

## Tarea Final - Batalla de barrios(vecindarios) de Montevideo - Parte 2

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### 4. Análisis de datos con Foursquare

4.1 Filtrado de datos por Municipios seleccionados

Como indicamos en la 1era. parte, seleccionaremos para trabajar con Foursquare los datos de los municipios B, CH y E.

```
import pandas as pd
import numpy as np
import json # librería para manejar archivos JSON
!conda install -c conda-forge geopy --yes
from geopy.geocoders import Nominatim # convertir una dirección en valores de latitud y longitud
import requests # librería para manejar solicitudes
from pandas.io.json import json_normalize # librería para convertir un archivo json en un dataframe pandas
# Matplotlib y módulos asociados para graficar
import matplotlib.cm as cm
import matplotlib.colors as colors
# importar k-means desde la fase de agrupación
from sklearn.cluster import KMeans
#!conda install -c conda-forge folium=0.5.0 --yes # retirar el comentario de esta línea si no ha completado el laboratorio de la API de FourSquare
import folium # librería para graficar mapas
from folium.features import DivIcon
```

```
/bin/bash: conda: command not found
```

```
# Importamos los datos de los dataframes guardados en la primera parte.
```

```
df_montevideo_coord2 =  
pd.read_csv(r'/content/df_montevideo_coord2.csv')  
df_montevideo_coord2
```

	Barrio	Poblacion	Municipio	Latitud
Longitude				
0	Pocitos	67992	CH	-34.911123 -
56.150593				
1	Cordón	42456	B	-34.900827 -
56.180125				
2	Unión	39880	D, E y F	-34.880236 -
56.137688				
3	La Paloma, Tomkinson	37424	A	-34.858785 -
56.259420				
4	Buceo	36998	CH y E	-34.897800 -
56.128658				
5	Casavalle	35979	D	-34.828916 -
56.168784				
6	Peñarol, Lavalleja	34485	G	-34.841683 -
56.186343				
7	Parque Batlle, Villa Dolores	31153	CH	-34.896868 -
56.153383				
8	Nuevo París	29873	A y G	-34.839535 -
56.243839				
9	Cerro	28306	NaN	-34.889817 -
56.252625				
10	Malvín	28102	E	-34.889692 -
56.094768				
11	Paso de la Arena	24196	NaN	-34.825292 -
56.331215				
12	Punta Carretas	24181	B y CH	-34.920202 -
56.160065				
13	Villa Española	23472	D y F	-34.868058 -
56.145421				
14	Las Canteras	22974	E y F	-34.868839 -
56.105227				
15	Las Acacias	22872	NaN	-34.842008 -
56.159857				
16	Piedras Blancas	22569	D y F	-34.822737 -
56.142885				
17	Centro	22120	B	-34.906067 -
56.189656				
18	Belvedere	21970	NaN	-34.848604 -
56.222195				
19	Manga	20867	F	-34.809745 -
56.146950				
20	Conciliación	20319	G	-34.822295 -

56.230308				
21	La Teja	20054	A	-34.865598 -
56.228432				
22	Malvín Norte	19916	E	-34.877897 -
56.119281				
23	Jardines del Hipódromo	19742	F	-34.839122 -
56.131355				
24	Flor de Maroñas	19188	F	-34.850440 -
56.121137				
25	Aguada	18557	B y C	-34.896676 -
56.189366				
26	Larrañaga	17956	C y CH	-34.880441 -
56.158788				
27	Cerrito	17945	NaN	-34.853071 -
56.170104				
28	Capurro, Bella Vista	17295	NaN	-34.871059 -
56.212661				
29	Brazo Oriental	16812	C	-34.863540 -
56.180233				
30	Tres Cruces	15926	B y CH	-34.892518 -
56.167113				
31	Aires Puros	15733	C y D	-34.852529 -
56.189214				
32	Mercado Modelo, Bolívar	15572	C y D	-34.872611 -
56.154157				
33	Carrasco	15488	E	-34.885577 -
56.058150				
34	Ituzaingó	14960	F	-34.847731 -
56.143636				
35	Sayago	14692	G	-34.835738 -
56.212567				
36	Punta Gorda	14259	E	-34.899841 -
56.081571				
37	Reducto	14096	C	-34.877108 -
56.186682				
38	Villa Muñoz, Retiro	13866	NaN	-34.888648 -
56.178905				
39	Carrasco Norte	13339	E	-34.872898 -
56.072086				
40	Palermo	12992	B	-34.911288 -
56.180698				
41	Parque Rodó	12944	B	-34.910082 -
56.169778				
42	Barrio Sur	12639	B	-34.911202 -
56.194784				
43	Ciudad Vieja	12555	B	-34.906351 -
56.205979				
44	Paso de las Duranas	12093	G	-34.845731 -
56.204960				
45	La Comercial	11444	B y C	-34.886749 -

56.169093				
46	La Figurita	11273	C	-34.876757 -
56.176720				
47	La Blanqueada	9600	CH y E	-34.887700 -
56.154518				
48	Jacinto Vera	8767	C	-34.874534 -
56.171774				
49	Bañados de Carrasco	8705	F	-34.840727 -
56.079019				
50	Atahualpa	8607	C	-34.867351 -
56.190297				

```
# Importamos los datos de los dataframes guardados en la primera parte
df_montevideo_all_municipio =
pd.read_csv(r'/content/df_montevideo_all_municipio.csv')
df_montevideo_socioeconom_municipio =
pd.read_csv(r'/content/df_montevideo_socioeconom_municipio.csv')
print(df_montevideo_all_municipio.head())
print(df_montevideo_socioeconom_municipio.head())
```

	Municipio	Barrio
Poblacion		
0	F Villa García, Manga Rural	MangaMaroñas, Parque ...
133776		
1	G Peñarol, Lavalleja	Colón Centro y NoroesteConci...
123867		
2	B CordónCentroPalermoParque Rodó	Barrio SurCiudad...
115706		
3	CH PocitosParque Batlle, Villa Dolores	
99145		
4	E MalvínMalvín NorteCarrascoPunta Gorda	Carrasco ...
91104		

  

	Municipio	Nivel-SocioEconómico	IngresoHogar
0	E	4.819555	24178.803953
1	CH	4.729483	14636.900456
2	B y CH	4.543561	12299.547249
3	CH y E	3.926684	7442.671847
4	A y C	3.883621	6193.896552

```
# De acuerdo a lo requerido, se selecciona los barrios de los
municipios B, CH y E
# Se unen los dataframes y se eliminan duplicados, reseteando el
indice.
# Se descartan municipios que no fueron asignados, asignando a uno
fuera de la selección ("A")
df_montevideo_coord2['Municipio'] =
df_montevideo_coord2['Municipio'].fillna('A')
df_montevideo_b =
df_montevideo_coord2[df_montevideo_coord2['Municipio'].str.contains('B
')]
df_montevideo_ch =
```

```

df_montevideo_coord2[df_montevideo_coord2['Municipio'].str.contains('C
H')]
df_montevideo_e =
df_montevideo_coord2[df_montevideo_coord2['Municipio'].str.contains('E
')]
df_montevideo_bche =
pd.concat([df_montevideo_b,df_montevideo_ch,df_montevideo_e])
df_montevideo_bche.drop_duplicates(['Barrio'], inplace = True)
df_montevideo_bche.reset_index(drop = True)

```

	Barrio	Poblacion	Municipio	Latitud
Longitude				
0	Cordón	42456	B	-34.900827 -
56.180125				
1	Punta Carretas	24181	B y CH	-34.920202 -
56.160065				
2	Centro	22120	B	-34.906067 -
56.189656				
3	Aguada	18557	B y C	-34.896676 -
56.189366				
4	Tres Cruces	15926	B y CH	-34.892518 -
56.167113				
5	Palermo	12992	B	-34.911288 -
56.180698				
6	Parque Rodó	12944	B	-34.910082 -
56.169778				
7	Barrio Sur	12639	B	-34.911202 -
56.194784				
8	Ciudad Vieja	12555	B	-34.906351 -
56.205979				
9	La Comercial	11444	B y C	-34.886749 -
56.169093				
10	Pocitos	67992	CH	-34.911123 -
56.150593				
11	Buceo	36998	CH y E	-34.897800 -
56.128658				
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868 -
56.153383				
13	Larrañaga	17956	C y CH	-34.880441 -
56.158788				
14	La Blanqueada	9600	CH y E	-34.887700 -
56.154518				
15	Unión	39880	D, E y F	-34.880236 -
56.137688				
16	Malvín	28102	E	-34.889692 -
56.094768				
17	Las Canteras	22974	E y F	-34.868839 -
56.105227				
18	Malvín Norte	19916	E	-34.877897 -
56.119281				

19	Carrasco	15488	E -34.885577 -
56.058150			
20	Punta Gorda	14259	E -34.899841 -
56.081571			
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56.072086			

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')]
df_montevideo_ch =
df_montevideo_coord2[df_montevideo_coord2['Municipio'].str.contains('C
H')]
df_montevideo_e =
df_montevideo_coord2[df_montevideo_coord2['Municipio'].str.contains('E
')]
```

```
df_montevideo_bche =
pd.concat([df_montevideo_b,df_montevideo_ch,df_montevideo_e])
df_montevideo_bche.drop_duplicates(['Barrio'], inplace = True)
df_montevideo_bche.reset_index(drop = True)
```

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Longitude				
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56.160065				
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56.189656				
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56.189366				
4	Tres Cruces	15926	B y CH	-34.892518 -
56.167113				
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56.180698				
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56.169778				
7	Barrio Sur	12639	B	-34.911202 -
56.194784				
8	Ciudad Vieja	12555	B	-34.906351 -
56.205979				
9	La Comercial	11444	B y C	-34.886749 -
56.169093				
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56.150593				
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56.128658				
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56.153383				
13	Larrañaga	17956	C y CH	-34.880441 -
56.158788				
14	La Blanqueada	9600	CH y E	-34.887700 -
56.154518				
15	Unión	39880	D, E y F	-34.880236 -
56.137688				
16	Malvín	28102	E	-34.889692 -
56.094768				
17	Las Canteras	22974	E y F	-34.868839 -
56.105227				
18	Malvín Norte	19916	E	-34.877897 -
56.119281				
19	Carrasco	15488	E	-34.885577 -
56.058150				
20	Punta Gorda	14259	E	-34.899841 -
56.081571				

21 Carrasco Norte 13339 E -34.872898 -  
56.072086

## 4.2 Aplicación de API de Foursquare

```
# The code was removed by Watson Studio for sharing.  
  
# Ubicamos los datos de uno de los barrios de los municipios  
seleccionados.  
print('El barrio elegido para probar Foursquare es:' ,  
df_montevideo_bche.loc[0, 'Barrio'])  
barrio_latitud = df_montevideo_bche.loc[0, 'Latitud'] # latitud del  
barrio  
barrio_longitud = df_montevideo_bche.loc[0, 'Longitud'] # longitud  
del barrio  
barrio_name = df_montevideo_bche.loc[0, 'Barrio'] # nombre del barrio  
print('Latitud y longitud de {} son {},  
{},'.format(barrio_name,barrio_latitud,barrio_longitud))
```

El barrio elegido para probar Foursquare es: Pocitos  
Latitud y longitud de Pocitos son -34.9111227, -56.1505928.

```
CLIENT_ID = 'LVNSPMLTBBDPN2INEYVDDVFWLONMFATTHN1UX0KODIXDTMZA'  
CLIENT_SECRET = 'UU3FWAT2QOHGJHGYAGR54F5GFB4NJZFNDITCJZUTFCNW2OYI'  
VERSION = 20200514 # Foursquare API version
```

```
print('Credentials Stored')
```

Credentials Stored

```
# Para la API de Foursquare, cargamos los datos.Obtengamos los 100  
sitios en Marble Hill dentro de un radio de 500 metros.  
# Primero, generemos una URL de solicitud GET. Nombre su URL url.  
LIMIT = 100 # limit of number of venues returned by Foursquare API  
radius = 500 # define radius  
url = 'https://api.foursquare.com/v2/venues/explore?  
&client_id={}&client_secret={}&v={}&ll={},  
{&radius={}&limit={}}'.format(  
    CLIENT_ID,  
    CLIENT_SECRET,  
    VERSION,  
    barrio_latitud,  
    barrio_longitud,  
    radius,  
    LIMIT)  
url  
  
{"type": "string"}  
  
# Enviar la solicitud GET y examinar los resultados.  
results = requests.get(url).json()  
results
```



```
{'meta': {'code': 200, 'requestId': '62ae14946123a7205a6f22ec'},
  'response': {'groups': [{ 'items': [{ 'reasons': { 'count': 0,
    'items': [{ 'reasonName': 'globalInteractionReason',
      'summary': 'This spot is popular',
      'type': 'general' } ] },
    'referralId': 'e-0-4f3f42ace4b0d66d1ef42641-0',
    'venue': { 'categories': [{ 'icon': { 'prefix':
      'https://ss3.4sqi.net/img/categories_v2/travel/bedandbreakfast_',
        'suffix': '.png' },
        'id': '4bf58dd8d48988d1f8931735',
        'name': 'Bed & Breakfast',
        'pluralName': 'Bed & Breakfasts',
        'primary': True,
        'shortName': 'B & B' } ] },
        'id': '4f3f42ace4b0d66d1ef42641',
        'location': { 'address': '26 Marzo 1125',
          'cc': 'UY',
          'city': 'Montevideo',
          'country': 'Uruguay',
          'distance': 81,
          'formattedAddress': ['26 Marzo 1125',
            'Montevideo Montevideo',
            'Uruguay'],
          'labeledLatLngs': [{ 'label': 'display',
            'lat': -34.91043020494529,
            'lng': -56.15030094680103 } ] },
            'lat': -34.91043020494529,
            'lng': -56.15030094680103,
            'state': 'Montevideo' },
            'name': 'Destino 26',
            'photos': { 'count': 0, 'groups': [ ] } } ] },
            {'reasons': { 'count': 0,
              'items': [{ 'reasonName': 'globalInteractionReason',
                'summary': 'This spot is popular',
                'type': 'general' } ] },
                'referralId': 'e-0-4e74e8f6c65bb91db41f997e-1',
                'venue': { 'categories': [{ 'icon': { 'prefix':
                  'https://ss3.4sqi.net/img/categories_v2/food/dessert_',
                    'suffix': '.png' },
                    'id': '4bf58dd8d48988d1d0941735',
                    'name': 'Dessert Shop',
                    'pluralName': 'Dessert Shops',
                    'primary': True,
                    'shortName': 'Desserts' } ] },
                    'id': '4e74e8f6c65bb91db41f997e',
                    'location': { 'address': 'José Martí 3340',
                      'cc': 'UY',
                      'city': 'Montevideo',
                      'country': 'Uruguay',
                      'crossStreet': 'Chucarro',
```

