

Coursera IBM Data Science Capstone Project

The Battle of Neighbourhoods

Selecting Top 10 Neighbourhood for Opening New Yoga Studio in Calgary



Introduction

Calgary is vibrant and upcoming big city of Canada with population of 1.3 million. Calgary has young and corporate workforce who are educated and progressive. Yoga scene in Calgary has been very active for past decades. Yoga has been known to not only help body but also mind, it helps in reducing stress and build high self-esteem. Importance of yoga has been growing over time and is apparent all over the world. This report intends to help anyone who intends to start a new yoga studio in Calgary and is looking for a suitable location. The recent pandemic has already put lot of strain on businesses such as yoga studios and many have already closed. Calgary economy has struggled to recover from low oil prices. Calgary job market is stagnant and people have less disposable income to spend. Yoga studios will still have its appeal when life will return to some normalcy post pandemic. It will be a good idea to look to start a yoga studio, but a careful analysis will be needed before selecting a location for a studio.

Business Problem

The objective of this report is to analyse and select best location/neighbourhood for opening a new yoga studio in city of Calgary. The report uses methods of data science and machine learning techniques such as clustering to find top 10 neighbourhoods in Calgary that are suitable for a successful venture of opening a business of yoga studio.

Data

Data needed for this report:

1. Neighbourhood names for city of Calgary along with latitude and longitude
2. Neighbourhood venues data, specially, data related to yoga studios and related businesses

Data Sources:

1. Data for Calgary neighbourhoods are captured from City of Calgary web page <https://data.calgary.ca/>. This data source was preferred over Wikipedia source as the data-set also included demographic information for each neighbourhood.
2. Neighbourhoods venue data are derived from Four Square API.
3. Existing yoga studios list is derived from Foursquare API call. JSON file then will be read into data-frame and list created.

