

“ROLLING” THROUGH WASHINGTON STATE

“Rolling,” as we call it, is a form of “sparring” and is a way for students to test their skills and abilities against their teammates. Like sparring in other martial arts, rolling helps identify opportunities for improvement, work on strengths and advantages, and continually practice and improve the techniques that require attention.

-from EVOLVE MMA

IBM Data Science Capstone Project
By Dru Norman

“ROLLING” THROUGH WASHINGTON STATE

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1. INTRODUCTION

1.1 Description & Discussion of the background

- As a martial arts practitioner and overall fan of combat sports (primarily: Brazilian JiuJitsu, Muay Thai, and Mixed Martial Arts) like many others, I enjoy training.
- In developing my own set of skills, acquiring new skills, and testing myself through competition or training with new people, it is often very challenging to find the right places to train. There are dozens of different styles of martial arts and a plethora of different places to chose from.

1.2 Target Audience:

- This project is intended to help serve as a guide to those interested in navigating their way through a sea of martial arts gyms, academies, and dojos across the beautiful state of Washington.
- It will primarily focus on helping those interested in finding academies that specifically relate to the martial arts style of Brazilian Jiu-jitsu (BJJ), and Mixed Martial Arts (MMA).

1.3 Additional info on Brazilian Jiu-jitsu:

- For those unfamiliar with Brazilian Jiu-jitsu (BJJ), it is a combat sport and self defense system that primarily focuses on grappling and ground fighting where the application of leverage, pressure, and strategy help one to complete different techniques to force an opponent to submit by joint lock or choke.
- This is only a brief definition which does not do it any justice. Please check out this link <https://www.renzogracieportland.com/brazilian-jiu-jitsu/> to get a much better understanding of BJJ.
- *I am in no way affiliated with this gym or team, but found the explanation by John Danaher the best and most complete representation for those unfamiliar.*

2. DATA

The analysis will focus on two datasets:

1. Washington State city data
2. Martial arts gyms data.

2.1 - City Data

- This is easily found at <https://simplemaps.com/data/us-cities> and can be downloaded in both .xlsx and .csv format.
- It contains 18 columns of information on 28,888 cities across the continental United States.

```
In [2]: # The code was removed by Watson Studio for sharing.  
Us-cities Dataset imported.  
Out[2]:
```

	city	city_ascii	state_id	state_name	county_fips	county_name	county_fips_all	county_name_all	lat	lng
0	South Creek	South Creek	WA	Washington	53053	Pierce	53053	Pierce	46.9994	-122.392
1	Roslyn	Roslyn	WA	Washington	53037	Kittitas	53037	Kittitas	47.2507	-121.098
2	Sprague	Sprague	WA	Washington	53043	Lincoln	53043	Lincoln	47.3048	-117.971
3	Gig Harbor	Gig Harbor	WA	Washington	53053	Pierce	53053	Pierce	47.3352	-122.596
4	Lake Cassidy	Lake Cassidy	WA	Washington	53061	Snohomish	53061	Snohomish	48.0639	-122.092

```
In [3]: df_data_1.shape  
Out[3]: (28889, 19)
```

2.1 Data Cont.

- For this project, only the specific info of: City, Population, State, Latitude, Longitude, and County Name is necessary.
- The data will be cleaned and sorted to only contain data on cities located in Washington State. This new dataset will be used in combination with the Martial Arts Gyms dataset.

```
# check the new list of Washington State cities
wa_cities
```

	city	population	lat	lng	source	state_id	county_name
0	Parkland	37019	47.1417	-122.4376	polygon	WA	Pierce
1	Poulsbo	10670	47.7417	-122.6408	polygon	WA	Kitsap
2	Anacortes	17955	48.4878	-122.6292	polygon	WA	Skagit
3	Centralia	41643	46.7225	-122.9695	polygon	WA	Lewis
4	South Hill	56379	47.1203	-122.2848	polygon	WA	Pierce
5	Fife	10154	47.2328	-122.3518	polygon	WA	Pierce
6	Camano	15989	48.1865	-122.4708	polygon	WA	Island
7	Toppenish	14441	46.3807	-120.3125	polygon	WA	Yakima
8	Yakima	133233	46.5923	-120.5496	polygon	WA	Yakima
9	Edmonds	42209	47.8114	-122.3533	polygon	WA	Snohomish