```
'distance': 162,
'formattedAddress': ['José Martí 3340 (Chucarro)',
'Montevideo Montevideo',
'Uruguay'],
'labeledLatLngs': [{'label': 'display',
'lat': -34.91218,
'lng': -56.149359}],
'lat': -34.91218,
'lng': -56.149359,
'neighborhood': 'Pocitos',
'state': 'Montevideo'},
'name': 'Petite Patisserie De Flor',
'photos': {'count': 0, 'groups': []}},
{'reasons': {'count': 0,
'items': [{'reasonName': 'globalInteractionReason',
'summary': 'This spot is popular',
'type': 'general'}]},
'referralId': 'e-0-4d0cfb9c3905b1f7d9a9974b-2',
'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/dessert_',
'suffix': '.png'},
'id': '4bf58dd8d48988d1d0941735',
'name': 'Dessert Shop',
'pluralName': 'Dessert Shops',
'primary': True,
'shortName': 'Desserts'}]},
'id': '4d0cfb9c3905b1f7d9a9974b',
'location': {'address': 'José Ellauri 1067',
'cc': 'UY',
'city': 'Montevideo',
'country': 'Uruguay',
'distance': 211,
'formattedAddress': ['José Ellauri 1067',
'Montevideo Montevideo',
'Uruguay'],
'labeledLatLngs': [{'label': 'display',
'lat': -34.911404569561256,
'lng': -56.15288805771525}],
'lat': -34.911404569561256,
'lng': -56.15288805771525,
'state': 'Montevideo'},
'name': "Cake's",
'photos': {'count': 0, 'groups': []}},
{'reasons': {'count': 0,
'items': [{'reasonName': 'globalInteractionReason',
'summary': 'This spot is popular',
'type': 'general'}]},
'referralId': 'e-0-5bbd58d386f4cc002c0936dc-3',
'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
```

```
    'suffix': '.png'},
    'id': '4bf58dd8d48988d16d941735',
    'name': 'Café',
    'pluralName': 'Cafés',
    'primary': True,
    'shortName': 'Café']],
    'id': '5bbd58d386f4cc002c0936dc',
    'location': {'address': 'Avenida Brasil 2858',
    'cc': 'UY',
    'city': 'Montevideo',
    'country': 'Uruguay',
    'crossStreet': 'Santiago Vazquez',
    'distance': 218,
    'formattedAddress': ['Avenida Brasil 2858 (Santiago Vazquez)',
    '11300 Montevideo Montevideo',
    'Uruguay'],
    'labeledLatLngs': [{'label': 'display',
    'lat': -34.910305,
    'lng': -56.152765}],
    'lat': -34.910305,
    'lng': -56.152765,
    'postalCode': '11300',
    'state': 'Montevideo'},
    'name': 'La Latina Café',
    'photos': {'count': 0, 'groups': []}},
    {'reasons': {'count': 0,
    'items': [{'reasonName': 'globalInteractionReason',
    'summary': 'This spot is popular',
    'type': 'general'}]},
    'referralId': 'e-0-507c998ae4b068bf277cf8a0-4',
    'venue': {'categories': [{'icon': {'prefix':
    'https://ss3.4sqi.net/img/categories_v2/food/japanese_',
    'suffix': '.png'},
    'id': '4bf58dd8d48988d111941735',
    'name': 'Japanese Restaurant',
    'pluralName': 'Japanese Restaurants',
    'primary': True,
    'shortName': 'Japanese'}]},
    'id': '507c998ae4b068bf277cf8a0',
    'location': {'address': 'Gabriel Pereira 3138',
    'cc': 'UY',
    'city': 'Montevideo',
    'country': 'Uruguay',
    'crossStreet': '26 de marzo',
    'distance': 322,
    'formattedAddress': ['Gabriel Pereira 3138 (26 de marzo)',
    'Montevideo Montevideo',
    'Uruguay'],
    'labeledLatLngs': [{'label': 'display',
    'lat': -34.90888601128947,
```

```
    'lng': -56.148351249791304}},
    'lat': -34.90888601128947,
    'lng': -56.148351249791304,
    'state': 'Montevideo'},
    'name': 'Miyagi Shushi',
    'photos': {'count': 0, 'groups': []}},
    {'reasons': {'count': 0,
    'items': [{'reasonName': 'globalInteractionReason',
    'summary': 'This spot is popular',
    'type': 'general'}]},
    'referralId': 'e-0-4b73436cf964a52015a52de3-5',
    'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/italian_',
    'suffix': '.png'},
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'Uruguay'],
'labeledLatLngs': [{'label': 'display',
'lat': -34.91305047403022,
'lng': -56.14859104156494}],
'lat': -34.91305047403022,
'lng': -56.14859104156494,
'postalCode': '11300',
'state': 'Montevideo'},
'name': 'Restaurant Hong Kong',

```

```

    'photos': {'count': 0, 'groups': []}},
    {'reasons': {'count': 0,
      'items': [{'reasonName': 'globalInteractionReason',
        'summary': 'This spot is popular',
        'type': 'general'}]},
      'referralId': 'e-0-4e4459b352b18fcc7999f667-59',
      'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/sports_outdoors_',
      'suffix': '.png'},
        'id': '4bf58dd8d48988d1f2941735',
        'name': 'Sporting Goods Shop',
        'pluralName': 'Sporting Goods Shops',
        'primary': True,
        'shortName': 'Sporting Goods'}]},
        'id': '4e4459b352b18fcc7999f667',
        'location': {'address': 'Miguel Barreiro 3243',
          'cc': 'UY',
          'city': 'Montevideo',
          'country': 'Uruguay',
          'crossStreet': 'Berro',
          'distance': 430,
          'formattedAddress': ['Miguel Barreiro 3243 (Berro)',
            '11300 Montevideo Montevideo',
            'Uruguay'],
          'labeledLatLngs': [{'label': 'display',
            'lat': -34.90903229089157,
            'lng': -56.14662338870139}],
          'lat': -34.90903229089157,
          'lng': -56.14662338870139,
          'postalCode': '11300',
          'state': 'Montevideo'},
          'name': 'Motociclo Sports',
          'photos': {'count': 0, 'groups': []}},
          {'reasons': {'count': 0,
            'items': [{'reasonName': 'globalInteractionReason',
              'summary': 'This spot is popular',
              'type': 'general'}]},
              'referralId': 'e-0-4fa76121d5fb145d03817ca3-60',
              'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/pharmacy_',
                'suffix': '.png'},
                  'id': '4bf58dd8d48988d10f951735',
                  'name': 'Pharmacy',
                  'pluralName': 'Pharmacies',
                  'primary': True,
                  'shortName': 'Pharmacy'}]},
                    'id': '4fa76121d5fb145d03817ca3',
                    'location': {'address': 'Benito Blanco 1098',
                      'cc': 'UY',
                      'city': 'Montevideo',

```

```
'country': 'Uruguay',
'crossStreet': 'Guayaquí',
'distance': 348,
'formattedAddress': ['Benito Blanco 1098 (Guayaquí)',
'11300 Montevideo Montevideo',
'Uruguay'],
'labeledLatLngs': [{'label': 'display',
'lat': -34.91202991399955,
'lng': -56.14693880081177}],
'lat': -34.91202991399955,
'lng': -56.14693880081177,
'postalCode': '11300',
'state': 'Montevideo'},
'name': 'Farmashop 12',
'photos': {'count': 0, 'groups': []}},
{'reasons': {'count': 0,
'items': [{'reasonName': 'globalInteractionReason',
'summary': 'This spot is popular',
'type': 'general'}]},
'referralId': 'e-0-50db73cee4b03ac47d6e6a80-61',
'venue': {'categories': [{'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/food_liquor_',
'suffix': '.png'},
'id': '4bf58dd8d48988d186941735',
'name': 'Liquor Store',
'pluralName': 'Liquor Stores',
'primary': True,
'shortName': 'Liquor Store'}]},
'id': '50db73cee4b03ac47d6e6a80',
'location': {'address': 'Juan Benito Blanco',
'cc': 'UY',
'city': 'Montevideo',
'country': 'Uruguay',
'crossStreet': 'Gabriel Pereyra',
'distance': 431,
'formattedAddress': ['Juan Benito Blanco (Gabriel Pereyra)',
'11300 Montevideo Montevideo',
'Uruguay'],
'labeledLatLngs': [{'label': 'display',
'lat': -34.911285436456524,
'lng': -56.145868168732456}],
'lat': -34.911285436456524,
'lng': -56.145868168732456,
'postalCode': '11300',
'state': 'Montevideo'},
'name': 'Tequila Macho',
'photos': {'count': 0, 'groups': []}}},
'name': 'recommended',
'type': 'Recommended Places'}],
'headerFullLocation': 'Pocitos, Montevideo',
```

```

'headerLocation': 'Pocitos',
'headerLocationGranularity': 'neighborhood',
'queryRefinements': {'refinements': [{'query': 'Food'},
{'query': 'Nightlife'},
{'query': 'Coffee'},
{'query': 'Shops'},
{'query': 'Arts'},
{'query': 'Outdoors'}]},
'target': {'params': {'ll': '-34.911123,-56.150593', 'radius':
'500'},
'type': 'path',
'url': '/venue/explore'}},
'suggestedBounds': {'ne': {'lat': -34.9066226955, 'lng': -
56.14511550847283},
'sw': {'lat': -34.9156227045, 'lng': -56.15607009152717}},
'suggestedFilters': {'filters': [{'key': 'openNow', 'name': 'Open
now'}]},
'header': 'Tap to show:}',
'totalResults': 62}}

```

*# Del laboratorio anterior de FourSquare sabemos que toda la información esta en la llave items.*

*# Antes de avanzar, usemos la función get\_category\_type del laboratorio anteriores.*

*# función para extraer la categoría del sitio*

```

def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']

```

*# Ahora estamos listos para limpiar el objeto json y estructurarlo en un dataframe pandas*

```

venues = results['response']['groups'][0]['items']
nearby_venues = json_normalize(venues) # objeto JSON

```

*# filtrar columnas*

```

filtered_columns = ['venue.name', 'venue.location.address',
'venue.categories', 'venue.location.lat', 'venue.location.lng']
nearby_venues = nearby_venues.loc[:, filtered_columns]

```

*# filtrar la categoría para cada fila*

```

nearby_venues['venue.categories'] =
nearby_venues.apply(get_category_type, axis=1)

```



```
# limpiar columnas
nearby_venues.columns = [col.split(".")[0] for col in
nearby_venues.columns]
nearby_venues.head()
```

```
# ¿Cuántos sitios nos regresó FourSquare?
print('{} venues fueron devueltos por
Foursquare.'.format(nearby_venues.shape[0]))
```

62 venues fueron devueltos por Foursquare.

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:17:
FutureWarning: pandas.io.json.json_normalize is deprecated, use
pandas.json_normalize instead
```

```
nearby_venues.head()
```

	categories \	name	address	
0	Destino 26	26 Marzo 1125	Bed &	
1	Petite Patisserie De Flor Shop	José Martí 3340	Dessert	
2	Cake's Shop	José Ellauri 1067	Dessert	
3	La Latina Café	Avenida Brasil 2858		
4	Miyagi Shushi Restaurant	Gabriel Pereira 3138	Japanese	

	lat	lng
0	-34.910430	-56.150301
1	-34.912180	-56.149359
2	-34.911405	-56.152888
3	-34.910305	-56.152765
4	-34.908886	-56.148351

```
# filtramos por los que son competencia, o sea categoria "Gym /
Fitness Center "
nearby_gym_fitness = nearby_venues[nearby_venues['categories'] == 'Gym
/ Fitness Center']
print('{} gyms-fitness center en {} fueron devueltos por
Foursquare.'.format(nearby_gym_fitness.shape[0],results['response']
['headerFullLocation']))
nearby_gym_fitness
```

2 gyms-fitness center en Pocitos, Montevideo fueron devueltos por Foursquare.

lng	name	address	categories	lat
-----	------	---------	------------	-----

```
6   Aerobic   Av. 26 de Marzo 1069   Gym / Fitness Center -34.911045 -
56.151235
16  Aerobic   Gabriel Pereira 3119   Gym / Fitness Center -34.908552 -
56.148650
```

En principio no habria mucha competencia en uno de los barrios de mayor población y nivel socioecoómico. Veamos que otras categorias tenemos en el dataframe

```
print(nearby_venues['categories'].unique())

['Bed & Breakfast' 'Dessert Shop' 'Café' 'Japanese Restaurant'
 'Italian Restaurant' 'Gym / Fitness Center' 'Falafel Restaurant'
 'Pizza Place' 'Restaurant' 'Burger Joint' 'Latin American Restaurant'
 'Beach' 'Scenic Lookout' 'Sandwich Place' 'Ice Cream Shop'
 'Shopping Mall' 'Coffee Shop' 'Hotel' 'Empanada Restaurant'
 'South American Restaurant' 'Basketball Stadium' 'Newsstand' 'BBQ
 Joint'
 'Bar' 'Multiplex' 'Bakery' 'Convenience Store' 'Steakhouse' 'Market'
 'Middle Eastern Restaurant' 'Beer Store' 'Supermarket' 'Pharmacy'
 'Hot Dog Joint' 'Mexican Restaurant' 'Paper / Office Supplies Store'
 'Cocktail Bar' 'Nightclub' 'Hostel' 'Diner' 'Chinese Restaurant'
 'Sporting Goods Shop' 'Liquor Store']
```

```
# Filtremos por Sporting Goods Shop y Basketball stadium
nearby_sports = nearby_venues[nearby_venues['categories'] == 'Sporting
Goods Shop']
nearby_sports2 = nearby_venues[nearby_venues['categories'] ==
'Basketball Stadium']
print('{} sports center en {} fueron devueltos por
Foursquare.'.format(nearby_sports.shape[0]+nearby_sports2.shape[0],res
ults['response']['headerFullLocation']))
nearby_sports.append(nearby_sports2)
```

2 sports center en Pocitos, Montevideo fueron devueltos por Foursquare.