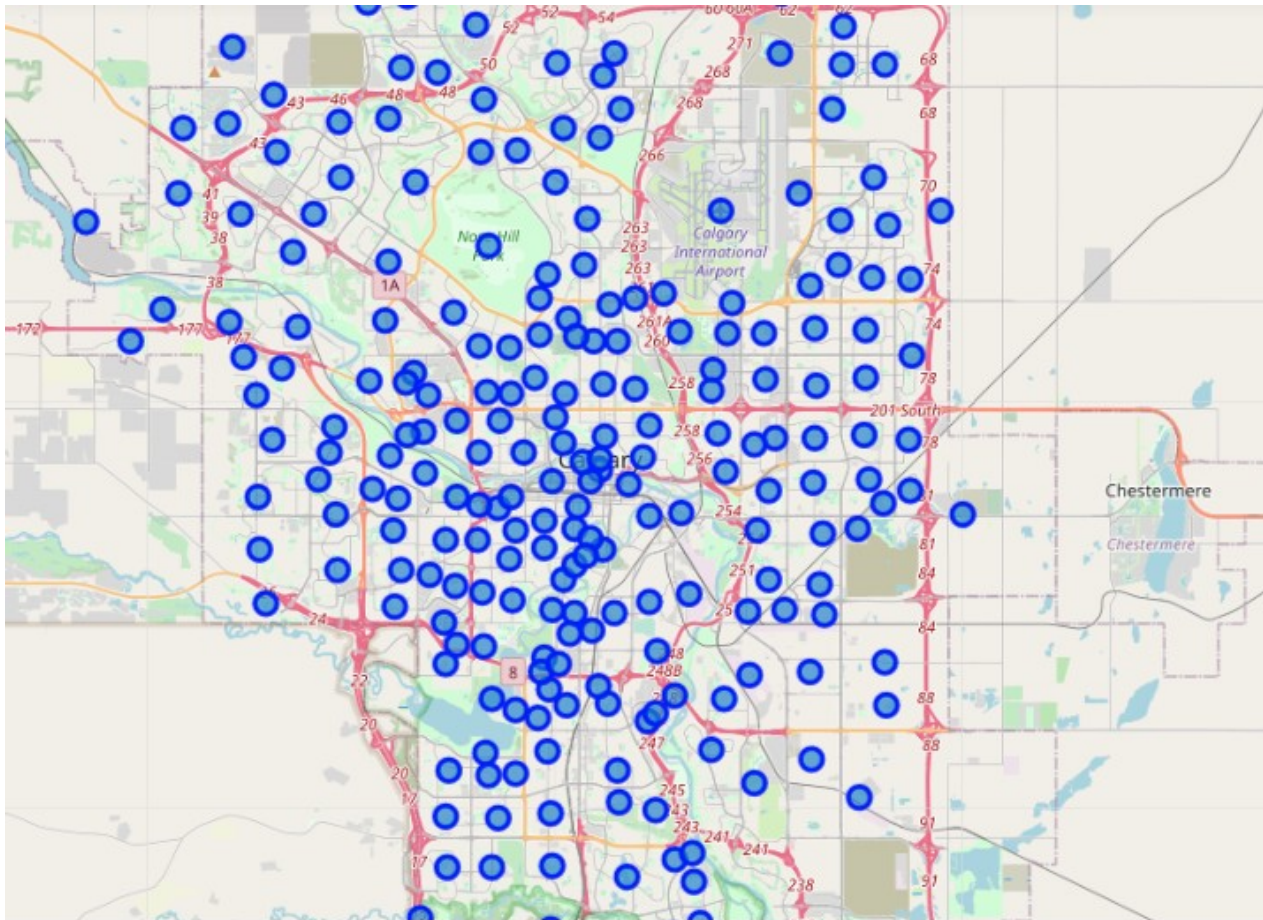
Methodologies

1. First, csv file related to Calgary is read into Pandas data-frame.

	CLASS	CLASS_CODE	NAME	SECTOR	RES_CNT	DWELL_CNT	OWNSHP_CNT	SING_FAMILY	DUPLEX	MULTI_PLEX	APARTME
0	Residential	1	ABBEYDALE	NORTHEAST	5957	2069	1356	1418	290	0	
1	Residential	1	ACADIA	SOUTH	10520	5046	2577	2282	132	1	20
2	Residential	1	ALBERT PARK/RADISSON HEIGHTS	EAST	6997	3010	819	909	474	27	7
3	Residential	1	ALTADORE	CENTRE	6942	3285	1928	1367	633	27	6
4	Industrial	2	ALYTH/BONNYBROOK	CENTRE	0	11	0	9	0	0	
5	Residential	1	APPLEWOOD PARK	EAST	6981	2415	1298	1371	20	1	8
6	Residential	1	ARBOUR LAKE	NORTHWEST	10619	3937	3193	2682	174	0	6
7	Residential	1	ASPEN WOODS	WEST	9446	3068	2455	2202	13	1	3
8	Residential	1	AUBURN BAY	SOUTHEAST	17607	6046	4342	3790	611	1	8
9	Industrial	2	AURORA BUSINESS PARK	NORTH	0	0	0	0	0	0	
10	Residential	1	BANFF TRAIL	CENTRE	4153	1949	649	997	286	11	1
11	Residential	1	BANKVIEW	CENTRE	5256	3531	826	483	115	50	24
12	Residential	1	BAYVIEW	SOUTH	751	248	236	212	0	0	
13	Residential	1	BEDDINGTON HEIGHTS	NORTH	11514	4405	2961	2599	923	7	
14	Residential	1	BEL-AIRE	CENTRE	390	159	134	159	0	0	

2. Longitudes and latitude values were missing from data-set, they were searched using Geopy and their values were included in the data-frame.
3. Map of neighbourhood locations of Calgary is created using Folium.

Calgary Neighbourhoods



4. Explored venues in each neighbourhood using Foursquare API call, group neighbourhoods and created a new data-frame with all the venue categories for each neighbourhood.

