



# Capstone Project - The Battle of Neighborhoods

# Introduction

COVID-19 not only has caused lots of deaths and grief to some around the world, but only has caused an economic lost in many countries.

This disruption on our life has created the necessity of many people to move to another cities in their countries.

Mexico City it is not the exception and as a Mexican we have seen how many people is looking for a better neighbourhood wich has all the best venues and make the best decision to move to a new neighbour.

Mexico City is one of the largest around the world and over the last decades has been growing faster in Latin America with more than 9 million people in the Cit and almost 20 million people in the metropolitan area.

In this report we will try to analyse what are the best neighbourhoods in the city according to its venues and other services which would be a valuable information to make people have the best decision according the features of a neighbourhood can offer.

## Data Requeriments

To achieve the objectives of this report we will use some Data Science concepts and techniques such as Machine Learning.

We will be using the following information:

- Mexico City, list of the boroughs according with its zipcodes, latitude and longitude. Data source : <https://datos.gob.mx/busca/dataset?q=codigos%20postales&> (<https://datos.gob.mx/busca/dataset?q=codigos%20postales&>)
- Information of the top venues in each neighbourhood by using the Foursquare API Description.
- We are going to generate maps to visualize the neighborhoods and how they cluster together by using the Geopy library from Python.
- We explore how many boroughs and neighborhoods contains the data set file.

With all this features we can start the process of analysing, reporting and making conclusions about the results.

## Methodology

As we previously mentioned, we will work with only boroughs of Mexico City.

We are going to generate maps to visualize the neighborhoods and how they cluster together.

Before we get the data and start exploring it, let's download all the dependencies that we will need.

```
In [3]: import numpy as np # Library to handle data in a vectorized manner

import pandas as pd # Library for data analysis
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json # Library to handle JSON files

# !conda install -c conda-forge geopy --yes # uncomment this line if you haven't completed the Foursquare API
# Lab
from geopy.geocoders import Nominatim # convert an address into latitude and longitude values

import requests # Library to handle requests
from pandas.io.json import json_normalize # transform JSON file into a pandas dataframe

# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.colors as colors

# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven't completed the Foursqua
# re API Lab
import folium # map rendering library

print('Libraries imported.')
```

Solving environment: done

## ## Package Plan ##

environment location: /opt/conda/envs/Python36

added / updated specs:  
- folium=0.5.0

The following packages will be downloaded:

package	build		
branca-0.4.1	py_0	26 KB	conda-forge
openssl-1.1.1h	h516909a_0	2.1 MB	conda-forge
folium-0.5.0	py_0	45 KB	conda-forge
altair-4.1.0	py_1	614 KB	conda-forge
ca-certificates-2020.6.20	hecda079_0	145 KB	conda-forge
vincent-0.4.4	py_1	28 KB	conda-forge
certifi-2020.6.20	py36h9880bd3_2	151 KB	conda-forge
python_abi-3.6	1_cp36m	4 KB	conda-forge
Total:		3.1 MB	

The following NEW packages will be INSTALLED:

altair:	4.1.0-py_1	conda-forge
branca:	0.4.1-py_0	conda-forge
folium:	0.5.0-py_0	conda-forge
python_abi:	3.6-1_cp36m	conda-forge
vincent:	0.4.4-py_1	conda-forge

The following packages will be UPDATED:

certifi:	2020.6.20-py36_0	--> 2020.6.20-py36h9880bd3_2	conda-forge
openssl:	1.1.1h-h7b6447c_0	--> 1.1.1h-h516909a_0	conda-forge

The following packages will be DOWNGRADED:

ca-certificates:	2020.10.14-0	--> 2020.6.20-hecda079_0	conda-forge
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### Downloading and Extracting Packages

branca-0.4.1	26 KB	#####	100%
openssl-1.1.1h	2.1 MB	#####	100%
folium-0.5.0	45 KB	#####	100%
altair-4.1.0	614 KB	#####	100%
ca-certificates-2020	145 KB	#####	100%
vincent-0.4.4	28 KB	#####	100%
certifi-2020.6.20	151 KB	#####	100%
python_abi-3.6	4 KB	#####	100%
Preparing transaction: done			
Verifying transaction: done			
Executing transaction: done			
Libraries imported.			

## Download and Explore Dataset

Mexico City's neighbourhoods are divided in 16 boroughs. In order to segment the neighborhoods and explore them, we will essentially need a dataset that contains the 16 boroughs and the neighborhoods that exist in each borough as well as the the latitude and longitude coordinates of each neighborhood.

This dataset was taken from the official site of the government in <https://datos.gob.mx/busca/dataset?q=codigos%20postales&>  
(<https://datos.gob.mx/busca/dataset?q=codigos%20postales&>)

We previously downloaded the file and placed it on our IBM Watson Studio session server, so we can simply run the following code to get and access the data.

Let's take a quick look of the data.

```

In [4]: import types
import pandas as pd
from botocore.client import Config
import ibm_boto3

def __iter__(self): return 0

# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
# You might want to remove those credentials before you share the notebook.
client_835b5d063a29441b961612412943b13a = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='FQL7z24FuSjk9JmMtQhLmZDNAt9sx0NIRayR1rVM8M0D',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3-api.us-geo.objectstorage.service.networklayer.com')

body = client_835b5d063a29441b961612412943b13a.get_object(Bucket='courseracapstone-donotdelete-pr-8m3qbnwwmal
t9s',Key='MX.csv')['Body']
# add missing __iter__ method, so pandas accepts body as file-like object
if not hasattr(body, "__iter__"): body.__iter__ = types.MethodType( __iter__, body )

df = pd.read_csv(body)
df.head()

```

Out[4]:

	CountryCode	PostalCode	Neighbourhood	State	Borough	StateCode	latitude	longitude
0	MX	20000	Zona Centro	Aguascalientes	Aguascalientes	1	21.8734	-102.2806
1	MX	20010	Las Brisas	Aguascalientes	Aguascalientes	1	21.9644	-102.3192
2	MX	20010	San Cayetano	Aguascalientes	Aguascalientes	1	21.9644	-102.3192
3	MX	20010	Ramon Romo Franco	Aguascalientes	Aguascalientes	1	21.9644	-102.3192
4	MX	20010	Olivares Santana	Aguascalientes	Aguascalientes	1	21.9644	-102.3192

We only process the cells that have a borough in Mexico City

```
In [5]: #we rename de column Neighbourhood, according with the data that Foursquare will return
df.rename(columns={'Neighbourhood': 'Neighborhood'}, inplace=True)

df.drop(df[df['State']!="Distrito Federal"].index,axis=0, inplace=True)
df.drop(['CountryCode', 'State', 'StateCode'], axis='columns', inplace=True)
df = df.reset_index(drop=True)
df.head()
```

Out[5]:

	PostalCode	Neighborhood	Borough	latitude	longitude
0	2000	Centro de Azcapotzalco	Azcapotzalco	19.4815	-99.1862
1	2008	Delegacion Politica Azcapotzalco	Azcapotzalco	19.4815	-99.1862
2	2010	Los Reyes	Azcapotzalco	19.4853	-99.1821
3	2010	San Rafael	Azcapotzalco	19.3961	-99.1170
4	2010	Nuevo Barrio San Rafael	Azcapotzalco	19.3961	-99.1170

We consider that one neighborhood can exist in one postal code area, then these rows will be combined into one row with the neighborhoods separated with a comma.

```
In [6]: df2= df.groupby('PostalCode').agg(lambda x: ','.join(x))
df2.head()
```

Out[6]:

	Neighborhood	Borough
PostalCode		
1000	San Angel	Alvaro Obregon
1010	Los Alpes	Alvaro Obregon
1020	Guadalupe Inn	Alvaro Obregon
1029	INFONAVIT	Alvaro Obregon
1030	Florida,Axotla	Alvaro Obregon,Alvaro Obregon



```
In [7]: neighborhoods= pd.merge(df, df2, how='inner', on=None, left_on=None, right_on=None,
    left_index=False, right_index=False, sort=True,
    suffixes=('_x', '_y'), copy=True, indicator=False,
    validate=None)

neighborhoods.head()
```

Out[7]:

	PostalCode	Neighborhood	Borough	latitude	longitude
0	11250	10 de Abril	Miguel Hidalgo	19.4486	-99.2110
1	15290	10 de Mayo	Venustiano Carranza	19.4332	-99.1202
2	7058	15 de Agosto	Gustavo A. Madero	19.4939	-99.1108
3	11810	16 de Septiembre	Miguel Hidalgo	19.4043	-99.1928
4	15440	1o. de Mayo	Venustiano Carranza	19.4431	-99.1134

Now we can remove the duplicate boroughs as follows:

```
In [8]: neighborhoods['Borough'] = neighborhoods['Borough'].str.replace('nan[{}\s]', '').str.split(',').apply(set).str
    .join(',').str.strip(',').str.replace(",{2,}", ",")
neighborhoods = neighborhoods.reset_index()
neighborhoods.head()
```

Out[8]:

	index	PostalCode	Neighborhood	Borough	latitude	longitude
0	0	11250	10 de Abril	MiguelHidalgo	19.4486	-99.2110
1	1	15290	10 de Mayo	VenustianoCarranza	19.4332	-99.1202
2	2	7058	15 de Agosto	GustavoA.Madero	19.4939	-99.1108
3	3	11810	16 de Septiembre	MiguelHidalgo	19.4043	-99.1928
4	4	15440	1o. de Mayo	VenustianoCarranza	19.4431	-99.1134

We finish making sure that the dataset has all 16 boroughs.

```
In [9]: print('The dataframe has {} boroughs and {} neighborhoods.'.format(
        len(neighborhoods['Borough'].unique()),
        neighborhoods.shape[0]
        )
    )
```

The dataframe has 16 boroughs and 1099 neighborhoods.

### Use geopy library to get the latitude and longitude values of Mexico City.

Let's get the geographical coordinates of Mexico City and in order to define an instance of the geocoder, we need to define a user\_agent. We will name our agent mx\_explorer, as shown below.

```
In [10]: address = 'Mexico City, MX'

geolocator = Nominatim(user_agent="mx_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Mexico City are {}, {}'.format(latitude, longitude))
```

The geograpical coordinate of Mexico City are 19.4326296, -99.1331785.

