Defining the best location for a new gym in the city of Campinas, Brazil

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Introduction

- The city of Campinas is one the biggest and most important cities in the state of São Paulo in Brazil.
- Due to its relevance, it is a popular target for entrepreneurs and companies looking for opportunities to expand their business.
- Current analysis aims at answering a gym owner where would be the best best neighborhood to place his new gym branch

Data Description

Geodata

- The geographical boundaries of each neighborhood as well as demographic data were collected at the citiy's data portal [2] under the "PD2018 Unidades Territoriais Básicas (UTB) e Unidades Territoriais Rurais (UTR)" tab in the form a shapefile (.shp extension)
- The .shp format was converted into GeoJson file.using the website OGRE [3] was used, resulting in a JSON file that could be imported in the python code.
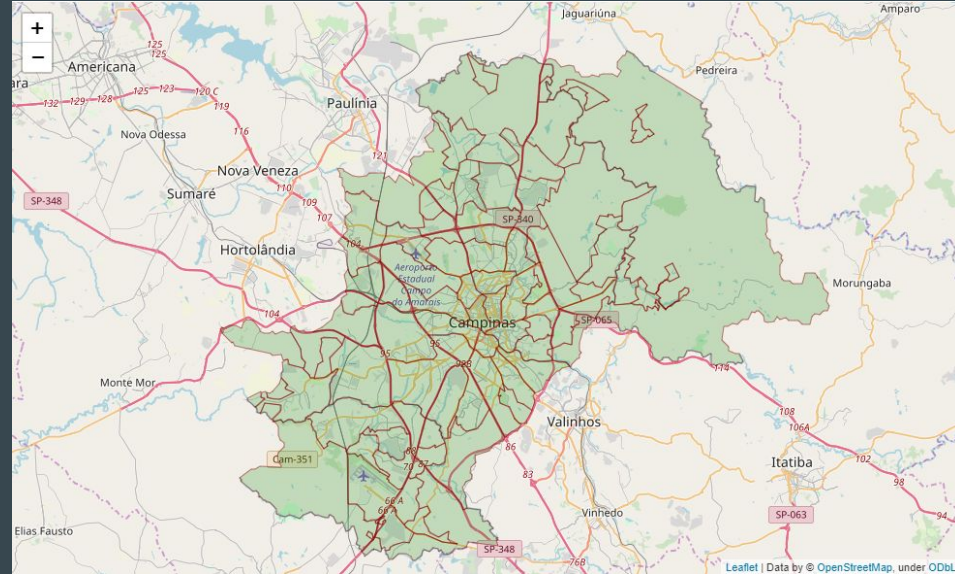
Foursquare

- The Foursquare API was used to get the number and type of venues in each neighborhood from Campinas.
- This data enabled also the classification of the regions into clusters according to its venues, helping to target at the most promising neighborhood to place the new gym facility.

Methodology

Neighborhoods of Campinas

The JSON file created from the shapefile contains the information that defines the limits of each neighborhood in the city. This data comprises a set of latitude and longitude pairs that when connected define the contour of each neighborhoods. These contours are shown on the picture over the map of campinas.
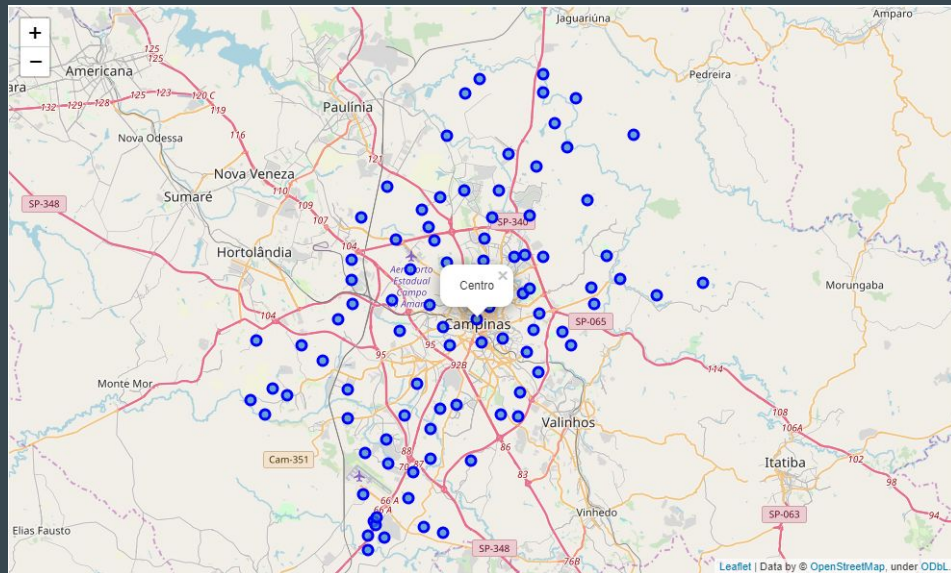
Neighborhoods of Campinas