	lat \	name	address	categories
59	34.909032	Motociclo Sports	Miguel Barreiro 3243	Sporting Goods Shop -
29	34.912473	Club Trouville	Chucarro 1031	Basketball Stadium -
	lng			
59	-56.146623			
29	-56.149755			

### 4.3 Preparación de datos para clustering

Vamos a crear una función que repita el mismo proceso para todos los barrios de los municipios B,CH,E

```

def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

        # crear la URL de solicitud de API
        url = 'https://api.foursquare.com/v2/venues/explore?
&client_id={}&client_secret={}&v={}&ll={},
{}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

        # solicitud GET
        results = requests.get(url).json()["response"]['groups'][0]
        ['items']

        # regresa solo información relevante de cada sitio cercano
        venues_list.append([
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['location']['formattedAddress'][0],
            v['venue']['categories'][0]['name']) for v in results])

    nearby_venues = pd.DataFrame([item for venue_list in venues_list
    for item in venue_list])
    nearby_venues.columns = ['Barrio',
                            'Barrio Latitud',
                            'Barrio Longitud',
                            'Local',
                            'Local Latitud',
                            'Local Longitud',
                            'Local Dirección(esquina)',
                            'Local Categoría']

    return(nearby_venues)

```

Ahora desarrollamos el código para determinar los sitios por barrio de los municipios B,CH y E, y creamos un dataframe **df\_montevideo\_bche\_sitios**.

```

df_montevideo_bche_sitios =
getNearbyVenues(names=df_montevideo_bche['Barrio'],

latitudes=df_montevideo_bche['Latitud'],

longitudes=df_montevideo_bche['Longitude']
)
#results
print(df_montevideo_bche_sitios.shape)
df_montevideo_bche_sitios.head(20)

```

```

Cordón
Punta Carretas
Centro
Aguada
Tres Cruces
Palermo
Parque Rodó
Barrio Sur
Ciudad Vieja
La Comercial
Pocitos
Buceo
Parque Batlle, Villa Dolores
Larrañaga
La Blanqueada
Unión
Malvín
Las Canteras
Malvín Norte
Carrasco
Punta Gorda
Carrasco Norte
(575, 8)

```

	Barrio	Barrio	Latitud	Barrio	Longitud	
Local \						
0	Cordón		-34.900827	-56.180125		La
	Trastienda Club					
1	Cordón		-34.900827	-56.180125		Feria de Tristán
	Narvaja					
2	Cordón		-34.900827	-56.180125		Confitería
	Carrera					
3	Cordón		-34.900827	-56.180125		Plaza de
	los 33					
4	Cordón		-34.900827	-56.180125	Asociación Cristiana de	
	Jóvenes					
5	Cordón		-34.900827	-56.180125		Palacio
	Peñarol					
6	Cordón		-34.900827	-56.180125		

Verde			
7	Cordón	-34.900827	-56.180125
Don Koto			
8	Cordón	-34.900827	-56.180125
Donut City			
9	Cordón	-34.900827	-56.180125
Mosca			
10	Cordón	-34.900827	-56.180125
Galpón			Teatro El
11	Cordón	-34.900827	-56.180125
Fábrica			La
12	Cordón	-34.900827	-56.180125
Touring			Bar
13	Cordón	-34.900827	-56.180125
Notariado			Teatro
14	Cordón	-34.900827	-56.180125
Club BPS			
15	Cordón	-34.900827	-56.180125
Finisterre Bar			
16	Cordón	-34.900827	-56.180125
Sportman			Gran
17	Cordón	-34.900827	-56.180125
Tortugueta			La
18	Cordón	-34.900827	-56.180125
Julio			Subway 18 de
19	Cordón	-34.900827	-56.180125
Uruguay			Red Mango

	Local Latitud	Local Longitud \
0	-34.898455	-56.178493
1	-34.899993	-56.178761
2	-34.902545	-56.179903
3	-34.903020	-56.180370
4	-34.900806	-56.176413
5	-34.898751	-56.182473
6	-34.899519	-56.179068
7	-34.901973	-56.178894
8	-34.904526	-56.181488
9	-34.904858	-56.181968
10	-34.904677	-56.180812
11	-34.900829	-56.178135
12	-34.902908	-56.181003
13	-34.903872	-56.178613
14	-34.901414	-56.180063
15	-34.904712	-56.177536
16	-34.902246	-56.177341
17	-34.900839	-56.178354
18	-34.901786	-56.175207
19	-34.901831	-56.175270

	Local Dirección(esquina) \
0	Fernández Crespo 1763 (Paysandú)
1	Tristán Narvaja (e/ Av. 18 de Julio y La Paz)
2	Magallanes (Colonia)
3	Av. 18 de Julio (e/ Minas y Magallanes)
4	Colonia 1870 (Eduardo Acevedo)
5	Magallanes 1721 (Galicia)
6	Montevideo Montevideo
7	Colonia 1758 (Gaboto)
8	Carlos Roxlo 1381
9	Av. 18 de Julio 1578 (Carlos Roxlo)
10	Avda. 18 de Julio 1618 (Carlos Roxlo)
11	Tristán Narvaja 1586 (Mercedes)
12	Colonia 1650 (Minas)
13	Montevideo Montevideo
14	Mercedes 1723 (Magallanes)
15	José Enrique Rodó 1799 (Gaboto)
16	18 de Julio (Tristán Narvaja)
17	Tristán Narvaja 1597 (Mercedes)
18	18 de Julio 1902 (Juan A. Rodríguez)
19	Calle Dr. Juan A. Rodriguez 1902

	Local Categoria
0	Music Venue
1	Flea Market
2	Dessert Shop
3	Plaza
4	Gym / Fitness Center
5	Basketball Court
6	Bar
7	BBQ Joint
8	Donut Shop
9	Paper / Office Supplies Store
10	Theater
11	Pizza Place
12	Breakfast Spot
13	Theater
14	Gym
15	Bar
16	South American Restaurant
17	Pizza Place
18	Sandwich Place
19	Ice Cream Shop

*# Exportamos el dataframe para guardarlo en Datos*

```
df_montevideo_bche_sitios.to_csv('df_montevideo_bche_sitios.csv',
index = False)
```

*#Contamos la cantidad de sitios por barrio*

```
print('Locales por Barrio',df_montevideo_bche_sitios.groupby('Barrio'))
```

```
[ 'Local'].count())
print('Se detectaron {} categorias
únicas.'.format(len(df_montevideo_bche_sitios[ 'Local
Categoria'].unique())))
```

Locales por Barrio Barrio

Aguada	7
Barrio Sur	37
Buceo	5
Carrasco	40
Carrasco Norte	4
Centro	62
Ciudad Vieja	67
Cordón	33
La Blanqueada	8
La Comercial	9
Larrañaga	6
Malvín	9
Malvín Norte	3
Palermo	33
Parque Batlle, Villa Dolores	14
Parque Rodó	58
Pocitos	62
Punta Carretas	85
Punta Gorda	6
Tres Cruces	22
Unión	5

Name: Local, dtype: int64

Se detectaron 133 categorias únicas.

*# Determinamos las categorias*

```
df_montevideo_bche_sitios[ 'Local Categoria'].unique()
```

```
array(['Music Venue', 'Flea Market', 'Dessert Shop', 'Plaza',
      'Gym / Fitness Center', 'Basketball Court', 'Bar', 'BBQ Joint',
      'Donut Shop', 'Paper / Office Supplies Store', 'Theater',
      'Pizza Place', 'Breakfast Spot', 'Gym',
      'South American Restaurant', 'Sandwich Place', 'Ice Cream
Shop',
      'Supermarket', 'Clothing Store', 'Gay Bar', 'Convenience
Store',
      'Coffee Shop', 'Soccer Field', 'Deli / Bodega',
      'Mediterranean Restaurant', 'Hotel', 'Café', 'Boutique',
      'Shoe Store', 'Tea Room', 'Restaurant', 'Shopping Mall',
      'Steakhouse', 'Wine Bar', 'Public Art', 'Golf Course',
      'Sushi Restaurant', 'Shop & Service', 'Mexican Restaurant',
      'Modern European Restaurant', "Women's Store", 'Night Market',
      'Burger Joint', 'Multiplex', 'Electronics Store', "Men's
Store",
      'Bookstore', 'Italian Restaurant', 'Bakery',
      'Fast Food Restaurant', 'Taco Place', 'Latin American
```

```

Restaurant',
    'Kebab Restaurant', 'Spanish Restaurant', 'Fountain',
'Gastropub',
    'Arts & Crafts Store', 'Scenic Lookout', 'Snack Place',
    'Chinese Restaurant', 'Pub', 'Art Gallery', 'Hostel',
'Pharmacy',
    'Movie Theater', 'Museum', 'Market', 'Athletics & Sports',
    'Train Station', 'Nightclub', 'Food & Drink Shop', 'Grocery
Store',
    'Food Court', 'Cafeteria', 'Other Great Outdoors',
    'Basketball Stadium', 'Stadium', 'Marijuana Dispensary',
    'Hot Dog Joint', 'Bistro', 'Diner', 'Brewery', 'Cocktail Bar',
    'Food', 'Irish Pub', 'Tapas Restaurant', 'American Restaurant',
    'Lounge', 'Empanada Restaurant', 'Casino', 'Smoothie Shop',
    'Furniture / Home Store', 'Concert Hall', 'Salsa Club',
    'Comfort Food Restaurant', 'History Museum', 'Health Food
Store',
    'Pedestrian Plaza', 'Salad Place', 'Vegetarian / Vegan
Restaurant',
    'Juice Bar', 'Swiss Restaurant', 'Art Museum', 'Design Studio',
    'Opera House', 'Southern / Soul Food Restaurant',
    'Monument / Landmark', 'Government Building', 'Chocolate Shop',
    'Bed & Breakfast', 'Science Museum', 'Bus Station',
    'Middle Eastern Restaurant', 'Japanese Restaurant',
    'Falafel Restaurant', 'Beach', 'Newsstand', 'Beer Store',
    'Sporting Goods Shop', 'Liquor Store', 'Park', 'Indie Theater',
    'Soccer Stadium', 'Track Stadium', 'Medical Center',
    'Department Store', 'Playground', 'Tennis Court', 'Gourmet
Shop',
    'German Restaurant', 'Toy / Game Store', 'Smoke Shop',
    'Seafood Restaurant'], dtype=object)

```

*# Filtramos el dataframe por las categorias que tengan que ver con deportes, gym, parques, outodoors, playas, etc. y lugares de comida.*

```

df_montevideo_gym =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Gym')]
df_montevideo_sport =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Sport')]
df_montevideo_outdoors =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Outdoor')]
df_montevideo_parques =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Park')]
df_montevideo_plazas =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Plaza')]
df_montevideo_estadios =

```



```

df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Stadium')]
df_montevideo_playas =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Beach')]
df_montevideo_basket =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Basket')]
df_montevideo_futbol =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Soccer')]
df_montevideo_golf =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Golf')]
df_montevideo_tennis =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Tennis')]
df_montevideo_restaurant =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Restaurant')]
df_montevideo_food =
df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local
Categoria'].str.contains('Food')]

df_montevideo_sport_foods_sitios =
pd.concat([df_montevideo_gym,df_montevideo_sport,df_montevideo_outdoor
s,df_montevideo_parques,

df_montevideo_plazas,df_montevideo_estadios,df_montevideo_playas,df_mo
ntevideo_basket,

df_montevideo_futbol,df_montevideo_tennis,df_montevideo_golf,df_montev
ideo_food,

df_montevideo_restaurant])
df_montevideo_sport_foods_sitios.drop_duplicates(['Local'], inplace =
True)

# Exportamos y mostramos el nuevo dataframe solo con los sitios que
nos interesan.
df_montevideo_sport_foods_sitios.to_csv('df_montevideo_sport_foods_sit
ios.csv', index = False)
df_montevideo_sport_foods_sitios.reset_index(drop=True)

```

	Barrio	Barrio	Latitud	Barrio	Longitud	\
0		Cordón	-34.900827		-56.180125	
1		Cordón	-34.900827		-56.180125	
2	Punta	Carretas	-34.920202		-56.160065	
3	Punta	Carretas	-34.920202		-56.160065	
4	Punta	Carretas	-34.920202		-56.160065	

157	Carrasco	-34.885577	-56.058150
158	Carrasco	-34.885577	-56.058150
159	Carrasco	-34.885577	-56.058150
160	Punta Gorda	-34.899841	-56.081571
161	Punta Gorda	-34.899841	-56.081571

	Local	Local Latitud	Local Longitud \
0	Asociación Cristiana de Jóvenes	-34.900806	-56.176413
1	Club BPS	-34.901414	-56.180063
2	Instinto Crossfit	-34.917322	-56.157522
3	Beauty Planet	-34.921482	-56.156163
4	Via Aqua Spa	-34.924113	-56.157570
157	Dackel	-34.889256	-56.057562
158	Hoy Te Quiero	-34.889672	-56.056654
159	Tajamar Restó	-34.883163	-56.061224
160	Hemingway	-34.898744	-56.082226
161	Chivitos Marcos	-34.896074	-56.080180

	Local Dirección(esquina)	Local
Categoria		
0	Colonia 1870 (Eduardo Acevedo)	Gym / Fitness
Center		
1	Mercedes 1723 (Magallanes)	
Gym		
2	21 De Setiembre 2745 (Luis De La Torre)	Gym / Fitness
Center		
3	Blanca Del Tabaré 2990 (Ellaauri)	
Gym		
4	Victor Soliño 375	
Gym		
..	...	..
.		
157	Gabriel Otero 6438 (Arocena)	German
Restaurant		
158	Arocena (Otero)	
Restaurant		
159	Lieja 6416 (Divina Comedia)	American
Restaurant		
160	Rambla República de México 5535	Seafood
Restaurant		
161	Coimbra (Gral. Paz)	Latin American
Restaurant		

[162 rows x 8 columns]

```
df_montevideo_sport_foods_sitios.to_csv('df_montevideo_sport_foods_sitios.csv', index = False)
```

```
#Contamos la cantidad de sitios por barrio
print('Locales por
Barrio',df_montevideo_sport_foods_sitios.groupby('Barrio')
['Local'].count())
print('Se detectaron {} categorias
únicas.'.format(len(df_montevideo_sport_foods_sitios['Local
Categoria'].unique())))
```

```
Locales por Barrio Barrio
Aguada 1
Barrio Sur 3
Buceo 1
Carrasco 14
Carrasco Norte 1
Centro 13
Ciudad Vieja 21
Cordón 8
La Blanqueada 3
La Comercial 1
Larrañaga 5
Malvín 4
Malvín Norte 2
Palermo 14
Parque Batlle, Villa Dolores 11
Parque Rodó 12
Pocitos 15
Punta Carretas 21
Punta Gorda 5
Tres Cruces 6
Unión 1
Name: Local, dtype: int64
Se detectaron 45 categorias únicas.
```

### Ahora procedemos a preparar los datos para el clustering

```
# codificación
montevideo_sport_foods_onehot =
pd.get_dummies(df_montevideo_sport_foods_sitios[['Local Categoria']],
prefix="", prefix_sep="")

# añadir la columna de barrio de regreso al dataframe
montevideo_sport_foods_onehot['Barrio'] =
df_montevideo_sport_foods_sitios['Barrio']

# mover la columna de barrio a la primer columna
fixed_columns = [montevideo_sport_foods_onehot.columns[-1]] +
list(montevideo_sport_foods_onehot.columns[:-1])
montevideo_sport_foods_onehot =
montevideo_sport_foods_onehot[fixed_columns]
```

```
montevideo_sport_foods_onehot.reset_index(drop=True).head()
```

	Barrio	American Restaurant	Athletics & Sports	Basketball
Court \				
0	Cordón	0	0	
0				
1	Cordón	0	0	
0				
2	Punta Carretas	0	0	
0				
3	Punta Carretas	0	0	
0				
4	Punta Carretas	0	0	
0				

	Basketball Stadium	Beach	Chinese Restaurant	Comfort Food
Restaurant \				
0	0	0	0	
0				
1	0	0	0	
0				
2	0	0	0	
0				
3	0	0	0	
0				
4	0	0	0	
0				

	Empanada Restaurant	Falafel Restaurant	...	\
0	0	0	...	
1	0	0	...	
2	0	0	...	
3	0	0	...	
4	0	0	...	

