

Distribution center

1. Introduction and business problem

Problem background

A significant portion of the city of Montevideo market is struggling with the consequences of the coronavirus. People cannot crowd in commercial places like shopping malls, restaurants, farmers markets and many more. This situation particularly affects businesses that depend on direct contact with their customers.

Due to this situation, it has become a necessity to look for alternatives that allow businesses to deliver their products to their customers and develop different strategies according to the needs of the population.

Problem description

Montevideo, the capital city of Uruguay, is the most populous in the country and has 62 neighborhoods. In most of these neighborhoods there are farmers markets called 'Feria' which provide food at a low price. There are also convenience stores and supermarkets with which people from Montevideo can provide all kinds of products for their homes. There are only a few shopping centers in Montevideo, so it is important to consider where they are located in relation to the aforementioned businesses. So the factors to study in order to decide de location are: city population and demographics and number and location of farmer markets, convenience stores, supermarkets and shopping malls.

Target Audience

The objective of this work is to locate the best place to build a distribution center to deliver home products from farmers markets, markets, convinience stores supermarkets and shopping malls.

Success Criteria

The success criteria is to ensure that the distribution center will be located in the neighborhood with the largest number of farmers markets, convenience stores, supermarkets and shopping malls nearby.

2. Data

The data used for this project will be the following:

Uruguay postal codes and neighborhoods

In the national postal administration website, there's a csv file with cities, neighbourhood and postal codes from Uruguay.

<https://www.correo.com.uy/IsisBusquedaDireccionPlugin/localidades.jsp>

	PostalCode	Department	Neighborhood
0	55000	Artigas	Baltasar Brum
1	55100	Artigas	Bella Union
2	55000	Artigas	Bernabe Rivera
3	55100	Artigas	Cainza
4	55100	Artigas	Cainza Campo 3

Montevideo population and demographics information

There's general information in Montevideo wikipedia page.

<https://en.wikipedia.org/wiki/Montevideo>

Population (2011 Census)^[6]	
• Density	6,726/km ² (17,421/sq mi)
• Urban	1,719,453
• Metro	1,947,604 ^{[3][4]}
• Department	1,319,108

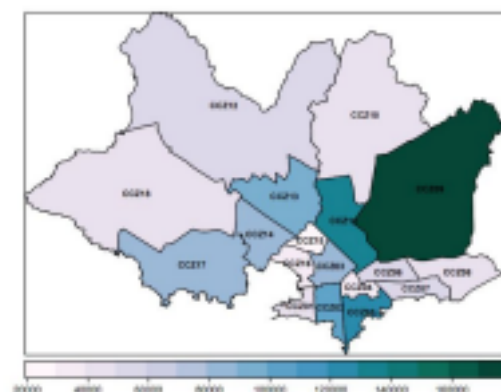
There is also information on population by zonal community centers on the website of the Intendence of Montevideo.

https://montevideo.gub.uy/sites/default/files/informe_censos_2011_mdeo_y_area_metro.pdf

Cuadro 2.2: Personas por CCZ según sexo (frecuencia y distribución). Censo 2011

CCZ	Hombres	Mujeres	Personas	%
CCZ01	20957	25404	46361	3,5
CCZ02	45023	56193	101216	7,7
CCZ03	36962	45262	82244	6,2
CCZ04	16668	20775	37643	2,9
CCZ05	53453	68432	121885	9,2
CCZ06	26810	32220	59030	4,5
CCZ07	22976	28040	51016	3,9
CCZ08	20945	28004	48949	3,7
CCZ09	81215	87062	168277	12,8
CCZ10	22384	23500	45884	3,5
CCZ11	64067	71202	135269	10,3
CCZ12	27627	30348	57975	4,4
CCZ13	43914	49413	93327	7,1
CCZ14	39001	44111	83112	6,3
CCZ15	13062	15000	28062	2,2
CCZ16	16906	20711	37617	2,9
CCZ17	40349	42782	83131	6,3
CCZ18	21987	19081	41068	3,2
Total	613756	704999	1318755	100,0

Figura 2.6: Total de personas por CCZ



Montevideo neighborhood coordinates

The nonimatim geopy module will be used together with the data retrieved from the email page to obtain the coordinates of latitude and longitude of each postal code.

<https://geopy.readthedocs.io/en/stable/#nominatim>

	PostalCode	Neighborhood	Latitude	Longitude
0	12400	Abayuba	-34.809	-56.1813
1	11800	Aguada	-34.8884	-56.1847
2	11700	Aires Puros	-34.8651	-56.2019
3	12300	Aires Puros	-34.8312	-56.1634
4	11700	Atahualpa	-34.8651	-56.2019

Montevideo venues

The foursquare api will be used to search for farmers markets, convenience stores, supermarkets and shopping malls in Montevideo.