The file also contains some demographic information from each neighborhood as total population and population density. This data was used to create a dataframe, where the latitude and longitude values are the average values of the points that form the neighborhood contour.

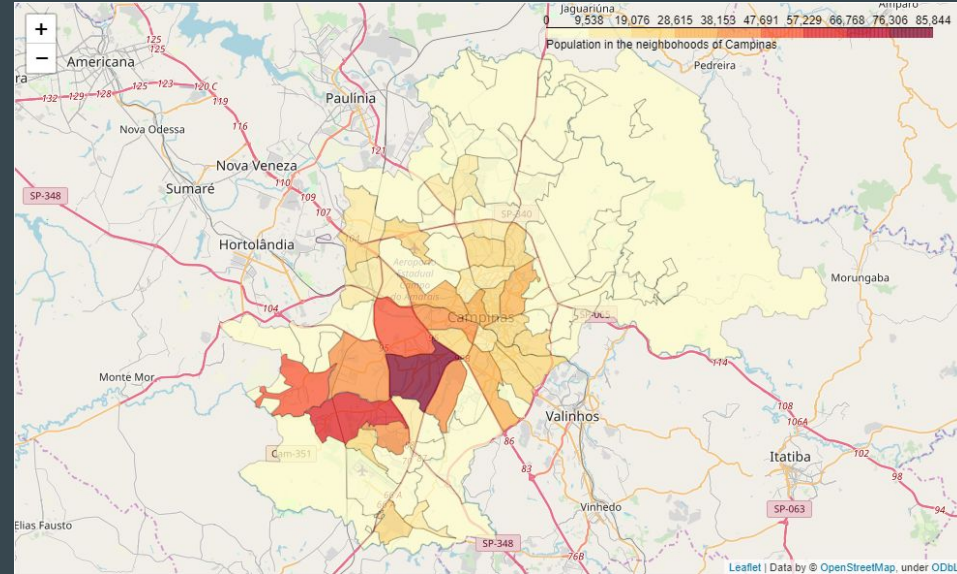|	Neighborhood	Population	Density	Latitude	Longitude
0	Pq. Valenca/Pq. Itajai	49026.0	3906.320993	-22.952906	-47.196391
1	Joaquim Egidio	849.0	0.000000	-22.886818	-46.932617
2	UTR - Pedra Branca	1883.0	0.000000	-22.995581	-47.065494
3	Pq. Ecologico	0.0	0.000000	-22.909946	-47.020844
4	UTR - Amarais / Barao Geraldo 1	2664.0	39.063210	-22.753775	-47.069453

Neighborhoods of Campinas

Using folium library each neighborhood has marked on the map, where the names are displayed in a pop-up when hovering over a marker.

Neighborhoods of Campinas

With the population information contained in the GeoJSON file a Choropleth map was created, showing that the most populous areas are located around the city center and on the southwestern area.

Venues of Campinas

- The Foursquare API was used to get the venues in each Neighborhood up to a limit of 200 and within a radius of 700 meter around the latitude and longitude coordinates of each area.
- The dataframe built with the Foursquare API contains the venues names, coordinates and venue's category.