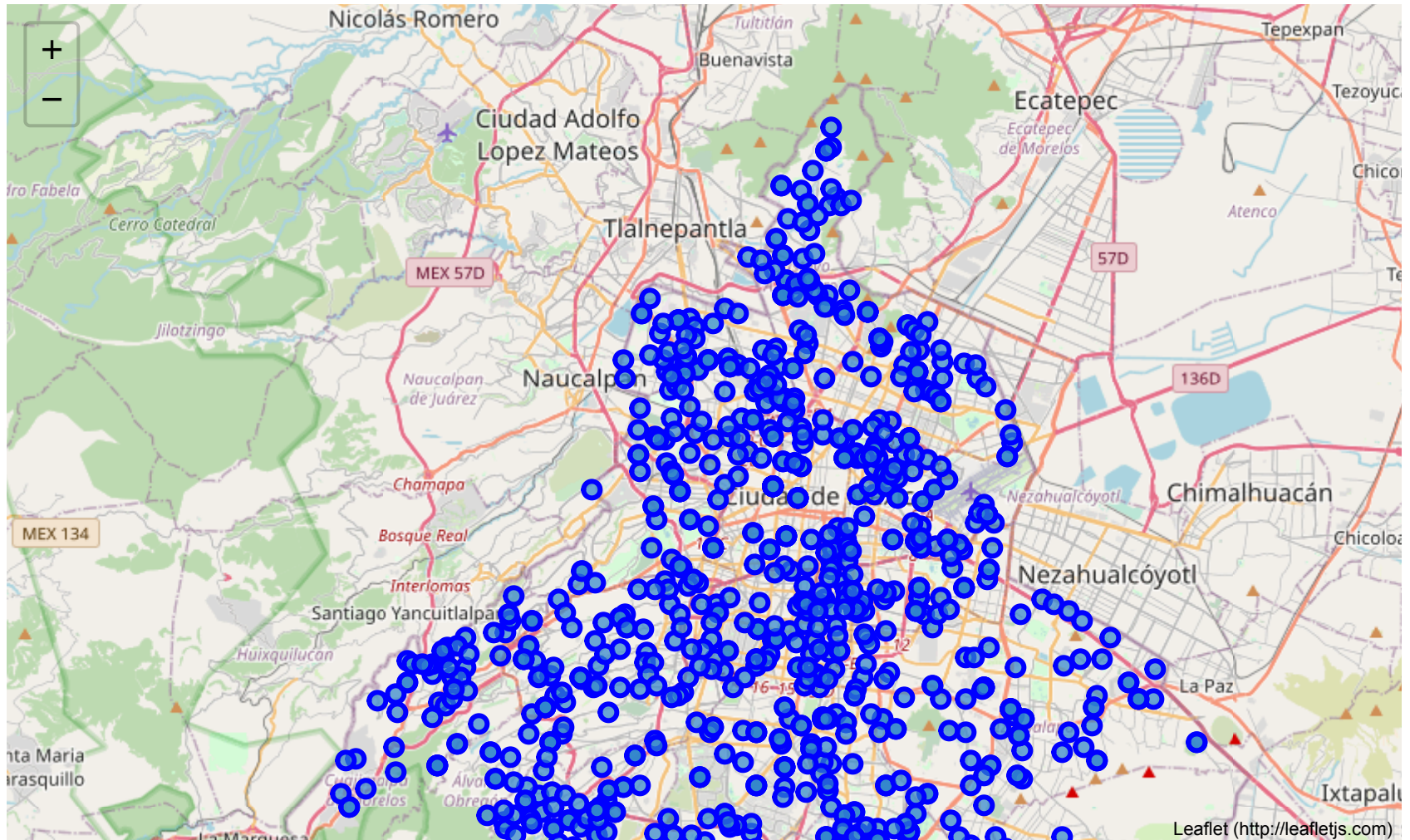
### Create a map of Mexico City with neighborhoods superimposed on top.

```
In [11]: # create map of Mexico City using Latitude and Longitude values
map_mexicocity = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, borough, neighborhood in zip(neighborhoods['latitude'], neighborhoods['longitude'], neighborhoo
ds['Borough'], neighborhoods['Neighborhood']):
    label = '{} {}'.format(neighborhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_mexicocity)

map_mexicocity
```

Out[11]:



Folium is a great visualization library. Feel free to zoom into the above map, and click on each circle mark to reveal the name of the neighborhood and its respective borough.

For this report purposes, we simplify the above map and segment and cluster only one of the main Boroughs and its neighbourhoods are near City Center heart of Mexico City, which is Cuauhtémoc. So let's slice the original dataframe and create a new dataframe of the Cuauhtémoc data.

```
In [12]: cuauhtemoc_data = neighborhoods[neighborhoods['Borough'] == 'Cuauhtemoc'].reset_index(drop=True)
cuauhtemoc_data.head()
```

Out[12]:

	index	PostalCode	Neighborhood	Borough	latitude	longitude
0	48	6880	Algarin	Cuauhtemoc	19.4053	-99.1408
1	54	6890	Ampliacion Asturias	Cuauhtemoc	19.4070	-99.1313
2	113	6850	Asturias	Cuauhtemoc	19.4039	-99.1308
3	116	6450	Atlampa	Cuauhtemoc	19.4581	-99.1562
4	125	6038	Banorte	Cuauhtemoc	19.4364	-99.1553

As we did with all the Boroughs we will create a map only with the Boroughs that contains 'Cuauhtemoc'

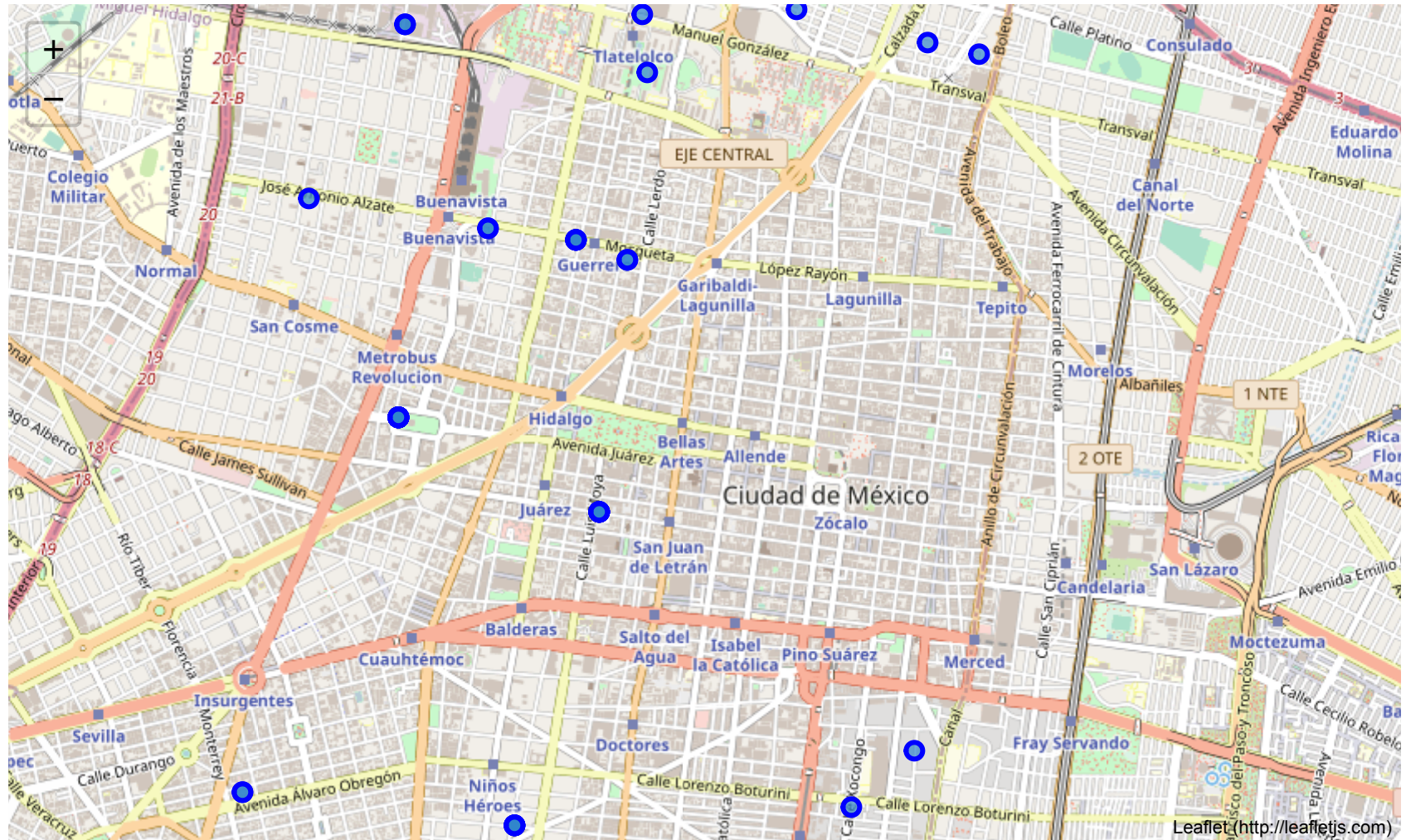
```
In [13]: # create map of Cuauhtemoc Borough using Latitude and Longitude values
map_cuauhtemoc = folium.Map(location=[latitude, longitude], zoom_start=14)

# add markers to map
for lat, lng, label in zip(cuauhtemoc_data['latitude'], cuauhtemoc_data['longitude'], cuauhtemoc_data['Neighborhood']):
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_cuauhtemoc)

map_cuauhtemoc
```



Out[13]:



Next, we are going to start utilizing the Foursquare API to explore the neighborhoods and segment them.

## Define Foursquare Credentials and Version

```
In [14]: # @hidden_cell
CLIENT_ID = 'XUIQAKXIYWZ2SHA4K4UANX2JZBYJAUT1GMFGK3OENTA05EQN' #'your-client-ID' # your Foursquare ID
CLIENT_SECRET = '1BG3OZ0ELQVVQMDIYRJJNFQ41ZKF3SKR03OFH0XF323Z0FBN' #'your-client-secret' # your Foursquare Secret
VERSION = '20180605' # Foursquare API version

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

Your credentials:

CLIENT\_ID: XUIQAKXIYWZ2SHA4K4UANX2JZBYJAUT1GMFGK3OENTA05EQN

CLIENT\_SECRET: 1BG3OZ0ELQVVQMDIYRJJNFQ41ZKF3SKR03OFH0XF323Z0FBN

Let's explore the City Centre neighborhood in our dataframe. Get the neighborhood's name.

```
In [15]: cuauhtemoc_data.loc[11, 'Neighborhood']
```

```
Out[15]: 'Centro (A\x81rea 1)'
```

Get the neighborhood's latitude and longitude values.

```
In [16]: neighborhood_latitude = cuauhtemoc_data.loc[11, 'latitude'] # neighborhood latitude value
neighborhood_longitude = cuauhtemoc_data.loc[11, 'longitude'] # neighborhood longitude value

neighborhood_name = cuauhtemoc_data.loc[11, 'Neighborhood'] # neighborhood name

print('Latitude and longitude values of {} are {}, {}'.format(neighborhood_name,
                                                                neighborhood_latitude,
                                                                neighborhood_longitude))
```

Latitude and longitude values of Centro (Area 1) are 19.4364, -99.1553.

Now, let us get the top 100 venues that are in Cuauhtemoc within a radius of 500 meters.

Firstly, let us create the GET request URL. Name your URL url.