2.2 Martial Arts Gym's Data

- This data will be leveraged using Foursquare’s Developer Tools API: <https://developer.foursquare.com/docs/api/venues/search>.
- Using the “venues search” function, we will populate a list of Martial Arts Gyms located throughout the entire state of Washington using Foursquare’s preassigned categoryid = ‘4bf58dd8d48988d101941734’ for “Martial Arts Dojos.”
- This query will provide a comprehensive set of data which will also be cleaned, sorted and then combined with the city data.



In [15]: `dojo_roster.head()`

Out[15]:

	city	dojo
0	Parkland	Lenderman Academy of Martial Arts
1	Parkland	Pierce County Kyokushinkai
2	Poulsbo	Warrior Buddha
3	Poulsbo	Cross Martial Arts
4	Poulsbo	Cross Martial Arts

2.2 Data Cont.

- The combination of both datasets should help narrow down the field of specific type of martial arts gym to Brazilian JiuJitsu (BJJ), and Mixed Martial Arts (MMA).
- A list of interesting statistics and more specific information from the combined datasets will be derived and visually represented using charts and maps in the following sections.

```
In [32]: # perform search for using parameters "jiu-jitsu"
jiujitsu_dojo = dojo_roster[dojo_roster.dojo.str.contains("jiu-jitsu")]
jiujitsu_dojo
```

Out[32]:

	city	dojo
10	Fife	Fife Brazilian Jiu-Jitsu
17	Edmonds	Edmonds Brazilian Jiu-Jitsu
52	Seattle	Summit Brazilian Jiu-Jitsu Club
75	Seattle	Praxis Brazilian Jiu-Jitsu
146	Bellevue	Gracie Barra Brazilian Jiu-Jitsu
156	Bellevue	Gracie Barra Jiu-Jitsu & MMA
173	Minnehaha	Progressive Jiu-Jitsu
201	Vancouver	Progressive Jiu-Jitsu
226	Martha Lake	Edmonds Brazilian Jiu-Jitsu
311	Bothell West	Edmonds Brazilian Jiu-Jitsu
350	Union Hill-Novelty Hill	Elite Brazilian Jiu-Jitsu
357	Orchards	Progressive Jiu-Jitsu
436	North Lynnwood	Edmonds Brazilian Jiu-Jitsu
455	Lynnwood	Edmonds Brazilian Jiu-Jitsu
506	Five Corners	Progressive Jiu-Jitsu
554	Redmond	Elite Brazilian Jiu-Jitsu
574	Mountlake Terrace	Edmonds Brazilian Jiu-Jitsu

3. METHODOLOGY

3.1 Processing The Cities Data

- First, the USCitiesData was downloaded and imported into pandas in a .csv format.
- This contained a huge list of cities located across the US.
- Since we only needed the cities listed for Washington State, we sliced and segmented the dataframe to include only the necessary data for cities in Washington state and the following info of: City, Population, State, Latitude, Longitude, and County.