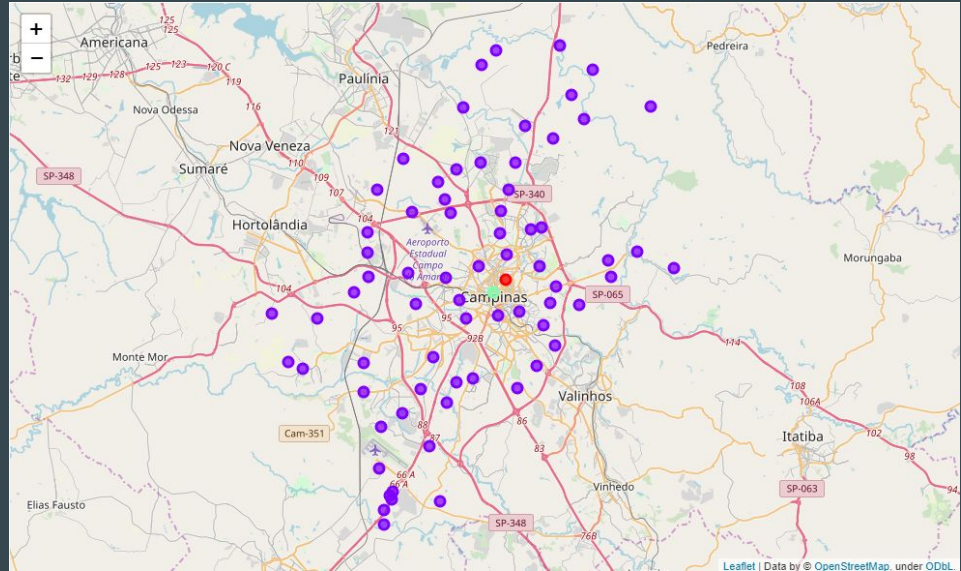|	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Pq. Valenca/Pq. Itajai	-22.952906	-47.196391	Fran Bazar	-22.954944	-47.197322	Arts & Crafts Store
1	Pq. Valenca/Pq. Itajai	-22.952906	-47.196391	Toca Do Pastel	-22.952035	-47.193625	Dumpling Restaurant
2	Pq. Valenca/Pq. Itajai	-22.952906	-47.196391	Tia Da Sorveteria	-22.956122	-47.199500	Ice Cream Shop
3	Joaquim Egidio	-22.886818	-46.932617	Restaurante Rancho Vô Joaquim	-22.888362	-46.934044	Brazilian Restaurant
4	Pq. Ecologico	-22.909946	-47.020844	D2	-22.910333	-47.018909	Badminton Court

Venues of Campinas

- The neighborhoods were clustered into 3 groups based on the amount and type of venues using the k-means algorithm.
- The results were organized on a dataframe where the cluster of each neighborhood is displayed along with the most common venues categories.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Cluster Labels	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
0	Aeroporto de Viracopos	-23.017966	-47.142582	1	Airport Terminal	Rental Car Location	Yoga Studio	Drugstore	Flea Market	Fishing Spot	Fast Food Restaurant	Farmers Market
1	Alto da Nova Campinas/Gramado	-22.911052	-46.999863	1	Restaurant	Yoga Studio	Drugstore	Flea Market	Fishing Spot	Fast Food Restaurant	Farmers Market	Farm
2	Bairro das Palmeiras	-22.899202	-47.016513	1	Tennis Court	Pool	Lake	Brazilian Restaurant	BBQ Joint	Diner	Restaurant	Volleyball Court
3	Bosque das Palmeiras	-22.793723	-47.038488	1	Pizza Place	Fishing Spot	Pet Store	Yoga Studio	Drugstore	Flea Market	Fast Food Restaurant	Farmers Market
4	Bosque/ Jd. Proenca	-22.915268	-47.043093	1	Bar	Japanese Restaurant	Health & Beauty Service	Plaza	Park	Restaurant	Drugstore	Campground