<https://developer.foursquare.com/docs/places-api/>

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
7	Aguada	-34.888445	-56.184863	iberpark	-34.888914	-56.183579	Convenience Store
13	Aguada	-34.888445	-56.184863	Supermercado Ta-Ta	-34.888913	-56.183258	Supermarket
18	Aguada	-34.888445	-56.184863	Domingo Mozo	-34.888942	-56.183454	Farmers Market
34	Aires Puros	-34.831189	-56.163407	Umpi	-34.829814	-56.168560	Convenience Store
53	Atahualpa	-34.888445	-56.184863	iberpark	-34.888914	-56.183579	Convenience Store

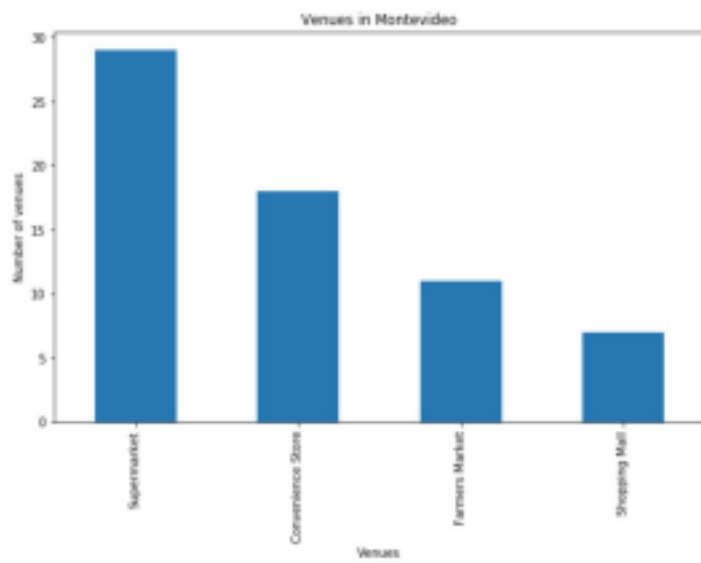
3. Methodology

Business understanding

The main goal is to locate the best place to build a distribution center to deliver home products from farmers markets, markets, convenience stores, supermarkets and shopping malls.

Analytic approach

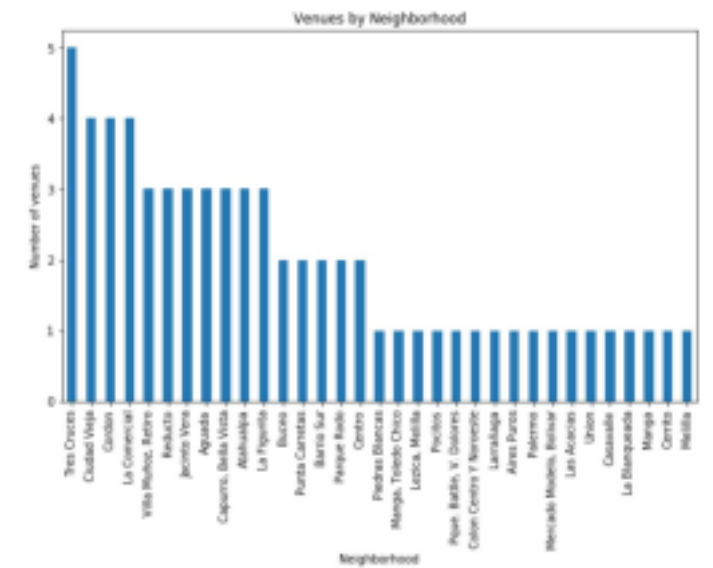
Considering data obtained through the Foursquare API, Montevideo has 29 supermarkets, 18 convenience stores, 11 farmers markets and 7 shopping centers.



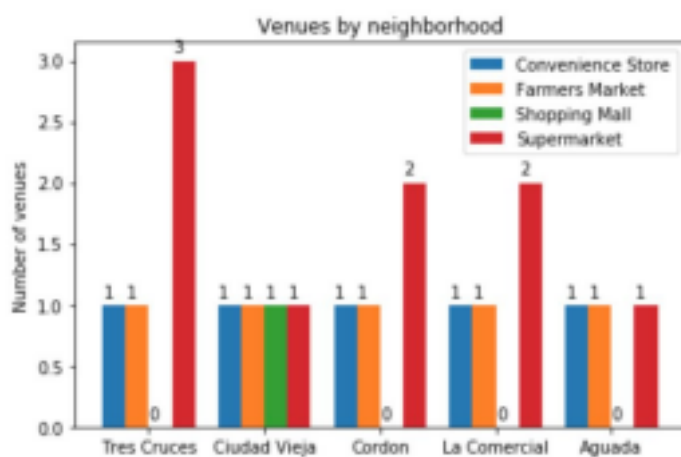
These are the 4 top common venues in Montevideo and we can see it all in this



The neighborhood with the largest number of venues is Tres Cruces.



The 5 neighborhoods with the largest number of venues grouped by selected categories



If we consider the average distance between the premises in each neighborhood. The Aguada neighborhood is the one with the least distance between the premises. While the Tres Cruces neighborhood has the highest average distance.

Aguada

Mean Distance from Mean coordinates
8.953480531578716e-05

Tres Cruces

Mean Distance from Mean coordinates
0.009208206964912846

Results

As we can see, Tres Cruces is the neighborhood with the highest number of venues. If we consider the average distance between the premises in each neighborhood. The Aguada

neighborhood is the one with the least distance between the premises. While the Tres Cruces neighborhood has the highest average distance. However, Tres Cruces is on CCZ 1 and CCZ 2, which is located within the most populated areas of Montevideo.