, United States	2
22	Wave Products	40.725279	-111.894872	Sporting Goods Shop	125 W 2100 S, Salt Lake City, UT 84115, United...	2
23	Salt Lake Running Company	40.527821	-111.858139	Sporting Goods Shop	1132 E Draper Pkwy, Draper, UT 84020, United S...	1
24	RunGr8 Running Center	40.522864	-111.955323	Sporting Goods Shop	2608 West 12600 South, Riverton, UT 84065, Uni...	1
25	DICK'S Sporting Goods	40.621096	-111.861725	Sporting Goods Shop	7170 S 1000 E, Midvale, UT 84047, United States	4
26	Nike Factory Store	40.434596	-111.884012	Sporting Goods Shop	3700 N Cabelas Blvd Ste 301 (at Outlets at Tra...	1
27	REI	40.700694	-111.801223	Sporting Goods Shop	3285 E 3300 S (Valley St), Salt Lake City, UT ...	2
28	Cabela's	40.437689	-111.888870	Sporting Goods Shop	2502 W Cabelas Blvd, Lehi, UT 84043, United St...	1
29	REI	40.564169	-111.898474	Sporting Goods Shop	230 W 10600 S, Ste 1700 (at South Towne Mall),...	1
30	Nike Factory Store	40.622394	-111.979784	Sporting Goods Shop	3736 W Center Park Dr Ste 120 (at Jordan Landi...	4
31	Nike Factory Store	40.725898	-111.552567	Sporting Goods Shop	6699 N Landmark Dr Ste L100, Park City, UT 840...	0
32	Ski Butlers Ski Rental Delivery	40.663820	-111.497620	Sporting Goods Shop	1821 Sidewinder Dr, Park City, UT 84060, Unite...	0
33	9 Dragons Fight Shop	40.713793	-111.887813	Sporting Goods Shop	2607 S State St Ste D, South Salt Lake, UT 841...	2

	Venue	Latitude	Longitude	Category	Address	cluster_id
34	Soccer Plus	40.558418	-111.937899	Sporting Goods Shop	1645 W Towne Center Dr, South Jordan, UT 84095...	1
35	Academy Sports Utah	40.623344	-111.854550	Sporting Goods Shop	7035 S 1300 E, Midvale, UT 84047, United States	4
36	Salt Lake Running Company	40.717681	-111.871720	Sporting Goods Shop	2454 S 700 E (at I-80), Salt Lake City, UT 841...	2
37	Sportsman's Warehouse	40.619291	-111.896042	Sporting Goods Shop	165 W 7200 S (at S 185 W), Midvale, UT 84047, ...	4
38	Patagonia Outlet	40.720938	-111.858306	Clothing Store	2292 S Highland Dr, Salt Lake City, UT 84106, ...	2
39	Eaglewood Golf Course	40.835462	-111.885946	Golf Course	1110 E Eaglewood Dr, North Salt Lake, UT 84054...	3
40	Park City Ski Swap	40.723785	-111.537155	Sporting Goods Shop	1388 Center Dr (at Basin Rec Field House), Par...	0
41	Backcountry.com Retail Store	40.712617	-111.966724	Sporting Goods Shop	2607 S 3200 W #A, Salt Lake City, UT 84119, Un...	4
42	Jans Mountain Outfitters	40.657009	-111.506273	Sporting Goods Shop	1600 Park Ave, Park City, UT 84060, United States	0
43	Scheels	40.546621	-111.893186	Sporting Goods Shop	11282 S State St (at Auto Mall Drive), Sandy, ...	1
44	Universal Athletics	40.622216	-111.870867	Sporting Goods Shop	735 E Fort Union Blvd, Midvale, UT 84047, Unit...	4
45	Poco Loco	40.702496	-111.852531	Sporting Goods Shop	3142 S Highland Dr, Salt Lake City, UT 84106, ...	2
46	Columbia Factory Store	40.728196	-111.551865	Clothing Store	6699 North Landmark Dr, Park City, UT 84098, U...	0

There are 47 venues identified within Salt Lake City and its surrounding area for the 'Sporting Goods Shop' category. We have created 5 clusters with these 47 venues and the cluster distribution is shown below.