In [9]: # check the new list of Washington State cities wa_cities							
Out[9]:	city	population	lat	lng	source	state_id	county_name
0	Parkland	37019	47.1417	-122.4376	polygon	WA	Pierce
1	Poulsbo	10670	47.7417	-122.6408	polygon	WA	Kitsap
2	Anacortes	17955	48.4878	-122.6292	polygon	WA	Skagit
3	Centralia	41643	46.7225	-122.9695	polygon	WA	Lewis
4	South Hill	56379	47.1203	-122.2848	polygon	WA	Pierce
5	Fife	10154	47.2328	-122.3518	polygon	WA	Pierce
6	Camano	15989	48.1865	-122.4708	polygon	WA	Island
7	Toppenish	14441	46.3807	-120.3125	polygon	WA	Yakima
8	Yakima	133233	46.5923	-120.5496	polygon	WA	Yakima
9	Edmonds	42209	47.8114	-122.3533	polygon	WA	Snohomish
10	Edgewood	11213	47.2309	-122.2832	polygon	WA	Pierce
11	Battle Ground	20576	45.7764	-122.5413	polygon	WA	Clark
12	Shoreline	56189	47.7564	-122.3426	polygon	WA	King
13	Grandview	18858	46.2431	-119.9084	polygon	WA	Yakima
14	Kelso	12130	46.1248	-122.8909	polygon	WA	Cowlitz
15	Des Moines	31238	47.3914	-122.3154	polygon	WA	King
16	Seattle	3643765	47.6211	-122.3244	polygon	WA	King
17	Everett	110079	47.9524	-122.1670	polygon	WA	Snohomish
18	Newcastle	11681	47.5303	-122.1633	polygon	WA	King
19	Lakeland North	12487	47.3374	-122.2814	polygon	WA	King
20	Camas	23331	45.6003	-122.4306	polygon	WA	Clark
21	Tukwila	20144	47.4748	-122.2727	polygon	WA	King
22	Wenatchee	71512	47.4338	-120.3286	polygon	WA	Chelan
23	Bellevue	144444	47.5953	-122.1550	polygon	WA	King
24	University Place	33401	47.2148	-122.5460	polygon	WA	Pierce
25	Elk Plain	14280	47.0448	-122.3671	polygon	WA	Pierce

```
In [10]: wa_cities.shape  
Out[10]: (122, 7)
```

*The new dataframe for wa_cities has 6 rows of data for 121 cities

3. METHODOLOGY CONT.

3.2 Processing The Martial Arts Gyms Data

- Using Foursquare Developers API “venues search” function, we are able to populate a list of Martial Arts Gyms located throughout the entire state of Washington.
- Since there are so many different names used for martial arts gyms, I found it best to use Foursquare’s preassigned categoryid =‘4bf58dd8d48988d101941734’ for “Martial Arts Dojos” to perform the search and refer to all of the gyms as “dojos” in my notebook code.
- I used code to return a list of the dojos and their count in each city according to the wa_cities dataframe.

```
dojo_roster, city_dojos = lookup_dojos(wa_cities)

1 Parkland 47.1417 -122.4376 has count of  2
2 Poulsbo 47.7417 -122.6408 has count of  3
3 Anacortes 48.4878 -122.6292 has count of  1
4 Centralia 46.7225 -122.9695 has count of  1
5 South Hill 47.1203 -122.2848 has count of  3
6 Fife 47.2328 -122.3518 has count of  4
7 Camano 48.1865 -122.4708 has count of  0
8 Toppenish 46.3807 -120.3125 has count of  0
9 Yakima 46.5923 -120.5496 has count of  2
```

In [15]: `dojo_roster.head()`

Out[15]:

	city	dojo
0	Parkland	Lenderman Academy of Martial Arts
1	Parkland	Pierce County Kyokushinkai
2	Poulsbo	Warrior Buddha
3	Poulsbo	Cross Martial Arts
4	Poulsbo	Cross Martial Arts

3. METHODOLOGY CONT.

- After combining the WA city data with Martial Arts Dojo data, you can easily look up the different representations of this new dataframe (city_dojos) according to different specifications.
- Here we used a search of King County to populate a list of cities and how many gyms were located there.

Look Up Dojos in Specific County (King)

In [18]: *# if interested, you could check out each county's representation with this quick search*

