

Predicting the optimal location to open a Jiu-Jitsu School in Denver, CO.

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1. Introduction: Business Problem

I plan to find an optimal location within Denver, CO, to see where a good place would be to open a Jit-Jitsu school without nearby competition. Specifically, this report will be targeted at stakeholders interested in opening a Jiu-Jitsu school in Denver, Colorado.

Since there are many Jiu-Jitsu schools in Denver, we will try to detect locations that are not already crowded with Jiu-Jitsu schools. It is of interest to have no similar martial art schools in the vicinity and prefer surrounding neighborhoods with high real estate value, assuming that the first two conditions are met.

We will use our data science powers to generate a few most promising neighborhoods based on these criteria. Each area's advantages will then be clearly expressed so that stakeholders can choose the best possible final location.

2. Data

Based on definition of our problem, factors that will influence our decision are:

- Number of existing Jiu-Jitsu schools in the neighborhood (any type of martial arts school)
- Number of and distance to any type of martial arts schools in the neighborhood, if any
- Real estate value

Following data sources will be needed to extract/generate the required information:

- Find data that has list of Denver neighborhoods and zip codes, google, DenverPost had downloadable csv, therefore did not have to use BeautifulSoup.
- Change Zipcodes to Coordinates using USzipcodes and SearchEngine
- Find existing Jiu-Jitsu schools, and neighborhood locations in Denver City using Google Places API reverse geocoding
- Number of popular venues and location in every neighborhood will be obtained using Foursquare API
- Coordinates of Denver, CO center will be obtained using Google Maps API geocoding of well-known Denver, CO location (Colorado Department of the Treasury)

3. Results:

First, gather info about Denver neighborhoods and their housing market. After a little digging through google.com, I was able to find a website that had this information, (however, from 2019, and not current 2021).

This data ranked by median2019 column; ref from (<https://www.denverpost.com/2020/02/09/denver-housing-market-prices-zip-codes-2019/>)

	ZIP	medianChange	rank2019	median2018	median2019	days2018	days2019	neighborhoods
0	80202	16.8	1	505000	590000	53	56	Downtown & Lodo
1	80206	15.6	2	618500	715000	30	35	Cherry Creek, Congress Park & City Park
2	80135	13.3	3	600000	680000	50	57	Sedalia, Westcreek & Deckers
3	80433	12.0	4	491000	550000	31	29	Conifer
4	80303	8.2	5	573000	620000	40	35	Arapahoe Ridge, Frasier Meadows, Meadow

Table 1. DenverPost housing market prices with zip codes and neighborhood names.

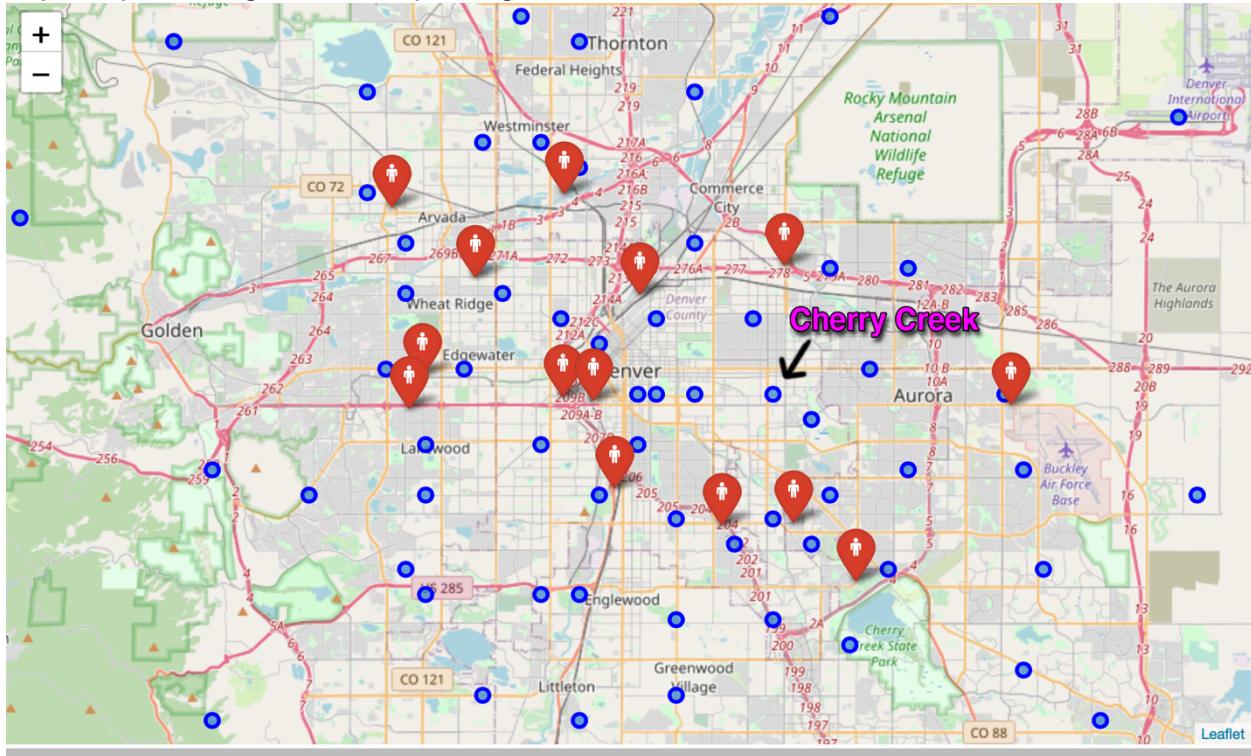
We have to use USzipcodes to convert zip codes to coordinates for all the neighborhoods. Then we need to find currently open Jiu Jitsu Schools.

