

The Restaurant Battle of Neighborhoods in Mexico City

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Business problem

- ▶ Mexico City is one of the top places to visit in the world.
- ▶ Mexico City possesses an extraordinary gastronomy, but for tourists locating the right place to eat can be complicated and challenging.
- ▶ Even for Mexicans finding the right restaurant is a difficult task.
- ▶ Then, the purpose of this data science project is to help tourists in Mexico City to find restaurants of their taste. That is, in which neighborhoods of Mexico City they will find different options of restaurants (i.e., Fast food, Vegetarian food, Italian, Japanese and so on).
- ▶ Foreign tourists and also Mexicans are the target audience of this project

Data acquisition and cleaning

- ▶ Postal codes from all boroughs and neighborhoods in Mexico City were taken from <https://micodigopostal.org/> with the pandas read function.
- ▶ Then, the postal codes from Mexico City were input in pgeocode, a python library that finds the GPS coordinates, region name, and municipality based on postal codes.
- ▶ After data cleaning and merging operations, new dataframes with relevant information of the boroughs and neighborhoods of Mexico City were created, as shown in the next slide.

Clean data frame of the Cuauhtémoc borough in Mexico city.

- In this project, I focused on the Cuauhtémoc borough to find the restaurants. This is because this borough is the most important one for international tourism.

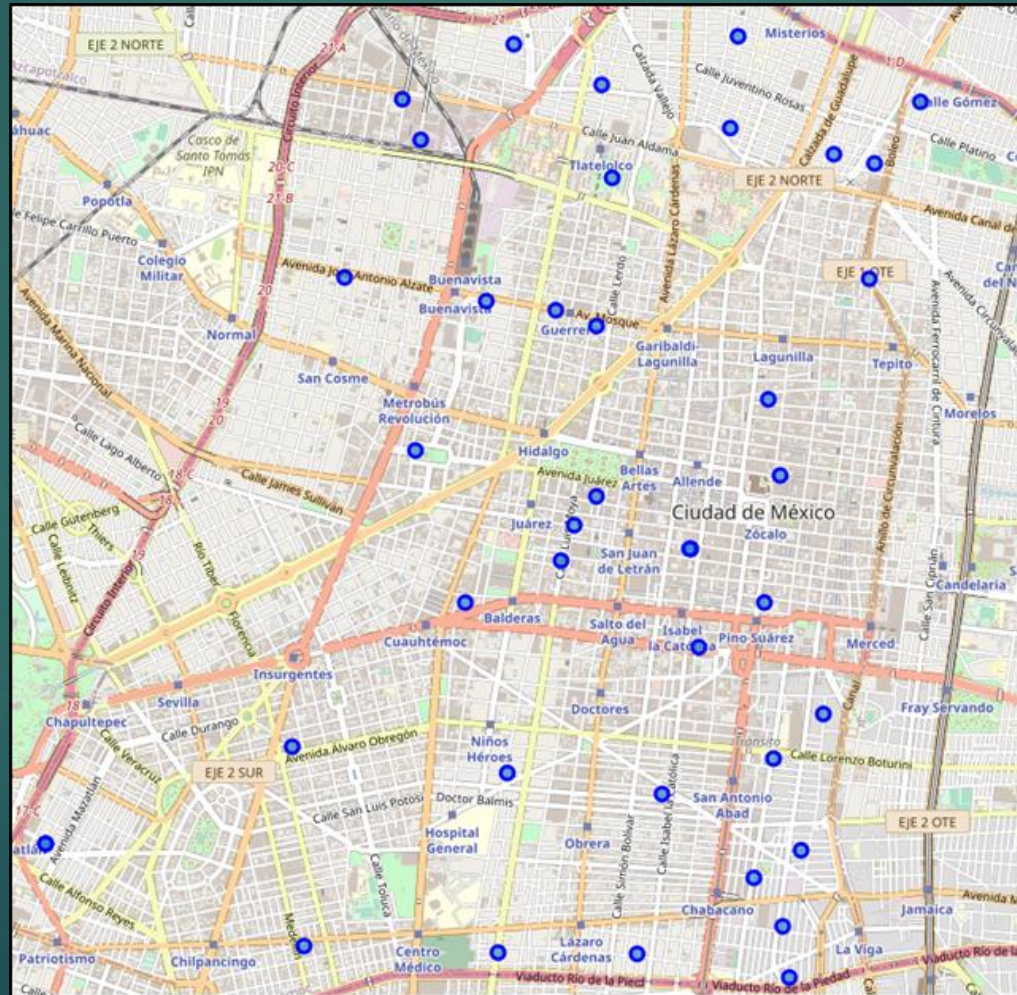
```
In [67]: Cuajimalpa= Cuajimalpa.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
Cuauhtemoc = Cuauhtemoc.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
Coyoacan = Coyoacan.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
BenitoJuarez = BenitoJuarez.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
AlvaroObregon = AlvaroObregon.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
MiguelHidalgo = MiguelHidalgo.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
Xochimilco = Xochimilco.rename(columns = {"Código Postal":"Postal Code", "Municipio":"Borough", "place_name":"Neighborhood", "latitude":"Latitude", "longitude":"Longitude"})
```