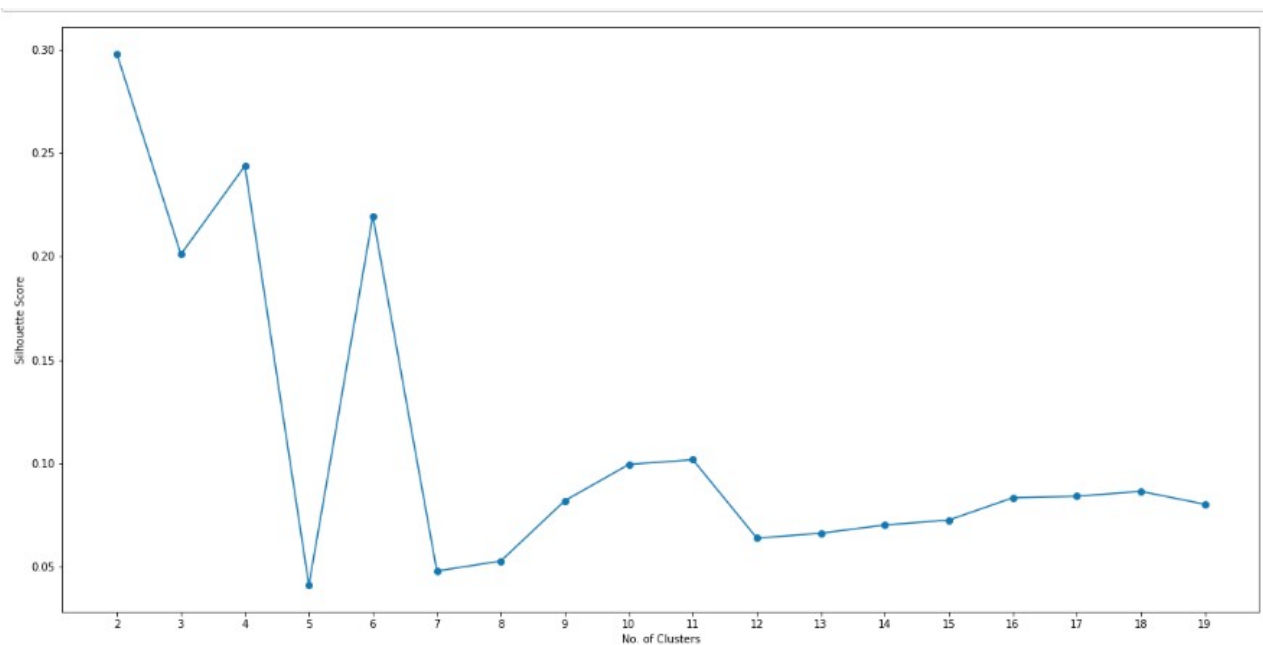
	Neighborhood	ATM	Airport	Airport Terminal	American Restaurant	Argentinian Restaurant	Art Gallery	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auto Workshop	Automotive Shop	BBQ Joint	Bagel Shop	Bake
0	ABBEYDALE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.000000	0.0	0.0	0.0	0.0	0
1	ACADIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.333333	0.0	0.0	0.0	0.0	0
2	ALBERT PARK/RADISSON HEIGHTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.25	0.000000	0.0	0.0	0.0	0.0	0
3	ALTADORE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.000000	0.0	0.0	0.0	0.0	0
4	ALYTH/BONNYBROOK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.000000	0.0	0.0	0.0	0.0	0

- Created a top 10 venue categories for each neighbourhood in Calgary for further analysis.

	Neighborhood	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	ABBEYDALE	Convenience Store	Wings Joint	Sandwich Place	Flea Market	Gastropub	Gas Station	Garden Center	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint
1	ACADIA	Construction & Landscaping	Athletics & Sports	Yoga Studio	Food & Drink Shop	German Restaurant	Gastropub	Gas Station	Garden Center	Furniture / Home Store	Frozen Yogurt Shop
2	ALBERT PARK/RADISSON HEIGHTS	Train Station	Asian Restaurant	Cosmetics Shop	Convenience Store	Food Court	Food Service	Food Truck	French Restaurant	Fried Chicken Joint	Yoga Studio
3	ALTADORE	Dog Run	Greek Restaurant	Coffee Shop	Massage Studio	Yoga Studio	Food & Drink Shop	Gastropub	Gas Station	Garden Center	Furniture / Home Store
4	ALYTH/BONNYBROOK	Gas Station	Café	Restaurant	Yoga Studio	Flea Market	Garden Center	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant

- Used K-means clustering for segregating neighbourhoods in distinct clusters. To find optimal number of clusters, used Silhouette Score from Sci-kit Learn.