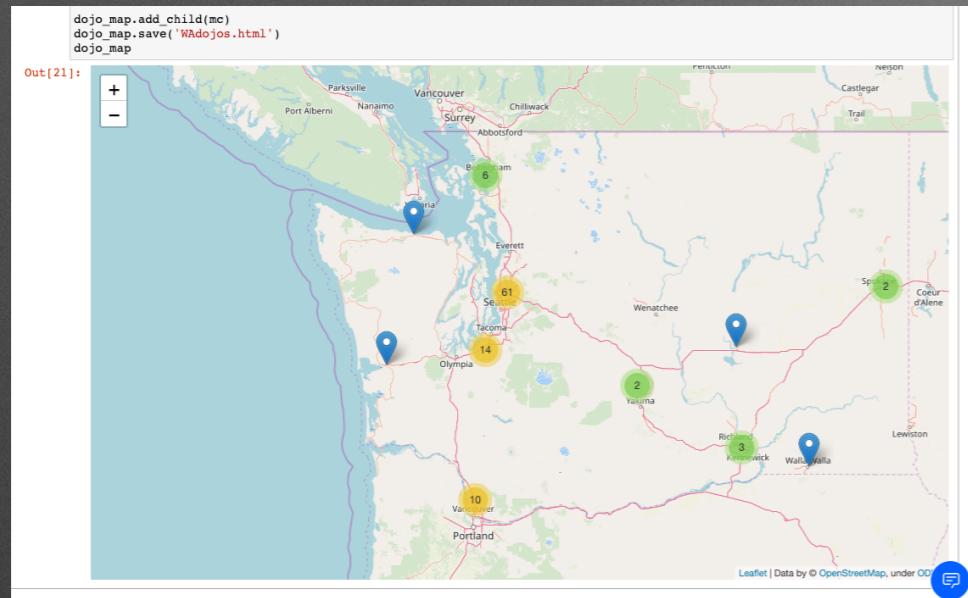
```
city_dojos[city_dojos.loc[:, 'county_name'] == 'King']
```

Out[18]:

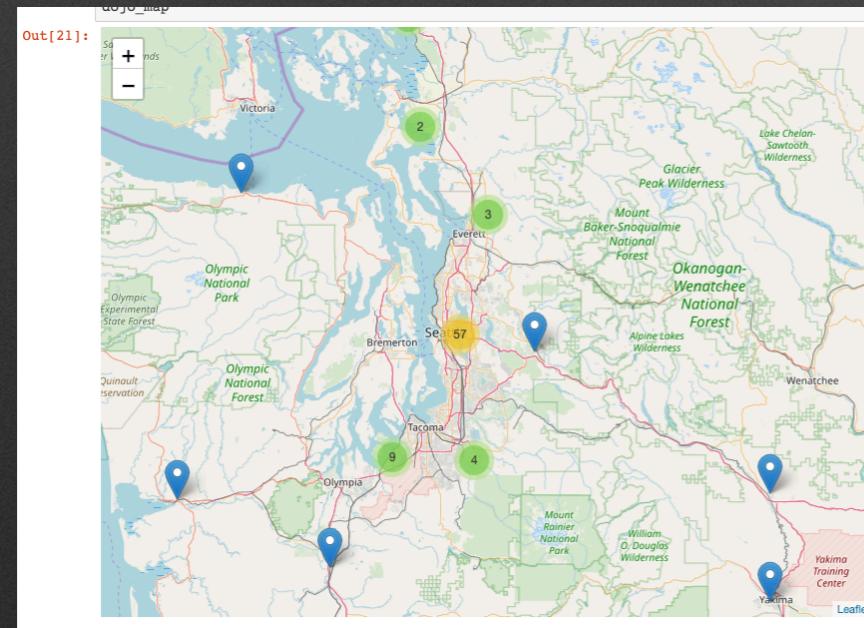
	city	population	lat	lng	source	state_id	county_name	number_of_dojos	dojos_per_capita	doj
0	Seattle	3643765	47.6211	-122.3244	polygon	WA	King	47	0.000013	1.28
1	Bellevue	144444	47.5953	-122.1550	polygon	WA	King	22	0.000152	15.2
2	Redmond	64291	47.6762	-122.1169	polygon	WA	King	21	0.000327	32.6
4	Kirkland	88630	47.6997	-122.2041	polygon	WA	King	19	0.000214	21.4
7	Lake Forest Park	13392	47.7597	-122.2878	polygon	WA	King	14	0.001045	104.
9	Shoreline	56189	47.7564	-122.3426	polygon	WA	King	14	0.000249	24.9
11	Renton	101379	47.4758	-122.1905	polygon	WA	King	13	0.000128	12.8
12	Lakeland North	12487	47.3374	-122.2814	polygon	WA	King	13	0.001041	104.
13	Mercer Island	25261	47.5625	-122.2265	polygon	WA	King	13	0.000515	51.4