```
In [17]: # type your answer here
LIMIT = 100 # limit of number of venues returned by Foursquare API
radius = 500 # define radius
# create URL
url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    neighborhood_latitude,
    neighborhood_longitude,
    radius,
    LIMIT)
url # display URL
```

```
Out[17]: 'https://api.foursquare.com/v2/venues/explore?&client_id=XUIQAKXIYWZ2SHA4K4UANX2JZBYJAUT1GMFGK3OENTA05EQN&client_secret=1BG3OZ0ELQVVQMDIYRJJNFQ41ZKF3SKR03OFH0XF323Z0FBN&v=20180605&ll=19.4364,-99.1553&radius=500&limit=100'
```

Send the GET request and examine the results

```
In [18]: results = requests.get(url).json()  
results
```

```

Out[18]: {'meta': {'code': 200, 'requestId': '5f923741b3c24f7b381315d1'},
  'response': {'suggestedFilters': {'header': 'Tap to show:',
    'filters': [{'name': 'Open now', 'key': 'openNow'}]},
    'headerLocation': 'Tabacalera',
    'headerFullLocation': 'Tabacalera, Mexico City',
    'headerLocationGranularity': 'neighborhood',
    'totalResults': 68,
    'suggestedBounds': {'ne': {'lat': 19.440900004500005,
      'lng': -99.15053695868468},
      'sw': {'lat': 19.431899995499993, 'lng': -99.16006304131531}},
    'groups': [{'type': 'Recommended Places',
      'name': 'recommended',
      'items': [{'reasons': {'count': 0,
        'items': [{'summary': 'This spot is popular',
          'type': 'general',
          'reasonName': 'globalInteractionReason'}]}],
      'venue': {'id': '5022cdeee4b04d1e265e085d',
        'name': 'Mirador Monumento a la Revolución Mexicana',
        'location': {'address': 'Plaza de la República S/N',
          'crossStreet': 'De la República',
          'lat': 19.436211537804873,
          'lng': -99.15475047643551,
          'labeledLatLngs': [{'label': 'display',
            'lat': 19.436211537804873,
            'lng': -99.15475047643551}]},
          'distance': 61,
          'postalCode': '06030',
          'cc': 'MX',
          'neighborhood': 'Tabacalera',
          'city': 'Tabacalera',
          'state': 'Distrito Federal',
          'country': 'México',
          'formattedAddress': ['Plaza de la República S/N (De la República)',
            '06030 Tabacalera, Distrito Federal',
            'México']},
      'categories': [{'id': '4bf58dd8d48988d165941735',
        'name': 'Scenic Lookout',
        'pluralName': 'Scenic Lookouts',
        'shortName': 'Scenic Lookout',
        'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/sceniclookout_',
          'suffix': '.png'},
        'primary': True}],
      'photos': {'count': 0, 'groups': []}}],

```

```

'referralId': 'e-0-5022cdeee4b04d1e265e085d-0'},
{'reasons': {'count': 0,
  'items': [{ 'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason' } ] },
'venuce': { 'id': '4b0586fff964a5203d7a22e3',
  'name': 'Monumento a la Revolución Mexicana',
  'location': { 'address': 'Plaza de la República s/n',
    'crossStreet': 'Ignacio Ramirez',
    'lat': 19.43602191953738,
    'lng': -99.15421236593387,
    'distance': 121,
    'postalCode': '06060',
    'cc': 'MX',
    'city': 'Cuauhtemoc',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': [ 'Plaza de la República s/n (Ignacio Ramirez)',
      '06060 Cuauhtémoc, Distrito Federal',
      'México' ] },
  'categories': [ { 'id': '4bf58dd8d48988d12d941735',
    'name': 'Monument / Landmark',
    'pluralName': 'Monuments / Landmarks',
    'shortName': 'Landmark',
    'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/government_monument_',
      'suffix': '.png' },
    'primary': True } ],
  'photos': { 'count': 0, 'groups': [] },
  'venuePage': { 'id': '38173053' } },
'referralId': 'e-0-4b0586fff964a5203d7a22e3-1'},
{'reasons': {'count': 0,
  'items': [{ 'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason' } ] },
'venuce': { 'id': '4d4db4bf72eba143f1ef4612',
  'name': 'Frontón México',
  'location': { 'address': 'Plaza de la República 17',
    'crossStreet': 'Miguel Ramos Arizpe',
    'lat': 19.436948,
    'lng': -99.153428,
    'labeledLatLngs': [ { 'label': 'display',
      'lat': 19.436948,
      'lng': -99.153428 } ],

```

```
'distance': 205,
'postalCode': '06030',
'cc': 'MX',
'neighborhood': 'Tabacalera',
'city': 'Ciudad de México',
'state': 'Distrito Federal',
'country': 'México',
'formattedAddress': ['Plaza de la República 17 (Miguel Ramos Arizpe)',
'06030 Ciudad de México, Distrito Federal',
'México']],
'categories': [{ 'id': '4bf58dd8d48988d1f1931735',
'name': 'General Entertainment',
'pluralName': 'General Entertainment',
'shortName': 'Entertainment',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/default_',
'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []}],
'referralId': 'e-0-4d4db4bf72eba143f1ef4612-2'},
{'reasons': { 'count': 0,
'items': [{ 'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': { 'id': '56cb81a2cd10f1544b58b333',
'name': 'Terraza Timberland',
'location': { 'address': 'Ramos Arizpe 38',
'crossStreet': 'Plaza de la República',
'lat': 19.43659101044001,
'lng': -99.1529476291976,
'labeledLatLngs': [{ 'label': 'display',
'lat': 19.43659101044001,
'lng': -99.1529476291976}],
'distance': 247,
'postalCode': '06030',
'cc': 'MX',
'city': 'Cuauhtemoc',
'state': 'Distrito Federal',
'country': 'México',
'formattedAddress': ['Ramos Arizpe 38 (Plaza de la República)',
'06030 Cuauhtémoc, Distrito Federal',
'México']],
'categories': [{ 'id': '4bf58dd8d48988d1f1931735',
'name': 'General Entertainment',
```

```

    'pluralName': 'General Entertainment',
    'shortName': 'Entertainment',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/default_',
    'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-56cb81a2cd10f1544b58b333-3'},
    {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]}],
    'venue': {'id': '4cf1696894feb1f7cd3b17ba',
    'name': 'Museo Nacional de la Revolución',
    'location': {'address': 'Plaza de la República s/n',
    'lat': 19.436153024063728,
    'lng': -99.15468580367143,
    'labeledLatLngs': [{'label': 'display',
    'lat': 19.436153024063728,
    'lng': -99.15468580367143}]},
    'distance': 70,
    'cc': 'MX',
    'city': 'Ciudad de México',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': ['Plaza de la República s/n',
    'Ciudad de México, Distrito Federal',
    'México']},
    'categories': [{'id': '4bf58dd8d48988d190941735',
    'name': 'History Museum',
    'pluralName': 'History Museums',
    'shortName': 'History Museum',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/museum_history_',
    'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4cf1696894feb1f7cd3b17ba-4'},
    {'reasons': {'count': 0,
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'categories': [ { 'id': '4bf58dd8d48988d1d3941735',
  'name': 'Vegetarian / Vegan Restaurant',
  'pluralName': 'Vegetarian / Vegan Restaurants',
  'shortName': 'Vegetarian / Vegan',
  'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/vegetarian_',
    'suffix': '.png' },
  'primary': True } ],
'photos': { 'count': 0, 'groups': [ ] },
'referralId': 'e-0-4faee3dee4b0e047b230dad6-58'},
{'reasons': {'count': 0,
  'items': [{ 'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason' } ]},
'venue': { 'id': '5261980511d2454d943d5847',
  'name': 'Smart Fit',
  'location': { 'address': 'Avenida Paseo de la Reforma 27',
    'crossStreet': 'Lafragua y Av. de La República',
    'lat': 19.434477425460415,
    'lng': -99.1519068267989,
    'labeledLatLngs': [ { 'label': 'display',
      'lat': 19.434477425460415,

```

```
    'lng': -99.1519068267989}],
    'distance': 415,
    'postalCode': '06600',
    'cc': 'MX',
    'city': 'Cuauhtemoc',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': ['Avenida Paseo de la Reforma 27 (Lafragua y Av. de La República)',
    '06600 Cuauhtémoc, Distrito Federal',
    'México']],
    'categories': [{ 'id': '4bf58dd8d48988d176941735',
    'name': 'Gym',
    'pluralName': 'Gyms',
    'shortName': 'Gym',
    'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/gym_',
    'suffix': '.png'},
    'primary': True}],
    'photos': { 'count': 0, 'groups': []}],
    'referralId': 'e-0-5261980511d2454d943d5847-59'},
    { 'reasons': { 'count': 0,
    'items': [{ 'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason' } ]}],
    'venue': { 'id': '4b6deb99f964a520f59b2ce3',
    'name': 'Cantina La Castellana',
    'location': { 'address': 'Antonio Caso 66',
    'crossStreet': 'insurgentes',
    'lat': 19.434195162318186,
    'lng': -99.15822430728898,
    'labeledLatLngs': [{ 'label': 'display',
    'lat': 19.434195162318186,
    'lng': -99.15822430728898 } ]},
    'distance': 393,
    'cc': 'MX',
    'city': 'Ciudad de México',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': ['Antonio Caso 66 (insurgentes)',
    'Ciudad de México, Distrito Federal',
    'México']],
    'categories': [{ 'id': '4bf58dd8d48988d116941735',
    'name': 'Bar',
    'pluralName': 'Bars',
```

```

    'shortName': 'Bar',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
            'suffix': '.png'},
    'primary': True}],
  'photos': {'count': 0, 'groups': []}},
  'referralId': 'e-0-4b6deb99f964a520f59b2ce3-60'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]}],
  'venue': {'id': '4d9a3f9c0d5f224be02ca24e',
    'name': 'Loquay',
    'location': {'address': 'Ribera de san cosme',
      'crossStreet': 'Dr. Enrique Gonzalez Martinez',
      'lat': 19.440470986314473,
      'lng': -99.15691120371385,
      'labeledLatLngs': [{'label': 'display',
        'lat': 19.440470986314473,
        'lng': -99.15691120371385}]},
    'distance': 483,
    'postalCode': '06400',
    'cc': 'MX',
    'city': 'Ciudad de México',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': ['Ribera de san cosme (Dr. Enrique Gonzalez Martinez)',
      '06400 Ciudad de México, Distrito Federal',
      'México']},
  'categories': [{'id': '4bf58dd8d48988d10c951735',
    'name': 'Cosmetics Shop',
    'pluralName': 'Cosmetics Shops',
    'shortName': 'Cosmetics',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/beauty_cosmetic_',
      'suffix': '.png'},
    'primary': True}],
  'photos': {'count': 0, 'groups': []}},
  'referralId': 'e-0-4d9a3f9c0d5f224be02ca24e-61'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]}],
  'venue': {'id': '578e94bf498e24eb11dd2e41',
    'name': 'Nelumbo Café',

```

```

'location': {'address': 'Insurgentes Centro 119',
'crossStreet': 'Antonio Caso',
'lat': 19.434014,
'lng': -99.158577,
'labeledLatLngs': [{'label': 'display',
'lat': 19.434014,
'lng': -99.158577}]},
'distance': 434,
'cc': 'MX',
'city': 'San Rafael',
'state': 'Distrito Federal',
'country': 'México',
'formattedAddress': ['Insurgentes Centro 119 (Antonio Caso)',
'San Rafael, Distrito Federal',
'México']},
'categories': [{'id': '4bf58dd8d48988d128941735',
'name': 'Cafeteria',
'pluralName': 'Cafeterias',
'shortName': 'Cafeteria',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/education/cafeateria_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'venuePage': {'id': '385370135'}},
'referralId': 'e-0-578e94bf498e24eb11dd2e41-62'},
{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}},
'venue': {'id': '511c0eeee4b0dc0dc345886c',
'name': "Italianni's",
'location': {'address': 'Av Cap Carlos Leon S/N Col Peñon de los Baños1',
'lat': 19.436295014907323,
'lng': -99.15809906897184,
'labeledLatLngs': [{'label': 'display',
'lat': 19.436295014907323,
'lng': -99.15809906897184}]},
'distance': 294,
'cc': 'MX',
'city': 'Ciudad de México',
'state': 'Distrito Federal',
'country': 'México',
'formattedAddress': ['Av Cap Carlos Leon S/N Col Peñon de los Baños1',

```