Venues of Campinas

- The clusters were plotted with different colors on the city's map as depicted below.
- The neighborhoods Cambuí (red mark) and City Center (green mark) comprise one single cluster each.
- These neighborhoods are known by their high concentration of venues
- Since the target of the gym owner is to locate the new branch in an area of lower competition, these two areas would not be considered as possibilities
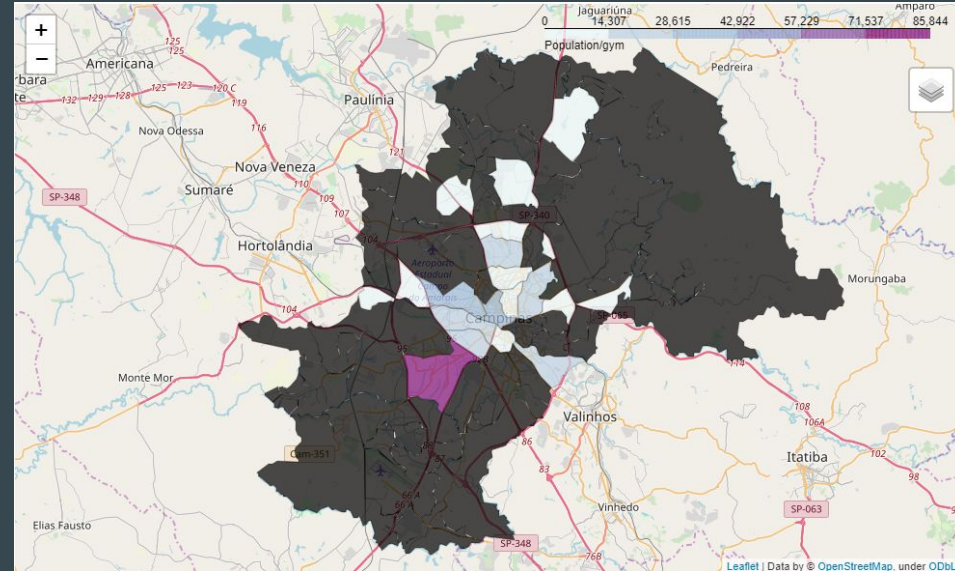
Results

Gyms of Campinas

- The parameter population by number of gyms was calculated by simply dividing the population of each neighborhood by the sum of venues with category 'Gym / Fitness Center' or 'Gym'.

	Neighborhood	Population	Density	Latitude	Longitude	Gym / Fitness Center	Gym	Total Gyms	Pop/gym
69	Jd. Santa Lucia/ V. Uniao/ Jd. do Lago	85844.0	0.000000	-22.945369	-47.104134	1	0	1.0	85844.0
58	Centro	34961.0	7.578698	-22.902441	-47.061105	0	1	1.0	34961.0
59	Jd. Eulina/ Jd. Chapadao/ Bonfim	31037.0	4.447642	-22.893458	-47.094633	0	1	1.0	31037.0
6	Swift/Jd.Sao Vicente/Jd.Esmeraldina	25858.0	64.858324	-22.937642	-47.017600	1	0	1.0	25858.0
25	V. Costa e Silva/ Primavera/ Pq. Taquaral	23896.0	36.744077	-22.864328	-47.056631	0	1	1.0	23896.0

Gyms of Campinas

- The same data can be better visualized in the form of a Choropleth map, where it is easily seen that the neighborhood Jd. Santa Lucia/V. Uniao/Jd. do Lago has the highest population per gym ratio among all neighborhoods in Campinas.

Discussion

Discussion

- When calculating the Population/gym ratio, the neighborhoods that returned no venues with category 'Gym / Fitness Center' or 'Gym' resulted in an infinite value.
- These neighborhoods were removed from the analysis assuming that the areas with at least one gym had already proven its viability for this type of business.
- In the areas with no gym, a deeper market analysis would be needed in order to assure the feasibility of starting a new venue.

> The neighborhood Jd. Santa Lucia/V. Uniao/Jd. do Lago is clearly the best place to place the new branch due its high population that is served by only one fitness center.

Conclusion

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- The present work showed how geospatial data and Foursquare API can be used to as tool to create a business plan.
- All information is free and publicly available, making it a powerful resource for business owners, investors and entrepreneurs.
- The total number of venues in the 'Gym' or 'Gym / Fitness Center' appears to be low considering the size of the city. A deeper analysis would be recommended as a second step trying to combine other data sources as class associations or market reports in order to expand the current analysis.

References

References

[1] https://pt.wikipedia.org/wiki/Campinas

[2] https://informacao-didc.campinas.sp.gov.br/metadados.php

[3] https://ogre.adc4gis.com/