3. METHODOLOGY CONT.

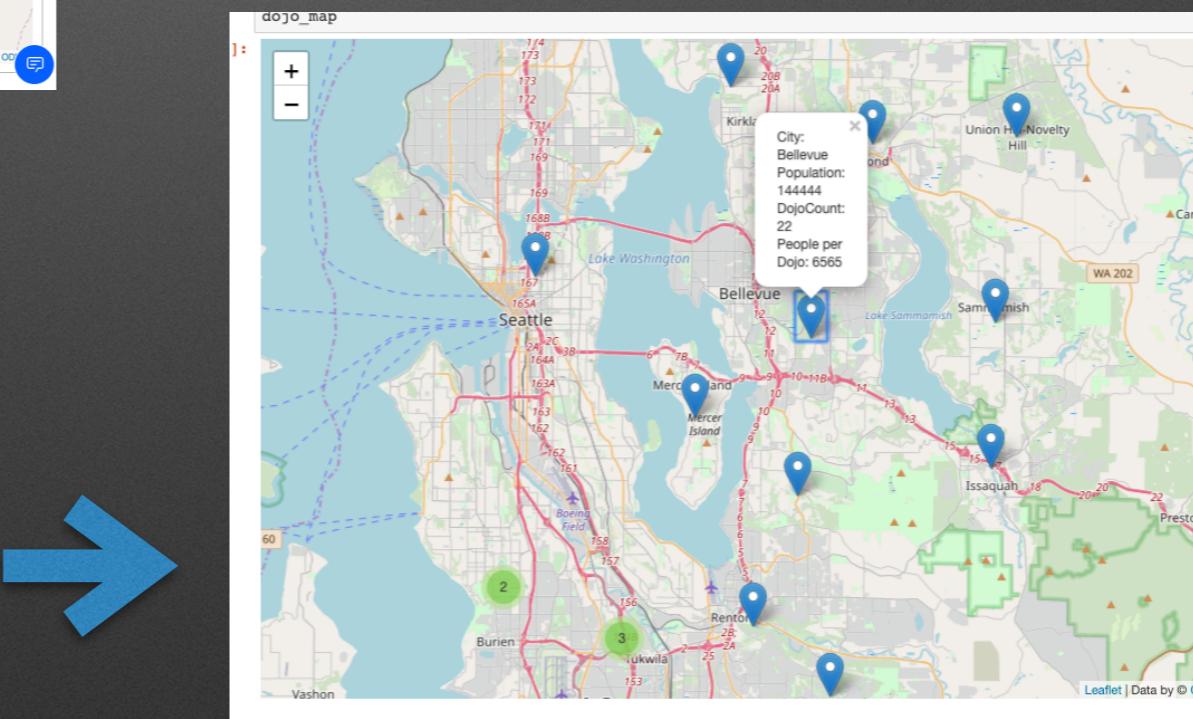
3.3 Visualizing The Results



As you zoom in
you can get a closer
look at each city



- We can also visualize this data on a map using the **folium** library and use cluster markers to display the count of Martial Arts dojos there are in each city along with other city info.



- You can navigate the map by clicking on the cluster circles to zoom in and find markers for each city. Info such as "City Name", "Population", "Dojo Count", and "People Per Dojo" is available when clicking on each individual city marker.