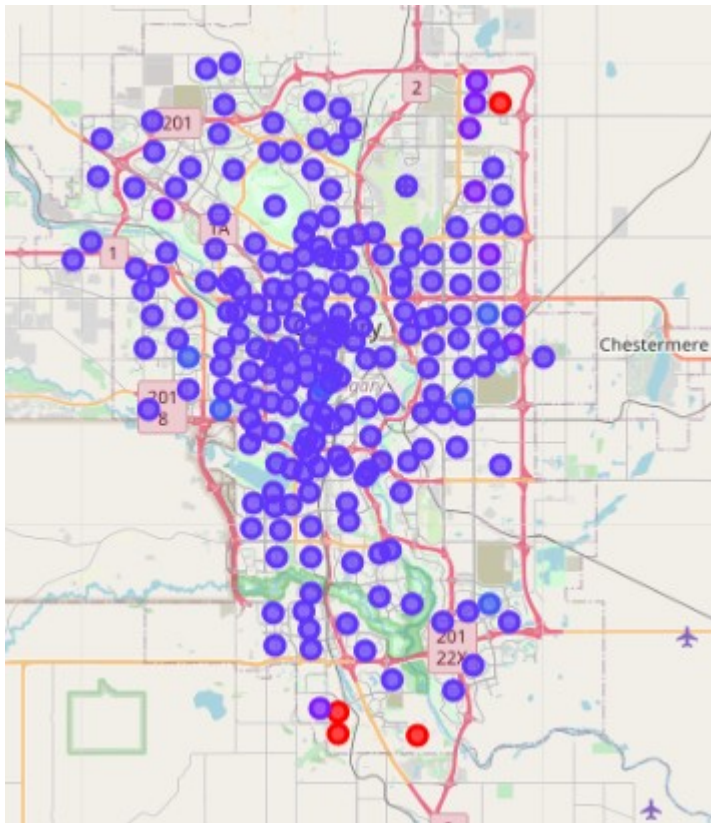
Silhouette Score



From this graph we see that optimal number of clusters is between 2-4, and 4 is used.

K-means cluster labels were inserted in grouped neighbourhood data-frame and merged with top 10 categories data-frame. This data-frame is then used to create map that shows clustering of neighbourhoods in Calgary.

Calgary Neighbourhoods Clusters



Calgary Neighbourhoods divided in 4 clusters.

2.0	199
1.0	8
3.0	6
0.0	4

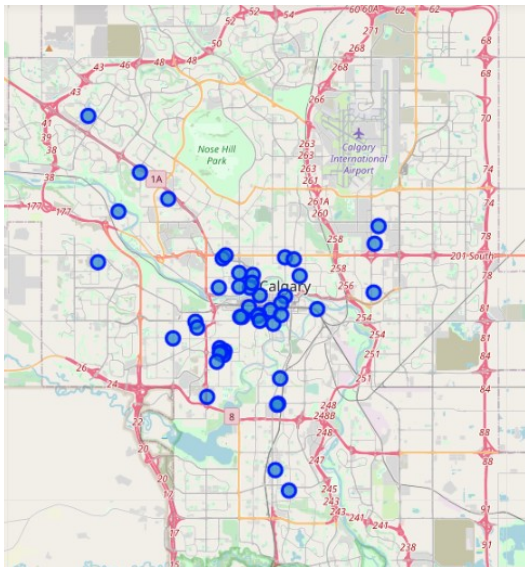
Here we can see most of the neighbourhood are in cluster 2. Very few are in cluster 0,1,3.

7. Next step was to get number of existing yoga studios in Calgary. This was done using Foursquare API call. From JSON file, name of yoga studio, address, latitude ,and longitude derived and put into a data-frame. This was done using SEARCH endpoint API call.

