

# 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.

```
In [1]: 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 e
import folium # Librería para graficar mapas
from folium.features import DivIcon

Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

# All requested packages already installed.
```

```
In [2]: # Importamos Los datos de Los dataframes guardados en la primera parte.
df_montevideo_coord2 = pd.read_csv(r'C:\Users\HUGO\Documents\Downloads\df_montevideo_coord2.csv')
df_montevideo_coord2
```

```
Out[2]:
```

	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

	Barrio	Poblacion	Municipio	Latitud	Longitud
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

In [3]:

```
# Importamos Los datos de Los dataframes guardados en la primera parte
df_monteideo_all_municipio = pd.read_csv(r'C:\Users\HUGO\Documents\Downloads\df_monteideo_all_municipio.csv')
df_monteideo_socioeconom_municipio = pd.read_csv(r'C:\Users\HUGO\Documents\Downloads\df_monteideo_socioecon')
print(df_monteideo_all_municipio.head())
print(df_monteideo_socioeconom_municipio.head())
```

	Municipio	Barrio	Poblacion
0	F	Villa García, Manga RuralMangaMaroñas, Parque ...	133776
1	G	Peñarol, LavallejaColón Centro y NoroesteConci...	123867
2	B	CordónCentroPalermoParque RodóBarrio SurCiudad...	115706
3	CH	PocitosParque Batlle, Villa Dolores	99145
4	E	MalvínMalvín NorteCarrascoPunta GordaCarrasco ...	91104
	Municipio	Nivel-SocioEconómico	IngresosHogar
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

```
In [4]: # 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 índice.
# 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('CH')]
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)
```

```
Out[4]:
```

	Barrio	Poblacion	Municipio	Latitud	Longitud
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

## 4.2 Aplicación de API de Foursquare

```
In [5]: # Definir la versión y credenciales de FourSquare
CLIENT_ID = 'YJMHUOR0YOWTSLOP45GILZL3HWEZQE3H04FSUYDM0YESHNX' # su ID de Foursquare
CLIENT_SECRET = 'YUEDBHKPIKSCZFAK00DFXHOQ0K4MSPNPHHIVDM4JV13TPEOS' # Secreto de Foursquare
VERSION = '20180605' # versión de la API de Foursquare
LIMIT = 100 # Un valor límite para la API de Foursquare

print('Your credentials:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)
```

```
Your credentials:
CLIENT_ID: YJMHUOR0YOWTSLOP45GILZL3HWEZQE3H04FSUYDM0YESHNX
```

CLIENT\_SECRET:YUEDBHKPIKSCZFAK00DFXHOQ0K4MSPNPHHIVDM4JV13TPEOS

```
In [6]: # 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.

```
In [7]: # Para La API de Foursquare, cargamos Los datos.Obtengamos Los 100 sitios en Marble Hill dentro de un radio d
# 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={}&li
CLIENT_ID,
CLIENT_SECRET,
VERSION,
barrio_latitud,
barrio_longitud,
radius,
LIMIT)
url
```

Out[7]: 'https://api.foursquare.com/v2/venues/explore?&client\_id=YJMHUOR0YOWTSLOP45GILZL3HWEZQE3H04FSUYDM0YESHNX&cli  
ent\_secret=YUEDBHKPIKSCZFAK00DFXHOQ0K4MSPNPHHIVDM4JV13TPEOS&v=20180605&ll=-34.9111227,-56.1505928&radius=500&  
limit=100'

```
In [8]: # Enviar La solicitud GET y examinar Los resultados.
results = requests.get(url).json()
results
```

```
Out[8]: {'meta': {'code': 200, 'requestId': '61a115cfca841b5be5b70545'},
'response': {'suggestedFilters': {'header': 'Tap to show:',
'filters': [{'name': 'Open now', 'key': 'openNow'}]},
'headerLocation': 'Pocitos',
'headerFullLocation': 'Pocitos, Montevideo',
'headerLocationGranularity': 'neighborhood',
'totalResults': 62,
'suggestedBounds': {'ne': {'lat': -34.9066226955, 'lng': -56.14511550847283},
'sw': {'lat': -34.9156227045, 'lng': -56.15607009152717}},
'groups': [{'type': 'Recommended Places',
'name': 'recommended',
'items': [{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}],
'venue': {'id': '4f3f42ace4b0d66d1ef42641',
'name': 'Destino 26',
'location': {'address': '26 Marzo 1125',
'lat': -34.91043020494529,
'lng': -56.15030094680103,
'labeledLatLngs': [{'label': 'display',
'lat': -34.91043020494529,
'lng': -56.15030094680103}],
'distance': 81,
'cc': 'UY',
'city': 'Montevideo',
'state': 'Montevideo',
'country': 'Uruguay',
'formattedAddress': ['26 Marzo 1125',
'Montevideo Montevideo',
'Uruguay']},
'categories': [{'id': '4bf58dd8d48988d1f8931735',
'name': 'Bed & Breakfast',
'pluralName': 'Bed & Breakfasts',
'shortName': 'B & B',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/travel/bedandbreakfast_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4f3f42ace4b0d66d1ef42641-0'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}],
'venue': {'id': '4e74e8f6c65bb91db41f997e',
'name': 'Petite Patisserie De Flor',
'location': {'address': 'José Martí 3340',
'crossStreet': 'Chucarro',
```

```

    'lat': -34.91218,
    'lng': -56.149359,
    'labeledLatLngs': [{ 'label': 'display',
        'lat': -34.91218,
        'lng': -56.149359}],
    'distance': 162,
    'cc': 'UY',
    'neighborhood': 'Pocitos',
    'city': 'Montevideo',
    'state': 'Montevideo',
    'country': 'Uruguay',
    'formattedAddress': ['José Martí 3340 (Chucarro)',
        'Montevideo Montevideo',
        'Uruguay']],
    'categories': [{ 'id': '4bf58dd8d48988d1d0941735',
        'name': 'Dessert Shop',
        'pluralName': 'Dessert Shops',
        'shortName': 'Desserts',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/dessert_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4e74e8f6c65bb91db41f997e-1'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason'}]},
        'venue': { 'id': '4d0cfb9c3905b1f7d9a9974b',
            'name': "Cake's",
            'location': { 'address': 'José Ellauri 1067',
                'lat': -34.911404569561256,
                'lng': -56.15288805771525,
                'labeledLatLngs': [{ 'label': 'display',
                    'lat': -34.911404569561256,
                    'lng': -56.15288805771525}],
                'distance': 211,
                'cc': 'UY',
                'city': 'Montevideo',
                'state': 'Montevideo',
                'country': 'Uruguay',
                'formattedAddress': ['José Ellauri 1067',
                    'Montevideo Montevideo',
                    'Uruguay']],
            'categories': [{ 'id': '4bf58dd8d48988d1d0941735',
                'name': 'Dessert Shop',
                'pluralName': 'Dessert Shops',
                'shortName': 'Desserts',
                'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/dessert_',
                    'suffix': '.png'},
                'primary': True}],
            'photos': { 'count': 0, 'groups': []},
            'referralId': 'e-0-4d0cfb9c3905b1f7d9a9974b-2'},
            { 'reasons': { 'count': 0,
                'items': [{ 'summary': 'This spot is popular',
                    'type': 'general',
                    'reasonName': 'globalInteractionReason'}]},
                    'venue': { 'id': '4df603e145dd4e269348ac2b',
                        'name': 'Aerobic',
                        'location': { 'address': 'Av. 26 de Marzo 1069',
                            'crossStreet': 'Av. Brasil',
                            'lat': -34.91104482312311,
                            'lng': -56.15123510373057,
                            'labeledLatLngs': [{ 'label': 'display',
                                'lat': -34.91104482312311,
                                'lng': -56.15123510373057}],
                            'distance': 59,
                            'postalCode': '11300',
                            'cc': 'UY',
                            'city': 'Montevideo',
                            'state': 'Montevideo',
                            'country': 'Uruguay',
                            'formattedAddress': ['Av. 26 de Marzo 1069 (Av. Brasil)',
                                '11300 Montevideo Montevideo',
                                'Uruguay']],
                        'categories': [{ 'id': '4bf58dd8d48988d175941735',
                            'name': 'Gym / Fitness Center',
                            'pluralName': 'Gyms or Fitness Centers',
                            'shortName': 'Gym / Fitness',
                            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/gym_',
                                'suffix': '.png'},
                            'primary': True}],
                        'photos': { 'count': 0, 'groups': []},
                        'referralId': 'e-0-4df603e145dd4e269348ac2b-3'},
                        { 'reasons': { 'count': 0,
                            'items': [{ 'summary': 'This spot is popular',
                                'type': 'general',
                                'reasonName': 'globalInteractionReason'}]}},

```