3. METHODOLOGY CONT.

3.4 Plotting The Results

- Even though maps give us a good visual representation of the cities, and we can also click on the markers for individual cities to view their dojo counts. Providing a general overview of the data will help us easily see which cities have the highest numbers of dojos, and when taking each city population estimates into account we can come up with a people per dojo statistic.

```
In [22]: # let's put this data into a dataframe
```

```
dojo_count = city_dojos[['city', 'number_of_dojos']]
dojo_count = dojo_count.sort_values(['number_of_dojos'], ascending=True).reset_index(drop=True)
dojo_count_top = dojo_count.sort_values(['number_of_dojos'], ascending=False).reset_index(drop=True).head(10)
dojo_count_top = dojo_count_top[::-1].head(15)
dojo_count_top
```

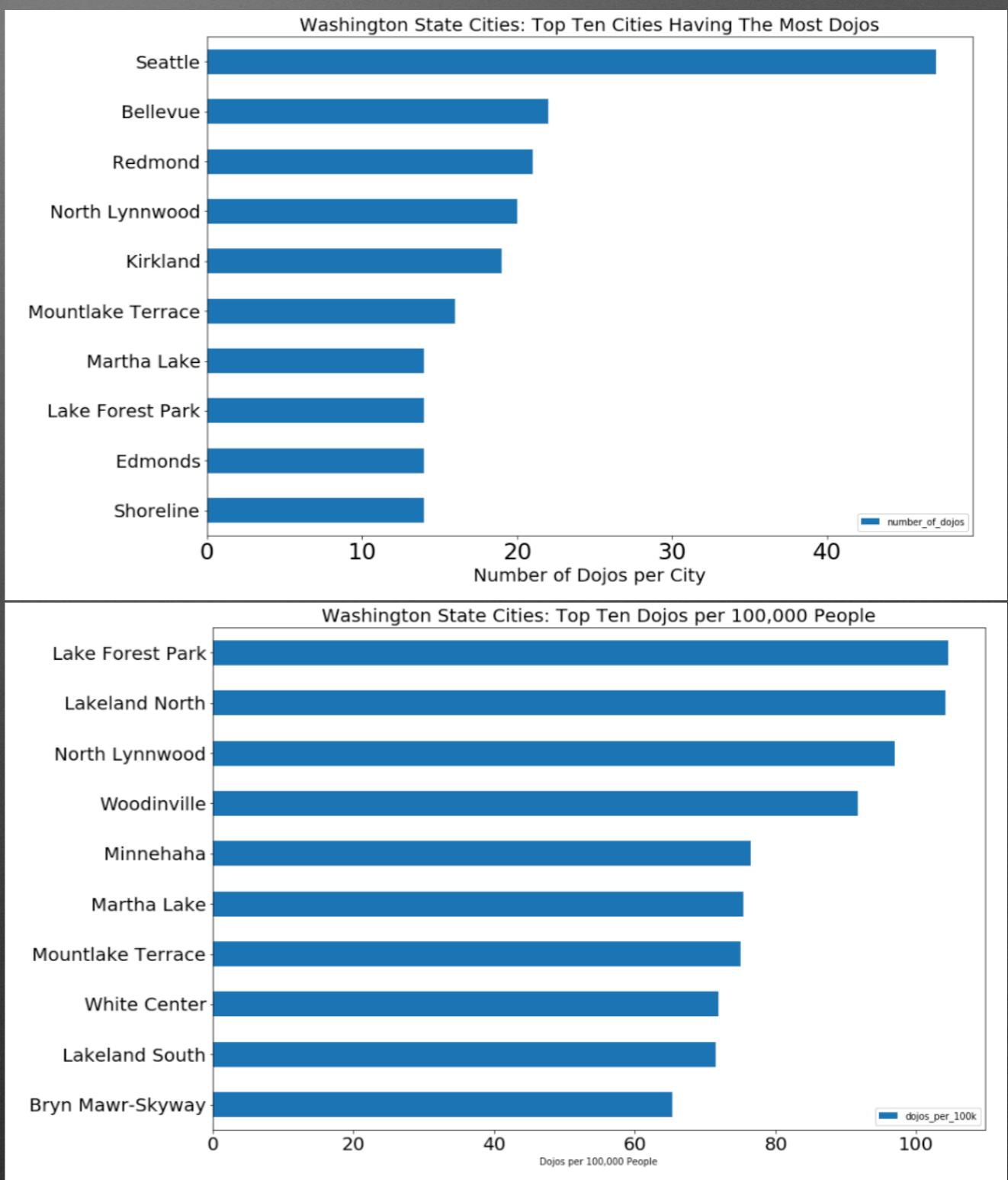
Out[22]:

	city	number_of_dojos
9	Shoreline	14
8	Edmonds	14
7	Lake Forest Park	14
6	Martha Lake	14
5	Mountlake Terrace	16
4	Kirkland	19
3	North Lynnwood	20
2	Redmond	21
1	Bellevue	22
0	Seattle	47