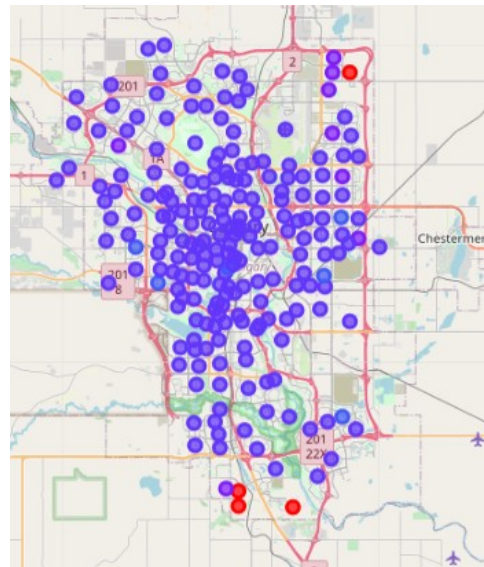
	name	location.address	location.lat	location.lng
0	Samadhi Yoga Wellness Centre	458 8 Street SW	51.049181	-114.080354
1	Yoga Santosha	821 14 Street NW	51.059283	-114.094880
2	The Yoga Studio (Calgary)	#110, 1330 15 Ave. S.W.	51.039671	-114.092934
3	Fifth Avenue Yoga	NaN	51.048630	-114.062908
4	Yoga Mandala	NaN	51.057613	-114.052788
5	Yoga MCC	NaN	51.024652	-114.105572
6	Unify Yoga	805 1st St. SW Unit 2	51.045657	-114.065522
7	Yoga and Beyond Centre Street	200, 1609 Centre Street NW	51.065989	-114.063064
8	Yoga Santosha	#320, 1800 4th St. SW	51.036847	-114.071234
9	Be Love Yoga	105 1409 Edmonton Trail NE	51.065084	-114.056801
10	Yoga Passage	524-11 Avenue South West	51.042799	-114.073123
11	Yoga Centre of Calgary Society	805 10 Avenue Southwest	51.040335	-114.081559
12	Brahma Kumaris Meditation Centre - Raja Yoga	100, 206 -10A Street NW	51.052678	-114.087470
13	Rejuve! Infrared yoga studio	202 320-10st NW	51.054801	-114.085857
14	J-Yoga: Calgary's Most Exclusive Yoga Studio	630 10 St NW	51.058067	-114.085701
15	SFM Yoga	NaN	51.040298	-114.082024
16	Yoga Studio South	110, 1330-15 Avenue SW	51.039857	-114.094544
17	Tri-yoga	1138 10 Ave SW	51.044185	-114.088174
18	My Yoga Calgary (MYC)	9152 Macleod Tr. SE	50.971683	-114.069419
19	Ashtanga Yoga Calgary	#202, 819 17 Ave SW	51.037805	-114.080862
20	Junction 9 Yoga & Pilates	919 9th Ave SW	51.042907	-114.040161
21	Be Love Yoga	1409 Edmonton Trail NE	51.052846	-114.094744
22	The Yoga Shala	1511 - 19th St NW	51.065595	-114.106764
23	Hot Yoga on Crowfoot	88 Crowfoot Terrace NW	51.128442	-114.201789

List of Calgary Yoga studios.

8. Created location map of existing yoga studios using folium map.



Existing Location of yoga studios in Calgary



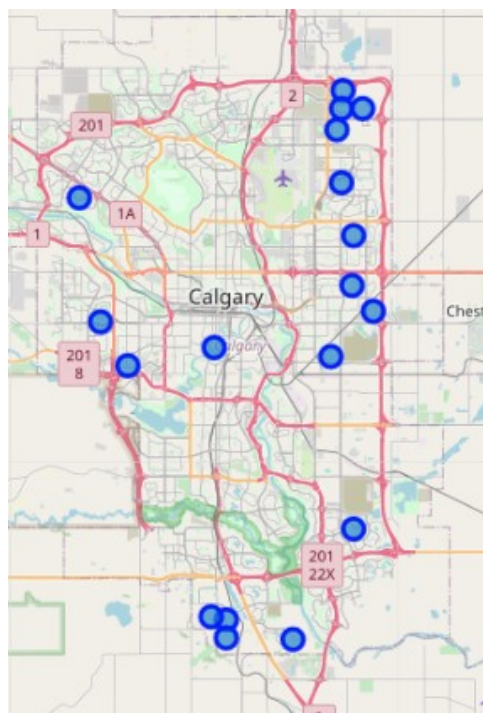
Calgary Neighbourhoods divided in 4 clusters.

Most of the yoga studios in the map are in cluster number 2. Cluster 0,1,3 were then further analyzed, with top 3 venue categories.