```

'venue': {'id': '507c998ae4b068bf277cf8a0',
'name': 'Miyagi Shushi',
'location': {'address': 'Gabriel Pereira 3138',
'crossStreet': '26 de marzo',
'lat': -34.90888601128947,
'lng': -56.148351249791304,
'labeledLatLngs': [{'label': 'display',
'lat': -34.90888601128947,
'lng': -56.148351249791304}]},
'distance': 322,
'cc': 'UY',
'city': 'Montevideo',
'state': 'Montevideo',
'country': 'Uruguay',
'formattedAddress': ['Gabriel Pereira 3138 (26 de marzo)',
'Montevideo Montevideo',
'Uruguay']},
'categories': [{'id': '4bf58dd8d48988d11941735',
'name': 'Japanese Restaurant',
'pluralName': 'Japanese Restaurants',
'shortName': 'Japanese',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/japanese_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'referralId': 'e-0-507c998ae4b068bf277cf8a0-4'},
{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '4b73436cf964a52015a52de3',
'name': 'Fellini Ristobaretto',
'location': {'address': 'José Martí 3408',
'crossStreet': 'Benito Blanco',
'lat': -34.9131961995647,
'lng': -56.148435797435795,
'labeledLatLngs': [{'label': 'display',
'lat': -34.9131961995647,
'lng': -56.148435797435795}]},
'distance': 303,
'cc': 'UY',
'city': 'Montevideo',
'state': 'Montevideo',
'country': 'Uruguay',
'formattedAddress': ['José Martí 3408 (Benito Blanco)',
'Montevideo Montevideo',
'Uruguay']},
'categories': [{'id': '4bf58dd8d48988d110941735',
'name': 'Italian Restaurant',
'pluralName': 'Italian Restaurants',
'shortName': 'Italian',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/italian_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'referralId': 'e-0-4b73436cf964a52015a52de3-5'},
{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '5bbd58d386f4cc002c0936dc',
'name': 'La Latina Café',
'location': {'address': 'Avenida Brasil 2858',
'crossStreet': 'Santiago Vazquez',
'lat': -34.910305,
'lng': -56.152765,
'labeledLatLngs': [{'label': 'display',
'lat': -34.910305,
'lng': -56.152765}]},
'distance': 218,
'postalCode': '11300',
'cc': 'UY',
'city': 'Montevideo',
'state': 'Montevideo',
'country': 'Uruguay',
'formattedAddress': ['Avenida Brasil 2858 (Santiago Vazquez)',
'11300 Montevideo Montevideo',
'Uruguay']},
'categories': [{'id': '4bf58dd8d48988d16d941735',
'name': 'Café',
'pluralName': 'Cafés',
'shortName': 'Café',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'referralId': 'e-0-5bbd58d386f4cc002c0936dc-6'},

```

```

{
  'reasons': {
    'count': 0,
    'items': [
      {
        'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'
      }
    ]
  },
  'venue': {
    'id': '4c084747d1329c749be4fc07',
    'name': 'Gago',
    'location': {
      'address': 'Jose Marti 3383',
      'crossStreet': 'Juan Benito Blanco',
      'lat': -34.912575387318455,
      'lng': -56.14884853363037,
      'labeledLatLngs': [
        {
          'label': 'display',
          'lat': -34.912575387318455,
          'lng': -56.14884853363037
        }
      ]
    },
    'distance': 226,
    'cc': 'UY',
    'city': 'Montevideo',
    'state': 'Montevideo',
    'country': 'Uruguay',
    'formattedAddress': [
      'Jose Marti 3383 (Juan Benito Blanco)',
      'Montevideo Montevideo',
      'Uruguay'
    ],
    'categories': [
      {
        'id': '4bf58dd8d48988d10b941735',
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      'pluralName': 'Pharmacies',
      'shortName': 'Pharmacy',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/pharmacy_',
        'suffix': '.png'},
      'primary': True}]},
    'photos': {'count': 0, 'groups': []}},
  'referralId': 'e-0-4fa76121d5fb145d03817ca3-60'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]}},
  'venue': {'id': '50db73cee4b03ac47d6e6a80',
    'name': 'Tequila Macho',
    'location': {'address': 'Juan Benito Blanco',
      'crossStreet': 'Gabriel Pereyra',
      'lat': -34.911285436456524,
      'lng': -56.145868168732456,
      'labeledLatLngs': [{'label': 'display',
        'lat': -34.911285436456524,
        'lng': -56.145868168732456}]},
    'distance': 431,
    'postalCode': '11300',
    'cc': 'UY',
    'city': 'Montevideo',
    'state': 'Montevideo',
    'country': 'Uruguay',

```

```

'formattedAddress': ['Juan Benito Blanco (Gabriel Pereyra)',
'11300 Montevideo Montevideo',
'Uruguay']],
'categories': [{ 'id': '4bf58dd8d48988d186941735',
'name': 'Liquor Store',
'pluralName': 'Liquor Stores',
'shortName': 'Liquor Store',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/food_liquor_',
'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []}],
'referralId': 'e-0-50db73cee4b03ac47d6e6a80-61'}}]]}}

```

```

In [9]: # 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'][0]['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(".")[1] 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.

```

<ipython-input-9-5d93b22b1db1>:17: FutureWarning: pandas.io.json.json_normalize is deprecated, use pandas.json_normalize instead
nearby_venues = json_normalize(venues) # objeto JSON

```

```

In [10]: nearby_venues.head()

```

```

Out[10]:
   name address categories lat lng
0  Destino 26  26 Marzo 1125  Bed & Breakfast  -34.910430  -56.150301
1  Petite Patisserie De Flor  José Martí 3340  Dessert Shop  -34.912180  -56.149359
2    Cake's  José Ellauri 1067  Dessert Shop  -34.911405  -56.152888
3    Aerobic  Av. 26 de Marzo 1069  Gym / Fitness Center  -34.911045  -56.151235
4  Miyagi Shushi  Gabriel Pereira 3138  Japanese Restaurant  -34.908886  -56.148351