Cuauhtemoc

```
Out[67]:
```

	Postal Code	Borough	Neighborhood	Latitude	Longitude
0	06880	Cuauhtémoc	Algarin	19.4053	-99.1408
1	06890	Cuauhtémoc	Ampliación Asturias	19.4070	-99.1313
2	06850	Cuauhtémoc	Asturias	19.4039	-99.1308
3	06450	Cuauhtémoc	Atlampa	19.4581	-99.1562
4	06350	Cuauhtémoc	Buenavista	19.4456	-99.1507
5	06780	Cuauhtémoc	Buenos Aires	19.4054	-99.1499
6	06000	Cuauhtémoc	Centro (Área 1)	19.4364	-99.1553
7	06010	Cuauhtémoc	Centro (Área 2)	19.4364	-99.1553
8	06020	Cuauhtémoc	Centro (Área 3)	19.4364	-99.1553
9	06040	Cuauhtémoc	Centro (Área 4)	19.4364	-99.1553

Map of the neighborhoods of Cuauhtémoc borough in Mexico City obtained with the folium package and the Cuauhtémoc-borough dataframe



Foursquare was used to locate all the venues within a radius of less than 500 meters from the center of each neighborhood of Cuauhtémoc borough

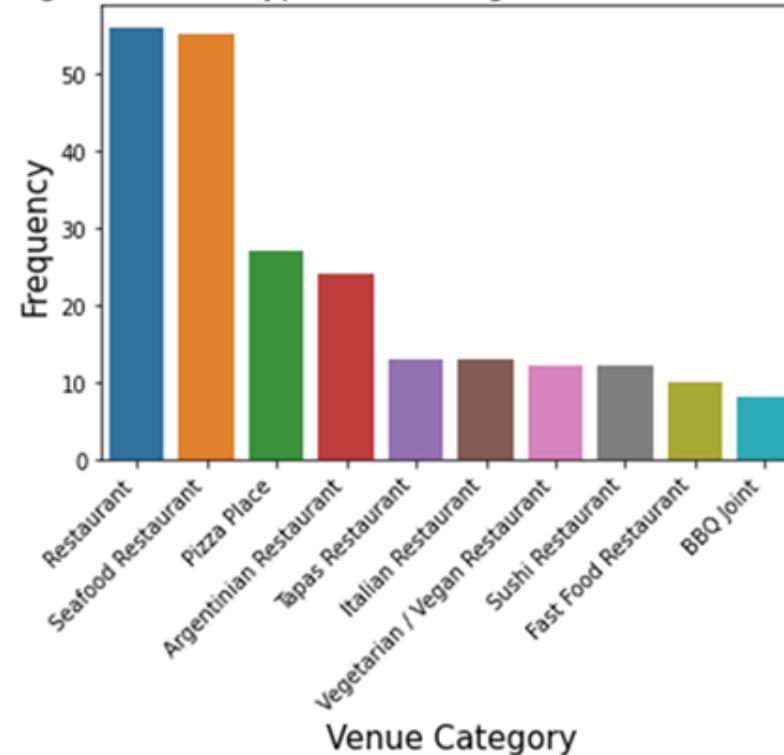
- ▶ 646 out of 2001 venues were restaurants

Mexican Restaurant	208
Taco Place	127
Restaurant	56
Seafood Restaurant	55
Pizza Place	27
Argentinian Restaurant	24
Italian Restaurant	13
Tapas Restaurant	13
Vegetarian / Vegan Restaurant	12
Sushi Restaurant	12
Fast Food Restaurant	10
BBQ Joint	8
Spanish Restaurant	8
Japanese Restaurant	8
Comfort Food Restaurant	7
Steakhouse	7
Indian Restaurant	6
Mediterranean Restaurant	6
German Restaurant	5
Russian Restaurant	4
Greek Restaurant	4
Bistro	4
Chinese Restaurant	3
Southern / Soul Food Restaurant	3
New American Restaurant	3
Empanada Restaurant	2
Paella Restaurant	2
Asian Restaurant	1
American Restaurant	1
Middle Eastern Restaurant	1
Peruvian Restaurant	1
Ramen Restaurant	1