3. METHODOLOGY CONT.

3.4 Plotting The Results

- We can use a horizontal bar chart to help visualize different aspects of our data.



4. RESULTS

4.1 Brazilian Jiu-jitsu (BJJ) Results

- Our ultimate goal was to find a list of gyms where one could learn and train Brazilian Jiu-jitsu in Washington State.
- Since there are numerous ways different academies may choose to paraphrase or use “Brazilian jiu-jitsu” in their name, we had to run multiple searches to produce the most complete list of places to train.

Using search parameters “gracie”

	city	dojo
110	Lakeland North	Gracie Barra Federal Way
146	Bellevue	Gracie Barra Brazilian Jiu-Jitsu
156	Bellevue	Gracie Barra Jiu-Jitsu & MMA
237	Lakeland South	Gracie Barra Federal Way
288	Issaquah	Gracie Barra Jiu Jitsu
340	Kirkland	Gracie Barra Kirkland
391	Federal Way	Gracie Barra Federal Way
602	Woodinville	Gracie Barra Kirkland

Using search parameters “bjj”

	city	dojo
13	Fife	MABJJ
25	Edmonds	Edmonds BJJ
36	Shoreline	Edmonds BJJ
65	Seattle	Summit Bjj
167	Olympia	BJJ Olympia & NW High Intensity Training
308	Lake Morton-Berrydale	Phantom BJJ
414	Lake Forest Park	Edmonds BJJ
479	Tacoma	MABJJ
534	Covington	Phantom BJJ
583	Mountlake Terrace	Edmonds BJJ
617	Tumwater	BJJ Olympia & NW High Intensity Training

Using search parameters “jiu-jitsu”

	city	dojo
10	Fife	Fife Brazilian Jiu-Jitsu
17	Edmonds	Edmonds Brazilian Jiu-Jitsu
52	Seattle	Summit Brazilian Jiu-Jitsu Club
75	Seattle	Praxis Brazilian Jiu-Jitsu
146	Bellevue	Gracie Barra Brazilian Jiu-Jitsu
156	Bellevue	Gracie Barra Jiu-Jitsu & MMA
173	Minnehaha	Progressive Jiu-Jitsu
201	Vancouver	Progressive Jiu-Jitsu
226	Martha Lake	Edmonds Brazilian Jiu-Jitsu
311	Bothell West	Edmonds Brazilian Jiu-Jitsu
350	Union Hill-Novelty Hill	Elite Brazilian Jiu-Jitsu
357	Orchards	Progressive Jiu-Jitsu
436	North Lynnwood	Edmonds Brazilian Jiu-Jitsu
455	Lynnwood	Edmonds Brazilian Jiu-Jitsu
506	Five Corners	Progressive Jiu-Jitsu
554	Redmond	Elite Brazilian Jiu-Jitsu
574	Mountlake Terrace	Edmonds Brazilian Jiu-Jitsu

4. RESULTS

4.2 Mixed Martial Arts (MMA) Results

Using search parameters “mma”

	city	dojo
6	Centralia	Mma Class
61	Seattle	Ivan Salaverry MMA
156	Bellevue	Gracie Barra Jiu-Jitsu & MMA
164	University Place	T-TOWN MMA
176	Minnehaha	Gladiator MMA
178	Minnehaha	Touch M Up MMA, LLC
204	Vancouver	Gladiator MMA
217	Kent	All Fitness MMA
225	Martha Lake	Crazy Monkey MMA
251	Kenmore	Northshore MMA Academy
273	Mill Creek	Crazy Monkey MMA
278	Mill Creek	CCMA MMA Gym
300	Hazel Dell	Touch M Up MMA, LLC
347	Kirkland	Northshore MMA Academy
354	Orchards	Gladiator MMA
366	Spokane	Hit Pit MMA
367	Spokane	School Of Boxing And MMA
402	Bothell	Northshore MMA Academy
438	North Lynnwood	Crazy Monkey MMA
447	North Lynnwood	CCMA MMA Gym