```

```

In [11]: # filtramos por los que son competencia, o sea categoría "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], nearby_gym_fitness['location.address'].iloc[0]))

```

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

```

Out[11]:
   name address categories lat lng
3  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 habría mucha competencia en uno de los barrios de mayor población y nivel socioeconómico.

Veamos que otras categorias tenemos en el dataframe

```
In [12]: print(nearby_venues['categories'].unique())
```

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

```
In [13]: # Filtramos 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
nearby_sports.append(nearby_sports2)
```

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

```
Out[13]:
```

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

```
In [14]: 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={},{}&radi
            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 Categoria']

    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**.

```
In [15]: 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  
(581, 8)

	Barrio	Barrio Latitud	Barrio Longitud	Local	Local Latitud	Local Longitud	Local Dirección(esquina)	Local Categoria
0	Cordón	-34.900827	-56.180125	La Trastienda Club	-34.898455	-56.178493	Fernández Crespo 1763 (Paysandú)	Music Venue
1	Cordón	-34.900827	-56.180125	Feria de Tristán Narvaja	-34.899993	-56.178761	Tristán Narvaja (e/ Av. 18 de Julio y La Paz)	Flea Market
2	Cordón	-34.900827	-56.180125	Confitería Carrera	-34.902545	-56.179903	Magallanes (Colonia)	Dessert Shop
3	Cordón	-34.900827	-56.180125	Asociación Cristiana de Jóvenes	-34.900806	-56.176413	Colonia 1870 (Eduardo Acevedo)	Gym / Fitness Center
4	Cordón	-34.900827	-56.180125	Plaza de los 33	-34.903020	-56.180370	Av. 18 de Julio (e/ Minas y Magallanes)	Plaza
5	Cordón	-34.900827	-56.180125	Palacio Peñarol	-34.898751	-56.182473	Magallanes 1721 (Galicia)	Basketball Court
6	Cordón	-34.900827	-56.180125	Donut City	-34.904526	-56.181488	Carlos Roxlo 1381	Donut Shop
7	Cordón	-34.900827	-56.180125	Teatro El Galpón	-34.904677	-56.180812	Avda. 18 de Julio 1618 (Carlos Roxlo)	Theater
8	Cordón	-34.900827	-56.180125	Verde	-34.899519	-56.179068	Montevideo Montevideo	Bar
9	Cordón	-34.900827	-56.180125	Don Koto	-34.901973	-56.178894	Colonia 1758 (Gaboto)	BBQ Joint
10	Cordón	-34.900827	-56.180125	Mosca	-34.904858	-56.181968	Av. 18 de Julio 1578 (Carlos Roxlo)	Paper / Office Supplies Store
11	Cordón	-34.900827	-56.180125	Bar Touring	-34.902908	-56.181003	Colonia 1650 (Minas)	Breakfast Spot
12	Cordón	-34.900827	-56.180125	Teatro Notariado	-34.903872	-56.178613	Montevideo Montevideo	Theater
13	Cordón	-34.900827	-56.180125	La Fábrica	-34.900829	-56.178135	Tristán Narvaja 1586 (Mercedes)	Pizza Place
14	Cordón	-34.900827	-56.180125	Finisterre Bar	-34.904712	-56.177536	José Enrique Rodó 1799 (Gaboto)	Bar
15	Cordón	-34.900827	-56.180125	Gran Sportman	-34.902246	-56.177341	18 de Julio (Tristán Narvaja)	South American Restaurant
16	Cordón	-34.900827	-56.180125	La Tortuguita	-34.900839	-56.178354	Tristán Narvaja 1597 (Mercedes)	Pizza Place
17	Cordón	-34.900827	-56.180125	Club BPS	-34.901414	-56.180063	Mercedes 1723 (Magallanes)	Gym
18	Cordón	-34.900827	-56.180125	Subway 18 de Julio	-34.901786	-56.175207	18 de Julio 1902 (Juan A. Rodríguez)	Sandwich Place

	Barrio	Barrio Latitud	Barrio Longitud	Local	Local Latitud	Local Longitud	Local Dirección(esquina)	Local Categoría
19	Cordón	-34.900827	-56.180125	Disco	-34.898966	-56.177644	Fernández Crespo 1727 (Uruguay)	Supermarket

```
In [16]: # Exportamos el dataframe para guardarlo en Datos
df_montevideo_bche_sitios.to_csv('df_montevideo_bche_sitios.csv', index = False)
```

```
In [17]: #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 Categoría'].unique()))
```

```
Locales por Barrio Barrio
Aguada                8
Barrio Sur            37
Buceo                 5
Carrasco              37
Carrasco Norte        4
Centro                63
Ciudad Vieja          66
Cordón                36
La Blanqueada         10
La Comercial          9
Larrañaga             6
Malvín                6
Malvín Norte          3
Palermo               33
Parque Batlle, Villa Dolores 15
Parque Rodó           60
Pocitos               62
Punta Carretas        88
Punta Gorda           7
Tres Cruces           21
Unión                 5
Name: Local, dtype: int64
Se detectaron 139 categorias únicas.
```

```
In [18]: # Determinamos Las categorias
df_montevideo_bche_sitios['Local Categoría'].unique()
```

```
Out[18]: array(['Music Venue', 'Flea Market', 'Dessert Shop',
                'Gym / Fitness Center', 'Plaza', 'Basketball Court', 'Donut Shop',
                'Theater', 'Bar', 'BBQ Joint', 'Paper / Office Supplies Store',
                'Breakfast Spot', 'Pizza Place', 'South American Restaurant',
                'Gym', 'Sandwich Place', 'Supermarket', 'Ice Cream Shop',
                'Gay Bar', 'Clothing Store', 'Convenience Store', 'Coffee Shop',
                'Lingerie Store', 'Bus Line', 'Soccer Field', 'Deli / Bodega',
                'Mediterranean Restaurant', 'Café', 'Hotel', 'Boutique',
                'Tapas Restaurant', 'Shoe Store', 'Shopping Mall', 'Tea Room',
                'Restaurant', 'Steakhouse', 'Wine Bar', 'Public Art',
                'Golf Course', 'Sushi Restaurant', 'Modern European Restaurant',
                'Shop & Service', 'Women's Store', 'Night Market', 'Burger Joint',
                'Bakery', 'Mexican Restaurant', 'Multiplex', 'Bookstore',
                'Italian Restaurant', 'Electronics Store', 'Men's Store',
                'Pharmacy', 'Fast Food Restaurant', 'Kebab Restaurant',
                'Latin American Restaurant', 'Spanish Restaurant', 'Fountain',
                'Indie Movie Theater', 'Gastropub', 'Chinese Restaurant',
                'Snack Place', 'Scenic Lookout', 'Arts & Crafts Store', 'Pub',
                'Art Gallery', 'Hostel', 'Movie Theater', 'Museum', 'Food Truck',
                'Train Station', 'Nightclub', 'Food & Drink Shop', 'Grocery Store',
                'Food Court', 'Cafeteria', 'Other Great Outdoors',
                'Basketball Stadium', 'Stadium', 'Hot Dog Joint', 'Bistro',
                'Diner', 'Cocktail Bar', 'Brewery', 'Food', 'Irish Pub',
                'American Restaurant', 'Lounge', 'Empanada Restaurant', 'Lake',
                'Casino', 'Smoothie Shop', 'Furniture / Home Store',
                'Concert Hall', 'Vegetarian / Vegan Restaurant', 'Salsa Club',
                'Comfort Food Restaurant', 'Health Food Store', 'Salad Place',
                'Pedestrian Plaza', 'Art Museum', 'History Museum', 'Juice Bar',
                'Swiss Restaurant', 'Design Studio', 'Opera House',
                'Monument / Landmark', 'Southern / Soul Food Restaurant',
                'Government Building', 'Chocolate Shop', 'Bed & Breakfast',
                'Science Museum', 'Bus Station', 'Middle Eastern Restaurant',
                'Japanese Restaurant', 'Falafel Restaurant', 'Beach', 'Newsstand',
                'Market', 'Beer Store', 'Sporting Goods Shop', 'Liquor Store',
                'Park', 'Indie Theater', 'Soccer Stadium', 'Track Stadium',
                'Medical Center', 'Athletics & Sports', 'Gun Range', 'Sports Club',
                'Department Store', 'Playground', 'Tennis Court', 'Gourmet Shop',
                'German Restaurant', 'Mobile Phone Shop', 'Toy / Game Store',
                'Smoke Shop', 'Seafood Restaurant'], dtype=object)
```