From the <https://www.denverpost.com/2020/02/09/denver-housing-market-prices-zip-codes-2019/>, we know that the neighborhood that is thriving the most in 2019 was 'Downtown, Lodo'. So Let's have that as our first query for any Jiu Jitsu schools near that neighborhood using 'jitsu' in the name and keyword.

	Address	Name	Latitude	Longitude
0	7808 Cherry Creek S Dr #205, Denver	Way of Jiu Jitsu Academy	39.679344	-104.899774
1	6821 W 120th Ave ste c, Broomfield	Jubera Brazilian Jiu-Jitsu	39.915164	-105.072809
2	4605 Quebec St b5, Denver	Colorado Brazilian Jiu Jitsu Satori (Jiu Jitsu...	39.781770	-104.904347
3	9860 W 59th Pl, Arvada	The Academy of Brazilian Jiu Jitsu Arvada	39.804898	-105.107889
4	1385 Carr St, Lakewood	Mile High Gracie Jiu-Jitsu	39.737661	-105.091563
5	8200 S Quebec St a10, Centennial	Busy Brazilian Jiu-Jitsu & Fitness (Busy BJJ)	39.567787	-104.902699
6	2790 Industrial Ln, Broomfield	Zingano Brazilin Jiu Jitsu	39.921063	-105.101373
7	4362 E Evans Ave, Denver	Morning Star Jiu Jitsu - Denver	39.678275	-104.936795
8	1304 S Santa Fe Dr, Denver	Easton Brazilian Jiu Jitsu	39.692814	-104.992287
9	4181 E County Line Rd C, Centennial	Gracie Barra Centennial Jiu-Jitsu	39.566575	-104.939076
10	9100 W 6th Ave, Lakewood	Atos Bjj Jiu Jitsu	39.724806	-105.098537
11	6161 W 44th Ave Suite 150, Wheat Ridge	10th Planet Jiu Jitsu Denver	39.777078	-105.064579
12	10200 E Girard Ave, Denver	Denver Jiu Jitsu I Rodrigo Salazar Team	39.656036	-104.867342
13	2595 W 8th Ave, Denver	Avenge Jiu Jitsu	39.729573	-105.019121
14	3440a Brighton Blvd, Denver	Lōgōs Jiu Jitsu	39.769853	-104.979229

Table 2. List of current Jiu Jitsu schools located near Denver, CO.

Then we can create a map of Denver with neighborhoods and Jiu Jitsu schools superimposed together on top using **Folium**.



Map 1 - overlay the neighborhoods and schools together.

By eye, you can see an open space around the neighborhoods Cherry Creek or South Park Hill. And it just so happens to be ranked 2nd on our 2019 home price gains data. Let's take a closer look!