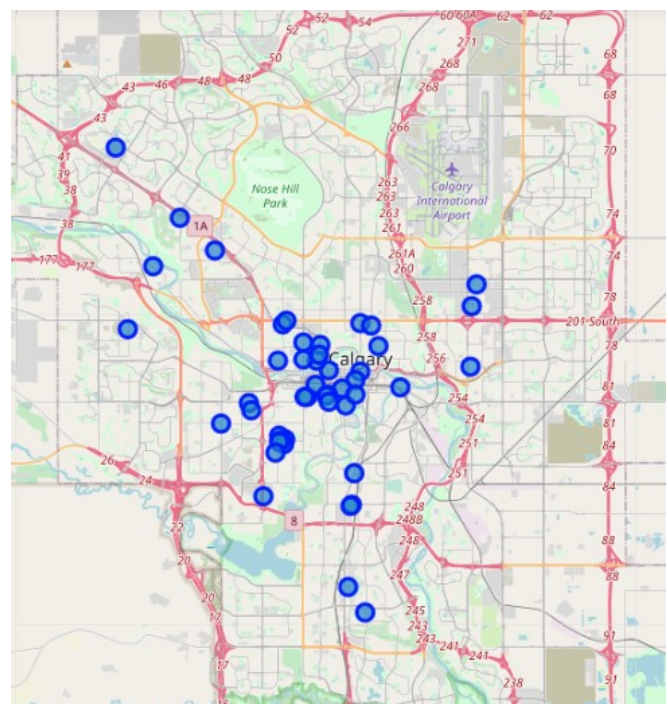
9. Created a data-frame that only had neighbourhoods from cluster 0,1 and 3., by excluding neighbourhoods from cluster 2. Filtered data-frame further by only including top 3 most common venue categories.

	Neighborhood	RES_CNT	CLIENTS	Latitude	Longitude	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	APPLEWOOD PARK	6981	3581	51.044658	-113.928930	Home Service	Liquor Store	Park
1	BELMONT	86	47	50.868495	-114.062773	Real Estate Office	Japanese Restaurant	Gastropub
2	CHRISTIE PARK	2128	715	51.038434	-114.176549	Park	Yoga Studio	Japanese Restaurant
3	CITYSCAPE	3104	1756	51.148549	-113.962668	Home Service	Ice Cream Shop	Filipino Restaurant
4	CORNERSTONE	2648	1586	51.160280	-113.939608	Real Estate Office	Japanese Restaurant	Gastropub
5	ERIN WOODS	7049	3575	51.019345	-113.968367	Park	Yoga Studio	Japanese Restaurant
6	GLAMORGAN	6522	3313	51.013442	-114.151697	Bus Station	Park	Yoga Studio
7	LEGACY	6420	3864	50.856893	-114.002560	Real Estate Office	Japanese Restaurant	Gastropub
8	MARLBOROUGH PARK	8523	4196	51.059881	-113.948947	Park	Yoga Studio	Japanese Restaurant
9	MARTINDALE	14245	7983	51.118134	-113.959042	Home Service	Gym	Construction & Landscaping
10	NEW BRIGHTON	13103	7591	50.920726	-113.947085	Park	Yoga Studio	Japanese Restaurant
11	PINE CREEK	14	0	50.857661	-114.062399	Real Estate Office	Japanese Restaurant	Gastropub
12	REDSTONE	5848	3181	51.170807	-113.957483	Home Service	Gift Shop	Gastropub
13	RIDEAU PARK	594	218	51.024344	-114.073599	Park	Yoga Studio	Japanese Restaurant
14	SILVER SPRINGS	8679	3622	51.109649	-114.195401	Home Service	Baseball Field	Food & Drink Shop
15	SKYVIEW RANCH	11707	6938	51.160534	-113.958135	Home Service	Gift Shop	Gastropub
16	TEMPLE	10977	5348	51.088424	-113.947877	Smoke Shop	Home Service	Yoga Studio
17	YORKVILLE	14	0	50.870531	-114.076523	Home Service	Gift Shop	Gastropub

10. Created map of the neighbourhoods in clusters 0, 1, 3 using folium map and compared with existing locations of yoga studios in Calgary.