```
In [19]: # Filtramos el dataframe por las categorias que tengan que ver con deportes, gym, parques, outdoors, playas,
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('Sp
df_montevideo_outdoors = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains(
df_montevideo_parques = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('
df_montevideo_plazas = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('P
df_montevideo_estadios = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains(
df_montevideo_playas = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('B
df_montevideo_basket = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('B
df_montevideo_futbol = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('S
df_montevideo_golf = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('Gol
df_montevideo_tennis = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('T
df_montevideo_restaurant = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contain
df_montevideo_food = df_montevideo_bche_sitios[df_montevideo_bche_sitios['Local Categoria'].str.contains('Foo

df_montevideo_sport_foods_sitios = pd.concat([df_montevideo_gym,df_montevideo_sport,df_montevideo_outdoors,df
df_montevideo_plazas,df_montevideo_estadios,df_montevideo_playas
df_montevideo_futbol,df_montevideo_tennis,df_montevideo_golf,df_
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_sitios.csv', index = False)
df_montevideo_sport_foods_sitios.reset_index(drop=True)
```

Out[19]:

	Barrio	Barrio Latitud	Barrio Longitud	Local	Local Latitud	Local Longitud	Local Dirección(esquina)	Local Categoria
0	Cordón	-34.900827	-56.180125	Asociación Cristiana de Jóvenes	-34.900806	-56.176413	Colonia 1870 (Eduardo Acevedo)	Gym / Fitness Center
1	Cordón	-34.900827	-56.180125	Club BPS	-34.901414	-56.180063	Mercedes 1723 (Magallanes)	Gym
2	Punta Carretas	-34.920202	-56.160065	Instinto Crossfit	-34.917322	-56.157522	21 De Setiembre 2745 (Luis De La Torre)	Gym / Fitness Center
3	Punta Carretas	-34.920202	-56.160065	Beauty Planet	-34.921482	-56.156163	Blanca Del Tabaré 2990 (Ellaury)	Gym
4	Punta Carretas	-34.920202	-56.160065	Via Aqua Spa	-34.924113	-56.157570	Victor Soliño 375	Gym
...	...	...	...	...	...	...	...	...
156	Carrasco	-34.885577	-56.058150	Dackel	-34.889256	-56.057562	Gabriel Otero 6438 (Arocena)	German Restaurant
157	Carrasco	-34.885577	-56.058150	Hoy Te Quiero	-34.889672	-56.056654	Arocena (Otero)	Restaurant
158	Carrasco	-34.885577	-56.058150	Tajamar Restó	-34.883163	-56.061224	Lieja 6416 (Divina Comedia)	American Restaurant
159	Punta Gorda	-34.899841	-56.081571	Hemingway	-34.898744	-56.082226	Rambla República de México 5535	Seafood Restaurant
160	Punta Gorda	-34.899841	-56.081571	Chivitos Marcos	-34.896074	-56.080180	Coimbra (Gral. Paz)	Latin American Restaurant

161 rows x 8 columns

```
In [20]: df_montevideo_sport_foods_sitios.to_csv('df_montevideo_sport_foods_sitios.csv', index = False)
```

```
In [21]: #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'].un
```

Locales por Barrio	Barrio
Aguada	1
Barrio Sur	4
Buceo	1
Carrasco	11
Carrasco Norte	1
Centro	13
Ciudad Vieja	21
Cordón	9
La Blanqueada	3
La Comercial	1
Larrañaga	5

```

Malvín          3
Malvín Norte    2
Palermo         15
Parque Batlle, Villa Dolores  10
Parque Rodó     11
Pocitos         15
Punta Carretas  23
Punta Gorda     5
Tres Cruces     6
Unión           1
Name: Local, dtype: int64
Se detectaron 47 categorías únicas.

```

Ahora procedemos a preparar los datos para el clustering

```

In [22]: # codificación
montevideo_sport_foods_onehot = pd.get_dummies(df_montevideo_sport_foods_sitios[['Local Categoria']], prefix=

# 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()

```

```

Out[22]:

```

	Barrio	American Restaurant	Athletics & Sports	Basketball Court	Basketball Stadium	Beach	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant	Falafel Restaurant	...	Spanish Restaurant
0	Cordón	0	0	0	0	0	0	0	0	0	...	0
1	Cordón	0	0	0	0	0	0	0	0	0	...	0
2	Punta Carretas	0	0	0	0	0	0	0	0	0	...	0
3	Punta Carretas	0	0	0	0	0	0	0	0	0	...	0
4	Punta Carretas	0	0	0	0	0	0	0	0	0	...	0

5 rows x 48 columns

```

In [23]: print(montevideo_sport_foods_onehot.shape)

(161, 48)

```

```

In [24]: 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

```

In [25]: montevideo_sport_foods_grouped = montevideo_sport_foods_onehot.groupby('Barrio').mean().reset_index()
montevideo_sport_foods_grouped

```

```

Out[25]:

```

	Barrio	American Restaurant	Athletics & Sports	Basketball Court	Basketball Stadium	Beach	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant	Falafel Restaurant	...	Spanish Restaurant
0	Aguada	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
1	Barrio Sur	0.250000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
2	Buceo	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
3	Carrasco	0.181818	0.000000	0.000000	0.000000	0.000000	0.000000	0.090909	0.000000	0.000000	...	0.00
4	Carrasco Norte	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
5	Centro	0.000000	0.000000	0.000000	0.000000	0.000000	0.076923	0.000000	0.000000	0.000000	...	0.07
6	Ciudad Vieja	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.047619	0.000000	0.000000	...	0.00
7	Cordón	0.000000	0.000000	0.222222	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00

	Barrio	American Restaurant	Athletics & Sports	Basketball Court	Basketball Stadium	Beach	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant	Falafel Restaurant	...	Sports Restaurant
8	La Blanqueada	0.000000	0.333333	0.333333	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
9	La Comercial	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
10	Larrañaga	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
11	Malvín	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
12	Malvín Norte	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
13	Palermo	0.000000	0.000000	0.066667	0.066667	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
14	Parque Batlle, Villa Dolores	0.000000	0.100000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
15	Parque Rodó	0.090909	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
16	Pocitos	0.000000	0.000000	0.000000	0.066667	0.133333	0.066667	0.000000	0.066667	0.066667	...	0.00
17	Punta Carretas	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00
18	Punta Gorda	0.000000	0.000000	0.000000	0.000000	0.200000	0.000000	0.000000	0.000000	0.000000	...	0.00
19	Tres Cruces	0.000000	0.000000	0.000000	0.000000	0.000000	0.166667	0.000000	0.000000	0.000000	...	0.00
20	Unión	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.00