	Southern / Soul Food Restaurant	Spanish Restaurant	Sporting Goods
Shop \			
0	0	0	
0			
1	0	0	
0			
2	0	0	
0			
3	0	0	
0			
4	0	0	
0			

	Stadium	Sushi Restaurant	Swiss Restaurant	Tapas Restaurant	\
--	---------	------------------	------------------	------------------	---

```

0          0          0          0          0
1          0          0          0          0
2          0          0          0          0
3          0          0          0          0
4          0          0          0          0

```

```

      Tennis Court  Track Stadium  Vegetarian / Vegan Restaurant
0                0                0                0
1                0                0                0
2                0                0                0
3                0                0                0
4                0                0                0

```

[5 rows x 46 columns]

```
print(montevideo_sport_foods_onehot.shape)
```

```
(162, 46)
```

```
montevideo_sport_foods_onehot.to_csv('montevideo_sport_foods_onehot.csv', index = False)
```

**Agrupemos las filas por barrios tomando la média de la frecuencia de la ocurrencia de cada categoría**

```
montevideo_sport_foods_grouped =
montevideo_sport_foods_onehot.groupby('Barrio').mean().reset_index()
montevideo_sport_foods_grouped
```

```

Sports \
0          Barrio American Restaurant  Athletics &
0.000000          Aguada                0.000000
1          Barrio Sur                0.333333
0.000000
2          Buceo                0.000000
0.000000
3          Carrasco                0.142857
0.000000
4          Carrasco Norte                0.000000
0.000000
5          Centro                0.000000
0.076923
6          Ciudad Vieja                0.000000
0.000000
7          Cordón                0.000000
0.000000
8          La Blanqueada                0.000000
0.333333
9          La Comercial                0.000000
0.000000

```

10	Larrañaga	0.000000
0.000000		
11	Malvín	0.000000
0.000000		
12	Malvín Norte	0.000000
0.000000		
13	Palermo	0.000000
0.000000		
14	Parque Batlle, Villa Dolores	0.000000
0.090909		
15	Parque Rodó	0.083333
0.000000		
16	Pocitos	0.000000
0.000000		
17	Punta Carretas	0.000000
0.000000		
18	Punta Gorda	0.000000
0.000000		
19	Tres Cruces	0.000000
0.000000		
20	Unión	0.000000
0.000000		

	Basketball Court	Basketball Stadium	Beach	Chinese Restaurant
\				
0	0.000000	0.000000	0.000000	0.000000
1	0.000000	0.000000	0.000000	0.000000
2	0.000000	0.000000	0.000000	0.000000
3	0.000000	0.000000	0.000000	0.000000
4	0.000000	0.000000	0.000000	0.000000
5	0.000000	0.000000	0.000000	0.076923
6	0.000000	0.000000	0.000000	0.000000
7	0.250000	0.000000	0.000000	0.000000
8	0.333333	0.000000	0.000000	0.000000
9	0.000000	0.000000	0.000000	0.000000
10	0.000000	0.000000	0.000000	0.000000
11	0.000000	0.000000	0.000000	0.000000

12	0.000000	0.000000	0.000000	0.000000
13	0.071429	0.071429	0.000000	0.000000
14	0.000000	0.000000	0.000000	0.000000
15	0.000000	0.000000	0.000000	0.000000
16	0.000000	0.066667	0.133333	0.066667
17	0.000000	0.000000	0.000000	0.000000
18	0.000000	0.000000	0.200000	0.000000
19	0.000000	0.000000	0.000000	0.166667
20	0.000000	0.000000	0.000000	0.000000

	Comfort Food Restaurant	Empanada Restaurant	Falafel Restaurant
0	0.000000	0.000000	
0.000000 ...			
1	0.000000	0.000000	
0.000000 ...			
2	0.000000	0.000000	
0.000000 ...			
3	0.071429	0.000000	
0.000000 ...			
4	0.000000	0.000000	
0.000000 ...			
5	0.000000	0.000000	
0.000000 ...			
6	0.047619	0.000000	
0.000000 ...			
7	0.000000	0.000000	
0.000000 ...			
8	0.000000	0.000000	
0.000000 ...			
9	0.000000	0.000000	
0.000000 ...			
10	0.000000	0.000000	
0.000000 ...			
11	0.000000	0.000000	
0.000000 ...			
12	0.000000	0.000000	
0.000000 ...			
13	0.000000	0.000000	
0.000000 ...			

14		0.000000	0.000000
0.000000	...		
15		0.000000	0.000000
0.000000	...		
16		0.000000	0.066667
0.066667	...		
17		0.000000	0.000000
0.000000	...		
18		0.000000	0.000000
0.000000	...		
19		0.000000	0.000000
0.000000	...		
20		0.000000	0.000000
0.000000	...		

	Southern / Soul Food Restaurant	Spanish Restaurant	Sporting
Goods Shop \			

0	0.000000	0.000000
0.000000		
1	0.000000	0.000000
0.000000		
2	0.000000	0.000000
0.000000		
3	0.000000	0.000000
0.000000		
4	0.000000	0.000000
0.000000		
5	0.000000	0.076923
0.000000		
6	0.047619	0.000000
0.000000		
7	0.000000	0.000000
0.000000		
8	0.000000	0.000000
0.000000		
9	0.000000	0.000000
0.000000		
10	0.000000	0.000000
0.000000		
11	0.000000	0.000000
0.000000		
12	0.000000	0.000000
0.000000		
13	0.000000	0.000000
0.000000		
14	0.000000	0.000000
0.000000		
15	0.000000	0.000000
0.000000		
16	0.000000	0.000000



0.066667		
17	0.000000	0.000000
0.000000		
18	0.000000	0.000000
0.000000		
19	0.000000	0.000000
0.000000		
20	0.000000	0.000000
0.000000		

	Stadium	Sushi Restaurant	Swiss Restaurant	Tapas Restaurant	\
0	0.000000	0.000000	0.000000	0.000000	
1	0.000000	0.000000	0.000000	0.000000	
2	0.000000	0.000000	0.000000	0.000000	
3	0.000000	0.000000	0.000000	0.000000	
4	0.000000	0.000000	0.000000	0.000000	
5	0.000000	0.000000	0.000000	0.000000	
6	0.000000	0.047619	0.047619	0.047619	
7	0.000000	0.000000	0.000000	0.000000	
8	0.000000	0.000000	0.000000	0.000000	
9	0.000000	0.000000	0.000000	0.000000	
10	0.000000	0.000000	0.000000	0.000000	
11	0.000000	0.000000	0.000000	0.000000	
12	0.500000	0.000000	0.000000	0.000000	
13	0.071429	0.000000	0.000000	0.000000	
14	0.000000	0.000000	0.000000	0.000000	
15	0.000000	0.000000	0.000000	0.083333	
16	0.000000	0.000000	0.000000	0.000000	
17	0.000000	0.047619	0.000000	0.000000	
18	0.000000	0.000000	0.000000	0.000000	
19	0.000000	0.000000	0.000000	0.000000	
20	0.000000	0.000000	0.000000	0.000000	

	Tennis Court	Track Stadium	Vegetarian / Vegan Restaurant
0	0.000000	0.000000	0.000000
1	0.000000	0.000000	0.000000
2	0.000000	0.000000	0.000000
3	0.071429	0.000000	0.000000
4	0.000000	0.000000	0.000000
5	0.000000	0.000000	0.000000
6	0.000000	0.000000	0.047619
7	0.000000	0.000000	0.000000
8	0.000000	0.000000	0.000000
9	0.000000	0.000000	0.000000
10	0.000000	0.000000	0.000000
11	0.000000	0.000000	0.000000
12	0.000000	0.000000	0.000000
13	0.000000	0.000000	0.000000
14	0.000000	0.090909	0.000000
15	0.000000	0.000000	0.000000

```

16      0.000000      0.000000      0.000000
17      0.000000      0.000000      0.000000
18      0.000000      0.000000      0.000000
19      0.000000      0.000000      0.000000
20      0.000000      0.000000      0.000000

```

```
[21 rows x 46 columns]
```

```
montevideo_sport_foods_grouped.shape
```

```
(21, 46)
```

```
montevideo_sport_foods_grouped.to_csv('montevideo_sport_foods_grouped.csv', index = False)
```

**Imprimamos cada barrio junto con los 5 sitios mas comunes**

```
num_top_venues = 5
```

```

for barrio in montevideo_sport_foods_grouped['Barrio']:
    print("----"+barrio+"----")
    temp =
montevideo_sport_foods_grouped[montevideo_sport_foods_grouped['Barrio']
] == barrio].T.reset_index()
    temp.columns = ['sitio', 'freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq',
ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')

```

```
----Aguada----
```

	sitio	freq
0	Food & Drink Shop	1.0
1	South American Restaurant	0.0
2	Modern European Restaurant	0.0
3	Other Great Outdoors	0.0
4	Park	0.0

```
----Barrio Sur----
```

	sitio	freq
0	American Restaurant	0.33
1	Restaurant	0.33
2	Food & Drink Shop	0.33
3	Tennis Court	0.00
4	Tapas Restaurant	0.00

```
----Buceo----
```

	sitio	freq
0	Park	1.0
1	American Restaurant	0.0
2	Mexican Restaurant	0.0
3	Modern European Restaurant	0.0
4	Other Great Outdoors	0.0

----Carrasco----

	sitio	freq
0	Restaurant	0.29
1	Plaza	0.21
2	American Restaurant	0.14
3	Comfort Food Restaurant	0.07
4	Park	0.07

----Carrasco Norte----

	sitio	freq
0	Park	1.0
1	American Restaurant	0.0
2	Mexican Restaurant	0.0
3	Modern European Restaurant	0.0
4	Other Great Outdoors	0.0

----Centro----

	sitio	freq
0	Plaza	0.15
1	Restaurant	0.15
2	Gym / Fitness Center	0.15
3	Athletics & Sports	0.08
4	Chinese Restaurant	0.08

----Ciudad Vieja----

	sitio	freq
0	Restaurant	0.33
1	Plaza	0.10
2	Vegetarian / Vegan Restaurant	0.05
3	Food & Drink Shop	0.05
4	Pedestrian Plaza	0.05

----Cordón----

	sitio	freq
0	South American Restaurant	0.25
1	Basketball Court	0.25
2	Plaza	0.12

3	Gym / Fitness Center	0.12
4	Gym	0.12

----La Blanqueada----

	sitio	freq
0	Basketball Court	0.33
1	Athletics & Sports	0.33
2	Latin American Restaurant	0.33
3	American Restaurant	0.00
4	Soccer Stadium	0.00

----La Comercial----

	sitio	freq
0	Middle Eastern Restaurant	1.0
1	Mexican Restaurant	0.0
2	Modern European Restaurant	0.0
3	Other Great Outdoors	0.0
4	Park	0.0

----Larrañaga----

	sitio	freq
0	Soccer Field	0.6
1	Soccer Stadium	0.2
2	Gym	0.2
3	American Restaurant	0.0
4	Modern European Restaurant	0.0

----Malvín----

	sitio	freq
0	Park	0.25
1	Restaurant	0.25
2	Gym	0.25
3	Soccer Field	0.25
4	American Restaurant	0.00

----Malvín Norte----

	sitio	freq
0	Stadium	0.5
1	Soccer Field	0.5
2	American Restaurant	0.0
3	Soccer Stadium	0.0
4	Modern European Restaurant	0.0

----Palermo----

	sitio	freq
0	Restaurant	0.43
1	Other Great Outdoors	0.07
2	Gym	0.07
3	Basketball Court	0.07
4	Basketball Stadium	0.07

----Parque Batlle, Villa Dolores----

	sitio	freq
0	Soccer Stadium	0.45
1	Soccer Field	0.18
2	Athletics & Sports	0.09
3	Track Stadium	0.09
4	Park	0.09

----Parque Rodó----

	sitio	freq
0	Restaurant	0.33
1	Gym	0.33
2	American Restaurant	0.08
3	Tapas Restaurant	0.08
4	Italian Restaurant	0.08

----Pocitos----

	sitio	freq
0	Beach	0.13
1	Italian Restaurant	0.13
2	Sporting Goods Shop	0.07
3	South American Restaurant	0.07
4	Restaurant	0.07

----Punta Carretas----

	sitio	freq
0	Restaurant	0.33
1	Mediterranean Restaurant	0.10
2	Fast Food Restaurant	0.10
3	Italian Restaurant	0.10
4	Gym / Fitness Center	0.10