In [10]: `venues_df.groupby('cluster_id').count()[['Venue']]`

Out[10]:

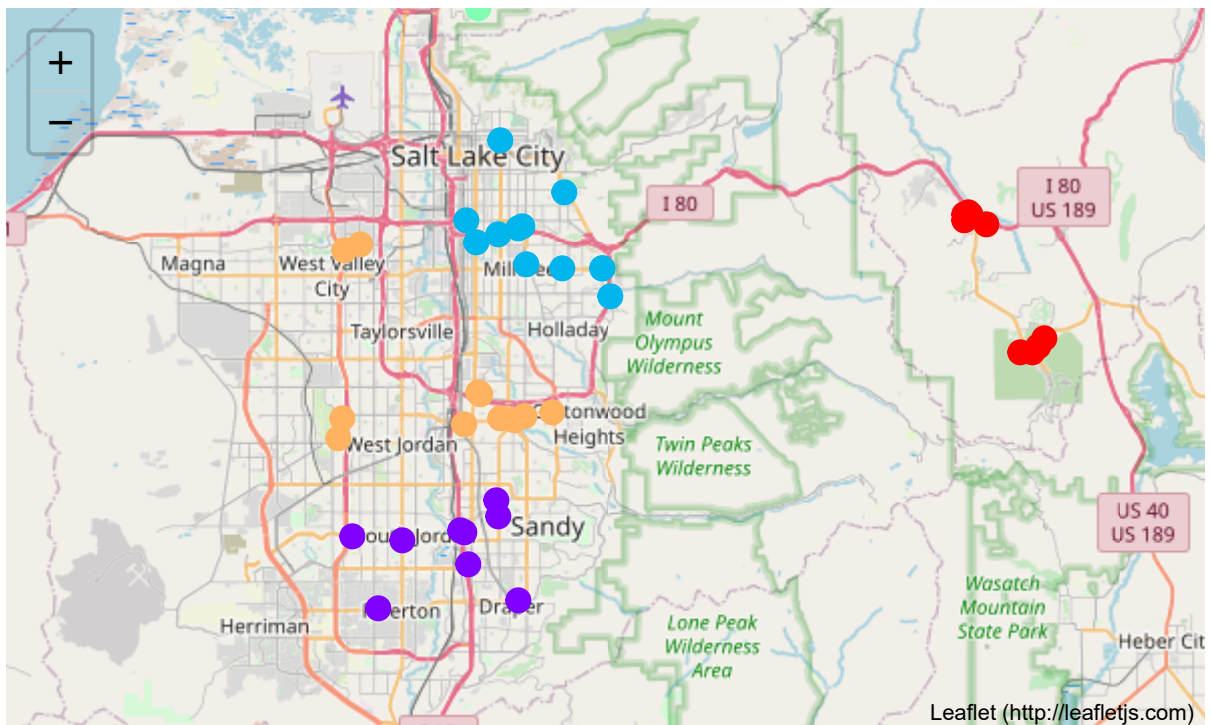|	Venue
cluster_id	
0	9
1	11
2	12
3	4
4	11

Visualize the map for Salt Lake City example

Finaly, we can visualize all 47 venues, their location in the city and the cluster to which they belong.

In [11]:
```
map_venues = createVenuesMap(latitude, longitude,kclusters,venues_df,zoom=10)
map_venues
```

Out[11]:

4.2. Results for 'Las Vegas, NV' and 'Pawn Shop'

The second experiment is performed using location as Las Vegas, NV and venue category as Pawn Shop. These inputs were decided considering that Las Vegas is famous for its mega casino-hotels and associated activities such as gambling and tourism. Establishing a Pawn Shop is definitely a good option for this city.

The venue data extracted from Foursquare for location 'Las Vegas, NV' and venue category 'Pawn Shop' is displayed below. We have also added the cluster_id column to idenfity to which cluster each venue belongs.

In [13]: venues2_df

Out[13]:

	Venue	Latitude	Longitude	Category	Address	cluster_id
0	EZ Pawn Las Vegas Blvd	36.167688	-115.141938	Pawn Shop	212 Las Vegas Blvd S, Las Vegas, NV 89101, Uni...	0
1	SuperPawn	36.130570	-115.189785	Pawn Shop	3270 S Valley View Blvd, Las Vegas, NV 89102, ...	2
2	Super Pawn	36.276683	-115.115617	Pawn Shop	6424 Losee Rd #135, North Las Vegas, NV 89086,...	3
3	SuperPawn	36.148801	-115.153086	Pawn Shop	1700 S Main St, Las Vegas, NV 89104, United St...	0
4	Max Pawn	36.144590	-115.224346	Pawn Shop	6040 W Sahara Ave (at S Jones Blvd), Las Vegas...	2
5	Ezpawn	36.136178	-115.190175	Pawn Shop	3010 S Valley View Blvd (Meade), Las Vegas, NV...	2
6	SuperPawn	36.142200	-115.208572	Pawn Shop	2645 S Decatur Blvd, Las Vegas, NV 89102, Unit...	2
7	SuperPawn	36.215870	-115.241501	Pawn Shop	3104 N Rainbow Blvd, Las Vegas, NV 89108, Unit...	3
8	EZPAWN	36.144755	-115.135495	Pawn Shop	1237 E Sahara Ave (Maryland), Las Vegas, NV 89...	0
9	EZPAWN	36.070157	-115.070916	Pawn Shop	2081 W Sunset Rd (Mountain Vista St), Henderso...	1
10	EZPAWN	36.035724	-114.976706	Pawn Shop	320 S Boulder Hwy, Henderson, NV 89015, United...	1
11	SuperPawn	36.196775	-115.222689	Pawn Shop	5910 W Lake Mead Blvd, Las Vegas, NV 89108, Un...	3
12	SuperPawn	36.234548	-115.228792	Pawn Shop	4111 N Rancho Dr, Las Vegas, NV 89130, United ...	3
13	EZPAWN	36.130502	-115.109274	Pawn Shop	3050 E Desert Inn Rd Ste 102-104, Las Vegas, N...	0
14	SuperPawn	36.158438	-115.118030	Pawn Shop	2300 E Charleston Blvd, Las Vegas, NV 89104, U...	0
15	EZPAWN	36.239881	-115.248981	Pawn Shop	7077 W Craig Rd, Las Vegas, NV 89129, United S...	3
16	EZ Pawn Shop	36.179357	-115.178524	Pawn Shop	821 N Rancho Dr (Washington), Las Vegas, NV 89...	2
17	SuperPawn	36.157637	-115.243099	Pawn Shop	1150 S Rainbow Blvd, Las Vegas, NV 89146, Unit...	2
18	SuperPawn	36.289779	-115.288591	Pawn Shop	7095 N Durango Dr, Las Vegas, NV 89149, United...	3
19	SuperPawn	36.065789	-115.035977	Pawn Shop	1100 W Sunset Rd, Henderson, NV 89014, United ...	1
20	SuperPawn	36.240467	-115.171875	Pawn Shop	2020 W Craig Rd, North Las Vegas, NV 89032, Un...	3
21	EZPAWN	36.171419	-115.115736	Pawn Shop	520 N Eastern Ave #150, Las Vegas, NV 89101, U...	0

	Venue	Latitude	Longitude	Category	Address	cluster_id
22	EZPAWN	36.240591	-115.110916	Pawn Shop	2820 E Craig Rd, North Las Vegas, NV 89030, Un...	0
23	EZ Pawn	36.147591	-115.242653	Pawn Shop	2200 S Rainbow Blvd (Sahara), Las Vegas, NV 89...	2
24	SuperPawn	36.216640	-115.093033	Pawn Shop	3252 Las Vegas Blvd N, Las Vegas, NV 89115, Un...	0
25	SuperPawn	36.169380	-115.205582	Pawn Shop	307 S Decatur Blvd, Las Vegas, NV 89107, Unite...	2
26	SuperPawn	36.001630	-115.104257	Pawn Shop	2646 W Horizon Ridge Pkwy, Henderson, NV 89052...	1
27	EZPAWN	36.192964	-115.131503	Pawn Shop	1832 Las Vegas Blvd N, North Las Vegas, NV 890...	0
28	Bargain Pawn	36.194923	-115.130740	Pawn Shop	1901 Las Vegas Blvd S (WILLIAMS), Las Vegas, N...	0
29	ez pawn	36.055732	-115.000644	Pawn Shop	Nevada, United States	1
30	Pawn Shop	36.106258	-115.173327	Pawn Shop	Paradise, NV, United States	2
31	Tnt Pawn	36.144010	-115.264390	Pawn Shop	Las Vegas, NV 89117, United States	2
32	Mr. Pawn	35.969437	-114.857597	Pawn Shop	1665 Boulder City Parkway, Boulder City, NV 89...	1
33	Metro Pawn	36.276131	-115.202356	Pawn Shop	North Las Vegas, NV 89084, United States	3
34	SuperPawn	36.115112	-115.141525	Pawn Shop	1040 E Flamingo Rd, Las Vegas, NV 89119, Unite...	0
35	Gold & Silver Pawn Shop	36.161563	-115.145366	Pawn Shop	713 Las Vegas Blvd S, Las Vegas, NV 89101, Uni...	0
36	SuperPawn	36.164349	-115.061699	Pawn Shop	300 N Nellis Blvd, Las Vegas, NV 89110, United...	0
37	SuperPawn	36.114999	-115.204652	Pawn Shop	4635 W Flamingo Rd, Las Vegas, NV 89103, Unite...	2
38	Silver and Gold Exchange	36.104014	-115.172424	Pawn Shop	9550 S Eastern Ave Ste 253, Las Vegas, NV 8912...	2
39	metro pawn	36.144181	-115.269668	Pawn Shop	Las Vegas, NV 89117, United States	2
40	EZ Super Pawn	36.130812	-115.189468	Pawn Shop	3270 S Valley View Blvd (Desert inn rd), Las V...	2
41	Ez Metro Pawn	36.209027	-115.199409	Pawn Shop	Las Vegas, NV, United States	3
42	cash for collectables	36.071224	-115.120178	Pawn Shop	Las Vegas, NV, United States	0

There are 43 venues identified within Las Vegas and its surrounding area for the 'Pawn Shop' category. We have gathered the 43 venues in 4 clusters and their distribution is shown below.