- *Finding “MMA” gyms was much easier.*



*** Note that there is another type of jiu-jitsu practiced specifically without the traditional uniform called, "nogi." ***

- One such branch of Bjj was developed especially for MMA competition at Founder and head professor, Eddie Bravo's "10TH Planet Studios" located worldwide. Currently, there are 2 in the state of Washington.

Using search parameters “10”

	city	dojo
145	Bellevue	10th Planet Seattle
304	Spokane Valley	Hit Pit 10th Planet Jiu Jitsu

4. RESULTS

4.3 Other Martial Arts Results

- *Generating a list of “kickboxing” gyms was also much easier.*
- *A list of any other style of martial arts gym or if there is a specific gym that is desired, it can also be located just as easy.*

	city	dojo
39	Shoreline	MKG Martial Arts, Kickboxing & Fitness
96	Seattle	I Love Kickboxing
114	Lakeland North	Kickboxing Class At The Federal Way Community ...
116	Lakeland North	NW Muay Thai Kickboxing
127	Tukwila	Leading Edge Kickboxing & Martial Arts
185	Bryn Mawr-Skyway	Leading Edge Kickboxing & Martial Arts
238	Lakeland South	NW Muay Thai Kickboxing
240	Lakeland South	Kickboxing Class At The Federal Way Community ...
344	Kirkland	AMC Kickboxing And Pankration
390	Federal Way	Kickboxing Class At The Federal Way Community ...
394	Federal Way	NW Muay Thai Kickboxing
418	Lake Forest Park	MKG Martial Arts, Kickboxing & Fitness
515	Renton	Leading Edge Kickboxing & Martial Arts
539	SeaTac	Leading Edge Kickboxing & Martial Arts

5. DISCUSSION

- Logically, most of the BJJ and MMA gyms in Washington State seem to be located in and around larger cities like Seattle and Bellevue.
- There seem to be a large number of “Gracie Barra” team gyms located across the state as well as “Edmonds Brazilian JiuJitsu” which also has 6 other academy locations in and around the Seattle metropolitan area.
 - Because of their popularity and abundance, one might conclude that one of these gyms would be a good place to train.
- However, just choosing a larger more popular gym may not always produce the best place to train. In my honest opinion, for someone just starting, finding a reputable gym within close proximity to one’s home, school, or work place would help ensure training consistency.
 - I highly recommend trying out a few different gyms to find the best “gym culture” fit. Some gyms are very traditional and have many rules that must be strictly followed, while others are more loose with their in-house culture.

6. CONCLUSION

- As my analysis has shown, searching for and locating any type of Martial Arts Gym in the state of Washington is not as difficult a task as one may think.
- Using only two sets of data: 1) UScity data, 2) Martial Arts Venues data, in combination with python and accessing the available libraries (ie. pandas, folium, etc...) we were able to generate a list of gyms and visualize their locations across the state of Washington.
- This type of analysis can be replicated and performed similarly to help answer numerous other types of data analysis and business problems.
- Some limitations of this analysis may be found in choosing the cities list. If you recall in the “2.1 City Data” section, cities chosen to populate the Wa_cities dataset were selected on having a minimum population of 10,000 residents. There may be some really nice gyms in smaller towns that were excluded because of this search parameter.

“ROLLING” THROUGH WASHINGTON STATE

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By Dru Norman

Thank you for viewing!

Here is a link to my python notebook: https://dataplatform.cloud.ibm.com/analytics/notebooks/v2/056b9c20-1fd0-4a52-a107-7d0b48035fb2/view?access_token=cbe21db09a2cd3726d3475df0000a921946d09605787e997de0783e026777750