```
'Ciudad de México, Distrito Federal',
'México']]],
'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-0-511c0eeee4b0dc0dc345886c-63'},
{'reasons': { 'count': 0,
'items': [{ 'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'} ]}],
'venue': { 'id': '51841736498e02f1cbe9b2',
'name': 'Toks',
'location': { 'address': 'Puente De Alvarado',
'lat': 19.43838987743527,
'lng': -99.15117074356841,
'labeledLatLngs': [{ 'label': 'display',
'lat': 19.43838987743527,
'lng': -99.15117074356841}],
'distance': 486,
'cc': 'MX',
'country': 'México',
'formattedAddress': ['Puente De Alvarado', 'México']}],
'categories': [{ 'id': '4bf58dd8d48988d1c1941735',
'name': 'Mexican Restaurant',
'pluralName': 'Mexican Restaurants',
'shortName': 'Mexican',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/mexican_',
'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []}],
'referralId': 'e-0-51841736498e02f1cbe9b2-64'},
{'reasons': { 'count': 0,
'items': [{ 'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'} ]}],
'venue': { 'id': '4dd2c3e91f6ef5f6ccdca799',
'name': 'Café Al Grano',
'location': { 'address': 'Serapio Rendón 56',
```

```
'lat': 19.437728413349706,
'lng': -99.15950318528142,
'labeledLatLngs': [{'label': 'display',
  'lat': 19.437728413349706,
  'lng': -99.15950318528142}],
'distance': 465,
'postalCode': '06470',
'cc': 'MX',
'city': 'Ciudad de México',
'state': 'Distrito Federal',
'country': 'México',
'formattedAddress': ['Serapio Rendón 56',
  '06470 Ciudad de México, Distrito Federal',
  'México']],
'categories': [{'id': '4bf58dd8d48988d1e0931735',
  'name': 'Coffee Shop',
  'pluralName': 'Coffee Shops',
  'shortName': 'Coffee Shop',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/coffeeshop_',
    'suffix': '.png'},
  'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4dd2c3e91f6ef5f6ccdca799-65'},
{'reasons': {'count': 0,
  'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]}],
'venue': {'id': '4e9750850aafdb60e0d3159f',
  'name': '+ gourmet',
  'location': {'address': 'Antonio Caso 73',
    'crossStreet': 'Sadi Carnot',
    'lat': 19.434546160249006,
    'lng': -99.15918384776148,
    'labeledLatLngs': [{'label': 'display',
      'lat': 19.434546160249006,
      'lng': -99.15918384776148}],
    'distance': 456,
    'postalCode': '06470',
    'cc': 'MX',
    'city': 'Ciudad de México',
    'state': 'Distrito Federal',
    'country': 'México',
    'formattedAddress': ['Antonio Caso 73 (Sadi Carnot)',
```



```

    '06470 Ciudad de México, Distrito Federal',
    'México']]],
    'categories': [{ 'id': '4bf58dd8d48988d1df931735',
        'name': 'BBQ Joint',
        'pluralName': 'BBQ Joints',
        'shortName': 'BBQ',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/bbqalt_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []}],
    'referralId': 'e-0-4e9750850aafdb60e0d3159f-66'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason'} ]}],
    'venue': { 'id': '505a6b2ae4b0a3801ab41221',
        'name': 'Madonnas Pizza',
        'location': { 'address': 'Gómez Farías 66-H',
            'crossStreet': 'Esq. Serapio Rendón',
            'lat': 19.437874220650897,
            'lng': -99.15903969024754,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 19.437874220650897,
                'lng': -99.15903969024754}],
            'distance': 425,
            'cc': 'MX',
            'city': 'Col. San Rafael',
            'state': 'Distrito Federal',
            'country': 'México',
            'formattedAddress': ['Gómez Farías 66-H (Esq. Serapio Rendón)',
                'Col. San Rafael, Distrito Federal',
                'México'] ]}],
    'categories': [{ 'id': '4bf58dd8d48988d1ca941735',
        'name': 'Pizza Place',
        'pluralName': 'Pizza Places',
        'shortName': 'Pizza',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/pizza_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []}],
    'referralId': 'e-0-505a6b2ae4b0a3801ab41221-67'} ] ] ] ] }

```

The next step would be extract the category name for all the venues.

```
In [19]: # function that extracts the category of the venue
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']
```

Now we are ready to clean the json and structure it into a pandas dataframe.

```
In [20]: venues = results['response']['groups'][0]['items']

nearby_venues = json_normalize(venues) # flatten JSON

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

# filter the category for each row
nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)

# clean columns
nearby_venues.columns = [col.split(".")[1] for col in nearby_venues.columns]

nearby_venues.head()
```

Out[20]:

	name	categories	lat	lng
0	Mirador Monumento a la Revolución Mexicana	Scenic Lookout	19.436212	-99.154750
1	Monumento a la Revolución Mexicana	Monument / Landmark	19.436022	-99.154212
2	Frontón México	General Entertainment	19.436948	-99.153428
3	Terraza Timberland	General Entertainment	19.436591	-99.152948
4	Museo Nacional de la Revolución	History Museum	19.436153	-99.154686

And how many venues were returned by Foursquare?

```
In [21]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))

68 venues were returned by Foursquare.
```

## Explore Neighborhoods in Mexico City Centre Cuauhtemoc Borough

Let's create a function to repeat the same process to all the neighborhoods in Cuauhtemoc Borough¶

```
In [22]: def getNearbyVenues(names, latitudes, longitudes, radius=500):

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

        # create the API request URL
        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)

        # make the GET request
        results = requests.get(url).json()["response"]["groups"][0]["items"]

        # return only relevant information for each nearby venue
        venues_list.append([(
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            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 = ['Neighborhood',
                            'Neighborhood Latitude',
                            'Neighborhood Longitude',
                            'Venue',
                            'Venue Latitude',
                            'Venue Longitude',
                            'Venue Category']

    return(nearby_venues)
```

Now write the code to run the above function on each neighborhood and create a new dataframe called `cuauhtemoc_venues`.

```
In [23]: cuauhtemoc_venues = getNearbyVenues(names=cuauhtemoc_data['Neighborhood'],  
                                              latitudes=cuauhtemoc_data['latitude'],  
                                              longitudes=cuauhtemoc_data['longitude']  
                                              )
```

Algarin  
Ampliacion Asturias  
Asturias  
Atlampa  
Banorte  
Buenavista  
Buenos Aires  
Camara Nacional de Aerotransportes  
Camara Nacional de Comercio de la Ciudad de Mexico  
Camara Nacional de Transportes y Comunicacion  
Camara Nacional de la Industria Cinematografica  
Centro (Area 1)  
Centro (Area 2)  
Centro (Area 3)  
Centro (Area 4)  
Centro (Area 5)  
Centro (Area 6)  
Centro (Area 7)  
Centro (Area 8)  
Centro (Area 9)  
Centro Medico Siglo XXI  
Centro Urbano Benito Juarez  
Comision Federal de Electricidad  
Condesa  
Confederacion de Camaras Nacionales de Comercio  
Cuauhtemoc  
Delegacion Politica Cuauhtemoc  
Direccion General de Recaudacion de la SHCP  
Doctores  
Esperanza  
Ex-Hipodromo de Peralvillo  
Felipe Pescador  
Guerrero  
H Camara de Senadores  
Hemphill Schools  
Hipodromo  
Hipodromo Condesa  
Hospital General de Mexico  
IMSS  
ISSSTE  
Instituto Mexicano de Comercio Exterior  
Juarez  
Maza

Nonoalco Tlatelolco  
Obrera  
Partido de La Revolucion Democratica  
Paulino Navarro  
Peralvillo  
Presidencia de La Republica  
Procuraduria General de La Republica  
Roma Norte  
Roma Sur  
San Rafael  
San Simon Tolnahuac  
Santa Maria Insurgentes  
Santa Maria la Ribera  
Secretaria de Economia  
Secretaria de Gobernacion  
Secretaria de Hacienda y Credito Publico  
Secretaria de Relaciones Exteriores  
Secretaria de Salud  
Secretaria de Transportes y Vialidad  
Suprema Corte de Justicia  
Tabacalera  
Telefonos de Mexico S.A. de CV  
Tesoreria del Distrito Federal  
Transito  
Unidad Soldominio  
Valle Gomez  
Vista Alegre

Let's check the size of the resulting dataframe



```
In [24]: print(cuauhtemoc_venues.shape)
cuauhtemoc_venues.head()
```

```
(3966, 7)
```

```
Out[24]:
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Algarin	19.4053	-99.1408	Los Pollitos	19.405406	-99.142848	Mexican Restaurant
1	Algarin	19.4053	-99.1408	Los Tolucos	19.406723	-99.142527	Mexican Restaurant
2	Algarin	19.4053	-99.1408	Barbacoa El Profe	19.407052	-99.139187	Mexican Restaurant
3	Algarin	19.4053	-99.1408	Barbacoa de horno "Toños"	19.406454	-99.139748	Taco Place
4	Algarin	19.4053	-99.1408	Sublima IDEAS	19.405163	-99.142554	Advertising Agency

Let's check how many venues were returned for each neighborhood

```
In [25]: cuauhtemoc_venues.groupby('Neighborhood').count()
```

Out[25]:

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Algarin	23	23	23	23	23	23
Ampliacion Asturias	21	21	21	21	21	21
Asturias	17	17	17	17	17	17
Atlampa	12	12	12	12	12	12
Banorte	68	68	68	68	68	68
Buenavista	70	70	70	70	70	70
Buenos Aires	10	10	10	10	10	10
Camara Nacional de Aerotransportes	69	69	69	69	69	69
Camara Nacional de Comercio de la Ciudad de Mexico	100	100	100	100	100	100
Camara Nacional de Transportes y Comunicacion	100	100	100	100	100	100
Camara Nacional de la Industria Cinematografica	85	85	85	85	85	85
Centro (Area 1)	68	68	68	68	68	68
Centro (Area 2)	68	68	68	68	68	68
Centro (Area 3)	68	68	68	68	68	68
Centro (Area 4)	68	68	68	68	68	68
Centro (Area 5)	68	68	68	68	68	68
Centro (Area 6)	68	68	68	68	68	68
Centro (Area 7)	68	68	68	68	68	68
Centro (Area 8)	68	68	68	68	68	68
Centro (Area 9)	68	68	68	68	68	68
Centro Medico Siglo XXI	16	16	16	16	16	16
Centro Urbano Benito Juarez	85	85	85	85	85	85
Comision Federal de Electricidad	69	69	69	69	69	69

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Condesa	96	96	96	96	96	96
Confederacion de Camaras Nacionales de Comercio	68	68	68	68	68	68
Cuauhtemoc	69	69	69	69	69	69
Delegacion Politica Cuauhtemoc	70	70	70	70	70	70
Direccion General de Recaudacion de la SHCP	56	56	56	56	56	56
Doctores	16	16	16	16	16	16
Esperanza	34	34	34	34	34	34
Ex-Hipodromo de Peralvillo	18	18	18	18	18	18
Felipe Pescador	25	25	25	25	25	25
Guerrero	56	56	56	56	56	56
H Camara de Senadores	68	68	68	68	68	68
Hemphill Schools	22	22	22	22	22	22
Hipodromo	96	96	96	96	96	96
Hipodromo Condesa	96	96	96	96	96	96
Hospital General de Mexico	16	16	16	16	16	16
IMSS	100	100	100	100	100	100
ISSSTE	68	68	68	68	68	68
Instituto Mexicano de Comercio Exterior	96	96	96	96	96	96
Juarez	100	100	100	100	100	100
Maza	29	29	29	29	29	29
Nonoalco Tlatelolco	27	27	27	27	27	27
Obrera	30	30	30	30	30	30
Partido de La Revolucion Democratica	85	85	85	85	85	85
Paulino Navarro	32	32	32	32	32	32

