

Analysis of the incidents managed by the local police in Barcelona's neighborhoods in 2019

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1. Business Problem

1.1. Background

Barcelona is well known as being one of the most dangerous cities in Europe because the many incidents happening every day. How local police manage these incidents and how effective they worked can improve the security of the city.

Incidents' types, locations and occurrence vary during the year. However, neighborhoods can be group depending on its incident's types occurrence.

Therefore, it is advantageous for the local police to have the neighborhood grouped based on the most common incidents. It could be used to be more efficient and distribute better the officers.

1.2. Problem

This project aims to cluster Barcelona's neighborhoods in groups depending on the occurrence of the top 10 most common incidents in each neighborhood manage by the local police. There are many incidents occurring in the different neighborhoods, if the neighborhoods are clustered in groups with similar incidents it would be useful for the local police to determined where they should send more teams and what kind of incidents they may encounter.

1.3. Interest

Local police would be interest in knowing in advance what incidents might they encounter in each neighborhood, helping them to be prepare and knowing at a first glance what is happening in each neighborhood.

2. Data acquisition and cleaning

2.1. Data sources

The data source chosen was 'Incidents managed for Guàrdia Urbana in the city of Barcelona' from the year 2019 from Open Data Ajuntament Barcelona, <https://opendata-ajuntament.barcelona.cat/data/en/dataset/incidents-gestionats-gub>, it contains the different categories of incidents managed by the local police of Barcelona in the different neighborhoods of the city as well as the number of each incident in the year 2019. This data source contains the neighborhood code, the neighborhood name, the district code, the district name and the postal code. It is very useful to locate all the different neighborhoods.

Afterwards, to the incidents data, the geospatial coordinates has been added. The obtaining geospatial coordinates process can be found in '[Obtain neighborhoods with coordinates cvs](#)' notebook. The geospatial data for the neighborhoods has been obtain in combination of using the geocoder library <https://geocoder.readthedocs.io/> and the neighborhood information in 'Incidents managed for Guàrdia Urbana in the city of Barcelona'. Also, it has been checked that the number of neighborhoods corresponds with the real ones and that none is missing.

Finally, in order to visualize the information in a map, 'barcelona_neighborhoods.json' has been used. This file contains geospatial data like the neighborhood's perimeters.

2.2. Data cleaning

It can be observed there are two data cleaning process, one in 'Data visualization of incidents in Barcelona's neighborhoods in 2019' and another one in 'Cluster Barcelona neighborhoods' notebook.

Data used in the notebooks is the same, is the combination of the coordinates found in 'Obtain neighborhoods with coordinates cvs' notebook and the neighborhood information in 'Incidents managed for Guàrdia Urbana in the city of Barcelona'.

They main actions to clean the data were to change the columns name, removed 'NaN' and 'Desconegut' values from 'Neighborhood' Column, change columns types, add the coordinates to the existing data frame and removed 'NaN' values after adding neighborhoods coordinates.

2.3. Feature selection

After data cleaning, different approaches were done depending on the needs of each notebook.

	Incident	District Code	District	Neighborhood Code	Neighborhood	Month	Number of Incidents	Neighborhood Latitude	Neighborhood Longitude
0	ACTIVITATS MOLESTES EN ESPAIS PÚBLICS ...	6	Gràcia	31	la Vila de Gràcia	1	85	41.403178	2.157166
1	ACCIDENTS DE TRÀNSIT SENSE FERITS ...	10	Sant Martí	73	la Verneda i la Pau	4	4	41.423220	2.202940
2	INCIDÈNCIES AMB AFECTACIÓ DE VIA ...	2	Eixample	9	la Nova Esquerra de l'Eixample	4	12	41.382816	2.149966
3	CONVIVÈNCIA VEINAL ...	6	Gràcia	31	la Vila de Gràcia	4	105	41.403178	2.157166
4	AGRESSIONS ...	1	Ciutat Vella	3	la Barceloneta	1	12	41.380653	2.189927

Figure 1 Incidents Barcelona 2019

In 'Data visualization of incidents in Barcelona's neighborhoods in 2019' notebook, the 'Month' column was transform from categorical to quantitative variable first, resulting in 12 different columns, one for each month of the year, and, also, the original 'Month' column was drop.

District Code	District	Neighborhood Code	Neighborhood	Incident	Number of Incidents	Neighborhood Latitude	Neighborhood Longitude	1	2	3	4	5	6	7	8	9	10	11	12
0	6	Gràcia	31	la Vila de Gràcia	ACTIVITATS MOLESTES EN ESPAIS PÚBLICS ...	85	41.403178	2.157166	1	0	0	0	0	0	0	0	0	0	0
1	10	Sant Martí	73	la Verneda i la Pau	ACCIDENTS DE TRÀNSIT SENSE FERITS ...	4	41.423220	2.202940	0	0	0	1	0	0	0	0	0	0	0
2	2	Eixample	9	la Nova Esquerra de l'Eixample	INCIDÈNCIES AMB AFECTACIÓ DE VIA ...	12	41.382816	2.149966	0	0	0	1	0	0	0	0	0	0	0
3	6	Gràcia	31	la Vila de Gràcia	CONVIVÈNCIA VEINAL ...	105	41.403178	2.157166	0	0	0	1	0	0	0	0	0	0	0
4	1	Ciutat Vella	3	la Barceloneta	AGRESSIONS ...	12	41.380653	2.189927	1	0	0	0	0	0	0	0	0	0	0

Figure 2 Months transformed into categorical variables

Afterwards the 'Number of incidents' were added to the month they occurred.

District Code	District	Neighborhood Code	Neighborhood	Incident	Neighborhood Latitude	Neighborhood Longitude	1	2	3	4	5	6	7	8	9	10	11	12
0	6	Gràcia	31	la Vila de Gràcia	ACTIVITATS MOLESTES EN ESPAIS PÚBLICS ...	41.403178	2.157166	85	0	0	0	0	0	0	0	0	0	0
1	10	Sant Martí	73	la Verneda i la Pau	ACCIDENTS DE TRÀNSIT SENSE FERITS ...	41.423220	2.202940	0	0	0	4	0	0	0	0	0	0	0
2	2	Eixample	9	la Nova Esquerra de l'Eixample	INCIDÈNCIES AMB AFECTACIÓ DE VIA ...	41.382816	2.149966	0	0	0	12	0	0	0	0	0	0	0
3	6	Gràcia	31	la Vila de Gràcia	CONVIVÈNCIA VEINAL ...	41.403178	2.157166	0	0	0	105	0	0	0	0	0	0	0
4	1	Ciutat Vella	3	la Barceloneta	AGRESSIONS ...	41.380653	2.189927	12	0	0	0	0	0	0	0	0	0	0

Figure 3 Number of incidents added in each month

In 'Cluster Barcelona Neighborhoods' notebook, also the 'Incident' column was transform from categorical to quantitative variable in different columns, one for each incident, and the original 'Incident' column was drop.

District Code	District	Neighborhood Code	Neighborhood	Month	Number of Incidents	Neighborhood Latitude	Neighborhood Longitude	ABOCAMENT DE RESIDUS	ACCIDENTS DE TRANŠIT AMB MATERIES PERILLOSES	ACCIDENTS DE TRANŠIT AMB FERITS	ACCIDENTS DE TRANŠIT SENSE FERITS	ACTES CONTRA LA PROPIETAT	ACTES CONTRA LA PROPIETAT PRIVADA	ACTES CONTRA LA PROPIETAT PUBLICA	ACTIVITAT AMB PRESOS	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	AGRESSIONS	ALARMES D'INCENDI / ROBATORI	ALTRES ACTUACIONS DE S. C.	ALTRES ACTUACIONS EN MED AMBIENT
0	6	Gràcia	31	la Vila de Gràcia	1	85	41.403178	2.157166	0	0	0	0	0	0	0	0	1	0	0	0
1	10	Sant Martí	73	la Verneda i la Pau	4	4	41.423320	2.202940	0	0	0	1	0	0	0	0	0	0	0	0
2	2	l'Eixample	9	la Nova Esquerra de l'Eixample	4	12	41.382816	2.149966	0	0	0	0	0	0	0	0	0	0	0	0
3	6	Gràcia	31	la Vila de Gràcia	4	105	41.403178	2.157166	0	0	0	0	0	0	0	0	0	0	0	0
4	1	Ciutat Vella	3	la Barceloneta	1	12	41.380653	2.189927	0	0	0	0	0	0	0	0	0	1	0	0

Figure 4 Incidents transformed into categorical variables

Afterwards, the mean of the occurrence of each type incident in each neighborhood was calculated.

Neighborhood	ABOCAMENT DE RESIDUS	ACCIDENTS DE TRANŠIT AMB MATERIES PERILLOSES	ACCIDENTS DE TRANŠIT AMB FERITS	ACCIDENTS DE TRANŠIT SENSE FERITS	ACTES CONTRA LA PROPIETAT	ACTES CONTRA LA PROPIETAT PRIVADA	ACTES CONTRA LA PROPIETAT PUBLICA	ACTIVITAT AMB PRESOS	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	AGRESSIONS	ALARMES D'INCENDI / ROBATORI	ALTRES ACTUACIONS DE S. C.	ALTRES ACTUACIONS EN MED AMBIENT	ALTRES INCIDENCIES AMB ANIMALS	ALTRES INTERVENCIONS DE P. ADMINISTRATIVA	ANIMALS / INSECTES PERILLOSO	ANIMALS DE COMPANYIA	ASSISTÈNCIA A CONDUCTORS EN V. P.
0	Baró de Viver	0.000000	0.000000	0.028409	0.028409	0.000000	0.039773	0.005682	0.056818	0.022727	0.017045	0.056818	0.000000	0.000000	0.017045	0.017045	0.022727	0.000000
1	Can Baró	0.003021	0.000000	0.033233	0.030211	0.000000	0.030211	0.009063	0.036254	0.027190	0.012085	0.036254	0.000000	0.003021	0.030211	0.015106	0.033233	0.012085
2	Can Peguera	0.009050	0.000000	0.022624	0.018100	0.000000	0.031674	0.004525	0.000000	0.054299	0.036199	0.022624	0.054299	0.000000	0.000000	0.018100	0.004525	0.036199
3	Canyelles	0.007143	0.000000	0.039286	0.042857	0.000000	0.039286	0.003571	0.000000	0.035714	0.028571	0.014286	0.042857	0.000000	0.000000	0.032143	0.014286	0.021429
4	Ciutat Meridiana	0.000000	0.000000	0.021978	0.016484	0.000000	0.030220	0.000000	0.000000	0.032967	0.030220	0.021978	0.032967	0.000000	0.013736	0.032967	0.016484	0.032967
5	Diagonal Mar i el Front Marítim del Poblenou	0.008889	0.000000	0.026667	0.026667	0.000000	0.026667	0.002222	0.000000	0.026667	0.022222	0.026667	0.026667	0.002222	0.002222	0.026667	0.008889	0.026667

Figure 5 Mean occurrence of each incident in each neighborhood

Finally, a new data frame was created with the top 10 incidents in each neighborhood.

Neighborhood	1st Most Common Incidents	2nd Most Common Incidents	3rd Most Common Incidents	4th Most Common Incidents	5th Most Common Incidents	6th Most Common Incidents	7th Most Common Incidents	8th Most Common Incidents	9th Most Common Incidents	10th Most Common Incidents
0	Baró de Viver	CONVIVÈNCIA VEINAL	VIGILÀNCIA POLICIAL	ALTRES ACTUACIONS DE S. C.	INFRACCIONS EN GUALS I RESERVES	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	INFRACCIONS EN MOVIMENT	INCENDIS	COL·LABORACIÓ AMB ALTRES SERVEIS	ASSISTÈNCIA A PERSONES EN ESPAIS PUBLICS
1	Can Baró	INFRACCIONS EN GUALS I RESERVES	RESTRICCIONS TEMPORALS DE TRANŠIT	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	INFRACCIONS PER ESTACIONAMENTS	CONVIVÈNCIA VEINAL	ASSISTÈNCIA A PERSONES EN ESPAIS PUBLICS	ALTRES ACTUACIONS DE S. C.	INCIDÈNCIES AMB AFECTACIÓ DE VIA	ANIMALS DE COMPANYIA
2	Can Peguera	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	ASSISTÈNCIA A PERSONES EN ESPAIS PUBLICS	CONVIVÈNCIA VEINAL	ACTUACIONS DE S. C.	VIGILÀNCIA POLICIAL	INFRACCIONS PER ESTACIONAMENTS	ASSISTÈNCIA A PERSONES EN EDIFICI	ANIMALS DE COMPANYIA	INFRACCIONS EN GUALS I RESERVES
3	Canyelles	INFRACCIONS EN MOVIMENT	VIGILÀNCIA POLICIAL	CONVIVÈNCIA VEINAL	ACTUACIONS DE S. C.	ACCIDENTS DE TRANŠIT SENSE FERITS	ACTES CONTRA LA PROPIETAT PRIVADA	INFRACCIONS EN GUALS I RESERVES	INFRACCIONS PER ESTACIONAMENTS	ACCIDENTS DE TRANŠIT AMB FERITS
4	Ciutat Meridiana	ALTRES ACTUACIONS DE S. C.	INFRACCIONS EN GUALS I RESERVES	VIOLENCIA DOMÈSTICA	VIGILÀNCIA POLICIAL	INFRACCIONS PER ESTACIONAMENTS	ASSISTÈNCIA A PERSONES EN EDIFICI	ACTIVITATS MOLESTES EN ESPAIS PUBLICS	CONVIVÈNCIA VEINAL	INFRACCIONS EN MOVIMENT

Figure 6 Top 10 most common incidents in each neighborhood