----Punta Gorda----

	sitio	freq
0	Plaza	0.4
1	Latin American Restaurant	0.2

2	Beach	0.2
3	Seafood Restaurant	0.2
4	American Restaurant	0.0

----Tres Cruces----

	sitio	freq
0	Latin American Restaurant	0.33
1	Food Court	0.17
2	Chinese Restaurant	0.17
3	Plaza	0.17
4	Soccer Field	0.17

----Unión----

	sitio	freq
0	Soccer Field	1.0
1	American Restaurant	0.0
2	Mexican Restaurant	0.0
3	Modern European Restaurant	0.0
4	Other Great Outdoors	0.0

### Pongamos eso en el dataframe

```
def return_most_common_venues(row, num_top_venues):
    row_categories = row.iloc[1:]
    row_categories_sorted =
row_categories.sort_values(ascending=False)

    return row_categories_sorted.index.values[0:num_top_venues]
```

Generemos el nuevo dataframe y mostremos los primeros 10 sitios de cada barrio.

```
num_top_venues = 10
```

```
indicators = ['st', 'nd', 'rd']
```

```
# crear las columnas acorde al numero de sitios populares
```

```
columns = ['Barrio']
```

```
for ind in np.arange(num_top_venues):
```

```
    try:
```

```
        columns.append('{}{} Most Common Venue'.format(ind+1,
indicators[ind]))
```

```
    except:
```

```
        columns.append('{}th Most Common Venue'.format(ind+1))
```

```
# crear un nuevo dataframe
```

```
montevideo_sport_foods_sorted = pd.DataFrame(columns=columns)
```

```
montevideo_sport_foods_sorted['Barrio'] =
montevideo_sport_foods_grouped['Barrio']

for ind in np.arange(montevideo_sport_foods_grouped.shape[0]):
    montevideo_sport_foods_sorted.iloc[ind, 1:] =
return_most_common_venues(montevideo_sport_foods_grouped.iloc[ind, :],
num_top_venues)
```

```
montevideo_sport_foods_sorted.head()
```

	Barrio	1st Most Common Venue	2nd Most Common Venue \
0	Aguada	Food & Drink Shop	South American Restaurant
1	Barrio Sur	American Restaurant	Restaurant
2	Buceo	Park	American Restaurant
3	Carrasco	Restaurant	Plaza
4	Carrasco Norte	Park	American Restaurant

	3rd Most Common Venue	4th Most Common Venue \
0	Modern European Restaurant	Other Great Outdoors
1	Food & Drink Shop	Tennis Court
2	Mexican Restaurant	Modern European Restaurant
3	American Restaurant	Comfort Food Restaurant
4	Mexican Restaurant	Modern European Restaurant

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue \
0	Park	Pedestrian Plaza	
1	Tapas Restaurant	Modern European Restaurant	Other Great Outdoors
2	Other Great Outdoors Plaza	Pedestrian Plaza	
3	Park	German Restaurant	Food Court
4	Other Great Outdoors Plaza	Pedestrian Plaza	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Restaurant	Seafood Restaurant	Soccer Field
1	Park	Pedestrian Plaza	Plaza
2	Restaurant	Seafood Restaurant	Soccer Field
3	Tennis Court	Sushi Restaurant	Soccer Field
4	Restaurant	Seafood Restaurant	Soccer Field

```
montevideo_sport_foods_sorted.shape
```

```
(21, 11)
```

```
montevideo_sport_foods_sorted.to_csv('montevideo_sport_foods_sorted.csv', index = False)
```

## 5. Análisis de clustering por K-Means

### 5.1 Preparación y armado de los clusters

Ejecutemos k-means para agrupar los barrios en 5 agrupaciones.

```
# establecer el número de agrupaciones
kclusters = 5

montevideo_grouped_clustering =
montevideo_sport_foods_grouped.drop('Barrio', 1)

# ejecutar k-means
kmeans = KMeans(n_clusters=kclusters,
random_state=0).fit(montevideo_grouped_clustering)

# revisar las etiquetas de las agrupaciones generadas para cada fila
del dataframe
kmeans.labels_[0:10]

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:4:
FutureWarning: In a future version of pandas all arguments of
DataFrame.drop except for the argument 'labels' will be keyword-only
after removing the cwd from sys.path.

array([3, 1, 2, 1, 2, 1, 1, 1, 1, 4], dtype=int32)
```

### 5.2 Preparación y armado del Dataframe

Generemos un nuevo dataframe que incluya la agrupación así como los 10 sitios más populares de cada barrio.

```
# añadir etiquetas
montevideo_sport_foods_sorted.insert(0, 'Cluster Labels',
kmeans.labels_)

montevideo_barrios_merged = df_montevideo_bche

# juntar el dataframe con cluster con el dataframe de los datos
montevideo_barrios_merged =
montevideo_barrios_merged.join(montevideo_sport_foods_sorted.set_index
('Barrio'), on='Barrio')

montevideo_barrios_merged.head() # revisar las ultimas columnas
```

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster
Labels \						
1	Cordón	42456	B	-34.900827	-56.180125	
1.0						
12	Punta Carretas	24181	B y CH	-34.920202	-56.160065	
1.0						



17	Centro	22120	B	-34.906067	-56.189656
1.0					
25	Aguada	18557	B y C	-34.896676	-56.189366
3.0					
30	Tres Cruces	15926	B y CH	-34.892518	-56.167113
1.0					

	1st Most Common Venue	2nd Most Common Venue \
1	South American Restaurant	Basketball Court
12	Restaurant	Mediterranean Restaurant
17	Plaza	Restaurant
25	Food & Drink Shop	South American Restaurant
30	Latin American Restaurant	Food Court

	3rd Most Common Venue	4th Most Common Venue	5th Most Common
Venue \			
1	Plaza	Gym / Fitness Center	
Gym			
12	Fast Food Restaurant	Italian Restaurant	Gym / Fitness
Center			
17	Gym / Fitness Center	Athletics & Sports	Chinese
Restaurant			
25	Modern European Restaurant	Other Great Outdoors	
Park			
30	Chinese Restaurant	Plaza	Soccer
Field			

	6th Most Common Venue	7th Most Common Venue	8th Most Common
Venue \			
1	Soccer Field	Soccer Stadium	Other Great
Outdoors			
12	Gym	Mexican Restaurant	Golf
Course			
17	Latin American Restaurant	Kebab Restaurant	Italian
Restaurant			
25	Pedestrian Plaza	Plaza	
Restaurant			
30	South American Restaurant	Other Great Outdoors	
Park			

	9th Most Common Venue	10th Most Common Venue
1	Park	Pedestrian Plaza
12	Modern European Restaurant	Sushi Restaurant
17	Spanish Restaurant	Gym
25	Seafood Restaurant	Soccer Field
30	Pedestrian Plaza	Restaurant

```
montevideo_barrios_merged.reset_index(drop=True, inplace = True)
montevideo_barrios_merged
```

Longitudo \	Barrio	Poblacion	Municipio	Latitud
0	Cordón	42456	B	-34.900827 -
56.180125				
1	Punta Carretas	24181	B y CH	-34.920202 -
56.160065				
2	Centro	22120	B	-34.906067 -
56.189656				
3	Aguada	18557	B y C	-34.896676 -
56.189366				
4	Tres Cruces	15926	B y CH	-34.892518 -
56.167113				
5	Palermo	12992	B	-34.911288 -
56.180698				
6	Parque Rodó	12944	B	-34.910082 -
56.169778				
7	Barrio Sur	12639	B	-34.911202 -
56.194784				
8	Ciudad Vieja	12555	B	-34.906351 -
56.205979				
9	La Comercial	11444	B y C	-34.886749 -
56.169093				
10	Pocitos	67992	CH	-34.911123 -
56.150593				
11	Buceo	36998	CH y E	-34.897800 -
56.128658				
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868 -
56.153383				
13	Larrañaga	17956	C y CH	-34.880441 -
56.158788				
14	La Blanqueada	9600	CH y E	-34.887700 -
56.154518				
15	Unión	39880	D, E y F	-34.880236 -
56.137688				
16	Malvín	28102	E	-34.889692 -
56.094768				
17	Las Canteras	22974	E y F	-34.868839 -
56.105227				
18	Malvín Norte	19916	E	-34.877897 -
56.119281				
19	Carrasco	15488	E	-34.885577 -
56.058150				
20	Punta Gorda	14259	E	-34.899841 -
56.081571				
21	Carrasco Norte	13339	E	-34.872898 -
56.072086				

Cluster Labels	1st Most Common Venue	2nd Most Common
0	1.0 South American Restaurant	Basketball

Court				
1	1.0		Restaurant	Mediterranean
Restaurant				
2	1.0		Plaza	
Restaurant				
3	3.0		Food & Drink Shop	South American
Restaurant				
4	1.0	Latin American	Restaurant	Food
Court				
5	1.0		Restaurant	Other Great
Outdoors				
6	1.0		Restaurant	
Gym				
7	1.0	American	Restaurant	
Restaurant				
8	1.0		Restaurant	
Plaza				
9	4.0	Middle Eastern	Restaurant	Mexican
Restaurant				
10	1.0		Beach	Italian
Restaurant				
11	2.0		Park	American
Restaurant				
12	1.0		Soccer Stadium	Soccer
Field				
13	0.0		Soccer Field	Soccer
Stadium				
14	1.0		Basketball Court	Athletics &
Sports				
15	0.0		Soccer Field	American
Restaurant				
16	1.0		Park	
Restaurant				
17	NaN		NaN	
NaN				
18	0.0		Stadium	Soccer
Field				
19	1.0		Restaurant	
Plaza				
20	1.0		Plaza	Latin American
Restaurant				
21	2.0		Park	American
Restaurant				

	3rd Most Common Venue	4th Most Common Venue \
0	Plaza	Gym / Fitness Center
1	Fast Food Restaurant	Italian Restaurant
2	Gym / Fitness Center	Athletics & Sports
3	Modern European Restaurant	Other Great Outdoors
4	Chinese Restaurant	Plaza

5		Gym	Basketball Court
6	American Restaurant		Tapas Restaurant
7	Food & Drink Shop		Tennis Court
8	Vegetarian / Vegan Restaurant		Food & Drink Shop
9	Modern European Restaurant		Other Great Outdoors
10	Sporting Goods Shop	South American Restaurant	
11	Mexican Restaurant	Modern European Restaurant	
12	Athletics & Sports		Track Stadium
13	Gym	American Restaurant	
14	Latin American Restaurant	American Restaurant	
15	Mexican Restaurant	Modern European Restaurant	
16	Gym		Soccer Field
17	NaN		NaN
18	American Restaurant		Soccer Stadium
19	American Restaurant	Comfort Food Restaurant	
20	Beach	Seafood Restaurant	
21	Mexican Restaurant	Modern European Restaurant	

	5th Most Common Venue	6th Most Common Venue \
0	Gym	Soccer Field
1	Gym / Fitness Center	Gym
2	Chinese Restaurant	Latin American Restaurant
3	Park	Pedestrian Plaza
4	Soccer Field	South American Restaurant
5	Basketball Stadium	Stadium
6	Italian Restaurant	Food
7	Tapas Restaurant	Modern European Restaurant
8	Pedestrian Plaza	Latin American Restaurant
9	Park	Pedestrian Plaza
10	Restaurant	Basketball Stadium
11	Other Great Outdoors	Pedestrian Plaza
12	Park	Plaza
13	Modern European Restaurant	Other Great Outdoors
14	Soccer Stadium	Other Great Outdoors
15	Other Great Outdoors	Park
16	American Restaurant	Soccer Stadium
17	NaN	NaN
18	Modern European Restaurant	Other Great Outdoors
19	Park	German Restaurant
20	American Restaurant	South American Restaurant
21	Other Great Outdoors	Pedestrian Plaza

	7th Most Common Venue	8th Most Common Venue \
0	Soccer Stadium	Other Great Outdoors
1	Mexican Restaurant	Golf Course
2	Kebab Restaurant	Italian Restaurant
3	Plaza	Restaurant
4	Other Great Outdoors	Park
5	Italian Restaurant	Gym / Fitness Center
6	Soccer Stadium	Other Great Outdoors

7	Other Great Outdoors	Park
8	Italian Restaurant	Health Food Store
9	Plaza	Restaurant
10	Chinese Restaurant	Middle Eastern Restaurant
11	Plaza	Restaurant
12	Middle Eastern Restaurant	Modern European Restaurant
13	Park	Pedestrian Plaza
14	Park	Pedestrian Plaza
15	Pedestrian Plaza	Plaza
16	Modern European Restaurant	Other Great Outdoors
17	NaN	NaN
18	Park	Pedestrian Plaza
19	Food Court	Tennis Court
20	Other Great Outdoors	Park
21	Plaza	Restaurant

	9th Most Common Venue	10th Most Common Venue
0	Park	Pedestrian Plaza
1	Modern European Restaurant	Sushi Restaurant
2	Spanish Restaurant	Gym
3	Seafood Restaurant	Soccer Field
4	Pedestrian Plaza	Restaurant
5	South American Restaurant	Park
6	Park	Pedestrian Plaza
7	Pedestrian Plaza	Plaza
8	South American Restaurant	Southern / Soul Food Restaurant
9	Seafood Restaurant	Soccer Field
10	Empanada Restaurant	Falafel Restaurant
11	Seafood Restaurant	Soccer Field
12	Other Great Outdoors	Pedestrian Plaza
13	Plaza	Restaurant
14	Plaza	Restaurant
15	Restaurant	Seafood Restaurant
16	Pedestrian Plaza	Plaza
17	NaN	NaN
18	Plaza	Restaurant
19	Sushi Restaurant	Soccer Field
20	Pedestrian Plaza	Restaurant
21	Seafood Restaurant	Soccer Field

```
# Eliminamos la fila de "Las Canteras " dado que no asignó sitios.
montevideo_barrios_merged.drop(17, axis=0, inplace = True)
```

```
montevideo_barrios_merged.reset_index(drop=True, inplace = True)
```

```
montevideo_barrios_merged
```

Longitude \	Barrio	Poblacion	Municipio	Latitud
0	Cordón	42456	B	-34.900827 -
56.180125				