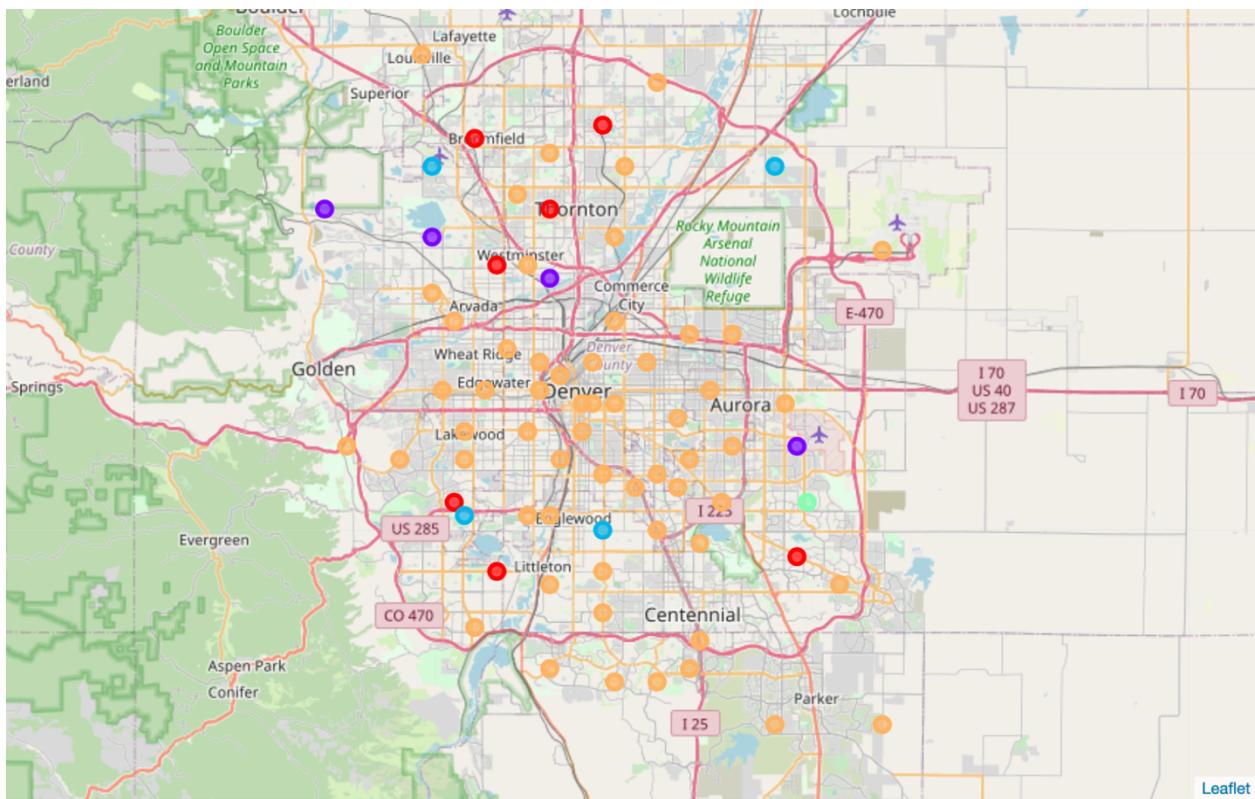
Just because there aren't Jiu Jitsu schools nearby, there may be other similar type gyms. Therefore, let's look at foursquare and potential martial arts or gyms within popular venues.

Now, let's get the top 50 venues that are in 'Cherry Creek' within a radius of 2000 meters using Foursquare. (top 50, because that is unfortunately the foursquare API call limit.)

	name	categories	lat	lng
0	Blue Pan	Pizza Place	39.735160	-104.945816
1	Sweet Cooie's	Ice Cream Shop	39.735028	-104.945825
2	TAG Burger Bar	Burger Joint	39.735612	-104.945835
3	Congress Park	Park	39.729840	-104.956720
4	Snooze, an A.M. Eatery	Breakfast Spot	39.727684	-104.940492
5	Congress Park Taproom	Pub	39.729790	-104.940933
6	Trader Joe's	Grocery Store	39.728677	-104.940433
7	Denver Botanic Gardens	Botanical Garden	39.731746	-104.960289
8	Cheba Hut Toasted Subs	Sandwich Place	39.728410	-104.941070
9	Sienna Wine Bar & Small Plates	Tapas Restaurant	39.735029	-104.946681
10	Steep	Coffee Shop	39.729077	-104.939342
11	Frank & Roze	Café	39.731930	-104.939438
12	Trader Joe's Wine Shop	Wine Shop	39.728768	-104.940367
13	Downpours Coffee	Coffee Shop	39.735262	-104.954793
14	Chef Zorba's Greek Restaurant	Greek Restaurant	39.735103	-104.955596
15	Yoga Pod Cherry Creek	Yoga Studio	39.725402	-104.955065
16	Shells and Sauce	Italian Restaurant	39.735105	-104.956106
17	Denver Divers	Sporting Goods Shop	39.725192	-104.952616
18	Blossoms Of Light	Botanical Garden	39.732019	-104.960182