21 rows × 48 columns



```
In [26]: montevideo_sport_foods_grouped.shape
```

```
Out[26]: (21, 48)
```

```
In [27]: montevideo_sport_foods_grouped.to_csv('montevideo_sport_foods_grouped.csv', index = False)
```

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

```
In [28]: 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	American Restaurant	0.0
2	South American Restaurant	0.0
3	Modern European Restaurant	0.0
4	Other Great Outdoors	0.0

----Barrio Sur----

	sitio	freq
0	American Restaurant	0.25
1	Food & Drink Shop	0.25
2	Restaurant	0.25
3	Vegetarian / Vegan Restaurant	0.25
4	Beach	0.00

----Buceo----



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

----Carrasco----

	sitio	freq
0	Restaurant	0.36
1	American Restaurant	0.18
2	Tennis Court	0.09
3	Park	0.09
4	Comfort Food Restaurant	0.09

----Carrasco Norte----

	sitio	freq
0	Park	1.0
1	American Restaurant	0.0
2	South American 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	Food Truck	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	0.22
1	Basketball Court	0.22
2	Plaza	0.22
3	Gym / Fitness Center	0.11
4	Gym	0.11

----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	South American Restaurant	0.00

----La Comercial----

	sitio	freq
0	Middle Eastern Restaurant	1.0
1	South American 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	Gym	0.2
2	Soccer Stadium	0.2
3	American Restaurant	0.0
4	Mexican Restaurant	0.0

----Malvín----

	sitio	freq
0	Park	0.33
1	Gym	0.33
2	Soccer Field	0.33
3	American Restaurant	0.00
4	Mexican Restaurant	0.00

```

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

```

```

----Palermo----
              sitio  freq
0      Restaurant  0.40
1  Gym / Fitness Center  0.13
2  Other Great Outdoors  0.07
3      Basketball Court  0.07
4      Basketball Stadium  0.07

```

```

----Parque Batlle, Villa Dolores----
              sitio  freq
0      Soccer Stadium  0.5
1  Athletics & Sports  0.1
2      Track Stadium  0.1
3          Park  0.1
4      Sports Club  0.1

```

```

----Parque Rodó----
              sitio  freq
0      Restaurant  0.36
1          Gym  0.27
2  American Restaurant  0.09
3      Tapas Restaurant  0.09
4      Italian Restaurant  0.09

```

```

----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  0.30
1  Mediterranean Restaurant  0.09
2      Fast Food Restaurant  0.09
3      Italian Restaurant  0.09
4      Gym / Fitness Center  0.09

```

```

----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  South American Restaurant  0.0
3  Modern European Restaurant  0.0
4      Other Great Outdoors  0.0

```

**Pongamos eso en el dataframe**

```
In [29]: 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.

```
In [30]: 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, 1:], num_top_venues)

montevideo_sport_foods_sorted.head()
```

```
Out[30]:
```

	Barrio	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Aguada	Food & Drink Shop	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Park	Pedestrian Plaza	Plaza	Restaurant	Seafood Restaurant
1	Barrio Sur	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach	Southern / Soul Food Restaurant	Park	Pedestrian Plaza	Plaza	Basketball Court
2	Buceo	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Pedestrian Plaza	Plaza	Restaurant	Seafood Restaurant	Soccer Field
3	Carrasco	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant	Plaza	German Restaurant	South American Restaurant	Other Great Outdoors	Pedestrian Plaza
4	Carrasco Norte	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Pedestrian Plaza	Plaza	Restaurant	Seafood Restaurant	Soccer Field

```
In [31]: montevideo_sport_foods_sorted.shape
```

```
Out[31]: (21, 11)
```

```
In [32]: 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.

```
In [33]: # 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]
```

```
Out[33]: array([2, 0, 4, 0, 4, 0, 0, 0, 0, 3])
```

## 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.

```
In [34]: # añadir etiquetas
montevideo_sport_foods_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

montevideo_barrios_merged = df_montevideo_bche

# juntar manhattan_grouped con manhattan_data
montevideo_barrios_merged = montevideo_barrios_merged.join(montevideo_sport_foods_sorted.set_index('Barrio'),
montevideo_barrios_merged.head() # revisar las ultimas columnas
```

```
Out[34]:
```

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Cordón	42456	B	-34.900827	-56.180125	0.0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
12	Punta Carretas	24181	B y CH	-34.920202	-56.160065	0.0	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
17	Centro	22120	B	-34.906067	-56.189656	0.0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
25	Aguada	18557	B y C	-34.896676	-56.189366	2.0	Food & Drink Shop	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
30	Tres Cruces	15926	B y CH	-34.892518	-56.167113	0.0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field

```
In [35]: montevideo_barrios_merged.reset_index(drop=True, inplace = True)
montevideo_barrios_merged
```

```
Out[35]:
```

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	B	-34.900827	-56.180125	0.0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
1	Punta Carretas	24181	B y CH	-34.920202	-56.160065	0.0	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
2	Centro	22120	B	-34.906067	-56.189656	0.0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
3	Aguada	18557	B y C	-34.896676	-56.189366	2.0	Food & Drink Shop	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
4	Tres Cruces	15926	B y CH	-34.892518	-56.167113	0.0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
5	Palermo	12992	B	-34.911288	-56.180698	0.0	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
6	Parque Rodó	12944	B	-34.910082	-56.169778	0.0	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
7	Barrio Sur	12639	B	-34.911202	-56.194784	0.0	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
8	Ciudad Vieja	12555	B	-34.906351	-56.205979	0.0	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
9	La Comercial	11444	B y C	-34.886749	-56.169093	3.0	Middle Eastern Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Park
10	Pocitos	67992	CH	-34.911123	-56.150593	0.0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
11	Buceo	36998	CH y E	-34.897800	-56.128658	4.0	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-56.153383	0.0	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club
13	Larrañaga	17956	C y CH	-34.880441	-56.158788	1.0	Soccer Field	Gym	Soccer Stadium	American Restaurant	Mexican Restaurant
14	La Blanqueada	9600	CH y E	-34.887700	-56.154518	0.0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
15	Unión	39880	D, E y F	-34.880236	-56.137688	1.0	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
16	Malvín	28102	E	-34.889692	-56.094768	1.0	Park	Gym	Soccer Field	American Restaurant	Mexican Restaurant
17	Las Canteras	22974	E y F	-34.868839	-56.105227	NaN	NaN	NaN	NaN	NaN	NaN
18	Malvín Norte	19916	E	-34.877897	-56.119281	1.0	Stadium	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant
19	Carrasco	15488	E	-34.885577	-56.058150	0.0	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant
20	Punta Gorda	14259	E	-34.899841	-56.081571	0.0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant
21	Carrasco Norte	13339	E	-34.872898	-56.072086	4.0	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors



```
In [36]: # Eliminamos la fila de "Las Canteras " dado que no asignó sitios.
montevideo_barrios_merged.drop(17, axis=0, inplace = True)
```