Proposed locations of yoga studios in Calgary

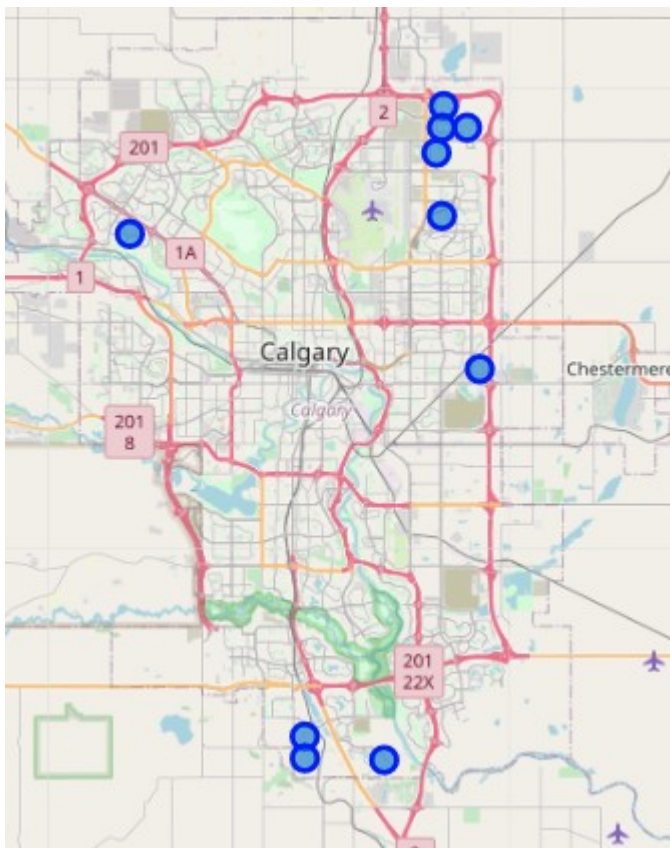


Existing Location of yoga studios in Calgary

As we can see we have 18 locations from clusters 0,1 and 3. These locations are away from existing yoga studios in Calgary, which is desirable. This 18 locations are further explored to narrow down selection to top 10 neighbourhoods.

11. From looking at most common venue categories, it was determined to remove the neighbourhoods that have yoga studios already listed in its top 3 venue categories. This process resulted in the list of 10 locations that were further sorted based on number of potential clients derived from city of Calgary demographic data and that gives us our final list to top 10 recommended locations in Calgary.

This data is used to create a map of top 10 recommended locations for yoga studio in Calgary.



Top 10 recommended locations for yoga studios in Calgary.

Recommendation

Based on reports findings, the top 10 locations are generated as shown in table below.

Top 10 recommended locations in Calgary to open a new yoga studio.

	Neighborhood	RES_CNT	CLIENTS	Latitude	Longitude	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	MARTINDALE	14245	7983	51.118134	-113.959042	Home Service	Gym	Construction & Landscaping
1	SKYVIEW RANCH	11707	6938	51.160534	-113.958135	Home Service	Gift Shop	Gastropub
2	LEGACY	6420	3864	50.856893	-114.002560	Real Estate Office	Japanese Restaurant	Gastropub
3	SILVER SPRINGS	8679	3622	51.109649	-114.195401	Home Service	Baseball Field	Food & Drink Shop
4	APPLEWOOD PARK	6981	3581	51.044658	-113.928930	Home Service	Liquor Store	Park
5	REDSTONE	5848	3181	51.170807	-113.957483	Home Service	Gift Shop	Gastropub
6	CITYSCAPE	3104	1756	51.148549	-113.962668	Home Service	Ice Cream Shop	Filipino Restaurant
7	CORNERSTONE	2648	1586	51.160280	-113.939608	Real Estate Office	Japanese Restaurant	Gastropub
8	BELMONT	86	47	50.868495	-114.062773	Real Estate Office	Japanese Restaurant	Gastropub
9	PINE CREEK	14	0	50.857661	-114.062399	Real Estate Office	Japanese Restaurant	Gastropub

Conclusion

The neighbourhoods that we see from table are new, upcoming, and vibrant and currently have less or no access to yoga studios nearby. Population in these neighbourhoods is growing and we can see it may be beneficial to open yoga studios there, of course, finding appropriate place in a given neighbourhood will be tricky and that is why we have recommended 10 neighbourhoods.