Table 3. Cherry Creek top 50 venues provided from Foursquare

As you can see, from the top 50, there are no Jiu Jitsu or similar martial art schools. Therefore, it seems the Cherry Creek might be an ideal location to open a new Jiu Jitsu school. But let's check out the other neighborhoods just to be sure. Best way to look at this is clustering neighborhoods using k-Means algorithm for my study in this project. I will run K-Means to cluster the neighborhoods into 5 clusters.



Map 2 – k-Means cluster of k = 5 from top venues for all Denver, CO neighborhoods.

Let's examine each cluster and determine the discriminating venue categories that distinguish each cluster. Based on the defining categories, you can then assign a name to each cluster.

Cluster 1 = Financial/Legal Service

	Neighborhood	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	Cluster Labels	ZIP	Latitude	Longitude
5	Bear Creek, Bear Valley & Lakewood Estates	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	0	80227	39.66	-105.10
9	Broomfield, Eagle Trace & Cottages at Willow Park	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	0	80020	39.92	-105.08
21	Eastlake	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	0	80241	39.93	-104.96
22	Federal Heights, Huron Green & Hillcrest	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	0	80260	39.87	-105.01
26	Grant Ranch, Governors Ranch, Bow Mar & Columbine	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	0	80123	39.61	-105.06
35	Lake Arbor, Lamar Heights	Donut Shop	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	0	80003	39.83	-105.06
52	Saddle Rock Ridge, Prides Crossing & Pheasant Run	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	0	80015	39.62	-104.78

Cluster 2 – Farmers Markets

	Neighborhood	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	Cluster Labels	ZIP	Latitude	Longitude
3	Aurora Highlands, Sienna & Louisiana Purchase	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	1	80017	39.70	-104.78
7	Berkeley, Twin Lakes, Sherrewood	Café	Electronics Store	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	1	80221	39.82	-105.01
14	Club Crest, Meadowglen & Lakecrest	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	1	80005	39.85	-105.12
69	West Woods, Leyden & Candelas	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	1	80007	39.87	-105.22

Cluster 3 – Financial or Legal Service/ Fishing Spot/ Fast food

	Neighborhood	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	Cluster Labels	ZIP	Latitude	Longitude
12	Cherry Hills, Logan Park, Broadway Heights	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	2	80113	39.64	-104.96
15	Commerce City, Reunion, Buffalo Run	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	2	80022	39.90	-104.80
40	Marston Slopes, Pinehurst CC & Pinecrest	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	2	80235	39.65	-105.09
57	Standley Lake, West Westminster & Interlocken	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	2	80021	39.90	-105.12

Cluster 4 – Fishing Spot

	Neighborhood	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	Cluster Labels	ZIP	Latitude	Longitude
43	Mission Viejo, Meadowood, Hampden Villas	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	3	80013	39.66	-104.77