```
In [37]: montevideo_barrios_merged.reset_index(drop=True, inplace = True)
```

```
In [38]: montevideo_barrios_merged
```

Out[38]:

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	B	-34.900827	-56.180125	0.0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
1	Punta Carretas	24181	B y CH	-34.920202	-56.160065	0.0	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
2	Centro	22120	B	-34.906067	-56.189656	0.0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
3	Aguada	18557	B y C	-34.896676	-56.189366	2.0	Food & Drink Shop	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
4	Tres Cruces	15926	B y CH	-34.892518	-56.167113	0.0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
5	Palermo	12992	B	-34.911288	-56.180698	0.0	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium
6	Parque Rodó	12944	B	-34.910082	-56.169778	0.0	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
7	Barrio Sur	12639	B	-34.911202	-56.194784	0.0	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
8	Ciudad Vieja	12555	B	-34.906351	-56.205979	0.0	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
9	La Comercial	11444	B y C	-34.886749	-56.169093	3.0	Middle Eastern Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Park
10	Pocitos	67992	CH	-34.911123	-56.150593	0.0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
11	Buceo	36998	CH y E	-34.897800	-56.128658	4.0	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-56.153383	0.0	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club
13	Larrañaga	17956	C y CH	-34.880441	-56.158788	1.0	Soccer Field	Gym	Soccer Stadium	American Restaurant	Mexican Restaurant
14	La Blanqueada	9600	CH y E	-34.887700	-56.154518	0.0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
15	Unión	39880	D, E y F	-34.880236	-56.137688	1.0	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
16	Malvín	28102	E	-34.889692	-56.094768	1.0	Park	Gym	Soccer Field	American Restaurant	Mexican Restaurant
17	Malvín Norte	19916	E	-34.877897	-56.119281	1.0	Stadium	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant
18	Carrasco	15488	E	-34.885577	-56.058150	0.0	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant
19	Punta Gorda	14259	E	-34.899841	-56.081571	0.0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
20	Carrasco Norte	13339	E	-34.872898	-56.072086	4.0	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors

In [39]:

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

In [40]:

```
# 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)
```

In [41]:

```
montevideo_barrios_merged
```

Out[41]:

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	B	-34.900827	-56.180125	0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
1	Punta Carretas	24181	B y CH	-34.920202	-56.160065	0	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
2	Centro	22120	B	-34.906067	-56.189656	0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
3	Aguada	18557	B y C	-34.896676	-56.189366	2	Food & Drink Shop	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
4	Tres Cruces	15926	B y CH	-34.892518	-56.167113	0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
5	Palermo	12992	B	-34.911288	-56.180698	0	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium
6	Parque Rodó	12944	B	-34.910082	-56.169778	0	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
7	Barrio Sur	12639	B	-34.911202	-56.194784	0	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
8	Ciudad Vieja	12555	B	-34.906351	-56.205979	0	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
9	La Comercial	11444	B y C	-34.886749	-56.169093	3	Middle Eastern Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Park
10	Pocitos	67992	CH	-34.911123	-56.150593	0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
11	Buceo	36998	CH y E	-34.897800	-56.128658	4	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
12	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-56.153383	0	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club
13	Larrañaga	17956	C y CH	-34.880441	-56.158788	1	Soccer Field	Gym	Soccer Stadium	American Restaurant	Mexican Restaurant

	Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
14	La Blanqueada	9600	CH y E	-34.887700	-56.154518	0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
15	Unión	39880	D, E y F	-34.880236	-56.137688	1	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoor
16	Malvín	28102	E	-34.889692	-56.094768	1	Park	Gym	Soccer Field	American Restaurant	Mexican Restaurant
17	Malvín Norte	19916	E	-34.877897	-56.119281	1	Stadium	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant
18	Carrasco	15488	E	-34.885577	-56.058150	0	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant
19	Punta Gorda	14259	E	-34.899841	-56.081571	0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant
20	Carrasco Norte	13339	E	-34.872898	-56.072086	4	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoor

### 5.3 Visualización en el mapa de los clusters

Finalmente visualicemos las agrupaciones resultantes

In [42]:

```
# 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

In [43]:

```
# 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['Longitud'],
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.Marker(
        [lat, lon],
        icon=DivIcon(
            icon_size=(20,20),
            icon_anchor=(0,0),
            html='<div style="font-size: 5; color: blue;"><b>{{bar}}</b></div>' % '{{bar}}'.format(bar)).add_to(montevideo_barrios_clusters)
```



```
montevideo_barrios_clusters
```

Out[43]:



## 5.4 Análisis de cada cluster

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

In [44]:

```
montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 0, montevideo_barrios_merged.col
```

Out[44]:

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
1	Punta Carretas	24181	0	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
2	Centro	22120	0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
4	Tres Cruces	15926	0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
5	Palermo	12992	0	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium
6	Parque Rodó	12944	0	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
7	Barrio Sur	12639	0	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
8	Ciudad Vieja	12555	0	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
10	Pocitos	67992	0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
12	Parque Batlle, Villa Dolores	31153	0	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club
14	La Blanqueada	9600	0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
18	Carrasco	15488	0	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant
19	Punta Gorda	14259	0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant

In [45]: `print('La poblacion del cluster 0 es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 0, montevideo_barrios_merged['Poblacion']])`

La poblacion del cluster 0 es : Poblacion 294305  
dtype: int64

In [46]: `montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 1, montevideo_barrios_merged['Poblacion']]`

Out[46]:

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
13	Larrañaga	17956	1	Soccer Field	Gym	Soccer Stadium	American Restaurant	Mexican Restaurant
15	Unión	39880	1	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
16	Malvín	28102	1	Park	Gym	Soccer Field	American Restaurant	Mexican Restaurant
17	Malvín Norte	19916	1	Stadium	Soccer Field	American Restaurant	South American Restaurant	Modern European Restaurant

In [47]: `print('La poblacion del cluster 1 es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 1, montevideo_barrios_merged['Poblacion']])`

La poblacion del cluster 1 es : Poblacion 105854  
dtype: int64

In [48]: `montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 2, montevideo_barrios_merged['Poblacion']]`

Out[48]:

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

In [49]: `print('La poblacion del cluster 2 es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 2, montevideo_barrios_merged['Poblacion']])`

La poblacion del cluster 2 es : Poblacion 18557  
dtype: int64

In [121]: `montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 3, montevideo_barrios_merged['Poblacion']]`

Out[121]:

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
9	La Comercial	11444	3	Middle Eastern Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors	Park

In [50]: `print('La poblacion del cluster 3 es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 3, montevideo_barrios_merged['Poblacion']])`

La poblacion del cluster 3 es : Poblacion 11444  
dtype: int64

In [51]: `montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 4, montevideo_barrios_merged['Poblacion']]`

Out[51]:

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
11	Buceo	36998	4	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors
20	Carrasco Norte	13339	4	Park	American Restaurant	South American Restaurant	Modern European Restaurant	Other Great Outdoors

In [52]: `print('La poblacion del cluster 4 es :',montevideo_barrios_merged.loc[montevideo_barrios_merged['Cluster Labels'] == 4, montevideo_barrios_merged['Poblacion']])`

La poblacion del cluster 4 es : Poblacion 50337  
dtype: int64

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

In [70]:

```

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

```

C:\Users\HUGO\anaconda3\lib\site-packages\pandas\core\frame.py:4308: 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)  
return super().drop(

