THE BATTLE OF THE NEIGHBORHOODS

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Opening new Mexican Restaurant in London, England

IBM Data Science Professional Certificate – Capstone Project

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INTRODUCTION

London is the capital and largest city of England and the United Kingdom. It is the third-most populous in Europe. London has a diverse range of people and cultures, and more than 300 languages are spoken in the region. It offers many business opportunities, like opening new restaurants, so is competitive. Careful consideration of analysis for the business expansion is so much important as it is directly proportional to the cost of the business. The analysis from this report helps for the new businesses strategically target the market and help in a high return on investment so is low risk.

There are 32 London boroughs and the City of London which is considered as the 33rd principal division and not a London borough. In this report I will consider the City of London as the 33rd borough and work with all of them, because the goal is to find the best location for opening new Mexican restaurant.

Background

Opening a new restaurant can be daunting. There are so many things to consider from choosing the right location to finding the financing to selecting the right name. As the location is one of the main factors in opening a new restaurant, we will focus on the restaurant business around the London area in this report. The first step in opening a new restaurant is deciding what type of restaurant it is going to be. Because that is already decided and it is going to be a specific type of cuisine i.e., Mexican restaurant, now choosing the location of the restaurant is one of the most important decisions. Will it be in a busy area with plenty of foot traffic, or is there enough parking or are there many other restaurants in the same spot? We will focus on the boroughs that has no or least Mexican restaurants, and at the same time have preferences for Mexican food, i.e., there are other restaurants with Latin American cuisine. This will be done with the help of clustering. The final goal is to conclude where it is a good place to open a new Mexican restaurant.

Problem

This project aim is to investigate and analyze any good location (borough) in London for opening new Mexican restaurant, based on data about most common venues in the different boroughs, most common types of restaurants and ratings and likes of those venues, i.e. restaurants.

Interest

Stakeholders or anyone who wants to open not only a new restaurant but any kind of venue in any geographic location, by modifying the analysis and the search criteriums.

DATA ACQUISITION AND CLEANING

Data sources

The data for the London boroughs can be found on this Wikipedia page.

Instead of python geocoder library I used the geographical coordinates for the boroughs that were listed in the table on the Wikipedia page. I had to do some reformatting to get them in Decimal degrees (DD) format, so that I can use them for plotting the maps. I used **Foursquare API venues explore** method to get the venues of given boroughs of London. Also I used **Foursquare API venues method** to get ranks and likes of Mexican/Latin American restaurants by given venue id.