1	Punta Carretas	24181	B y CH	-34.920202	-
56.160065					
2	Centro	22120	B	-34.906067	-
56.189656					
3	Aguada	18557	B y C	-34.896676	-
56.189366					
4	Tres Cruces	15926	B y CH	-34.892518	-
56.167113					
5	Palermo	12992	B	-34.911288	-
56.180698					
6	Parque Rodó	12944	B	-34.910082	-
56.169778					
7	Barrio Sur	12639	B	-34.911202	-
56.194784					
8	Ciudad Vieja	12555	B	-34.906351	-
56.205979					
9	La Comercial	11444	B y C	-34.886749	-
56.169093					
10	Pocitos	67992	CH	-34.911123	-
56.150593					
11	Buceo	36998	CH y E	-34.897800	-
56.128658					
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-
56.153383					
13	Larrañaga	17956	C y CH	-34.880441	-
56.158788					
14	La Blanqueada	9600	CH y E	-34.887700	-
56.154518					
15	Unión	39880	D, E y F	-34.880236	-
56.137688					
16	Malvín	28102	E	-34.889692	-
56.094768					
17	Malvín Norte	19916	E	-34.877897	-
56.119281					
18	Carrasco	15488	E	-34.885577	-
56.058150					
19	Punta Gorda	14259	E	-34.899841	-
56.081571					
20	Carrasco Norte	13339	E	-34.872898	-
56.072086					

Cluster Labels	1st Most Common Venue	2nd Most Common
0	South American Restaurant	Basketball
1	Restaurant	Mediterranean
2	Plaza	
3	Food & Drink Shop	South American

Restaurant				
4	1.0	Latin American Restaurant		Food
Court				
5	1.0	Restaurant	Other Great	
Outdoors				
6	1.0	Restaurant		
Gym				
7	1.0	American Restaurant		
Restaurant				
8	1.0	Restaurant		
Plaza				
9	4.0	Middle Eastern Restaurant	Mexican	
Restaurant				
10	1.0	Beach	Italian	
Restaurant				
11	2.0	Park	American	
Restaurant				
12	1.0	Soccer Stadium	Soccer	
Field				
13	0.0	Soccer Field	Soccer	
Stadium				
14	1.0	Basketball Court	Athletics &	
Sports				
15	0.0	Soccer Field	American	
Restaurant				
16	1.0	Park		
Restaurant				
17	0.0	Stadium	Soccer	
Field				
18	1.0	Restaurant		
Plaza				
19	1.0	Plaza	Latin American	
Restaurant				
20	2.0	Park	American	
Restaurant				

	3rd Most Common Venue	4th Most Common Venue \
0	Plaza	Gym / Fitness Center
1	Fast Food Restaurant	Italian Restaurant
2	Gym / Fitness Center	Athletics & Sports
3	Modern European Restaurant	Other Great Outdoors
4	Chinese Restaurant	Plaza
5	Gym	Basketball Court
6	American Restaurant	Tapas Restaurant
7	Food & Drink Shop	Tennis Court
8	Vegetarian / Vegan Restaurant	Food & Drink Shop
9	Modern European Restaurant	Other Great Outdoors
10	Sporting Goods Shop	South American Restaurant
11	Mexican Restaurant	Modern European Restaurant
12	Athletics & Sports	Track Stadium

13		Gym	American Restaurant
14	Latin American Restaurant		American Restaurant
15	Mexican Restaurant	Modern European Restaurant	
16		Gym	Soccer Field
17	American Restaurant		Soccer Stadium
18	American Restaurant	Comfort Food Restaurant	
19	Beach	Seafood Restaurant	
20	Mexican Restaurant	Modern European Restaurant	

	5th Most Common Venue	6th Most Common Venue \
0	Gym	Soccer Field
1	Gym / Fitness Center	Gym
2	Chinese Restaurant	Latin American Restaurant
3	Park	Pedestrian Plaza
4	Soccer Field	South American Restaurant
5	Basketball Stadium	Stadium
6	Italian Restaurant	Food
7	Tapas Restaurant	Modern European Restaurant
8	Pedestrian Plaza	Latin American Restaurant
9	Park	Pedestrian Plaza
10	Restaurant	Basketball Stadium
11	Other Great Outdoors	Pedestrian Plaza
12	Park	Plaza
13	Modern European Restaurant	Other Great Outdoors
14	Soccer Stadium	Other Great Outdoors
15	Other Great Outdoors	Park
16	American Restaurant	Soccer Stadium
17	Modern European Restaurant	Other Great Outdoors
18	Park	German Restaurant
19	American Restaurant	South American Restaurant
20	Other Great Outdoors	Pedestrian Plaza

	7th Most Common Venue	8th Most Common Venue \
0	Soccer Stadium	Other Great Outdoors
1	Mexican Restaurant	Golf Course
2	Kebab Restaurant	Italian Restaurant
3	Plaza	Restaurant
4	Other Great Outdoors	Park
5	Italian Restaurant	Gym / Fitness Center
6	Soccer Stadium	Other Great Outdoors
7	Other Great Outdoors	Park
8	Italian Restaurant	Health Food Store
9	Plaza	Restaurant
10	Chinese Restaurant	Middle Eastern Restaurant
11	Plaza	Restaurant
12	Middle Eastern Restaurant	Modern European Restaurant
13	Park	Pedestrian Plaza
14	Park	Pedestrian Plaza
15	Pedestrian Plaza	Plaza
16	Modern European Restaurant	Other Great Outdoors



17	Park	Pedestrian Plaza
18	Food Court	Tennis Court
19	Other Great Outdoors	Park
20	Plaza	Restaurant
9th Most Common Venue		10th Most Common Venue
0	Park	Pedestrian Plaza
1	Modern European Restaurant	Sushi Restaurant
2	Spanish Restaurant	Gym
3	Seafood Restaurant	Soccer Field
4	Pedestrian Plaza	Restaurant
5	South American Restaurant	Park
6	Park	Pedestrian Plaza
7	Pedestrian Plaza	Plaza
8	South American Restaurant	Southern / Soul Food Restaurant
9	Seafood Restaurant	Soccer Field
10	Empanada Restaurant	Falafel Restaurant
11	Seafood Restaurant	Soccer Field
12	Other Great Outdoors	Pedestrian Plaza
13	Plaza	Restaurant
14	Plaza	Restaurant
15	Restaurant	Seafood Restaurant
16	Pedestrian Plaza	Plaza
17	Plaza	Restaurant
18	Sushi Restaurant	Soccer Field
19	Pedestrian Plaza	Restaurant
20	Seafood Restaurant	Soccer Field

```
montevideo_barrios_merged.to_csv('montevideo_barrios_merged.csv',
index = False)
```

```
# Dado que da error al generar el mapa, convertimos los labels de float a int
```

```
montevideo_barrios_merged['Cluster Labels'] =
montevideo_barrios_merged['Cluster Labels'].astype(int)
```

```
montevideo_barrios_merged
```

Longitude \	Barrio	Poblacion	Municipio	Latitud
0	Cordón	42456	B	-34.900827 -
56.180125				
1	Punta Carretas	24181	B y CH	-34.920202 -
56.160065				
2	Centro	22120	B	-34.906067 -
56.189656				
3	Aguada	18557	B y C	-34.896676 -
56.189366				
4	Tres Cruces	15926	B y CH	-34.892518 -
56.167113				
5	Palermo	12992	B	-34.911288 -

56.180698				
6	Parque Rodó	12944	B	-34.910082 -
56.169778				
7	Barrio Sur	12639	B	-34.911202 -
56.194784				
8	Ciudad Vieja	12555	B	-34.906351 -
56.205979				
9	La Comercial	11444	B y C	-34.886749 -
56.169093				
10	Pocitos	67992	CH	-34.911123 -
56.150593				
11	Buceo	36998	CH y E	-34.897800 -
56.128658				
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868 -
56.153383				
13	Larrañaga	17956	C y CH	-34.880441 -
56.158788				
14	La Blanqueada	9600	CH y E	-34.887700 -
56.154518				
15	Unión	39880	D, E y F	-34.880236 -
56.137688				
16	Malvín	28102	E	-34.889692 -
56.094768				
17	Malvín Norte	19916	E	-34.877897 -
56.119281				
18	Carrasco	15488	E	-34.885577 -
56.058150				
19	Punta Gorda	14259	E	-34.899841 -
56.081571				
20	Carrasco Norte	13339	E	-34.872898 -
56.072086				

Cluster Labels	1st Most Common Venue	2nd Most Common
Venue \		
0	1 South American Restaurant	Basketball
Court		
1	1 Restaurant	Mediterranean
Restaurant		
2	1 Plaza	
Restaurant		
3	3 Food & Drink Shop	South American
Restaurant		
4	1 Latin American Restaurant	Food
Court		
5	1 Restaurant	Other Great
Outdoors		
6	1 Restaurant	
Gym		
7	1 American Restaurant	
Restaurant		

8	1	Restaurant	
Plaza			
9	4	Middle Eastern Restaurant	Mexican
Restaurant			
10	1	Beach	Italian
Restaurant			
11	2	Park	American
Restaurant			
12	1	Soccer Stadium	Soccer
Field			
13	0	Soccer Field	Soccer
Stadium			
14	1	Basketball Court	Athletics &
Sports			
15	0	Soccer Field	American
Restaurant			
16	1	Park	
Restaurant			
17	0	Stadium	Soccer
Field			
18	1	Restaurant	
Plaza			
19	1	Plaza	Latin American
Restaurant			
20	2	Park	American
Restaurant			

	3rd Most Common Venue	4th Most Common Venue \
0	Plaza	Gym / Fitness Center
1	Fast Food Restaurant	Italian Restaurant
2	Gym / Fitness Center	Athletics & Sports
3	Modern European Restaurant	Other Great Outdoors
4	Chinese Restaurant	Plaza
5	Gym	Basketball Court
6	American Restaurant	Tapas Restaurant
7	Food & Drink Shop	Tennis Court
8	Vegetarian / Vegan Restaurant	Food & Drink Shop
9	Modern European Restaurant	Other Great Outdoors
10	Sporting Goods Shop	South American Restaurant
11	Mexican Restaurant	Modern European Restaurant
12	Athletics & Sports	Track Stadium
13	Gym	American Restaurant
14	Latin American Restaurant	American Restaurant
15	Mexican Restaurant	Modern European Restaurant
16	Gym	Soccer Field
17	American Restaurant	Soccer Stadium
18	American Restaurant	Comfort Food Restaurant
19	Beach	Seafood Restaurant
20	Mexican Restaurant	Modern European Restaurant

	5th Most Common Venue	6th Most Common Venue \
0	Gym	Soccer Field
1	Gym / Fitness Center	Gym
2	Chinese Restaurant	Latin American Restaurant
3	Park	Pedestrian Plaza
4	Soccer Field	South American Restaurant
5	Basketball Stadium	Stadium
6	Italian Restaurant	Food
7	Tapas Restaurant	Modern European Restaurant
8	Pedestrian Plaza	Latin American Restaurant
9	Park	Pedestrian Plaza
10	Restaurant	Basketball Stadium
11	Other Great Outdoors	Pedestrian Plaza
12	Park	Plaza
13	Modern European Restaurant	Other Great Outdoors
14	Soccer Stadium	Other Great Outdoors
15	Other Great Outdoors	Park
16	American Restaurant	Soccer Stadium
17	Modern European Restaurant	Other Great Outdoors
18	Park	German Restaurant
19	American Restaurant	South American Restaurant
20	Other Great Outdoors	Pedestrian Plaza

	7th Most Common Venue	8th Most Common Venue \
0	Soccer Stadium	Other Great Outdoors
1	Mexican Restaurant	Golf Course
2	Kebab Restaurant	Italian Restaurant
3	Plaza	Restaurant
4	Other Great Outdoors	Park
5	Italian Restaurant	Gym / Fitness Center
6	Soccer Stadium	Other Great Outdoors
7	Other Great Outdoors	Park
8	Italian Restaurant	Health Food Store
9	Plaza	Restaurant
10	Chinese Restaurant	Middle Eastern Restaurant
11	Plaza	Restaurant
12	Middle Eastern Restaurant	Modern European Restaurant
13	Park	Pedestrian Plaza
14	Park	Pedestrian Plaza
15	Pedestrian Plaza	Plaza
16	Modern European Restaurant	Other Great Outdoors
17	Park	Pedestrian Plaza
18	Food Court	Tennis Court
19	Other Great Outdoors	Park
20	Plaza	Restaurant

	9th Most Common Venue	10th Most Common Venue
0	Park	Pedestrian Plaza
1	Modern European Restaurant	Sushi Restaurant
2	Spanish Restaurant	Gym

3	Seafood Restaurant	Soccer Field
4	Pedestrian Plaza	Restaurant
5	South American Restaurant	Park
6	Park	Pedestrian Plaza
7	Pedestrian Plaza	Plaza
8	South American Restaurant	Southern / Soul Food Restaurant
9	Seafood Restaurant	Soccer Field
10	Empanada Restaurant	Falafel Restaurant
11	Seafood Restaurant	Soccer Field
12	Other Great Outdoors	Pedestrian Plaza
13	Plaza	Restaurant
14	Plaza	Restaurant
15	Restaurant	Seafood Restaurant
16	Pedestrian Plaza	Plaza
17	Plaza	Restaurant
18	Sushi Restaurant	Soccer Field
19	Pedestrian Plaza	Restaurant
20	Seafood Restaurant	Soccer Field

### 5.3 Visualización en el mapa de los clusters

Finalmente visualicemos las agrupaciones resultantes

```
# Definimos las coordenadas de Montevideo
address = 'Montevideo, Uruguay'
geolocator = Nominatim(user_agent="to_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude

print('Latitud Montevideo-Ciudad:',latitude)
print('Longitud Montevideo-Ciudad:',longitude)

Latitud Montevideo-Ciudad: -34.9058916
Longitud Montevideo-Ciudad: -56.1913095

# crear mapa
montevideo_barrios_clusters = folium.Map(location=[latitude,
longitude], zoom_start=13, tiles = 'Stamen Toner')

# establecer el esquema de color para las agrupaciones
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

# añadir marcadores al mapa
markers_colors = []
for lat, lon, bar, cluster , first in
zip(montevideo_barrios_merged['Latitud'],
montevideo_barrios_merged['Longitude'],
```

```

montevideo_barrios_merged['Barrio'],
montevideo_barrios_merged['Cluster Labels'],
montevideo_barrios_merged['1st Most Common Venue']):
    label = folium.Popup(str(bar) + ' Cluster ' + str(cluster) + ' - '
'First Venue :' + str(first), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=10,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
        fill_color=rainbow[cluster-1],
        fill_opacity=0.7).add_to(montevideo_barrios_clusters)
    folium.map.Marker(
        [lat,lon],
        icon=DivIcon(
            icon_size=(20,20),
            icon_anchor=(0,0),
            html='<div style="font-size: 5; color: blue;"><b>%s</b></div>'
% '{}'.format(bar))).add_to(montevideo_barrios_clusters)

montevideo_barrios_clusters
<folium.folium.Map at 0x7f2e3b5de610>