Out[70]:

	Barrio	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Cordón	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym	Soccer Field	American Restaurant	Other Great Outdoors	Park	Pedestrian Plaza
1	Punta Carretas	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center	Gym	Mexican Restaurant	Golf Course	South American Restaurant	Modern European Restaurant
2	Centro	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant	Latin American Restaurant	Kebab Restaurant	Italian Restaurant	Spanish Restaurant	Gym
3	Tres Cruces	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field	Southern / Soul Food Restaurant	Other Great Outdoors	Park	Pedestrian Plaza	Restaurant
4	Palermo	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium	Stadium	Italian Restaurant	Gym	South American Restaurant	Soccer Stadium
5	Parque Rodó	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant	Food	Soccer Stadium	Other Great Outdoors	Park	Pedestrian Plaza
6	Barrio Sur	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach	Southern / Soul Food Restaurant	Park	Pedestrian Plaza	Plaza	Basketball Court
7	Ciudad Vieja	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza	Latin American Restaurant	Italian Restaurant	Health Food Store	South American Restaurant	Southern Soul Food Restaurant
8	Pocitos	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant	Basketball Stadium	Chinese Restaurant	Middle Eastern Restaurant	Empanada Restaurant	Falafel Restaurant
9	Parque Batlle, Villa Dolores	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club	Soccer Field	Middle Eastern Restaurant	Modern European Restaurant	Other Great Outdoors	Pedestrian Plaza
10	La Blanqueada	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant	Other Great Outdoors	Park	Pedestrian Plaza	Plaza	Restaurant
11	Carrasco	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant	Plaza	German Restaurant	South American Restaurant	Other Great Outdoors	Pedestrian Plaza
12	Punta Gorda	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant	South American Restaurant	Other Great Outdoors	Park	Pedestrian Plaza	Restaurant

In [76]:

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

```

0          Cordón
1      Punta Carretas
2          Centro
3      Tres Cruces
4          Palermo
5      Parque Rodó
6      Barrio Sur
7      Ciudad Vieja
8          Pocitos
9  Parque Batlle, Villa Dolores
10     La Blanqueada
11     Carrasco

```

12 Punta Gorda  
Name: Barrio, dtype: object

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

In [106...

```
# Filtrado porcada barrio del cluster cero
montevideo_cordon = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Cordón']
montevideo_puntacarretas = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Pu
montevideo_centro = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Centro']
montevideo_trescruces = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Tres
montevideo_palermo = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Palermo'
montevideo_parquerodo = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Parqu
montevideo_barriosur = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Barrio
montevideo_ciudadvieja = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Ciud
montevideo_pocitos = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Pocitos'
montevideo_batlledolores = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Pa
montevideo_blanqueada = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'La Bl
montevideo_carrasco = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Carrasc
montevideo_puntagorda = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Punta

montevideo_sitios_cluster_cero = pd.concat([montevideo_cordon,montevideo_puntacarretas,montevideo_centro,mont
montevideo_palermo,montevideo_parquerodo,montevideo_barriosur,mont
montevideo_pocitos,montevideo_batlledolores,montevideo_blanqueada,
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="
montevideo_cluster_cero_onehot['Barrio'] = montevideo_sitios_cluster_cero['Barrio']
fixed_columns = [montevideo_cluster_cero_onehot.columns[-1]] + list(montevideo_cluster_cero_onehot.columns[:-
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.
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 asi 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
montevideo_cluster_cero_merged.reset_index(drop=True, inplace = True)
montevideo_cluster_cero_merged = montevideo_cluster_cero_merged[montevideo_cluster_cero_merged['Cluster Label
montevideo_cluster_cero_merged['Cluster Labels'] = montevideo_cluster_cero_merged['Cluster Labels'].astype(in
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

Out[106...

Barrio	Poblacion	Municipio	Latitud	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
--------	-----------	-----------	---------	-----------	----------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

	Barrio	Poblacion	Municipio	Latitud	Longitud	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	B	-34.900827	-56.180125	0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
1	Punta Carretas	24181	B y CH	-34.920202	-56.160065	2	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
2	Centro	22120	B	-34.906067	-56.189656	0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
3	Tres Cruces	15926	B y CH	-34.892518	-56.167113	0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
4	Palermo	12992	B	-34.911288	-56.180698	2	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium
5	Parque Rodó	12944	B	-34.910082	-56.169778	2	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
6	Barrio Sur	12639	B	-34.911202	-56.194784	2	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
7	Ciudad Vieja	12555	B	-34.906351	-56.205979	2	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
8	Pocitos	67992	CH	-34.911123	-56.150593	0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
9	Parque Batlle, Villa Dolores	31153	CH	-34.896868	-56.153383	1	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club
10	La Blanqueada	9600	CH y E	-34.887700	-56.154518	0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
11	Carrasco	15488	E	-34.885577	-56.058150	2	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food Restaurant
12	Punta Gorda	14259	E	-34.899841	-56.081571	0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant

Visualizamos como se subdivide el cluster CERO

In [103]

```
#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

In [114]

```
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['Longitud'], 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)
    montevideo_cluster_cero_merged = montevideo_cluster_cero_merged.add_to(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_merged))
    montevideo_cluster_cero_merged = montevideo_cluster_cero_merged.add_to(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_merged))

```

Out[114...



Re-analizamos los sub-cluster del cluster cero original

In [116...

```

print('La poblacion del sub-cluster 0 es :', montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Cluster Labels'] == 0, montevideo_cluster_cero_merged['Poblacion'].max())

```

La poblacion del sub-cluster 0 es : Poblacion 172353  
dtype: int64

Out[116...

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Cordón	42456	0	South American Restaurant	Basketball Court	Plaza	Gym / Fitness Center	Gym
2	Centro	22120	0	Plaza	Restaurant	Gym / Fitness Center	Food Truck	Chinese Restaurant
3	Tres Cruces	15926	0	Latin American Restaurant	Food Court	Chinese Restaurant	Plaza	Soccer Field
8	Pocitos	67992	0	Beach	Italian Restaurant	Sporting Goods Shop	South American Restaurant	Restaurant
10	La Blanqueada	9600	0	Basketball Court	Athletics & Sports	Latin American Restaurant	American Restaurant	South American Restaurant
12	Punta Gorda	14259	0	Plaza	Latin American Restaurant	Beach	Seafood Restaurant	American Restaurant



```
In [117... print('La poblacion del sub-cluster 1 es :',montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Cluster Labels'] == 1, montevideo_cluster_
```

La poblacion del sub-cluster 1 es : Poblacion 31153  
dtype: int64

Out[117...

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
9	Parque Batlle, Villa Dolores	31153	1	Soccer Stadium	Athletics & Sports	Track Stadium	Park	Sports Club

```
In [118... print('La poblacion del sub-cluster 2 es :',montevideo_cluster_cero_merged.loc[montevideo_cluster_cero_merged['Cluster Labels'] == 2, montevideo_cluster_
```

La poblacion del sub-cluster 2 es : Poblacion 90799  
dtype: int64

Out[118...