Name: Venue Category, dtype: int64

The ten most common types of restaurants in the Cuauhtémoc borough of Mexico City

10 Most Frequently Occurring Restaurant types in 40 Neighborhoods of Cuauhtemec borough in Mexico City



Five Clusters of restaurants were formed by using k-means technique

- ▶ To do so, first each neighborhood of Cuauhtémoc borough was analyzed by one-hot encoding. Then, the frequency of each restaurant category was determined for each neighborhood in the Cuauhtémoc borough. After, a new pandas data frame was created with the ten most common types of restaurants in each neighborhoods of Cuauhtémoc borough. Finally, the k-means clustering algorithm was applied to the data frame showed below (only 6 neighborhoods are shown):

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

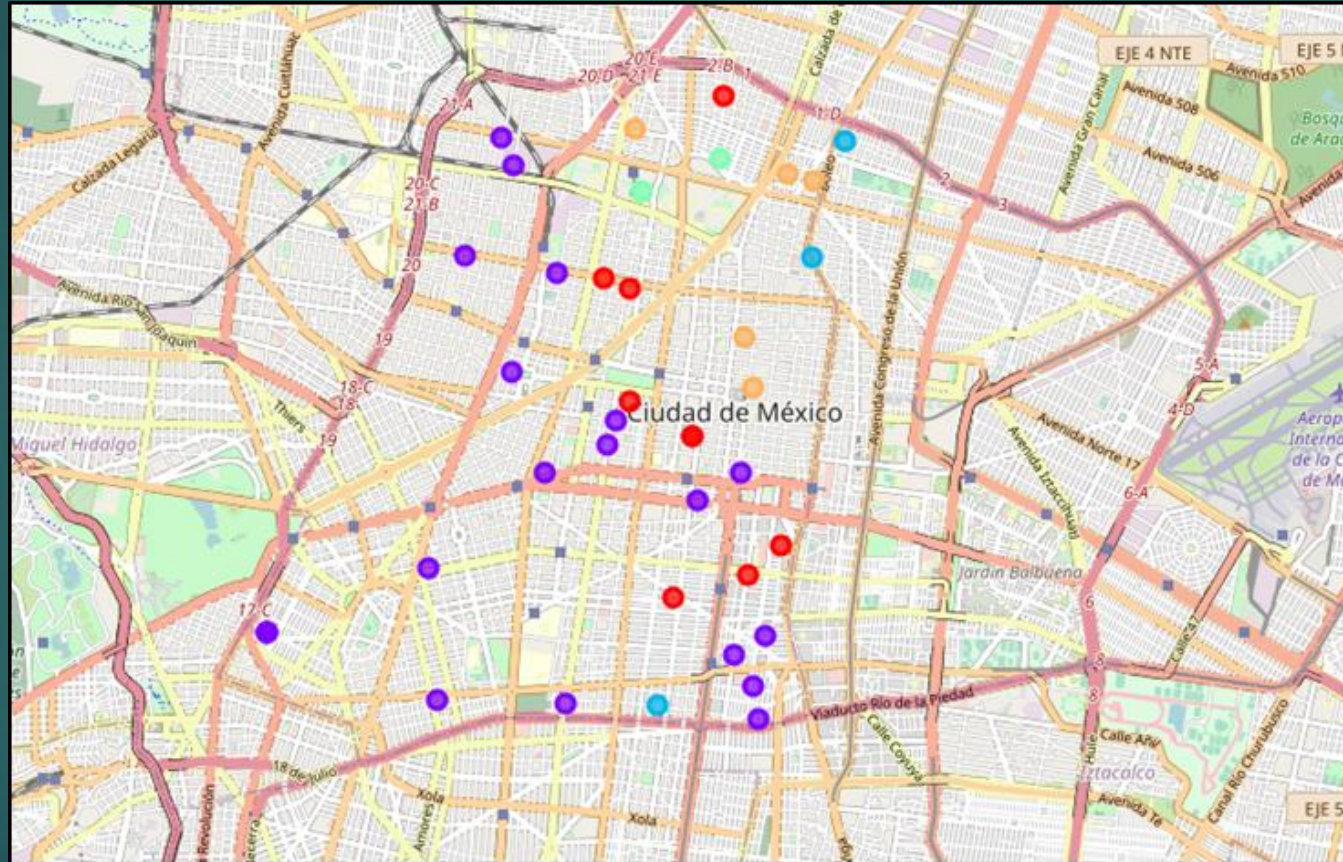
for ind in np.arange(Cuauhtemoc_grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(Cuauhtemoc_grouped.iloc[ind, :], num_top_venues)

neighborhoods_venues_sorted.head(50)
```

Out[40]:

	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	Algarín	Steakhouse	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
1	Ampliación Asturias	Argentinian Restaurant	Vegetarian / Vegan Restaurant	Restaurant	Japanese Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
2	Asturias	Argentinian Restaurant	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Tapas Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
3	Buenavista	Sushi Restaurant	American Restaurant	Chinese Restaurant	Restaurant	Fast Food Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro
4	Buenos Aires	Argentinian Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
5	Centro (Área 1)	Seafood Restaurant	Restaurant	Spanish Restaurant	Tapas Restaurant	Empanada Restaurant	Comfort Food Restaurant	Greek Restaurant	German Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant
6	Centro (Área 2)	Seafood Restaurant	Restaurant	Spanish Restaurant	Tapas Restaurant	Empanada Restaurant	Comfort Food Restaurant	Greek Restaurant	German Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant

Map of the five restaurant clusters in the neighborhoods of the Cuauhtémoc borough in Mexico City



The Five Restaurant Clusters

► The Seafood cluster

Cluster 1 : This is the Seafood cluster

```
In [116]: Cuauhtemoc_merged.loc[Cuauhtemoc_merged['Cluster_Labels'] == 0, Cuauhtemoc_merged.columns[[0,2,3,4] + list(range(5, Cuauhtemoc_merged.shape[1]))]]
```

Out[116]:

	Postal Code	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
6	06000	Centro (Área 1)	19.4303	-99.1373	0	Seafood Restaurant	Restaurant	Spanish Restaurant	Tapas Restaurant	Empanada Restaurant	Comfort Food Restaurant	Greek Restaurant	German Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant
7	06010	Centro (Área 2)	19.4303	-99.1374	0	Seafood Restaurant	Restaurant	Spanish Restaurant	Tapas Restaurant	Empanada Restaurant	Comfort Food Restaurant	Greek Restaurant	German Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant
10	06050	Centro (Área 5)	19.4336	-99.1435	0	Restaurant	Seafood Restaurant	Spanish Restaurant	Comfort Food Restaurant	Vegetarian / Vegan Restaurant	Argentinian Restaurant	Japanese Restaurant	BBQ Joint	Asian Restaurant	Bistro
16	06500	Cuauhtémoc	19.4451	-99.1461	0	Seafood Restaurant	Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant
17	06040	Esperanza	19.4201	-99.1265	0	Seafood Restaurant	Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant
20	06300	Guerrero	19.4441	-99.1435	0	Seafood Restaurant	Fast Food Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant
27	06800	Obrera	19.4152	-99.1392	0	Seafood Restaurant	Bistro	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
29	06220	Peralvillo	19.4620	-99.1342	0	Seafood Restaurant	Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Italian Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant
36	06820	Tránsito	19.4174	-99.1319	0	Seafood Restaurant	Restaurant	Sushi Restaurant	Steakhouse	Argentinian Restaurant	Comfort Food Restaurant	Greek Restaurant	German Restaurant	Fast Food Restaurant	Empanada Restaurant

► The Diverse Food cluster

Cluster 2 This is the Diverse Food cluster