```

#### 5.4 Análisis de cada cluster

Ahora puede examinar cada agrupación y determinar las categorías del sitio que distingue a cada cluster.

```

montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 0, montevideo_barrios_merged.columns[[0]+[1] +
list(range(5, 11))]]

```

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue \
13	Larrañaga	17956	0	Soccer Field
15	Unión	39880	0	Soccer Field
17	Malvín Norte	19916	0	Stadium

	2nd Most Common Venue \	3rd Most Common Venue	4th Most Common
13	Soccer Stadium	Gym	American
15	American Restaurant	Mexican Restaurant	Modern European
17	Soccer Field	American Restaurant	Soccer

	5th Most Common Venue
13	Modern European Restaurant

```
15         Other Great Outdoors
17 Modern European Restaurant
```

```
print('La poblacion del cluster 0
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 0, montevideo_barrios_merged.columns[[1]]].sum())
```

```
La poblacion del cluster 0 es : Poblacion      77752
dtype: int64
```

```
montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 1, montevideo_barrios_merged.columns[[0]+[1] +
list(range(5, 11))]]
```

	Barrio	Poblacion	Cluster Labels	\
0	Cordón	42456	1	
1	Punta Carretas	24181	1	
2	Centro	22120	1	
4	Tres Cruces	15926	1	
5	Palermo	12992	1	
6	Parque Rodó	12944	1	
7	Barrio Sur	12639	1	
8	Ciudad Vieja	12555	1	
10	Pocitos	67992	1	
12	Parque Batlle, Villa Dolores	31153	1	
14	La Blanqueada	9600	1	
16	Malvín	28102	1	
18	Carrasco	15488	1	
19	Punta Gorda	14259	1	

	1st Most Common Venue	2nd Most Common Venue	\
0	South American Restaurant	Basketball Court	
1	Restaurant	Mediterranean Restaurant	
2	Plaza	Restaurant	
4	Latin American Restaurant	Food Court	
5	Restaurant	Other Great Outdoors	
6	Restaurant	Gym	
7	American Restaurant	Restaurant	
8	Restaurant	Plaza	
10	Beach	Italian Restaurant	
12	Soccer Stadium	Soccer Field	
14	Basketball Court	Athletics & Sports	
16	Park	Restaurant	
18	Restaurant	Plaza	
19	Plaza	Latin American Restaurant	

	3rd Most Common Venue	4th Most Common Venue	\
0	Plaza	Gym / Fitness Center	
1	Fast Food Restaurant	Italian Restaurant	
2	Gym / Fitness Center	Athletics & Sports	
4	Chinese Restaurant	Plaza	

5		Gym	Basketball Court
6	American Restaurant		Tapas Restaurant
7	Food & Drink Shop		Tennis Court
8	Vegetarian / Vegan Restaurant		Food & Drink Shop
10	Sporting Goods Shop	South American Restaurant	
12	Athletics & Sports		Track Stadium
14	Latin American Restaurant	American Restaurant	
16	Gym		Soccer Field
18	American Restaurant	Comfort Food Restaurant	
19	Beach	Seafood Restaurant	

#### 5th Most Common Venue

0	Gym
1	Gym / Fitness Center
2	Chinese Restaurant
4	Soccer Field
5	Basketball Stadium
6	Italian Restaurant
7	Tapas Restaurant
8	Pedestrian Plaza
10	Restaurant
12	Park
14	Soccer Stadium
16	American Restaurant
18	Park
19	American Restaurant

```
print('La poblacion del cluster 1
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 1, montevideo_barrios_merged.columns[[1]]].sum())
```

La poblacion del cluster 1 es : Poblacion 322407  
dtype: int64

```
montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 2, montevideo_barrios_merged.columns[[0]+[1] +
list(range(5, 11))]]
```

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue \
11	Buceo	36998	2	Park
20	Carrasco Norte	13339	2	Park

	2nd Most Common Venue \	3rd Most Common Venue	4th Most Common Venue \
11	American Restaurant	Mexican Restaurant	Modern European Restaurant
20	American Restaurant	Mexican Restaurant	Modern European Restaurant

#### 5th Most Common Venue



```
11 Other Great Outdoors
20 Other Great Outdoors
```

```
print('La poblacion del cluster 2
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 2, montevideo_barrios_merged.columns[[1]]].sum())
```

```
La poblacion del cluster 2 es : Poblacion    50337
dtype: int64
```

```
montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 3, montevideo_barrios_merged.columns[[0]+[1] +
list(range(5, 11))]]
```

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue \
3	Aguada	18557	3	Food & Drink Shop
				2nd Most Common Venue
3	South American Restaurant			3rd Most Common Venue \
				Modern European Restaurant
				4th Most Common Venue
3	Other Great Outdoors			5th Most Common Venue
				Park

```
print('La poblacion del cluster 3
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 3, montevideo_barrios_merged.columns[[1]]].sum())
```

```
La poblacion del cluster 3 es : Poblacion    18557
dtype: int64
```

```
montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 4, montevideo_barrios_merged.columns[[0]+[1] +
list(range(5, 11))]]
```

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue
9	La Comercial	11444	4	Middle Eastern Restaurant

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue \
9	Mexican Restaurant	Modern European Restaurant	Other Great Outdoors

	5th Most Common Venue
9	Park

```
print('La poblacion del cluster 2
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 2, montevideo_barrios_merged.columns[[1]]].sum())
```

```
print('La poblacion del cluster 3
es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
```

```

Labels'] == 3, montevideo_barrios_merged.columns[[1]].sum())
print('La poblacion del cluster 4
es :', montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster
Labels'] == 4, montevideo_barrios_merged.columns[[1]].sum())

```

```

La poblacion del cluster 2 es : Poblacion      50337
dtype: int64
La poblacion del cluster 3 es : Poblacion      18557
dtype: int64
La poblacion del cluster 4 es : Poblacion      11444
dtype: int64

```

Vamos a profundizar el análisis del cluster 0 por ser el de mayor diversidad de barrios y sitios y el más poblado

```

montevideo_cluster_cero =
montevideo_barrios_merged[montevideo_barrios_merged['Cluster Labels']
== 0]
montevideo_cluster_cero.drop(['Poblacion', 'Municipio', 'Latitud',
'Longitude', 'Cluster Labels'], axis = 1, inplace = True)
montevideo_cluster_cero.reset_index(drop=True, inplace = True)
montevideo_cluster_cero

```

```

/usr/local/lib/python3.7/dist-packages/pandas/core/frame.py:4913:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

```

See the caveats in the documentation:  
[https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)  
errors=errors,

	Barrio	1st Most Common Venue	2nd Most Common Venue	\
0	Larrañaga	Soccer Field	Soccer Stadium	
1	Unión	Soccer Field	American Restaurant	
2	Malvín Norte	Stadium	Soccer Field	

  

	3rd Most Common Venue	4th Most Common Venue	\
0	Gym	American Restaurant	
1	Mexican Restaurant	Modern European Restaurant	
2	American Restaurant	Soccer Stadium	

  

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Modern European Restaurant	Other Great Outdoors Park		
1	Other Great Outdoors Plaza	Park	Pedestrian	
2	Modern European Restaurant	Other Great Outdoors Park		

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Pedestrian Plaza	Plaza	Restaurant
1	Plaza	Restaurant	Seafood Restaurant
2	Pedestrian Plaza	Plaza	Restaurant

```
print(montevideo_cluster_cero['Barrio'])
```

```
0      Larrañaga
1      Unión
2      Malvín Norte
Name: Barrio, dtype: object
```

Generamos el dataframe para estos barrios de forma de aplicar los procesos y determinar Kmeans

*# Filtrado por cada barrio del cluster cero*

```
montevideo_cordon =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Cordón']
montevideo_puntacarretas =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Punta Carretas']
montevideo_centro =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Centro']
montevideo_trescruces =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Tres Cruces']
montevideo_palermo =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Palermo']
montevideo_parquerodo =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Parque Rodó']
montevideo_barriosur =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Barrio Sur']
montevideo_ciudadvieja =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Ciudad Vieja']
montevideo_pocitos =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Pocitos']
montevideo_batlledolores =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Parque Batlle, Villa Dolores']
montevideo_blanqueada =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'La Blanqueada']
montevideo_carrasco =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
```

```

rio'] == 'Carrasco']
montevideo_puntagorda =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Bar
rio'] == 'Punta Gorda']

montevideo_sitios_cluster_cero =
pd.concat([montevideo_cordon,montevideo_puntacarretas,montevideo_centro,
montevideo_trescruces,

montevideo_palermo,montevideo_parquerodo,montevideo_barriosur,montevideo_ciudadvieja,

montevideo_pocitos,montevideo_batlledolores,montevideo_blanqueada,montevideo_carrasco,
montevideo_puntagorda])
montevideo_sitios_cluster_cero.drop_duplicates(['Local'], inplace =
True)
montevideo_sitios_cluster_cero.to_csv('montevideo_sitios_cluster_cero.csv', index = False)
montevideo_sitios_cluster_cero.reset_index(drop=True)

#Ahora procedemos a preparar los datos para el clustering
montevideo_cluster_cero_onehot =
pd.get_dummies(montevideo_sitios_cluster_cero[['Local Categoria']],
prefix="", prefix_sep="")
montevideo_cluster_cero_onehot['Barrio'] =
montevideo_sitios_cluster_cero['Barrio']
fixed_columns = [montevideo_cluster_cero_onehot.columns[-1]] +
list(montevideo_cluster_cero_onehot.columns[:-1])
montevideo_cluster_cero_onehot =
montevideo_cluster_cero_onehot[fixed_columns]
montevideo_cluster_cero_onehot.reset_index(drop=True).head()
montevideo_cluster_cero_grouped =
montevideo_cluster_cero_onehot.groupby('Barrio').mean().reset_index()
montevideo_cluster_cero_grouped
num_top_venues = 10
indicators = ['st', 'nd', 'rd']
columns = ['Barrio']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{} Most Common Venue'.format(ind+1,
indicators[ind]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

montevideo_cluster_cero_sorted = pd.DataFrame(columns=columns)
montevideo_cluster_cero_sorted['Barrio'] =
montevideo_cluster_cero_grouped['Barrio']

for ind in np.arange(montevideo_cluster_cero_grouped.shape[0]):

```

```

montevideo_cluster_cero_sorted.iloc[ind, 1:] =
return_most_common_venues(montevideo_cluster_cero_grouped.iloc[ind, :],
, num_top_venues)
montevideo_cluster_cero_sorted.head()
montevideo_cluster_cero_sorted.to_csv('montevideo_cluster_cero_sorted.
csv', index = False)

```

*#Ejecutemos k-means para agrupar los barrios en 3 agrupaciones.*

```

kclusterscero = 3
montevideo_grouped_cero =
montevideo_cluster_cero_grouped.drop('Barrio', 1)
kmeanscero = KMeans(n_clusters=kclusterscero,
random_state=0).fit(montevideo_grouped_cero)
kmeanscero.labels_[0:10]

```

*#Generemos un nuevo dataframe que incluya la agrupación así como los 10 sitios mas populares de cada barrio*

*# añadir etiquetas*

```

montevideo_cluster_cero_sorted.insert(0, 'Cluster Labels',
kmeanscero.labels_)
montevideo_cluster_cero_merged = df_montevideo_bche
montevideo_cluster_cero_merged =
montevideo_cluster_cero_merged.join(montevideo_cluster_cero_sorted.set
_index('Barrio'), on='Barrio')
montevideo_cluster_cero_merged.reset_index(drop=True, inplace = True)
montevideo_cluster_cero_merged =
montevideo_cluster_cero_merged[montevideo_cluster_cero_merged['Cluster
Labels'].notnull()]
montevideo_cluster_cero_merged['Cluster Labels'] =
montevideo_cluster_cero_merged['Cluster Labels'].astype(int)
montevideo_cluster_cero_merged.reset_index(drop=True, inplace = True)
print('Poblacion del cluster cero
total :',montevideo_cluster_cero_merged['Poblacion'].sum())
montevideo_cluster_cero_merged

```

Poblacion del cluster cero total : 294305

/usr/local/lib/python3.7/dist-packages/ipykernel\_launcher.py:51:  
FutureWarning: In a future version of pandas all arguments of  
DataFrame.drop except for the argument 'labels' will be keyword-only

Longitude \	Barrio	Poblacion	Municipio	Latitud
0 56.180125	Cordón	42456	B	-34.900827 -
1 56.160065	Punta Carretas	24181	B y CH	-34.920202 -
2 56.189656	Centro	22120	B	-34.906067 -
3 56.167113	Tres Cruces	15926	B y CH	-34.892518 -

4	Palermo	12992	B	-34.911288	-
56.180698					
5	Parque Rodó	12944	B	-34.910082	-
56.169778					
6	Barrio Sur	12639	B	-34.911202	-
56.194784					
7	Ciudad Vieja	12555	B	-34.906351	-
56.205979					
8	Pocitos	67992	CH	-34.911123	-
56.150593					
9	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-
56.153383					
10	La Blanqueada	9600	CH y E	-34.887700	-
56.154518					
11	Carrasco	15488	E	-34.885577	-
56.058150					
12	Punta Gorda	14259	E	-34.899841	-
56.081571					

Cluster Labels		1st Most Common Venue	2nd Most Common
Venue \			
0	2	South American Restaurant	Basketball
Court			
1	1	Restaurant	Mediterranean
Restaurant			
2	2	Plaza	
Restaurant			
3	2	Latin American Restaurant	Food
Court			
4	1	Restaurant	Other Great
Outdoors			
5	1	Restaurant	
Gym			
6	1	American Restaurant	
Restaurant			
7	1	Restaurant	
Plaza			
8	2	Beach	Italian
Restaurant			
9	2	Soccer Stadium	Soccer
Field			
10	0	Basketball Court	Athletics &
Sports			
11	1	Restaurant	
Plaza			
12	2	Plaza	Latin American
Restaurant			