Cluster 5 – Variety / Food / Spa

	Neighborhood	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	Cluster Labels	ZIP	Latitude	Longitude
0	Alamo Placita, Cheeesman Park, City Park West	Bike Rental / Bike Share	New American Restaurant	Pet Store	Soccer Field	Food	Track	4	80218	39.73	-104.97
1	Appleridge Estates, Arvada Plaza, Olde Town	Women's Store	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farm	Eye Doctor	4	80002	39.79	-105.10
2	Applewood, Cedar Crest & Heverly Heights	Spa	Sandwich Place	Mexican Restaurant	Fried Chicken Joint	Miscellaneous Shop	Bowling Alley	4	80215	39.74	-105.11
4	Barnum, Westwood, Mar Lee & Harvey Park	Convenience Store	Spa	Fast Food Restaurant	Food	Grocery Store	Dim Sum Restaurant	4	80219	39.71	-105.03
6	Belmar, Glennon Heights & Creighton	Doctor's Office	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	4	80226	39.71	-105.09
8	Berkeley, West Highlands & Sloan's Lake	Liquor Store	Marijuana Dispensary	Brewery	Building	Burrito Place	Restaurant	4	80212	39.77	-105.05
10	Central Highlands Ranch & Back Country	Spa	Dog Run	Women's Store	Donut Shop	Fishing Spot	Financial or Legal Service	4	80126	39.53	-104.95
11	Cherry Creek, Congress Park & City Park	Flea Market	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	4	80206	39.73	-104.95
62	Valverde, Baker, Overland & Athmar Park	Music Venue	Shop & Service	Women's Store	Donut Shop	Fast Food Restaurant	Farmers Market	4	80223	39.69	-105.00
63	Villa Park, West Colfax & Lincoln Park	Brewery	Café	Sporting Goods Shop	Print Shop	Sports Bar	Bar	4	80204	39.74	-105.02
64	Virginia Village, Goldsmith & University Hills	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	Event Space	4	80222	39.67	-104.93
65	Washington Park, Belcaro	Event Space	Sandwich Place	Mexican Restaurant	Sushi Restaurant	Thai Restaurant	Cajun / Creole Restaurant	4	80209	39.71	-104.98
66	Washington Virginia Vale	Pharmacy	Pizza Place	Pool Hall	Discount Store	Donut Shop	Mediterranean Restaurant	4	80224	39.68	-104.91
67	Welby, City View Heights	Electronics Store	Flea Market	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	4	80229	39.85	-104.95
68	West Lochwood, Kendrick Lake & Greenbriar	Dog Run	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	4	80232	39.69	-105.09
70	Western Highlands Ranch, Westridge	Dog Run	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor	4	80129	39.54	-105.01
71	Willow Creek, Dove Valley & Meridian	Café	Furniture / Home Store	Electronics Store	Restaurant	Burger Joint	Light Rail Station	4	80112	39.56	-104.87
72	Windsor & Dayton Triangle	Deli / Bodega	Electronics Store	Fishing Spot	Financial or Legal Service	Fast Food Restaurant	Farmers Market	4	80247	39.69	-104.88

Note, none of these clusters seemed to have Gyms in their top venues. This could be a good or bad thing depending on how you look at it.

One thing to also consider when looking for a place to open a Jiu Jitsu school, is the financial status of each neighborhood.

So, let's look again at the info we downloaded from the DenverPost, add and analyze the median house price to our data frame. Thus, we can look at this project from a different angle. On first thought, one would think opening a school in a "richer" neighborhood would be ideal. This may indicate higher priced housing means more students willing to pay more on monthly fees.

We can examine what the frequency of housing sales prices in different ranges. Thus, histogram can help to visualization