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Peralvillo	25	25	25	25	25	25
Presidencia de La Republica	68	68	68	68	68	68
Procuraduria General de La Republica	68	68	68	68	68	68
Roma Norte	85	85	85	85	85	85
Roma Sur	37	37	37	37	37	37
San Rafael	22	22	22	22	22	22
San Simon Tolnahuac	37	37	37	37	37	37
Santa Maria Insurgentes	11	11	11	11	11	11
Santa Maria la Ribera	42	42	42	42	42	42
Secretaria de Economia	96	96	96	96	96	96
Secretaria de Gobernacion	100	100	100	100	100	100
Secretaria de Hacienda y Credito Publico	68	68	68	68	68	68
Secretaria de Relaciones Exteriores	43	43	43	43	43	43
Secretaria de Salud	100	100	100	100	100	100
Secretaria de Transportes y Vialidad	85	85	85	85	85	85
Suprema Corte de Justicia	68	68	68	68	68	68
Tabacalera	68	68	68	68	68	68
Telefonos de Mexico S.A. de CV	69	69	69	69	69	69
Tesoreria del Distrito Federal	16	16	16	16	16	16
Transito	38	38	38	38	38	38
Unidad Soldominio	16	16	16	16	16	16
Valle Gomez	17	17	17	17	17	17
Vista Alegre	57	57	57	57	57	57

Let's find out how many unique categories can be curated from all the returned venues

```
In [26]: print('There are {} uniques categories.'.format(len(cuauhtemoc_venues['Venue Category'].unique())))
```

There are 193 uniques categories.

```
In [30]: # create a dataframe of top 10 categories
cuauhtemoc_venues_top10 = cuauhtemoc_venues['Venue Category'].value_counts()[0:10].to_frame(name='frequency')
cuauhtemoc_venues_top10 = cuauhtemoc_venues_top10.reset_index()
#Top Venues in Cuauhtemoc Borough

cuauhtemoc_venues_top10.rename(index=str, columns={"index": "Venue_Category", "frequency": "Frequency"}, inplace=True)
cuauhtemoc_venues_top10
```

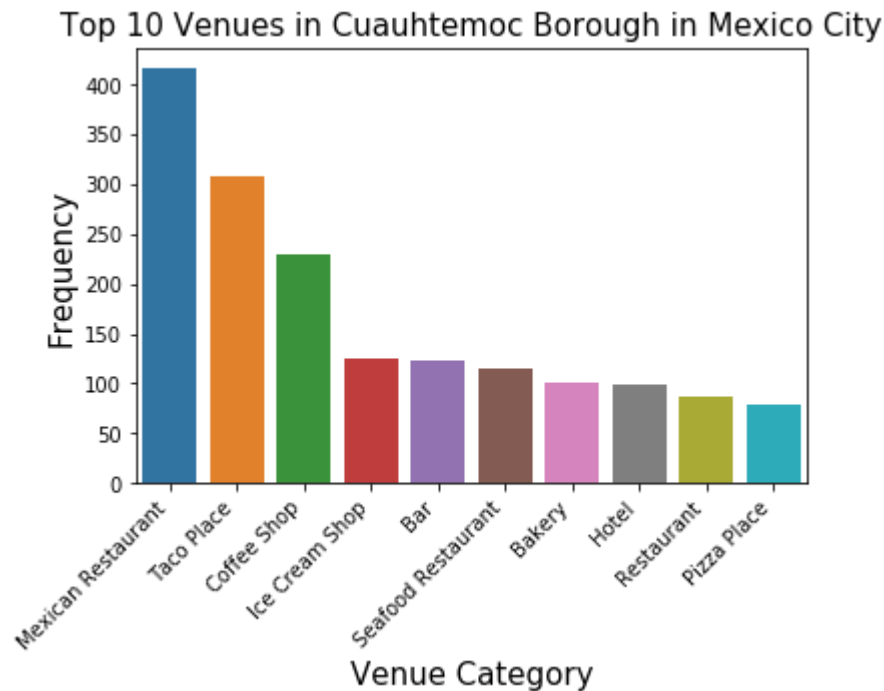
Out[30]:

	Venue_Category	Frequency
0	Mexican Restaurant	416
1	Taco Place	307
2	Coffee Shop	229
3	Ice Cream Shop	124
4	Bar	122
5	Seafood Restaurant	115
6	Bakery	101
7	Hotel	98
8	Restaurant	87
9	Pizza Place	79

```
In [32]: import seaborn as sns
from matplotlib import pyplot as plt

s=sns.barplot(x="Venue_Category", y="Frequency", data=cuauhtemoc_venues_top10)
s.set_xticklabels(s.get_xticklabels(), rotation=45, horizontalalignment='right')

plt.title('Top 10 Venues in Cuauhtemoc Borough in Mexico City', fontsize=15)
plt.xlabel("Venue Category", fontsize=15)
plt.ylabel("Frequency", fontsize=15)
plt.savefig("Most_Freq_Venues1.png", dpi=300)
fig = plt.figure(figsize=(18,7))
plt.show()
```



<Figure size 1296x504 with 0 Axes>

## Analyze Each Neighborhood

```
In [33]: # one hot encoding
cuauhtemoc_onehot = pd.get_dummies(cuauhtemoc_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
cuauhtemoc_onehot['Neighborhood'] = cuauhtemoc_venues['Neighborhood']

# move neighborhood column to the first column
fixed_columns = [cuauhtemoc_onehot.columns[-1]] + list(cuauhtemoc_onehot.columns[:-1])
cuauhtemoc_onehot = cuauhtemoc_onehot[fixed_columns]

cuauhtemoc_onehot.head()
```

Out[33]:

	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auto Garage	Auto Workshop	BBQ Joint	Ba
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	1	0	0	0	0	0	0	0	0	0	0	0	

And let's examine the new dataframe size.

```
In [34]: cuauhtemoc_onehot.shape
```

Out[34]: (3966, 193)

Next, let's group rows by neighborhood and by taking the mean of the frequency of occurrence of each category



```
In [35]: cuauhtemoc_grouped = cuauhtemoc_onehot.groupby('Neighborhood').mean().reset_index()  
cuauhtemoc_grouped
```

Out[35]:

	Neighborhood	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	A Gar
0	Algarin	0.000000	0.043478	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
1	Ampliacion Asturias	0.000000	0.000000	0.000000	0.00	0.047619	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
2	Asturias	0.000000	0.000000	0.000000	0.00	0.058824	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
3	Atlampa	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0833
4	Banorte	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
5	Buenavista	0.000000	0.000000	0.014286	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
6	Buenos Aires	0.000000	0.000000	0.000000	0.00	0.100000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
7	Camara Nacional de Aerotransportes	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
8	Camara Nacional de Comercio de la Ciudad de Me...	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
9	Camara Nacional de Transportes y Comunicacion	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
10	Camara Nacional de la Industria Cinematografica	0.000000	0.000000	0.000000	0.00	0.011765	0.023529	0.000000	0.000000	0.011765	0.000000	0.0000
11	Centro (Area 1)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
12	Centro (Area 2)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
13	Centro (Area 3)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
14	Centro (Area 4)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
15	Centro (Area 5)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
16	Centro (Area 6)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
17	Centro (Area 7)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000

	Neighborhood	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	A Gar:
18	Centro (Area 8)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
19	Centro (Area 9)	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
20	Centro Medico Siglo XXI	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
21	Centro Urbano Benito Juarez	0.000000	0.000000	0.000000	0.00	0.011765	0.023529	0.000000	0.000000	0.011765	0.000000	0.0000
22	Comision Federal de Electricidad	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
23	Condesa	0.020833	0.000000	0.000000	0.00	0.020833	0.010417	0.000000	0.000000	0.000000	0.000000	0.0000
24	Confederacion de Camaras Nacionales de Comercio	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
25	Cuauhtemoc	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
26	Delegacion Politica Cuauhtemoc	0.000000	0.000000	0.014286	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
27	Direccion General de Recaudacion de la SHCP	0.000000	0.000000	0.000000	0.00	0.000000	0.017857	0.000000	0.000000	0.000000	0.000000	0.0000
28	Doctores	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
29	Esperanza	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
30	Ex-Hipodromo de Peralvillo	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.055556	0.0000
31	Felipe Pescador	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.120000	0.000000	0.000000	0.0400
32	Guerrero	0.000000	0.000000	0.000000	0.00	0.000000	0.017857	0.000000	0.000000	0.000000	0.000000	0.0000
33	H Camara de Senadores	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
34	Hemphill Schools	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0450

	Neighborhood	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	A Gar
35	Hipodromo	0.020833	0.000000	0.000000	0.00	0.020833	0.010417	0.000000	0.000000	0.000000	0.000000	0.0000
36	Hipodromo Condesa	0.020833	0.000000	0.000000	0.00	0.020833	0.010417	0.000000	0.000000	0.000000	0.000000	0.0000
37	Hospital General de Mexico	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
38	IMSS	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
39	ISSSTE	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
40	Instituto Mexicano de Comercio Exterior	0.020833	0.000000	0.000000	0.00	0.020833	0.010417	0.000000	0.000000	0.000000	0.000000	0.0000
41	Juarez	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
42	Maza	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.103448	0.000000	0.000000	0.0000
43	Nonoalco Tlatelolco	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.037037	0.0000
44	Obrera	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
45	Partido de La Revolucion Democratica	0.000000	0.000000	0.000000	0.00	0.011765	0.023529	0.000000	0.000000	0.011765	0.000000	0.0000
46	Paulino Navarro	0.000000	0.000000	0.000000	0.00	0.031250	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
47	Peralvillo	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.080000	0.000000	0.000000	0.0000
48	Presidencia de La Republica	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
49	Procuraduria General de La Republica	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
50	Roma Norte	0.011765	0.000000	0.000000	0.00	0.000000	0.023529	0.000000	0.000000	0.011765	0.000000	0.0000
51	Roma Sur	0.000000	0.000000	0.000000	0.00	0.081081	0.000000	0.000000	0.000000	0.000000	0.027027	0.0000
52	San Rafael	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.045

	Neighborhood	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	A Gar:
53	San Simon Tolnahuac	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
54	Santa Maria Insurgentes	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
55	Santa Maria la Ribera	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
56	Secretaria de Economia	0.020833	0.000000	0.000000	0.00	0.020833	0.010417	0.000000	0.000000	0.000000	0.000000	0.0000
57	Secretaria de Gobernacion	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
58	Secretaria de Hacienda y Credito Publico	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
59	Secretaria de Relaciones Exteriores	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.023256	0.0000
60	Secretaria de Salud	0.000000	0.000000	0.000000	0.01	0.020000	0.000000	0.010000	0.000000	0.000000	0.000000	0.0000
61	Secretaria de Transportes y Vialidad	0.011765	0.000000	0.000000	0.00	0.000000	0.023529	0.000000	0.000000	0.011765	0.000000	0.0000
62	Suprema Corte de Justicia	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
63	Tabacalera	0.000000	0.000000	0.000000	0.00	0.014706	0.000000	0.014706	0.000000	0.000000	0.000000	0.0000
64	Telefonos de Mexico S.A. de CV	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
65	Tesoreria del Distrito Federal	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
66	Transito	0.000000	0.000000	0.000000	0.00	0.026316	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
67	Unidad Soldominio	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
68	Valle Gomez	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000

	Neighborhood	Yoga Studio	Advertising Agency	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	A Gar:
69	Vista Alegre	0.000000	0.000000	0.000000	0.00	0.017544	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Let's confirm the new size

```
In [36]: cuauhtemoc_grouped.shape
```

```
Out[36]: (70, 193)
```

Let's print each neighborhood along with the top 5 most common venues

```
In [46]: num_top_venues = 5

for hood in cuauhtemoc_grouped['Neighborhood']:
    print("-----"+hood+"-----")
    temp = cuauhtemoc_grouped[cuauhtemoc_grouped['Neighborhood'] == hood].T.reset_index()
    temp.columns = ['venue', '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')
```

## ----Algarin----

	venue	freq
0	Mexican Restaurant	0.22
1	Taco Place	0.17
2	Clothing Store	0.09
3	Bakery	0.09
4	Paper / Office Supplies Store	0.04

## ----Ampliacion Asturias----

	venue	freq
0	Ice Cream Shop	0.10
1	Mexican Restaurant	0.10
2	Taco Place	0.10
3	Bar	0.05
4	Diner	0.05

## ----Asturias----

	venue	freq
0	Mexican Restaurant	0.18
1	Bakery	0.18
2	Cupcake Shop	0.06
3	Fast Food Restaurant	0.06
4	Gift Shop	0.06

## ----Atlampa----

	venue	freq
0	Mexican Restaurant	0.33
1	Convenience Store	0.08
2	Gym / Fitness Center	0.08
3	Photography Studio	0.08
4	Pharmacy	0.08

## ----Banorte----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04



## ----Buenavista----

	venue	freq
0	Ice Cream Shop	0.07
1	Taco Place	0.06
2	Mexican Restaurant	0.04
3	Clothing Store	0.04
4	Gym / Fitness Center	0.04

## ----Buenos Aires----

	venue	freq
0	Pizza Place	0.1
1	Gym	0.1
2	Boutique	0.1
3	Paper / Office Supplies Store	0.1
4	Beer Garden	0.1

## ----Camara Nacional de Aerotransportes----

	venue	freq
0	Mexican Restaurant	0.22
1	Taco Place	0.22
2	Bar	0.04
3	Convenience Store	0.04
4	Seafood Restaurant	0.04

## ----Camara Nacional de Comercio de la Ciudad de Mexico----

	venue	freq
0	Mexican Restaurant	0.12
1	Deli / Bodega	0.06
2	Taco Place	0.06
3	Bookstore	0.04
4	Seafood Restaurant	0.04

## ----Camara Nacional de Transportes y Comunicacion----

	venue	freq
0	Mexican Restaurant	0.12
1	Deli / Bodega	0.06
2	Taco Place	0.06

3	Bookstore	0.04
4	Seafood Restaurant	0.04

----Camara Nacional de la Industria Cinematografica----

	venue	freq
0	Taco Place	0.09
1	Mexican Restaurant	0.06
2	Hotel	0.06
3	Restaurant	0.05
4	Ice Cream Shop	0.05

----Centro (Area 1)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Centro (Area 2)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Centro (Area 3)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Centro (Area 4)----

	venue	freq
0	Coffee Shop	0.10

1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Centro (Area 5)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Centro (Area 6)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Centro (Area 7)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Centro (Area 8)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Centro (Area 9)----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Centro Medico Siglo XXI----

	venue	freq
0	Mexican Restaurant	0.31
1	Bar	0.12
2	Taco Place	0.06
3	Shopping Mall	0.06
4	Flea Market	0.06

----Centro Urbano Benito Juarez----

	venue	freq
0	Taco Place	0.09
1	Mexican Restaurant	0.06
2	Hotel	0.06
3	Restaurant	0.05
4	Ice Cream Shop	0.05

----Comision Federal de Electricidad----

	venue	freq
0	Mexican Restaurant	0.22
1	Taco Place	0.22
2	Bar	0.04
3	Convenience Store	0.04
4	Seafood Restaurant	0.04

----Condesa----

	venue	freq
0	Coffee Shop	0.07
1	Ice Cream Shop	0.07
2	Bakery	0.05
3	Burger Joint	0.03
4	Italian Restaurant	0.03

## ----Confederacion de Camaras Nacionales de Comercio----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Cuauhtemoc----

	venue	freq
0	Mexican Restaurant	0.22
1	Taco Place	0.22
2	Bar	0.04
3	Convenience Store	0.04
4	Seafood Restaurant	0.04

## ----Delegacion Politica Cuauhtemoc----

	venue	freq
0	Ice Cream Shop	0.07
1	Taco Place	0.06
2	Mexican Restaurant	0.04
3	Clothing Store	0.04
4	Gym / Fitness Center	0.04

## ----Direccion General de Recaudacion de la SHCP----

	venue	freq
0	Mexican Restaurant	0.21
1	Taco Place	0.16
2	Bar	0.05
3	Gym	0.05
4	Seafood Restaurant	0.04

## ----Doctores----

	venue	freq
0	Mexican Restaurant	0.31
1	Bar	0.12
2	Taco Place	0.06
3	Shopping Mall	0.06

4 Flea Market 0.06

----Esperanza----

	venue	freq
0	Seafood Restaurant	0.15
1	Burger Joint	0.09
2	Mexican Restaurant	0.09
3	Coffee Shop	0.09
4	Warehouse Store	0.06

----Ex-Hipodromo de Peralvillo----

	venue	freq
0	Mexican Restaurant	0.22
1	Pie Shop	0.06
2	Auto Workshop	0.06
3	Food Truck	0.06
4	Pizza Place	0.06

----Felipe Pescador----

	venue	freq
0	Taco Place	0.12
1	Arts & Crafts Store	0.12
2	Restaurant	0.08
3	Convenience Store	0.08
4	Bar	0.04

----Guerrero----

	venue	freq
0	Mexican Restaurant	0.21
1	Taco Place	0.16
2	Bar	0.05
3	Gym	0.05
4	Seafood Restaurant	0.04

----H Camara de Senadores----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09

2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Hemphill Schools----

	venue	freq
0	Mexican Restaurant	0.32
1	Bridge	0.05
2	Restaurant	0.05
3	Optical Shop	0.05
4	Performing Arts Venue	0.05

----Hipodromo----

	venue	freq
0	Coffee Shop	0.07
1	Ice Cream Shop	0.07
2	Bakery	0.05
3	Burger Joint	0.03
4	Italian Restaurant	0.03

----Hipodromo Condesa----

	venue	freq
0	Coffee Shop	0.07
1	Ice Cream Shop	0.07
2	Bakery	0.05
3	Burger Joint	0.03
4	Italian Restaurant	0.03

----Hospital General de Mexico----

	venue	freq
0	Mexican Restaurant	0.31
1	Bar	0.12
2	Taco Place	0.06
3	Shopping Mall	0.06
4	Flea Market	0.06

----IMSS----

	venue	freq
--	-------	------

0	Mexican Restaurant	0.12
1	Deli / Bodega	0.06
2	Taco Place	0.06
3	Bookstore	0.04
4	Seafood Restaurant	0.04

----ISSSTE----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Instituto Mexicano de Comercio Exterior----

	venue	freq
0	Coffee Shop	0.07
1	Ice Cream Shop	0.07
2	Bakery	0.05
3	Burger Joint	0.03
4	Italian Restaurant	0.03

----Juarez----

	venue	freq
0	Mexican Restaurant	0.12
1	Deli / Bodega	0.06
2	Taco Place	0.06
3	Bookstore	0.04
4	Seafood Restaurant	0.04

----Maza----

	venue	freq
0	Mexican Restaurant	0.14
1	Arts & Crafts Store	0.10
2	Taco Place	0.10
3	Department Store	0.07
4	Restaurant	0.07



## ----Nonoalco Tlatelolco----

	venue	freq
0	Mexican Restaurant	0.11
1	Pizza Place	0.07
2	Movie Theater	0.07
3	Burger Joint	0.07
4	Taco Place	0.04

## ----Obrera----

	venue	freq
0	Bar	0.20
1	Taco Place	0.17
2	Mexican Restaurant	0.10
3	Seafood Restaurant	0.07
4	Bakery	0.07

## ----Partido de La Revolucion Democratica----

	venue	freq
0	Taco Place	0.09
1	Mexican Restaurant	0.06
2	Hotel	0.06
3	Restaurant	0.05
4	Ice Cream Shop	0.05

## ----Paulino Navarro----

	venue	freq
0	Mexican Restaurant	0.12
1	Ice Cream Shop	0.09
2	Taco Place	0.06
3	Coffee Shop	0.06
4	Burrito Place	0.03

## ----Peralvillo----

	venue	freq
0	Mexican Restaurant	0.12
1	Seafood Restaurant	0.08
2	Arts & Crafts Store	0.08
3	Gym	0.08
4	Fried Chicken Joint	0.04

## ----Presidencia de La Republica----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Procuraduria General de La Republica----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

## ----Roma Norte----

	venue	freq
0	Coffee Shop	0.07
1	Cocktail Bar	0.07
2	Mexican Restaurant	0.05
3	Taco Place	0.04
4	Italian Restaurant	0.04

## ----Roma Sur----

	venue	freq
0	Mexican Restaurant	0.19
1	Taco Place	0.11
2	Argentinian Restaurant	0.08
3	Coffee Shop	0.08
4	Café	0.05

## ----San Rafael----

	venue	freq
0	Mexican Restaurant	0.32
1	Bridge	0.05
2	Restaurant	0.05

3           Optical Shop   0.05  
4   Performing Arts Venue   0.05

----San Simon Tolnahuac----

	venue	freq
0	Taco Place	0.16
1	Mexican Restaurant	0.11
2	Burger Joint	0.08
3	Lounge	0.05
4	Bus Station	0.05

----Santa Maria Insurgentes----

	venue	freq
0	Mexican Restaurant	0.18
1	Gym / Fitness Center	0.18
2	Park	0.18
3	Taco Place	0.09
4	Sandwich Place	0.09

----Santa Maria la Ribera----

	venue	freq
0	Mexican Restaurant	0.19
1	Coffee Shop	0.07
2	Pizza Place	0.07
3	Ice Cream Shop	0.07
4	Restaurant	0.05

----Secretaria de Economia----

	venue	freq
0	Coffee Shop	0.07
1	Ice Cream Shop	0.07
2	Bakery	0.05
3	Burger Joint	0.03
4	Italian Restaurant	0.03

----Secretaria de Gobernacion----

	venue	freq
0	Mexican Restaurant	0.12

1	Deli / Bodega	0.06
2	Taco Place	0.06
3	Bookstore	0.04
4	Seafood Restaurant	0.04

----Secretaria de Hacienda y Credito Publico----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Secretaria de Relaciones Exteriores----

	venue	freq
0	Taco Place	0.12
1	Pizza Place	0.09
2	Park	0.07
3	Burger Joint	0.05
4	Restaurant	0.05