	Barrio	Poblacion	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Punta Carretas	24181	2	Restaurant	Mediterranean Restaurant	Fast Food Restaurant	Italian Restaurant	Gym / Fitness Center
4	Palermo	12992	2	Restaurant	Gym / Fitness Center	Other Great Outdoors	Basketball Court	Basketball Stadium
5	Parque Rodó	12944	2	Restaurant	Gym	American Restaurant	Tapas Restaurant	Italian Restaurant
6	Barrio Sur	12639	2	American Restaurant	Food & Drink Shop	Restaurant	Vegetarian / Vegan Restaurant	Beach
7	Ciudad Vieja	12555	2	Restaurant	Plaza	Vegetarian / Vegan Restaurant	Food & Drink Shop	Pedestrian Plaza
11	Carrasco	15488	2	Restaurant	American Restaurant	Tennis Court	Park	Comfort Food 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 artículos deportivos y de comida acorde.

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

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

```
In [121]... montevideo_pocitos = df_montevideo_sport_foods_sitios[df_montevideo_sport_foods_sitios['Barrio'] == 'Pocitos']
montevideo_pocitos
```

	Barrio	Barrio Latitud	Barrio Longitud	Local	Local Latitud	Local Longitud	Local Dirección(esquina)	Local Categoria
480	Pocitos	-34.911123	-56.150593	Motociclo Sports	-34.909032	-56.146623	Miguel Barreiro 3243 (Berro)	Sporting Goods Shop
461	Pocitos	-34.911123	-56.150593	Club Trouville	-34.912473	-56.149755	Chucarro 1031	Basketball Stadium
433	Pocitos	-34.911123	-56.150593	Playa de los Pocitos	-34.912655	-56.145973	Rambla República del Perú (Avenida de Brasil)	Beach
448	Pocitos	-34.911123	-56.150593	Rambla y Avenida Brasil	-34.914673	-56.148711	Montevideo Montevideo	Beach
425	Pocitos	-34.911123	-56.150593	Miyagi Shushi	-34.908886	-56.148351	Gabriel Pereira 3138 (26 de marzo)	Japanese Restaurant
426	Pocitos	-34.911123	-56.150593	Fellini Ristobaretto	-34.913196	-56.148436	José Martí 3408 (Benito Blanco)	Italian Restaurant
428	Pocitos	-34.911123	-56.150593	Gago	-34.912575	-56.148849	Jose Marti 3383 (Juan Benito Blanco)	Falafel Restaurant
430	Pocitos	-34.911123	-56.150593	Tandory	-34.907692	-56.152395	Ramon Masini 1130 (Libertad)	Restaurant
436	Pocitos	-34.911123	-56.150593	La Cavia	-34.912359	-56.152623	26 de Marzo (Cavia)	Latin American Restaurant
445	Pocitos	-34.911123	-56.150593	Milajó	-34.907083	-56.151044	Libertad (Gabriel Pereira)	Italian Restaurant
450	Pocitos	-34.911123	-56.150593	Lokotas	-34.908826	-56.148432	Montevideo Montevideo	Empanada Restaurant
451	Pocitos	-34.911123	-56.150593	Chivitos lo de Pepe	-34.915114	-56.150585	Roque Graseras (Bvar. España)	South American Restaurant
452	Pocitos	-34.911123	-56.150593	Erevan	-34.907465	-56.149652	Ellauri 1308 (Gabriel Pereira)	Middle Eastern Restaurant
469	Pocitos	-34.911123	-56.150593	La Taquería	-34.912611	-56.148763	José Martí 3373 (Benito Blanco)	Mexican Restaurant
478	Pocitos	-34.911123	-56.150593	Restaurant Hong Kong	-34.913050	-56.148591	José Martí 3397 (Benito Blanco)	Chinese Restaurant

```
In [149]... #Definimos las coordenadas de Montevideo
latituede3 =montevideo_pocitos.iloc[[0],[1]].astype(float)
longituede3 = montevideo_pocitos.iloc[[0],[2]].astype(float)
```



```
print('Latitud Pocitos-Monteideo:',latitude3)
print('Longitud Pocitos-Monteideo:',longitude3)
```

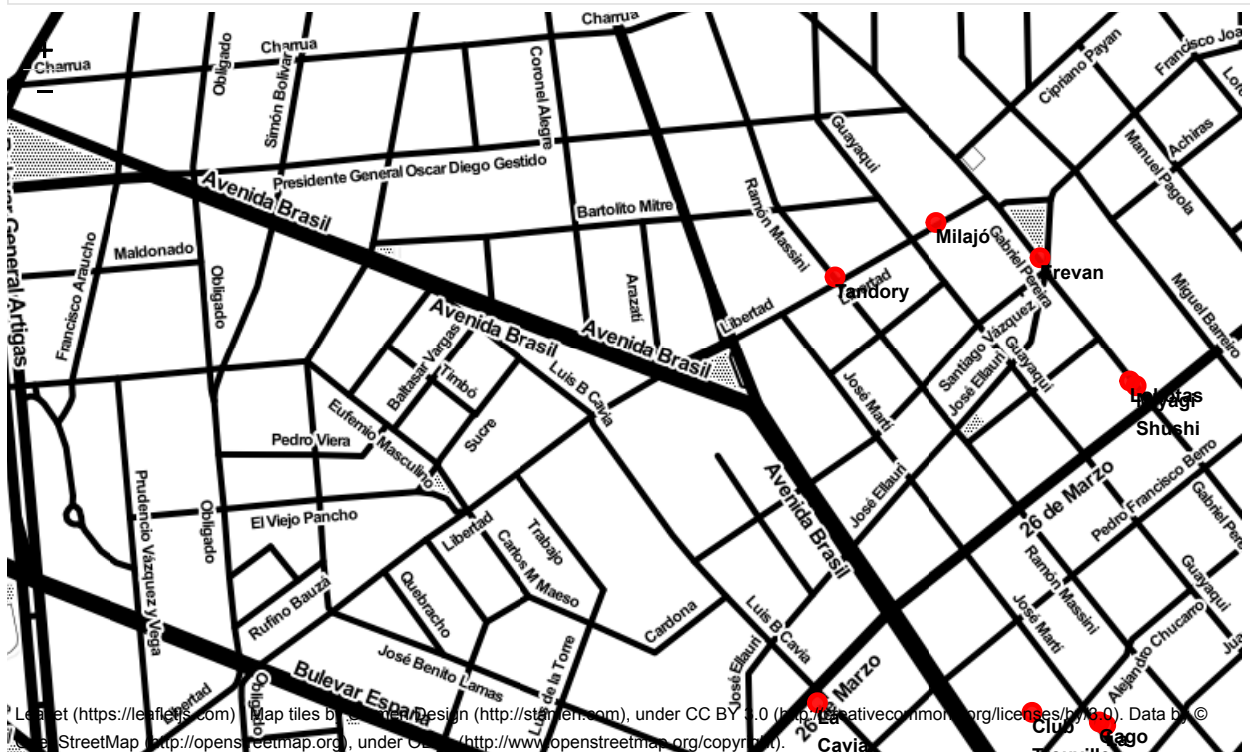
```
Latitud Pocitos-Monteideo: Barrio Latitud
480 -34.911123
Longitud Pocitos-Monteideo: Barrio Longitud
480 -56.150593
```

In [153...

```
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 Categoría'],
                                   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
montevideo_pocitos_map
```

Out[153...



In [158...

```
import datetime
print('Terminado:', datetime.date.today().strftime('%d/%m/%Y'))
```

Terminado: 26/11/2021

In [ ]: