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Capstone Project - The Battle of Neighborhoods

Report

1. Introduction

Mexico City is one of the largest and most populous cities in the world. It is the capital of Mexico and its main social, political and economic center. Being classified as a global city, it is one of the most important financial and cultural centers in the world, which is attractive for many people from the rest of the country who decide to migrate and settle in Mexico City.

Deciding on a place to live in Mexico City is not an easy task. There are many factors to consider such as: proximity to attractive places, restaurants, work and safety.

In the last 12 years or so, Mexico has suffered a wave of violence plagued by criminal organizations and Mexico City is no exception. So it is of great importance to take into account the safety rates in the different neighborhoods of the city to decide a good place to live.

The objective of this project is to find the best place to live in Mexico City, considering safety and of course multiple options for entertainment.

2. Data

The data used in this project was obtained from an official page of Mexico City, the database used is "pgjcdmx.csv", which contains the Street Level Crime Investigation Folders for the first half of 2019.

- **año_hechos**: crime year
- **mes_hechos**: crime month
- **fecha_hechos**: crime date

- **delito**: specific crime
- **categoria_delito**: crime classification
- **fiscalía**: place of investigation
- **agencia**: agency where the investigation was conducted
- **unidad_investigacion**: investigation unit
- **colonia_hechos**: neighborhood where the crime occurred
- **alcaldia_hechos**: borough where the crime occurred
- **fecha_inicio**: investigation start date
- **mes_inicio**: investigation start month
- **ao_inicio**: investigation start year
- **calle_hechos**: street where the crime occurred
- **calle_hechos2**: second street where the crime occurred
- **longitud**: longitude of the crime
- **latitud**: latitude of the crime
- **Geopoint**: the latitude and longitude of the crime

This database will seek to find the boroughs with the lowest number of crimes. Subsequently, a borough will be selected to find the neighborhoods with the highest number of crimes, the neighborhoods with the lowest number of crimes and the category of crimes that occurred most frequently.

Finally, the coordinates of the neighborhoods will be obtained using Google Maps API geocoding to create a new dataset that will be used to generate the venues for each neighborhood using the Foursquare API.

3. Methodology

3.1 Exploratory Data Analysis

Columns deemed to have data that was not needed for our analysis were removed. Later, a table was made where the boroughs with the least number of crimes were listed to decide the best borough to live.

	Alcaldia	Colonia	Categoria
2	MILPA ALTA	715	715
3	CUAJIMALPA DE MORELOS	1674	1674
4	LA MAGDALENA CONTRERAS	1869	1869
5	TLAHUAC	2574	2574
6	XOCHIMILCO	3330	3330

Fig 1. Boroughs and crimes

Subsequently, Cuajimalpa de Morelos was chosen on the basis that it appeared in second place in the table with fewer crimes and according to a UN report published in 2019 places it in the top 10 of the municipalities with the highest HDI in Mexico.

Entidad	Municipio	Índice de Desarrollo Humano		Índice de Educación		Índice de Salud		Índice de Ingreso	
		2010	2015	2010	2015	2010	2015	2010	2015
Ciudad de México	Benito Juárez	0.929	0.944	0.872	0.913	0.979	0.972	0.940	0.948
Ciudad de México	Miguel Hidalgo	0.888	0.917	0.819	0.859	0.958	0.961	0.891	0.935
Nuevo León	San Pedro Garza García	0.866	0.901	0.775	0.842	0.916	0.913	0.915	0.951
Ciudad de México	Coyoacán	0.868	0.883	0.798	0.834	0.956	0.954	0.858	0.864
Ciudad de México	Cuauhtémoc	0.854	0.878	0.775	0.809	0.950	0.950	0.847	0.882
Oaxaca	San Sebastián Tutla	0.856	0.868	0.823	0.840	0.919	0.943	0.828	0.826
Ciudad de México	Iztacalco	0.831	0.861	0.753	0.782	0.939	0.943	0.811	0.866
Nuevo León	San Nicolás de los Garza	0.848	0.859	0.757	0.779	0.936	0.940	0.860	0.865
Ciudad de México	Azcapotzalco	0.842	0.854	0.759	0.785	0.946	0.944	0.831	0.841
Ciudad de México	Cuajimalpa de Morelos	0.812	0.850	0.715	0.784	0.923	0.927	0.811	0.845

Fig 2. Top 10 of the municipalities with the highest HDI in Mexico.

Later, the neighborhoods of Cuajimalpa de Morelos were listed to observe which ones had the lowest and highest number of crimes and were plotted.
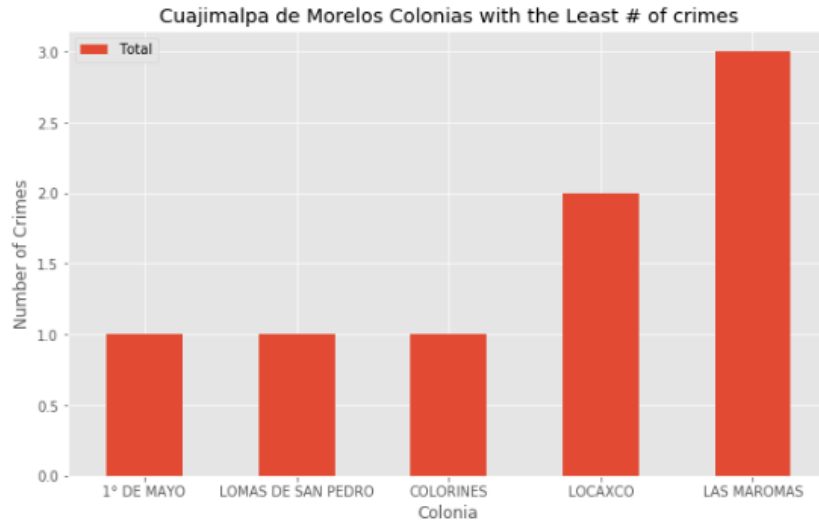
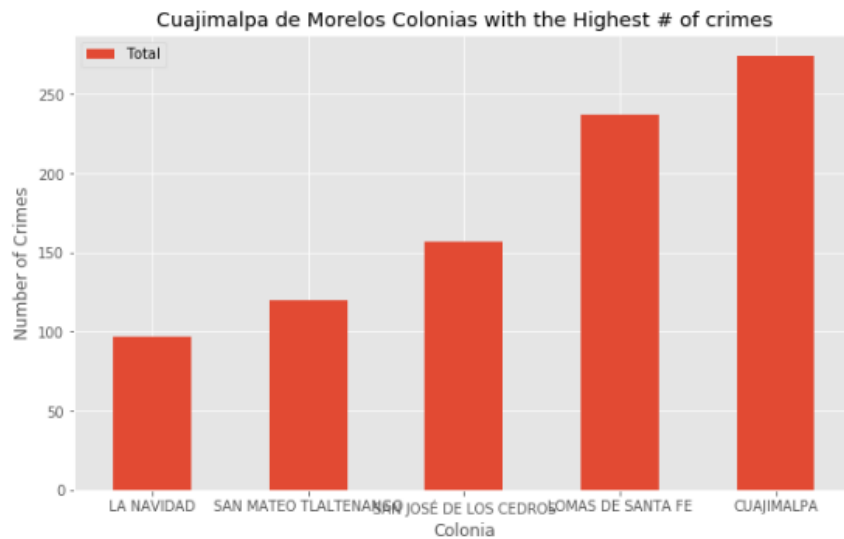*Fig 3. Neighborhoods with the lowest crime rates*

Fig 4. Neighborhoods with the highest crime rates

The number of crimes occurred according to their category was also plotted and the frequency of crimes per neighborhood was obtained.
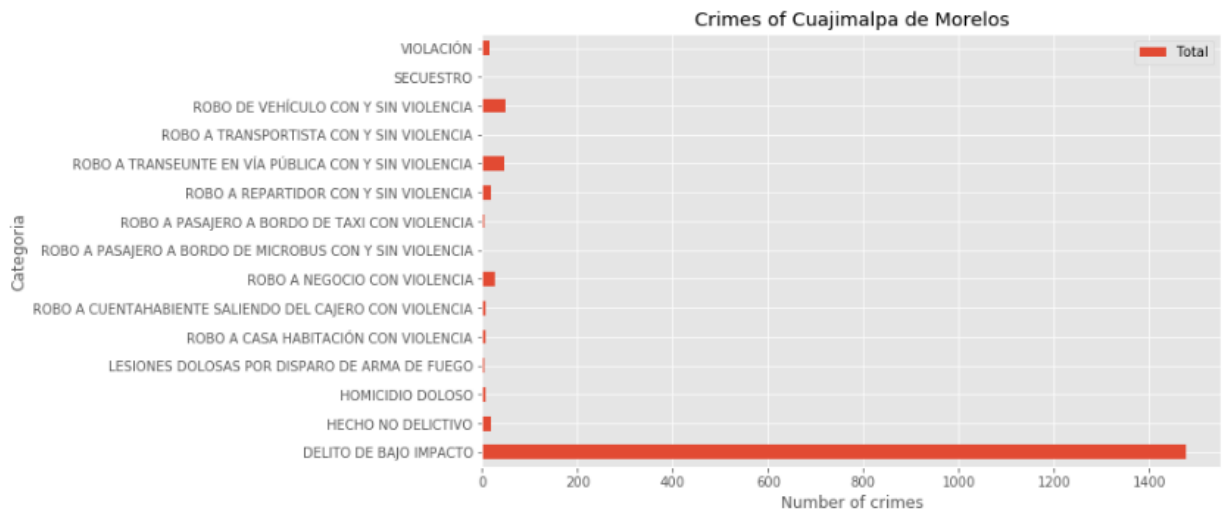
Fig 5. Number of crimes in Cuajimalpa de Morelos

3.2 Neighborhoods of Cuajimalpa de Morelos

The coordinates of the neighborhoods of Cuajimalpa de Morelos were obtained and a map was made for their visualization
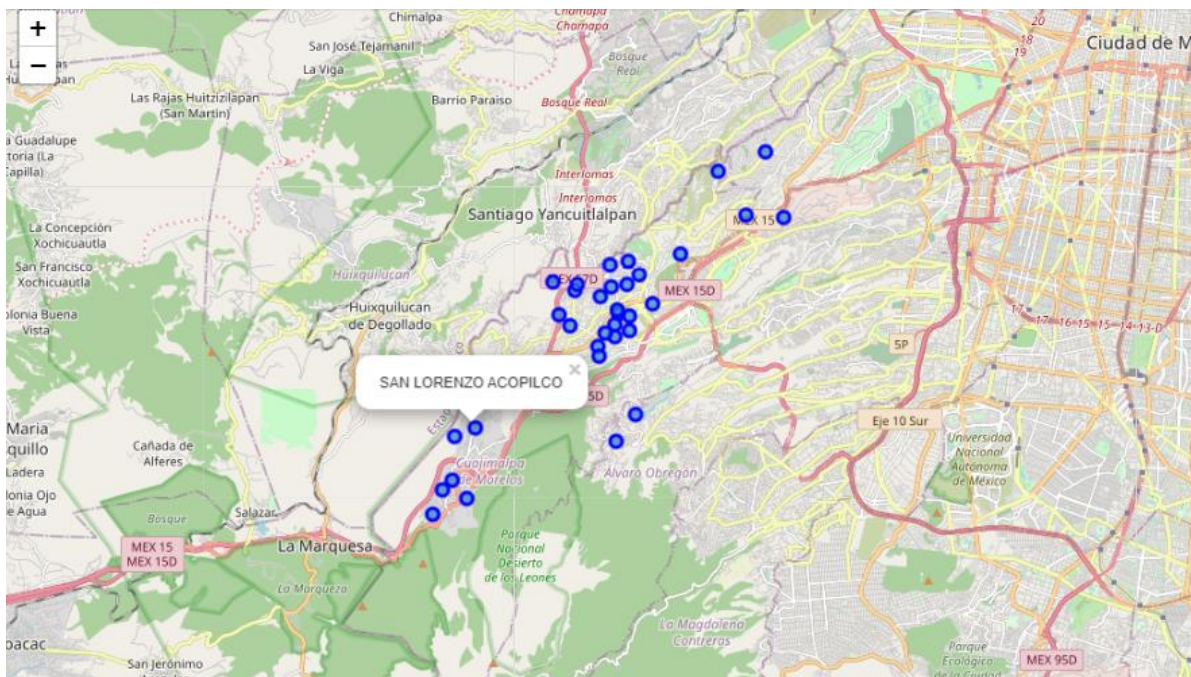

Fig 6. Cuajimalpa de Morelos neighborhoods

In addition, using the Foursquare API, venues near the neighborhoods of Cuajimalpa de Morelos were obtained and the 10 most common by neighborhood were selected.

	Colonia	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	ABDIAS GARCIA SOTO	Pizza Place	Mexican Restaurant	Soccer Field	Gym	Dive Shop	Burger Joint	Taco Place	Shopping Mall	Dessert Shop	Discount Store
1	AGUA BENDITA	Taco Place	Pizza Place	Gym Pool	Convenience Store	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio	Electronics Store	Dance Studio
2	AHUATENCO	Lounge	Yoga Studio	Farm	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio	Dance Studio	Deli / Bodega	Department Store
3	AMADO NERVO	Gymnastics Gym	Other Great Outdoors	Bus Stop	Mountain	ATM	Toy / Game Store	Donut Shop	Construction & Landscaping	Convenience Store	Cosmetics Shop
4	BOSQUES DE LAS LOMAS	Ice Cream Shop	Sushi Restaurant	Bakery	Coffee Shop	Restaurant	Tea Room	Food Truck	Seafood Restaurant	Juice Bar	Road

Fig 7. The most common venues

3.3 Clustering Neighborhoods

After applying K-means clustering, five clusters were created and a map was made for viewing.
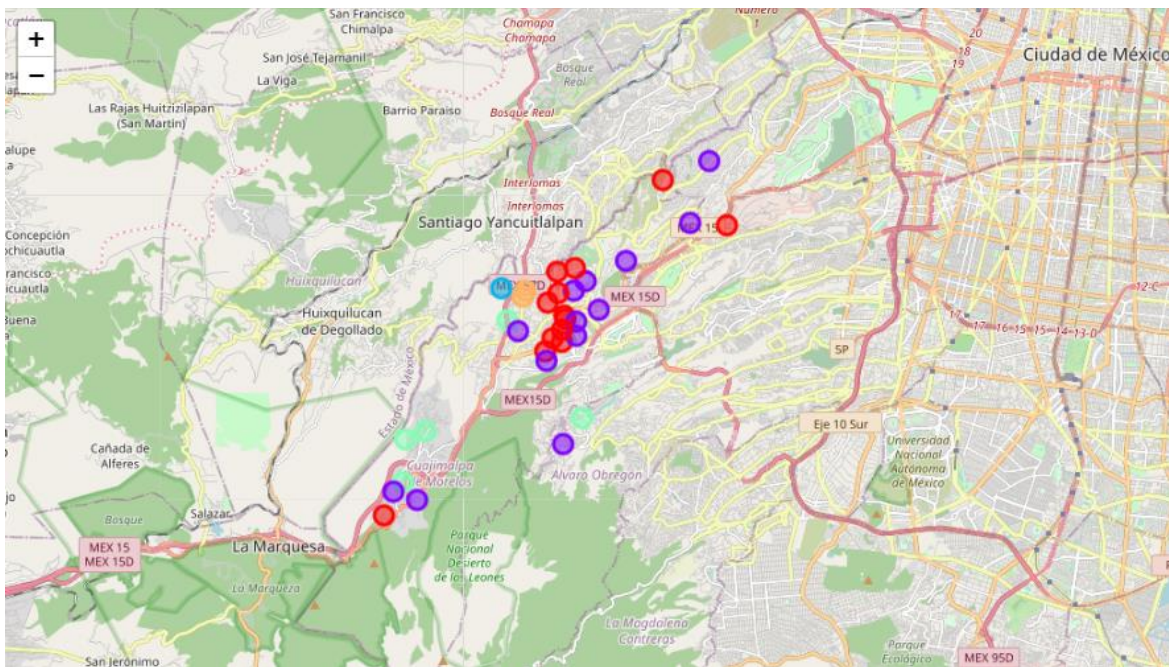

Fig 8. Clustered neighborhoods

4. Results

The first cluster is one of the biggest with 13 neighborhoods and contains a great diversity of venues. We can see that the most common venues in these neighborhoods are Restaurants, Pubs and Sports Clubs.

	Colonia	Latitude	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	9th Most Common Venue	10th Most Common Venue
0	LOMAS DE SAN PEDRO	19.354139	-99.287959	0	Mexican Restaurant	Gym	Taco Place	Cheese Shop	Shopping Mall	Convenience Store	Dive Shop	Steakhouse	Burger Joint	Lounge
2	LOCAXCO	19.355183	-99.290793	0	Mexican Restaurant	Pizza Place	Taco Place	Burger Joint	Shopping Mall	Soccer Field	Coffee Shop	Dive Shop	Lounge	Seafood Restaurant
4	COLA DE PATO	19.307019	-99.339242	0	Food Truck	Mexican Restaurant	Bus Station	Yoga Studio	Dive Shop	Discount Store	Diner	Dessert Shop	Department Store	Electronics Store
7	MEMETLA	19.360346	-99.286888	0	Mexican Restaurant	Taco Place	Coffee Shop	Gym / Fitness Center	Convenience Store	Farmers Market	Car Wash	Diner	Burger Joint	Food & Drink Shop
9	EL MOLINITO	19.361478	-99.287066	0	Mexican Restaurant	Taco Place	Coffee Shop	Sports Club	Food & Drink Shop	Farmers Market	Convenience Store	Pet Store	Car Wash	Burger Joint
11	ABDIAS GARCIA SOTO	19.351729	-99.292683	0	Pizza Place	Mexican Restaurant	Soccer Field	Gym	Dive Shop	Burger Joint	Taco Place	Shopping Mall	Dessert Shop	Discount Store
12	EL ÉBANO	19.373219	-99.289308	0	Taco Place	Mexican Restaurant	Breakfast Spot	Farmers Market	Restaurant	Beer Garden	Bar	Convenience Store	Pizza Place	Gym
16	JESÚS DEL MONTE	19.365039	-99.291991	0	Mexican Restaurant	Taco Place	Convenience Store	Pet Store	Shopping Mall	Dance Studio	Bus Stop	Soccer Field	Soccer Stadium	Food & Drink Shop
20	LOMAS DE MEMETLA	19.357515	-99.287942	0	Mexican Restaurant	Gym	Coffee Shop	Lounge	Diner	Dive Shop	Japanese Restaurant	Shopping Mall	Cycle Studio	Farmers Market

Fig 9. Cluster 1

The second cluster is as big as the first with 13 neighborhoods and also contains a great diversity of venues. We can see Restaurants, Gyms, Supermarkets and stores.

	Colonia	Latitude	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	9th Most Common Venue	10th Most Common Venue
1	COLORINES	19.368216	-99.284595	1	Gym	Sports Club	Pizza Place	Restaurant	Mexican Restaurant	Seafood Restaurant	Convenience Store	Farmers Market	Fish & Chips Shop	Japanese Restaurant
8	SANTA ROSA XOCHIAC	19.326362	-99.287530	1	Taco Place	Burger Joint	Plaza	Diner	Dance Studio	Discount Store	Dessert Shop	Department Store	Deli / Bodega	Yoga Studio
13	EL YAQUI	19.359756	-99.283855	1	Spa	Gym	Gym / Fitness Center	Coffee Shop	Diner	Taco Place	Hotel	Yoga Studio	Construction & Landscaping	Cycle Studio
14	XALPA	19.311017	-99.329788	1	Bar	Campground	Basketball Court	Taco Place	Yoga Studio	Donut Shop	Dive Shop	Discount Store	Diner	Dessert Shop
18	LAS TINAJAS	19.356007	-99.283654	1	Coffee Shop	Gym	Taco Place	Japanese Restaurant	Cycle Studio	Café	Restaurant	Diner	Mexican Restaurant	Construction & Landscaping
19	JARDINES DE LA PALMA	19.370751	-99.281087	1	Pizza Place	Pharmacy	Paper / Office Supplies Store	Bar	Grocery Store	Gym / Fitness Center	Fast Food Restaurant	Comfort Food Restaurant	Park	Pet Store
21	LA PILA	19.313429	-99.336615	1	Department Store	Basketball Court	Moving Target	River	Bakery	Dive Shop	Discount Store	Diner	Dessert Shop	Yoga Studio
22	CONTADERO	19.349088	-99.292516	1	Pizza Place	Shopping Mall	Fast Food Restaurant	Gym	Asian Restaurant	Construction & Landscaping	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio
23	LA ROSITA	19.363135	-99.277228	1	Gym	Coffee Shop	Restaurant	Breakfast Spot	Cosmetics Shop	Shopping Mall	Mexican Restaurant	Hotel	Department Store	Furniture / Home Store

Fig 10. Cluster 2

The third cluster has one neighborhood which consists of venues related to personal care.

	Colonia	Latitude	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	9th Most Common Venue	10th Most Common Venue
17	AHUATENCO	19.368721	-99.305322	2	Lounge	Yoga Studio	Farm	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio	Dance Studio	Deli / Bodega	Department Store

Fig 11. Cluster 3

The fourth cluster is similar to the previous one but also contains Restaurants and stores.

	Colonia	Latitude	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	9th Most Common Venue	10th Most Common Venue
3	LAS MAROMAS	19.327676	-99.333119	3	Taco Place	Coffee Shop	Convenience Store	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio	Dance Studio	Farm	Deli / Bodega
10	AGUA BENDITA	19.360055	-99.303682	3	Taco Place	Pizza Place	Gym Pool	Convenience Store	Cosmetics Shop	Coworking Space	Cupcake Shop	Cycle Studio	Electronics Store	Dance Studio
15	LAS LAJAS	19.315850	-99.333852	3	Taco Place	River	Diner	Dance Studio	Basketball Court	Yoga Studio	Dive Shop	Discount Store	Dessert Shop	Department Store
28	SAN LORENZO ACOPILCO	19.329801	-99.327412	3	Taco Place	Pie Shop	Outdoors & Recreation	Soccer Stadium	Coffee Shop	Coworking Space	Cosmetics Shop	Cupcake Shop	Convenience Store	Dive Shop
30	SAN MATEO TLALTENANGO	19.333532	-99.282052	3	Taco Place	Farm	Deli / Bodega	Donut Shop	Dive Shop	Discount Store	Diner	Dessert Shop	Department Store	Yoga Studio

Fig 12. Cluster 4

The fifth cluster is dominated by venues related to Sports.

	Colonia	Latitude	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	9th Most Common Venue	10th Most Common Venue
5	MANZANASTITLA	19.366438	-99.299183	4	Gymnastics Gym	Soccer Stadium	Restaurant	Soccer Field	ATM	Toy / Game Store	Donut Shop	Construction & Landscaping	Convenience Store	Cosmetics Shop
6	AMADO NERVO	19.368275	-99.298458	4	Gymnastics Gym	Other Great Outdoors	Bus Stop	Mountain	ATM	Toy / Game Store	Donut Shop	Construction & Landscaping	Convenience Store	Cosmetics Shop

Fig 13. Cluster 5

5. Discussion

As we can see, the first two clusters have neighborhoods with a large number of venues, so they could be good places to live, however in general they present a greater number of crimes that can be motivated by the great flow of money.

The third and fourth clusters have a small variety of venues, however we can find neighborhoods with a low number of crimes.

The last cluster is a special case since it contains two neighborhoods that are close to natural areas, so it presents venues related to outdoor activities.

6. Conclusion

This project aims to provide information about safety and the most common places in the boroughs of Mexico City and in some of its neighborhoods to people who want to live in Mexico City.

Making the decision to choose the best neighborhood to live in the end depends on the personal tastes of each person, however this work can facilitate decision-making through an objective analysis.

7. References

- PNUD. (2019). Informe de desarrollo humano municipal 2010-2015. Transformando México desde lo local. México: Offset Santiago.