0	3rd Most Common Venue	4th Most Common Venue \
	Plaza	Gym / Fitness Center

1	Fast Food Restaurant	Italian Restaurant
2	Gym / Fitness Center	Athletics & Sports
3	Chinese Restaurant	Plaza
4	Gym	Basketball Court
5	American Restaurant	Tapas Restaurant
6	Food & Drink Shop	Tennis Court
7	Vegetarian / Vegan Restaurant	Food & Drink Shop
8	Sporting Goods Shop	South American Restaurant
9	Athletics & Sports	Track Stadium
10	Latin American Restaurant	American Restaurant
11	American Restaurant	Comfort Food Restaurant
12	Beach	Seafood Restaurant

	5th Most Common Venue	6th Most Common Venue \
0	Gym	Soccer Field
1	Gym / Fitness Center	Gym
2	Chinese Restaurant	Latin American Restaurant
3	Soccer Field	South American Restaurant
4	Basketball Stadium	Stadium
5	Italian Restaurant	Food
6	Tapas Restaurant	Modern European Restaurant
7	Pedestrian Plaza	Latin American Restaurant
8	Restaurant	Basketball Stadium
9	Park	Plaza
10	Soccer Stadium	Other Great Outdoors
11	Park	German Restaurant
12	American Restaurant	South American Restaurant

	7th Most Common Venue	8th Most Common Venue \
0	Soccer Stadium	Other Great Outdoors
1	Mexican Restaurant	Golf Course
2	Kebab Restaurant	Italian Restaurant
3	Other Great Outdoors	Park
4	Italian Restaurant	Gym / Fitness Center
5	Soccer Stadium	Other Great Outdoors
6	Other Great Outdoors	Park
7	Italian Restaurant	Health Food Store
8	Chinese Restaurant	Middle Eastern Restaurant
9	Middle Eastern Restaurant	Modern European Restaurant
10	Park	Pedestrian Plaza
11	Food Court	Tennis Court
12	Other Great Outdoors	Park

	9th Most Common Venue	10th Most Common Venue
0	Park	Pedestrian Plaza
1	Modern European Restaurant	Sushi Restaurant
2	Spanish Restaurant	Gym
3	Pedestrian Plaza	Restaurant
4	South American Restaurant	Park
5	Park	Pedestrian Plaza

6	Pedestrian Plaza	Plaza
7	South American Restaurant	Southern / Soul Food Restaurant
8	Empanada Restaurant	Falafel Restaurant
9	Other Great Outdoors	Pedestrian Plaza
10	Plaza	Restaurant
11	Sushi Restaurant	Soccer Field
12	Pedestrian Plaza	Restaurant

Visualizamos como se subdivide el cluster CERO

*#Definimos las coordenadas de Montevideo*

```
address = 'Punta Carretas,Montevideo, Uruguay'
geolocator = Nominatim(user_agent="to_explorer")
location2 = geolocator.geocode(address)
latitude2 = location2.latitude
longitude2 = location2.longitude
```

```
print('Latitud Punta Carretas-Montevideo:',latitude2)
print('Longitud Punta Carretas-Montevideo:',longitude2)
```

```
Latitud Punta Carretas-Montevideo: -34.9058916
Longitud Punta Carretas-Montevideo: -56.1913095
```

```
montevideo_cluster_cero = folium.Map(location=[latitude2, longitude2],
zoom_start=13, tiles = 'Stamen Toner')
```

*# establecer el esquema de color para las agrupaciones*

```
x = np.arange(kclusterscero)
ys = [i + x + (i*x)**3 for i in range(kclusterscero)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]
```

*# añadir marcadores al mapa*

```
markers_colors = []
for lat, lon, bar, cluster , first in
zip(montevideo_cluster_cero_merged['Latitud'],
montevideo_cluster_cero_merged['Longitude'],

montevideo_cluster_cero_merged['Barrio'],
montevideo_cluster_cero_merged['Cluster Labels'],
```

```
montevideo_cluster_cero_merged['1st Most Common Venue']):
    label = folium.Popup(str(bar) + ' Cluster ' + str(cluster) + ' - '
'First Venue :' + str(first), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=10,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
```



```

        fill_color=rainbow[cluster-1],
        fill_opacity=0.9).add_to(montevideo_cluster_cero)
folium.map.Marker(
    [lat,lon],
    icon=DivIcon(
        icon_size=(20,20),
        icon_anchor=(0,0),
        html='<div style="font-size: 5; color: blue;"><b>%s</b></div>'
% '{}'.format(bar))).add_to(montevideo_cluster_cero)

```

montevideo\_cluster\_cero

<folium.folium.Map at 0x7f2e3977ed90>

Re-analizamos los sub-cluster del cluster cero original

```

print('La poblacion del sub-cluster 0
es :',montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merge
d['Cluster Labels'] == 0,
montevideo_cluster_cero_merged.columns[[1]].sum())
montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Clu
ster Labels'] == 0, montevideo_cluster_cero_merged.columns[[0]+[1] +
list(range(5, 11))]]

```

La poblacion del sub-cluster 0 es : Poblacion 9600  
dtype: int64

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue \
10	La Blanqueada	9600	0	Basketball Court

	2nd Most Common Venue \	3rd Most Common Venue	4th Most Common
10	Athletics & Sports Restaurant	Latin American Restaurant	American

	5th Most Common Venue
10	Soccer Stadium

```

print('La poblacion del sub-cluster 1
es :',montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merge
d['Cluster Labels'] == 1,
montevideo_cluster_cero_merged.columns[[1]].sum())
montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Clu
ster Labels'] == 1, montevideo_cluster_cero_merged.columns[[0]+[1] +
list(range(5, 11))]]

```

La poblacion del sub-cluster 1 es : Poblacion 90799  
dtype: int64

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue \
1	Punta Carretas	24181	1	Restaurant
4	Palermo	12992	1	Restaurant

5	Parque Rodó	12944	1	Restaurant
6	Barrio Sur	12639	1	American Restaurant
7	Ciudad Vieja	12555	1	Restaurant
11	Carrasco	15488	1	Restaurant

2nd Most Common Venue		3rd Most Common Venue \	
1	Mediterranean Restaurant		Fast Food Restaurant
4	Other Great Outdoors		Gym
5	Gym		American Restaurant
6	Restaurant		Food & Drink Shop
7	Plaza		Vegetarian / Vegan Restaurant
11	Plaza		American Restaurant

4th Most Common Venue		5th Most Common Venue	
1	Italian Restaurant		Gym / Fitness Center
4	Basketball Court		Basketball Stadium
5	Tapas Restaurant		Italian Restaurant
6	Tennis Court		Tapas Restaurant
7	Food & Drink Shop		Pedestrian Plaza
11	Comfort Food Restaurant		Park

```
print('La poblacion del sub-cluster 2
es :',montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merge
d['Cluster Labels'] == 2,
montevideo_cluster_cero_merged.columns[[1]].sum())
montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Clu
ster Labels'] == 2, montevideo_cluster_cero_merged.columns[[0]+[1] +
list(range(5, 11))]]
```

La poblacion del sub-cluster 2 es : Poblacion 193906  
dtype: int64

	Barrio	Poblacion	Cluster Labels \
0	Cordón	42456	2
2	Centro	22120	2
3	Tres Cruces	15926	2
8	Pocitos	67992	2
9	Parque Batlle, Villa Dolores	31153	2
12	Punta Gorda	14259	2

1st Most Common Venue		2nd Most Common Venue \	
0	South American Restaurant		Basketball Court
2	Plaza		Restaurant
3	Latin American Restaurant		Food Court
8	Beach		Italian Restaurant
9	Soccer Stadium		Soccer Field
12	Plaza		Latin American Restaurant

3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
-----------------------	-----------------------	-----------------------

0	Plaza	Gym / Fitness Center	
Gym			
2	Gym / Fitness Center	Athletics & Sports	Chinese
Restaurant			
3	Chinese Restaurant	Plaza	Soccer
Field			
8	Sporting Goods Shop	South American Restaurant	
Restaurant			
9	Athletics & Sports	Track Stadium	
Park			
12	Beach	Seafood Restaurant	American
Restaurant			

## 6. Resultados y conclusiones Finales

### 6.1 Resumen de resultados obtenidos

El sub-cluster cero del cluster cero original, es el que tiene mayor población y en el top 5 tiene:

2 playas

3 gimnasios

3 estadios deportivos

2 sitios de articulos deportivos

4 plazas

16 sitios de comida y restaurantes

**El sub-cluster dos del cluster cero original, es el que tiene sigue en cantida de población y en el top 5 tiene:**

1 playas

3 gimnasios

3 estadios deportivos

2 parque o sitios al aire libre

0 sitios de articulos deportivos

2 plazas

19 sitios de comida y restaurantes

**El sub-cluster uno del cluster cero original, es el menor población y en el top 5 tiene:**

0 playas

0 gimnasios

- 2 estadios deportivos
- 1 parque o sitios al aire libre
- 1 sitios de articulos deportivos
- 0 plazas o sitios al aire libre
- 0 sitios de comida y restaurantes
- 1 club deportivo

## 6.2 Conclusiones finales y recomendación

En resumen, los barrios más indicados para instalar el nuevo centro deportivo son aquellos dentro del cluster cero, sub-cluster cero, dado que pertenecen a la municipios preseleccionados por mayor población, nivel socioeconómico y cercanía a la costa, y además cuentan con mayor cantidad de sitios deportivos y gimnasios, así como playas y sitios al aire libre o plazas, y una propuesta de sitios de comida y restaurantes importante. Esto implica que la población de estos barrios es ávida por la práctica de deportes en sitios cerrados y al aire libre, y posee suficiente poder económico para recepcionar una nueva propuesta de centro deportivo y de venta de articulos deportivos y de comida acorde.

De los barrios considerados, Pocitos parece ser el más adecuado por la cantidad de

	Barrio	Poblacion
0	Cordón	42456
2	Centro	22120
3	Tres Cruces	15926
8	Pocitos	67992
10	La Blanqueada	9600
12	Punta Gorda	14259

población:

```
montevideo_pocitos =
df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Pocitos']
montevideo_pocitos
```

	Barrio	Barrio	Latitud	Barrio	Longitud	Local
\						
472	Pocitos	-34.911123	-56.150593			Motociclo Sports
442	Pocitos	-34.911123	-56.150593			Club Trouville

425	Pocitos	-34.911123	-56.150593	Playa de los Pocitos
436	Pocitos	-34.911123	-56.150593	Rambla y Avenida Brasil
417	Pocitos	-34.911123	-56.150593	Miyagi Shushi
418	Pocitos	-34.911123	-56.150593	Fellini Ristobaretto
420	Pocitos	-34.911123	-56.150593	Gago
422	Pocitos	-34.911123	-56.150593	Tandory
424	Pocitos	-34.911123	-56.150593	La Cavia
439	Pocitos	-34.911123	-56.150593	Lokotas
440	Pocitos	-34.911123	-56.150593	Milajó
441	Pocitos	-34.911123	-56.150593	Chivitos lo de Pepe
455	Pocitos	-34.911123	-56.150593	Erevan
462	Pocitos	-34.911123	-56.150593	La Taquería
471	Pocitos	-34.911123	-56.150593	Restaurant Hong Kong

	Local Latitud	Local Longitud	\
472	-34.909032	-56.146623	
442	-34.912473	-56.149755	
425	-34.912655	-56.145973	
436	-34.914673	-56.148711	
417	-34.908886	-56.148351	
418	-34.913196	-56.148436	
420	-34.912575	-56.148849	
422	-34.907692	-56.152395	
424	-34.912359	-56.152623	
439	-34.908826	-56.148432	
440	-34.907083	-56.151044	
441	-34.915114	-56.150585	
455	-34.907465	-56.149652	
462	-34.912611	-56.148763	
471	-34.913050	-56.148591	

	Local Dirección(esquina)	Local
Categoria		
472	Miguel Barreiro 3243 (Berro)	Sporting
Goods Shop		

442	Chucarro 1031	Basketball
Stadium		
425	Rambla República del Perú (Avenida de Brasil)	
Beach		
436	Montevideo Montevideo	
Beach		
417	Gabriel Pereira 3138 (26 de marzo)	Japanese
Restaurant		
418	José Martí 3408 (Benito Blanco)	Italian
Restaurant		
420	Jose Marti 3383 (Juan Benito Blanco)	Falafel
Restaurant		
422	Ramon Masini 1130 (Libertad)	
Restaurant		
424	26 de Marzo (Cavia)	Latin American
Restaurant		
439	Montevideo Montevideo	Empanada
Restaurant		
440	Libertad (Gabriel Pereira)	Italian
Restaurant		
441	Roque Graseras (Bvar. España)	South American
Restaurant		
455	Ellauri 1308 (Gabriel Pereira)	Middle Eastern
Restaurant		
462	José martí 3373 (Benito Blanco)	Mexican
Restaurant		
471	José Martí 3397 (Benito Blanco)	Chinese
Restaurant		

#### *#Definimos las coordenadas de Montevideo*

```
latitude3 =montevideo_pocitos.iloc[[0],[1]].astype(float)
longitude3 = montevideo_pocitos.iloc[[0],[2]].astype(float)
print('Latitud Pocitos-Montevideo:',latitude3)
print('Longitud Pocitos-Montevideo:',longitude3)
```

```
Latitud Pocitos-Montevideo:      Barrio Latitud
472      -34.911123
Longitud Pocitos-Montevideo:      Barrio Longitud
472      -56.150593
```

```
montevideo_pocitos_map = folium.Map(location=[-34.911123, -56.150593],
zoom_start=16, tiles = 'Stamen Toner')
```

*# establecer el esquema de color para las agrupaciones*

*# añadir marcadores al mapa*

```
for lat, lon, loc, cat, addr in zip(montevideo_pocitos['Local
Latitud'], montevideo_pocitos['Local Longitud'],
montevideo_pocitos['Local'],
montevideo_pocitos['Local Categoria'],
montevideo_pocitos['Local
Dirección(esquina)']):
```

```

        label = folium.Popup(str(addr) + ' - ' + str(cat),
parse_html=True)
        folium.CircleMarker(
            [lat, lon],
            radius=5,
            popup=label,
            color=rainbow[cluster-1],
            fill=True,
            fill_color=rainbow[cluster-1],
            fill_opacity=0.9).add_to(montevideo_pocitos_map)
        folium.map.Marker(
            [lat,lon],
            icon=DivIcon(
                icon_size=(20,20),
                icon_anchor=(0,0),
                html='<div style="font-size: 5; color: blue;"><b>%s</b></div>'
% '{}'.format(loc))).add_to(montevideo_pocitos_map)

montevideo_pocitos_map
<folium.folium.Map at 0x7f2e391a9f50>

```