```
In [117]: Cuauhtemoc_merged.loc[Cuauhtemoc_merged['Cluster_Labels'] == 1, Cuauhtemoc_merged.columns[[0,2,3,4] + list(range(5, Cuauhtemoc_merged.shape[1]))]]
```

Out[117]:

	Postal Code	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
1	06890	Ampliación Asturias	19.4070	-99.1313	1	Argentinian Restaurant	Vegetarian / Vegan Restaurant	Restaurant	Japanese Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
2	06850	Asturias	19.4039	-99.1308	1	Argentinian Restaurant	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Tapas Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
3	06450	Atlatempa	19.4581	-99.1562	1	Vegetarian / Vegan Restaurant	Tapas Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant	Fast Food Restaurant
4	06350	Buenavista	19.4458	-99.1507	1	Sushi Restaurant	American Restaurant	Chinese Restaurant	Restaurant	Fast Food Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro
5	06780	Buenos Aires	19.4054	-99.1499	1	Argentinian Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
9	06040	Centro (Área 4)	19.4270	-99.1520	1	German Restaurant	Italian Restaurant	Argentinian Restaurant	Seafood Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Asian Restaurant	BBQ Joint	Bistro
12	06070	Centro (Área 7)	19.4296	-99.1458	1	Vegetarian / Vegan Restaurant	Seafood Restaurant	Comfort Food Restaurant	Argentinian Restaurant	Restaurant	Tapas Restaurant	Pizza Place	Spanish Restaurant	Southern / Soul Food Restaurant	Japanese Restaurant
13	06080	Centro (Área 8)	19.4243	-99.1368	1	Pizza Place	Steakhouse	Chinese Restaurant	Fast Food Restaurant	Tapas Restaurant	Vegetarian / Vegan Restaurant	Italian Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint
14	06090	Centro (Área 9)	19.4270	-99.1325	1	Seafood Restaurant	Pizza Place	Italian Restaurant	Argentinian Restaurant	Steakhouse	Tapas Restaurant	Middle Eastern Restaurant	Restaurant	Empanada Restaurant	German Restaurant
15	06140	Condesa	19.4121	-99.1795	1	Mediterranean Restaurant	Indian Restaurant	Argentinian Restaurant	Tapas Restaurant	Seafood Restaurant	Restaurant	German Restaurant	Italian Restaurant	New American Restaurant	Pizza Place
21	06100	Hípódromo	19.4121	-99.1795	1	Mediterranean Restaurant	Indian Restaurant	Argentinian Restaurant	Tapas Restaurant	Seafood Restaurant	Restaurant	German Restaurant	Italian Restaurant	New American Restaurant	Pizza Place
22	06170	Hípódromo Condesa	19.4121	-99.1795	1	Mediterranean Restaurant	Indian Restaurant	Argentinian Restaurant	Tapas Restaurant	Seafood Restaurant	Restaurant	German Restaurant	Italian Restaurant	New American Restaurant	Pizza Place

The Five Restaurant Clusters

► The Fast Food / Vegetarian-Vegan cluster

Cluster 3 This is the Fast Food/Vegerian-Vegan cluster

```
In [118]: Cuauhtemoc_merged.loc[Cuauhtemoc_merged['Cluster Labels'] == 2, Cuauhtemoc_merged.columns[[0,2,3,4] + list(range(5, Cuauhtemoc_merged.shape[1]))]]
```

Out[118]:

	Postal Code	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	06880	Algarin	19.4053	-99.1408	2	Steakhouse	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
25	06200	Morelos, Plan Tepito	19.4470	-99.1256	2	Fast Food Restaurant	Vegetarian / Vegan Restaurant	Tapas Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
37	06240	Valle Gómez	19.4579	-99.1223	2	Fast Food Restaurant	Steakhouse	Chinese Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Comfort Food Restaurant

► The Pizza cluster

Cluster 4 This is the Pizza cluster

```
In [119]: Cuauhtemoc_merged.loc[Cuauhtemoc_merged['Cluster Labels'] == 3, Cuauhtemoc_merged.columns[[0,2,3,4] + list(range(5, Cuauhtemoc_merged.shape[1]))]]
```

Out[119]:

	Postal Code	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
18	06250	Ex-Hipódromo de Peralvillo	19.4563	-99.1347	3	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant	Empanada Restaurant
26	06900	Nonoalco Tlateloico	19.4532	-99.1424	3	Pizza Place	Sushi Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant

► The Mexican Food cluster

Cluster 5: This is the Mexican Food Cluster

```
In [120]: Cuauhtemoc_merged.loc[Cuauhtemoc_merged['Cluster Labels'] == 4, Cuauhtemoc_merged.columns[[0,2,3,4] + list(range(5, Cuauhtemoc_merged.shape[1]))]]
```

Out[120]:

	Postal Code	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
8	06020	Centro (Área 3)	19.4396	-99.1322	4	Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant
11	06060	Centro (Área 6)	19.4349	-99.1314	4	Restaurant	Pizza Place	Italian Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant
19	06280	Felipe Pescador	19.4541	-99.1253	4	Restaurant	Seafood Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant
24	06270	Maza	19.4547	-99.1279	4	Restaurant	Seafood Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant
33	06920	San Simón Tlahuac	19.4590	-99.1431	4	Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Japanese Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bistro	Chinese Restaurant	Comfort Food Restaurant

Conclusions

- ▶ A data science project was developed to help tourists in Mexico City to locate restaurant of their taste.
- ▶ Five clusters were found in the Cuauhtémoc borough (the most important one for tourism): the seafood, the diverse-food, the Fast Food/Vegetarian-Vegan, the pizza, and the Mexican-food clusters.
- ▶ The code can be easily modified to find restaurants in other boroughs of Mexico City.