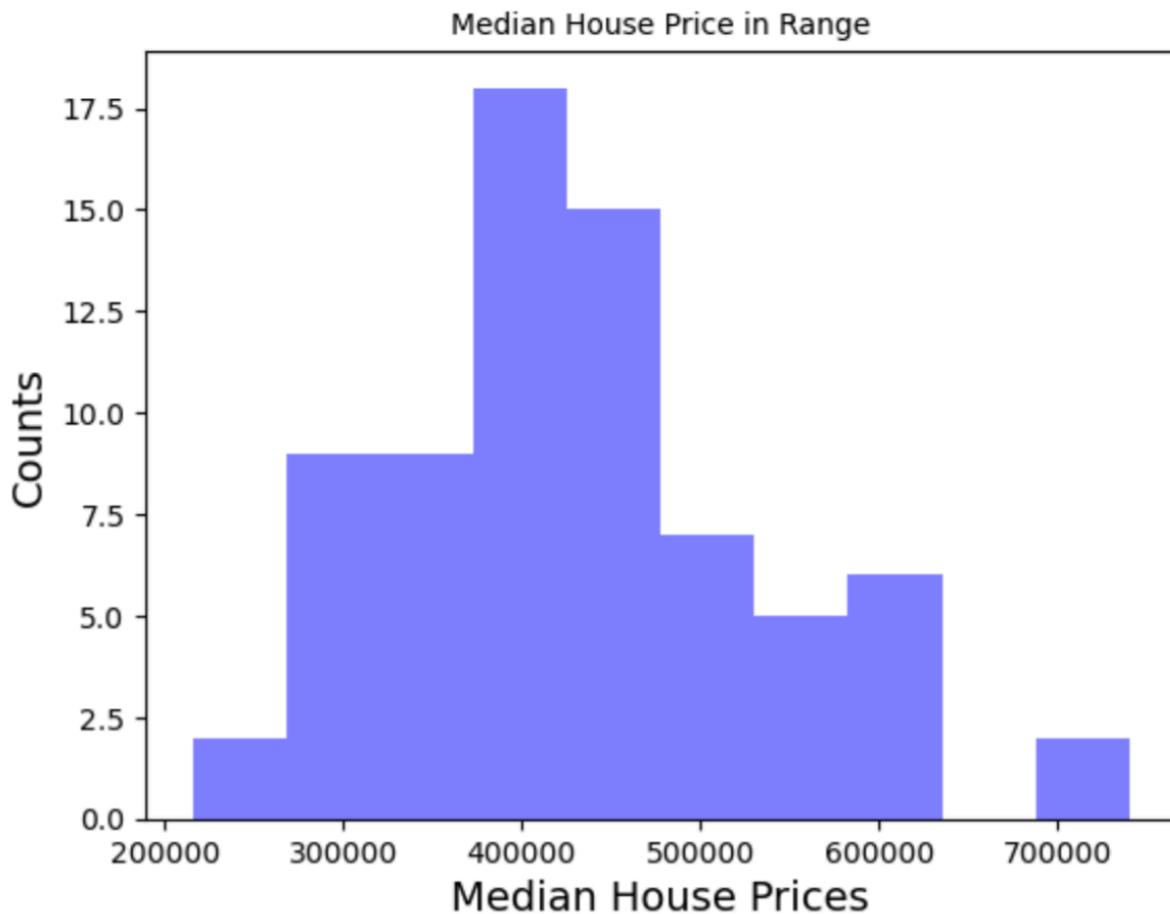
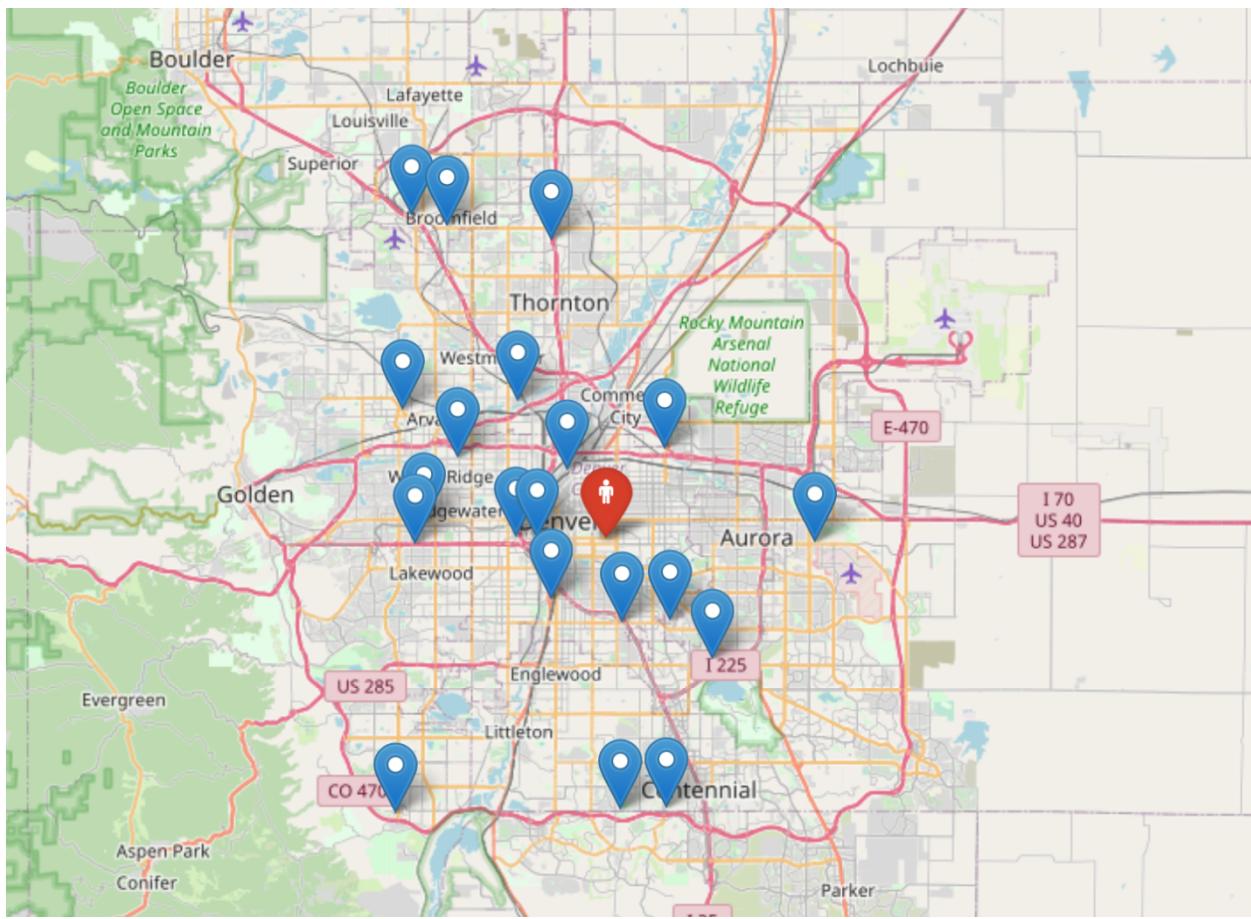


Figure 1 – Bar graph of Denver, CO neighborhood median house prices.

Now from these results, it seems that not only does Cherry Creek place 2nd rank (median = 715000) in the highest median house price, but it also does not seem to have gyms or fitness venues listed in the top common venues. This is a good thing.

Let's add the neighborhood to a map with the rest of the current Jiu Jitsu schools opened. First, we have to add a special point on the map to distinguish where we have decided to look for commercial property to open a Jiu Jitsu school.



Map 3 –Map of all current Jiu Jitsu schools in Denver, CO (blue points) and highlighted in red, Cherry Creek Neighborhood.

4. Discussion

Denver is a decent-sized city with a variety of venues and cultures. The goal of this project was to assess the availability and competition distance for a jiu-jitsu school. Denver is already populated with several Jiu-Jitsu academies or similar martial arts schools. However, using Google Places and Foursquare, I was able to find a few neighborhoods that would be of interest. The necessary components I looked for, was 1.) There is no near jiu-jitsu school within a 10-mile radius, 2.) no similar venues nearby, and 3.) level of real estate pricing. However, some significant values and datasets needed to be aligned/incorporated into these data frames to make a well-informed decision. For example, price of commercial property, how many students (and monthly tuition fees) would you need to make a profit, level of quality from your competitors nearby, etc.

I first downloaded 2019 data from the DenverPost to get neighborhood data; neighborhood names, associated zip codes, and median house prices. Then I used uszipcode to link the coordinates to each zip code. Then used Google Places to find local Jiu-Jitsu schools and neighborhoods in Denver. Visually it was easy to see which neighborhoods lacked Jiu-Jitsu schools. Then I called foursquare to see what popular venues are in each neighborhood to overlay any potentially similar competition within the "martial arts" venues. However, Foursquare only provides 50 top venues, therefore I should have narrowed my search to only include Gym/ Fitness venue category venues. (However, when running this, Foursquare spit back 0 results. Thus, this section needs to be optimized.) Visually it was easy to assess that Cherry Creek and nearby neighborhoods were in perspective. From this, I decided to look at the real estate pricing range within these neighborhoods and found that these were in the higher end, which can go either way. Higher house prices mean higher income, which means higher potential to pay school tuition fees. But this could also mean commercial real estate also becomes rather expensive. Then the statistical analysis for profit would need to be incorporated. It would be easy to look at lower-income neighborhoods from this model too. Overall, this pipeline produces a very nice format to follow when one is interested in opening a new business in any city/neighborhood in the world.

5. Conclusion

Data science is becoming more and more vital to many aspects of life, particularly for this project, business owners/entrepreneurs. This pipeline is a good baseline to build off of, or at least begin the process of investigating business options/interest. For this project, I was able to find a few good starting neighborhoods (Cherry Creek, Congress Park & City Park) to look at for opening a Jiu-Jitsu school in Denver, CO.

References:

- [1] [Denver Housing Stats 2019 - Denverpost.com](#)
- [2] [Foursquare API](#)
- [3] [Google Map](#)

work done by: [JBinder github](#)