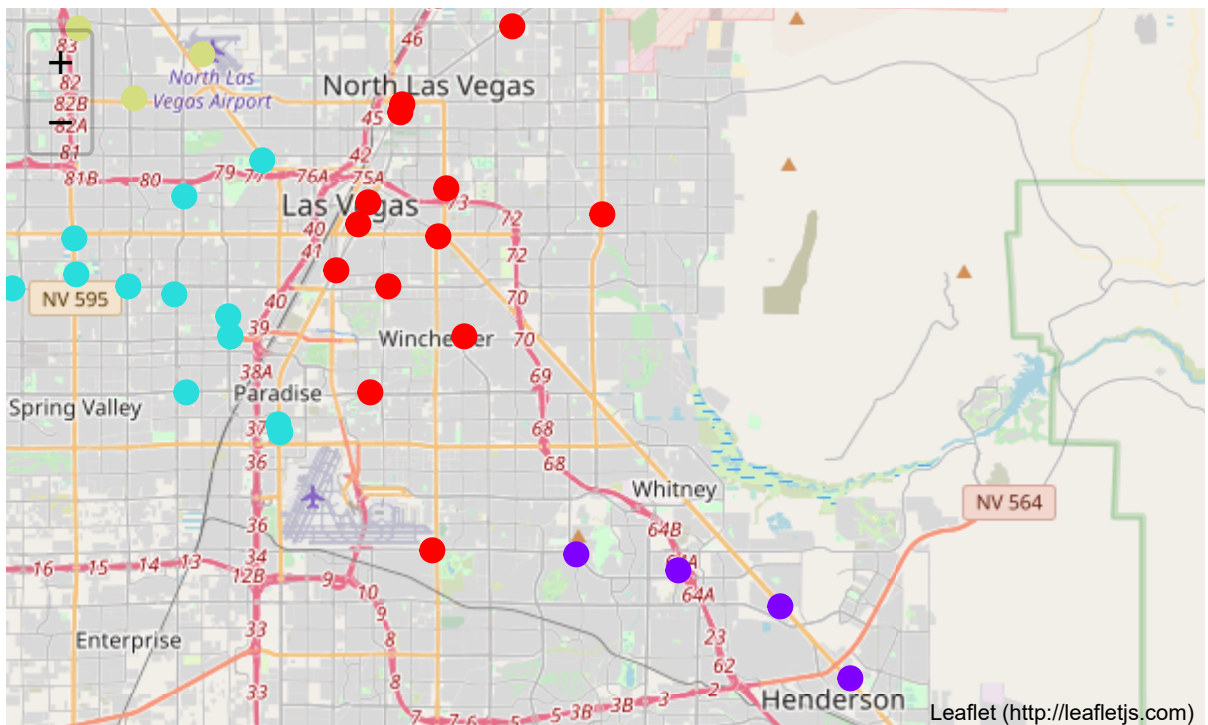In [14]: `venues2_df.groupby('cluster_id').count()[['Venue']]`

Out[14]:

	Venue
cluster_id	
0	14
1	6
2	14
3	9

Visualize the map for Las Vegas experiment

Finaly, we can visualize all 43 venues, their location in the city and the cluster to which they belong.

In [15]:
```
map_venues2 = createVenuesMap(latitude2, longitude2,kclusters2,venues2_df,zoom
=11)
map_venues2
```

Out[15]:

5. Conclusion

On this document, we propose a tool to assist the users to analyze a given city's blueprint for a particular business category. This is achived by generating a map of the city and pin-pointing the most popular venues of the business category in scope. Then, the venues are grouped in different clusters and marked on the map with different colors. The map, in turn, gives the users a city-wide overview of the venues location, how they are distributed among the clusters and how they are arranged with each other; which may be used to identify areas with no venues or areas with too many venues. This information results very usefull to decide on the best location to establish a new business venue.

We use the Foursquare location data to solve this problem. We implement a K-mean clustering algorithm using the venues location data extracted from Foursquare to map how these venues are distributed throughout the city. We use sklearn.cluster.KMeans module to perform the clustering processing and folium for map rendering.

The input for the analysis is a location (i.e. a city name) and a venue category. In the experiments presented in this document we use two different cities (Salt Lake City & Las Vegas) and two different categories (Sporting Goods Shop & Pawn Shop) but the tool can be used for any city or location and for any category available in Foursquare database.

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