----Secretaria de Salud----

	venue	freq
0	Mexican Restaurant	0.12
1	Deli / Bodega	0.06
2	Taco Place	0.06
3	Bookstore	0.04
4	Seafood Restaurant	0.04

----Secretaria de Transportes y Vialidad----

	venue	freq
0	Coffee Shop	0.07
1	Cocktail Bar	0.07
2	Mexican Restaurant	0.05
3	Taco Place	0.04
4	Italian Restaurant	0.04

----Suprema Corte de Justicia----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Tabacalera----

	venue	freq
0	Coffee Shop	0.10
1	Mexican Restaurant	0.09
2	Taco Place	0.07
3	Plaza	0.04
4	Hotel	0.04

----Telefonos de Mexico S.A. de CV----

	venue	freq
0	Mexican Restaurant	0.22
1	Taco Place	0.22
2	Bar	0.04
3	Convenience Store	0.04
4	Seafood Restaurant	0.04

----Tesoreria del Distrito Federal----

	venue	freq
0	Mexican Restaurant	0.31
1	Bar	0.12
2	Taco Place	0.06
3	Shopping Mall	0.06
4	Flea Market	0.06

----Transito----

	venue	freq
0	Mexican Restaurant	0.11
1	Ice Cream Shop	0.08
2	Seafood Restaurant	0.08
3	Paper / Office Supplies Store	0.05
4	Coffee Shop	0.05

```

----Unidad Soldominio----
      venue  freq
0 Mexican Restaurant  0.31
1           Bar      0.12
2       Taco Place   0.06
3   Shopping Mall   0.06
4       Flea Market   0.06

```

```

----Valle Gomez----
      venue  freq
0       Taco Place  0.18
1         Bakery   0.06
2   Nature Preserve  0.06
3   Metro Station   0.06
4 Fast Food Restaurant  0.06

```

```

----Vista Alegre----
      venue  freq
0 Mexican Restaurant  0.14
1 Convenience Store  0.07
2       Pizza Place  0.05
3       Taco Place  0.05
4 Paper / Office Supplies Store  0.05

```

Let's put that into a pandas dataframe.

Firstly, let's write a function to sort the venues in descending order.

```

In [47]: 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]

```

Now let's create the new dataframe and display the top 10 venues for each neighborhood.

```

In [48]: num_top_venues = 10

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

# create columns according to number of top venues
columns = ['Neighborhood']
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))

# create a new dataframe
neighborhoods_venues_sorted = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted['Neighborhood'] = cuauhtemoc_grouped['Neighborhood']

for ind in np.arange(cuauhtemoc_grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(cuauhtemoc_grouped.iloc[ind, :], num_top_venues)

neighborhoods_venues_sorted.head()

```

Out[48]:

	Neighborhood	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	Algarin	Mexican Restaurant	Taco Place	Bakery	Clothing Store	South American Restaurant	Food Truck	Steakhouse	Print Shop	Gym / Fitness Center	Dance Studio
1	Ampliacion Asturias	Taco Place	Mexican Restaurant	Ice Cream Shop	Diner	Flea Market	Restaurant	Café	Food Truck	Bed & Breakfast	Bar
2	Asturias	Bakery	Mexican Restaurant	Bar	Juice Bar	Cupcake Shop	Café	Fast Food Restaurant	Dessert Shop	Ice Cream Shop	Gift Shop
3	Atlampa	Mexican Restaurant	Convenience Store	Auto Garage	Nightclub	Optical Shop	Performing Arts Venue	Pharmacy	Photography Studio	Gym / Fitness Center	Asian Restaurant
4	Banorte	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	Bar	Café	Pizza Place



## Cluster Neighborhoods

Run k-means to cluster the neighborhood into 5 clusters.

```
In [49]: # set number of clusters
kclusters = 5

cuauhtemoc_grouped_clustering = cuauhtemoc_grouped.drop('Neighborhood', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(cuauhtemoc_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
```

```
Out[49]: array([3, 4, 4, 2, 1, 0, 1, 3, 4, 4], dtype=int32)
```

Let's create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

```
In [50]: # add clustering labels
neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

cuauhtemoc_merged = cuauhtemoc_data

# merge cuauhtemoc_grouped with cuauhtemoc_data to add Latitude/Longitude for each neighborhood
cuauhtemoc_merged = cuauhtemoc_merged.join(neighborhoods_venues_sorted.set_index('Neighborhood'), on='Neighborhood')

cuauhtemoc_merged.head() # check the last columns!
```

Out[50]:

	index	PostalCode	Neighborhood	Borough	latitude	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	48	6880	Algarin	Cuauhtemoc	19.4053	-99.1408	3	Mexican Restaurant	Taco Place	Bakery	Clothing Store	South American Restaurant
1	54	6890	Ampliacion Asturias	Cuauhtemoc	19.4070	-99.1313	4	Taco Place	Mexican Restaurant	Ice Cream Shop	Diner	Flea Market
2	113	6850	Asturias	Cuauhtemoc	19.4039	-99.1308	4	Bakery	Mexican Restaurant	Bar	Juice Bar	Cupcake Shop
3	116	6450	Atlapa	Cuauhtemoc	19.4581	-99.1562	2	Mexican Restaurant	Convenience Store	Auto Garage	Nightclub	Optical Shop
4	125	6038	Banorte	Cuauhtemoc	19.4364	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel

Finally, let's visualize the resulting clusters

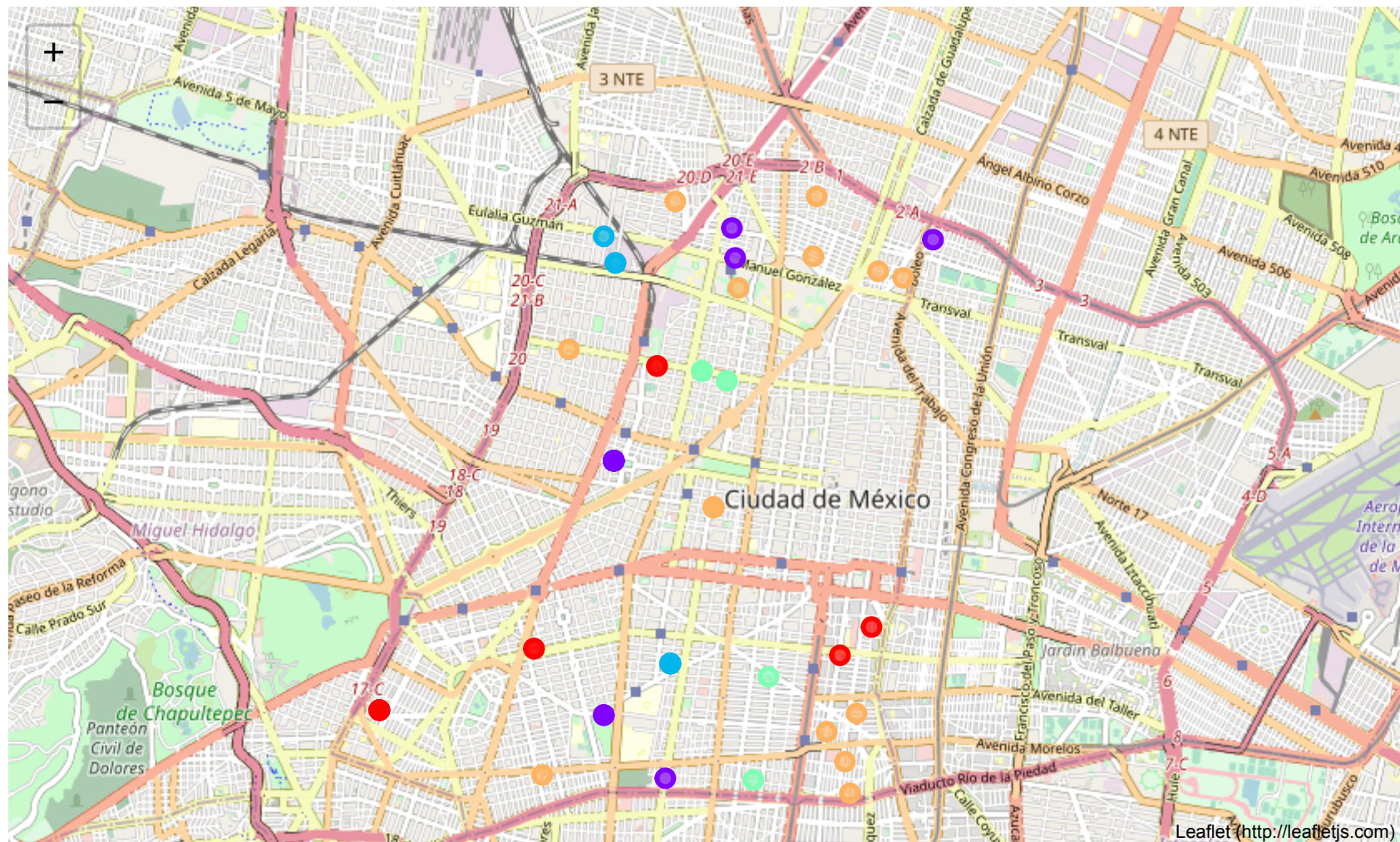
```
In [56]: # create map
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=13)

# set color scheme for the clusters
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]

# add markers to the map
markers_colors = []
for lat, lon, poi, cluster in zip(cuauhtemoc_merged['latitude'], cuauhtemoc_merged['longitude'], cuauhtemoc_m
merged['Neighborhood'], cuauhtemoc_merged['Cluster Labels']):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
        fill_color=rainbow[cluster-1],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters
```

Out[56]:



## Examine Clusters

Now, you can examine each cluster and determine the discriminating venue categories that distinguish each cluster. Based on the defining categories, we can then assign a name to each cluster in future reports.

### Cluster 1

In [67]: `cuauhtemoc_merged.loc[cuauhtemoc_merged['Cluster Labels'] == 0, cuauhtemoc_merged.columns[[1,2] + list(range(5, cuauhtemoc_merged.shape[1]))]]`

Out[67]:

	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
5	6350	Buenavista	-99.1507	0	Ice Cream Shop	Taco Place	Mexican Restaurant	Gym / Fitness Center	Clothing Store	Chinese Restaurant	Sporting Goods Shop	
23	6140	Condesa	-99.1795	0	Ice Cream Shop	Coffee Shop	Bakery	Burger Joint	Spa	Italian Restaurant	Yoga Studio	Sanc F
26	6357	Delegacion Politica Cuauhtemoc	-99.1507	0	Ice Cream Shop	Taco Place	Mexican Restaurant	Gym / Fitness Center	Clothing Store	Chinese Restaurant	Sporting Goods Shop	
29	6840	Esperanza	-99.1286	0	Seafood Restaurant	Coffee Shop	Burger Joint	Mexican Restaurant	Warehouse Store	Snack Place	Sandwich Place	M
35	6100	Hipodromo	-99.1795	0	Ice Cream Shop	Coffee Shop	Bakery	Burger Joint	Spa	Italian Restaurant	Yoga Studio	Sanc F
36	6170	Hipodromo Condesa	-99.1795	0	Ice Cream Shop	Coffee Shop	Bakery	Burger Joint	Spa	Italian Restaurant	Yoga Studio	Sanc F
40	6171	Instituto Mexicano de Comercio Exterior	-99.1795	0	Ice Cream Shop	Coffee Shop	Bakery	Burger Joint	Spa	Italian Restaurant	Yoga Studio	Sanc F
50	6700	Roma Norte	-99.1634	0	Cocktail Bar	Coffee Shop	Mexican Restaurant	Italian Restaurant	Pizza Place	Seafood Restaurant	Bar	F
56	6179	Secretaria de Economia	-99.1795	0	Ice Cream Shop	Coffee Shop	Bakery	Burger Joint	Spa	Italian Restaurant	Yoga Studio	Sanc F
61	6707	Secretaria de Transportes y Vialidad	-99.1634	0	Cocktail Bar	Coffee Shop	Mexican Restaurant	Italian Restaurant	Pizza Place	Seafood Restaurant	Bar	F
66	6820	Transito	-99.1319	0	Mexican Restaurant	Seafood Restaurant	Ice Cream Shop	Coffee Shop	Warehouse Store	Paper / Office Supplies Store	Taco Place	Bee

**Cluster 2**

```
In [68]: cuauhtemoc_merged.loc[cuauhtemoc_merged['Cluster Labels'] == 1, cuauhtemoc_merged.columns[[1,2] + list(range(5, cuauhtemoc_merged.shape[1]))]]
```



Out[68]:

	PostalCode	Neighborhood	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
4	6038	Banorte	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
6	6780	Buenos Aires	-99.1499	1	Gym	Taco Place	Pizza Place	Paper / Office Supplies Store	Boutique	Beer Garden	Juice Bar	
10	6796	Camara Nacional de la Industria Cinematografica	-99.1563	1	Taco Place	Hotel	Mexican Restaurant	Ice Cream Shop	Restaurant	Pizza Place	Art Gallery	Res
11	6000	Centro (Area 1)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
12	6010	Centro (Area 2)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
13	6020	Centro (Area 3)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
14	6040	Centro (Area 4)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
15	6050	Centro (Area 5)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
16	6060	Centro (Area 6)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
17	6070	Centro (Area 7)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
18	6080	Centro (Area 8)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
19	6090	Centro (Area 9)	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
21	6740	Centro Urbano Benito Juarez	-99.1563	1	Taco Place	Hotel	Mexican Restaurant	Ice Cream Shop	Restaurant	Pizza Place	Art Gallery	Res
24	6079	Confederacion de Camaras Nacionales de Comercio	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	



	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
<b>33</b>	6018	H Camara de Senadores	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>39</b>	6039	ISSSTE	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>45</b>	6798	Partido de La Revolucion Democratica	-99.1563	1	Taco Place	Hotel	Mexican Restaurant	Ice Cream Shop	Restaurant	Pizza Place	Art Gallery	Res
<b>48</b>	6067	Presidencia de La Republica	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>49</b>	6058	Procuraduria General de La Republica	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>53</b>	6920	San Simon Tolnahuac	-99.1431	1	Taco Place	Mexican Restaurant	Burger Joint	Lounge	Park	Restaurant	Big Box Store	
<b>58</b>	6066	Secretaria de Hacienda y Credito Publico	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>59</b>	6995	Secretaria de Relaciones Exteriores	-99.1427	1	Taco Place	Pizza Place	Park	Coffee Shop	Big Box Store	Burger Joint	Lounge	
<b>62</b>	6065	Suprema Corte de Justicia	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>63</b>	6030	Tabacalera	-99.1553	1	Coffee Shop	Mexican Restaurant	Taco Place	Plaza	Hotel	Seafood Restaurant	Hostel	
<b>68</b>	6240	Valle Gomez	-99.1223	1	Taco Place	Gym	Soccer Field	Convenience Store	Lounge	Farmers Market	Movie Theater	

### Cluster 3

```
In [69]: cuauhtemoc_merged.loc[cuauhtemoc_merged['Cluster Labels'] == 2, cuauhtemoc_merged.columns[[1,2] + list(range(5, cuauhtemoc_merged.shape[1]))]]
```

Out[69]:

	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8 C
<b>3</b>	6450	Atlampa	-99.1562	2	Mexican Restaurant	Convenience Store	Auto Garage	Nightclub	Optical Shop	Performing Arts Venue	Pharmacy	Phot
<b>20</b>	6725	Centro Medico Siglo XXI	-99.1493	2	Mexican Restaurant	Bar	Pie Shop	Taco Place	Burger Joint	Shopping Mall	Fish & Chips Shop	
<b>28</b>	6720	Doctores	-99.1493	2	Mexican Restaurant	Bar	Pie Shop	Taco Place	Burger Joint	Shopping Mall	Fish & Chips Shop	
<b>34</b>	6479	Hemphill Schools	-99.1550	2	Mexican Restaurant	Brewery	Auto Garage	Bridge	Performing Arts Venue	Restaurant	Japanese Restaurant	
<b>37</b>	6729	Hospital General de Mexico	-99.1493	2	Mexican Restaurant	Bar	Pie Shop	Taco Place	Burger Joint	Shopping Mall	Fish & Chips Shop	
<b>52</b>	6470	San Rafael	-99.1550	2	Mexican Restaurant	Brewery	Auto Garage	Bridge	Performing Arts Venue	Restaurant	Japanese Restaurant	
<b>65</b>	6727	Tesoreria del Distrito Federal	-99.1493	2	Mexican Restaurant	Bar	Pie Shop	Taco Place	Burger Joint	Shopping Mall	Fish & Chips Shop	
<b>67</b>	6728	Unidad Soldominio	-99.1493	2	Mexican Restaurant	Bar	Pie Shop	Taco Place	Burger Joint	Shopping Mall	Fish & Chips Shop	

## Cluster 4

```
In [70]: cuauhtemoc_merged.loc[cuauhtemoc_merged['Cluster Labels'] == 3, cuauhtemoc_merged.columns[[1,2] + list(range(5, cuauhtemoc_merged.shape[1]))]]
```

Out[70]:

	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue
0	6880	Algarin	-99.1408	3	Mexican Restaurant	Taco Place	Bakery	Clothing Store	South American Restaurant	Food Truck	Steakhouse
7	6589	Camara Nacional de Aerotransportes	-99.1461	3	Mexican Restaurant	Taco Place	Seafood Restaurant	Bar	Convenience Store	Brewery	Gym
22	6598	Comision Federal de Electricidad	-99.1461	3	Mexican Restaurant	Taco Place	Seafood Restaurant	Bar	Convenience Store	Brewery	Gym
25	6500	Cuauhtemoc	-99.1461	3	Mexican Restaurant	Taco Place	Seafood Restaurant	Bar	Convenience Store	Brewery	Gym
27	6309	Direccion General de Recaudacion de la SHCP	-99.1435	3	Mexican Restaurant	Taco Place	Gym	Bar	Seafood Restaurant	Convenience Store	Bakery
32	6300	Guerrero	-99.1435	3	Mexican Restaurant	Taco Place	Gym	Bar	Seafood Restaurant	Convenience Store	Bakery
44	6800	Obrera	-99.1392	3	Bar	Taco Place	Mexican Restaurant	Seafood Restaurant	Bakery	Indie Theater	Clothing Store
64	6599	Telefonos de Mexico S.A. de CV	-99.1461	3	Mexican Restaurant	Taco Place	Seafood Restaurant	Bar	Convenience Store	Brewery	Gym

## Cluster 5

```
In [71]: cuauhtemoc_merged.loc[cuauhtemoc_merged['Cluster Labels'] == 4, cuauhtemoc_merged.columns[[1,2] + list(range(5, cuauhtemoc_merged.shape[1]))]]
```

Out[71]:

	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue
1	6890	Ampliacion Asturias	-99.1313	4	Taco Place	Mexican Restaurant	Ice Cream Shop	Diner	Flea Market	Restaurant	Café
2	6850	Asturias	-99.1308	4	Bakery	Mexican Restaurant	Bar	Juice Bar	Cupcake Shop	Café	Fast Food Restaurant
8	6609	Camara Nacional de Comercio de la Ciudad de Me...	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
9	6693	Camara Nacional de Transportes y Comunicacion	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
30	6250	Ex-Hipodromo de Peralvillo	-99.1347	4	Mexican Restaurant	Pie Shop	Auto Workshop	Gym	Pizza Place	Department Store	Diner
31	6280	Felipe Pescador	-99.1253	4	Arts & Crafts Store	Taco Place	Convenience Store	Restaurant	Gym	Bakery	Par
38	6698	IMSS	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
41	6600	Juarez	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
42	6270	Maza	-99.1279	4	Mexican Restaurant	Taco Place	Arts & Crafts Store	Restaurant	Department Store	Seafood Restaurant	Sandwich Place
43	6900	Nonoalco Tlatelolco	-99.1424	4	Mexican Restaurant	Movie Theater	Burger Joint	Pizza Place	Park	Sushi Restaurant	Big Box Store
46	6870	Paulino Navarro	-99.1301	4	Mexican Restaurant	Ice Cream Shop	Coffee Shop	Taco Place	Gift Shop	Convenience Store	Dessert Shop
47	6220	Peralvillo	-99.1342	4	Mexican Restaurant	Gym	Seafood Restaurant	Arts & Crafts Store	Fried Chicken Joint	Motel	Market
51	6760	Roma Sur	-99.1626	4	Mexican Restaurant	Taco Place	Argentinian Restaurant	Coffee Shop	Gym / Fitness Center	Optical Shop	Café

	PostalCode	Neighborhood	longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue
54	6430	Santa Maria Insurgentes	-99.1489	4	Gym / Fitness Center	Park	Mexican Restaurant	Candy Store	Sandwich Place	Taco Place	Fried Chicken Joint
55	6400	Santa Maria la Ribera	-99.1599	4	Mexican Restaurant	Ice Cream Shop	Pizza Place	Coffee Shop	Plaza	Restaurant	Baker
57	6699	Secretaria de Gobernacion	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
60	6696	Secretaria de Salud	-99.1449	4	Mexican Restaurant	Taco Place	Deli / Bodega	Bookstore	Bakery	Seafood Restaurant	Coffee Shop
69	6860	Vista Alegre	-99.1332	4	Mexican Restaurant	Convenience Store	Coffee Shop	Taco Place	Pizza Place	Paper / Office Supplies Store	Brewery

## Results

As we can see according to the results presented that all the information labeled as cluster =1 is the zone which has much more neighbourhood with top 10 venues compared with other clusters

This statement can be true due to most of its neighbourhoods are located in Mexico City Centre which is well known is a touristic place with lots of museums, shops and restaurants to visit for.

The frequency of these venues are concentrated in the industry of prepared food such as Mexican Restaurants, Taco places, Coffee shops, Bars, etc.

## Discussion

According to the problem to solve and the results, this information can be really useful, not only for the persone who likes to move to a neighbourhood which has the main venues into a Borough in the City.

Moreover, this information can be useful as well, for people thinking in start a new business and what would be the best option to choose.

Finally, this sort of analysis can be complemented adding information about the cost of renting house or even if you want to choose a safer place to live you can include crime records dataset in the same city.

## Conclusion

There are many models for clustering out there. In this report, we have presented a model that is considered the one of the simplest model among them. Despite its simplicity, *k*-means is vastly used for clustering in many data science applications, especially useful if you need to quickly discover insights from unlabeled data.

This report can be complemented with othe models such as DBScan and its results can vary or confirm the obtained results.