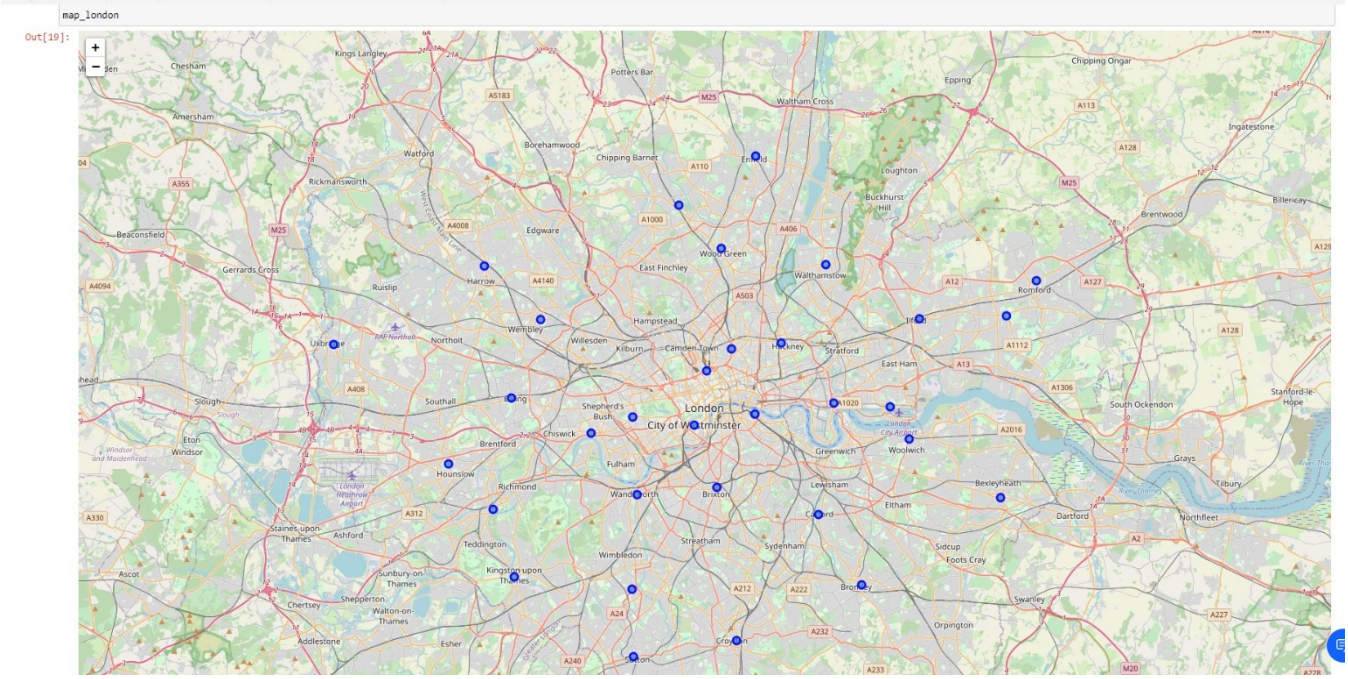
Data cleaning

The table that I retrieved from the Wikipedia page has a lot of information that I did not need, so that had to be cleaned. Then the column with the geographical coordinates had to be cleaned and afterwards divided in two columns so that I can get the latitude and longitude in separate columns in DD format suitable for plotting maps. After data cleaning I got the following dataset:

	Borough	Latitude	Longitude
0	Barking and Dagenham	51.5607	0.1557
1	Barnet	51.6252	-0.1517
2	Bexley	51.4549	0.1505
3	Brent	51.5588	-0.2817
4	Bromley	51.4039	0.0198
5	Camden	51.5290	-0.1255
6	Croydon	51.3714	-0.0977
7	Ealing	51.5130	-0.3089
8	Enfield	51.6538	-0.0799
9	Greenwich	51.4892	0.0648
10	Hackney	51.5450	-0.0553
11	Hammersmith and Fulham	51.4927	-0.2339
12	Haringey	51.6000	-0.1119
13	Harrow	51.5898	-0.3346
14	Havering	51.5812	0.1837
15	Hillingdon	51.5441	-0.4760
16	Hounslow	51.4746	-0.3680
17	Islington	51.5416	-0.1022
18	Kensington and Chelsea	51.5020	-0.1947
19	Kingston upon Thames	51.4085	-0.3064
20	Lambeth	51.4607	-0.1163
21	Lewisham	51.4452	-0.0209
22	Merton	51.4014	-0.1958
23	Newham	51.5077	0.0469
24	Redbridge	51.5590	0.0741
25	Richmond upon Thames	51.4479	-0.3260
26	Southwark	51.5035	-0.0804
27	Sutton	51.3618	-0.1945
28	Tower Hamlets	51.5099	-0.0059
29	Waltham Forest	51.5908	-0.0134
30	Wandsworth	51.4567	-0.1910
31	Westminster	51.4973	-0.1372
32	City of London	51.5155	0.0922

Feature selection

For plotting the map of London boroughs using the latitude and longitude values that I extracted earlier I am using the Python library Folium, which is a library used for visualizing geospatial data. I got the following map:



I will try to find similarities of the boroughs by classifying them by using venues distribution (1st Most common venue, 2nd most common venue...10th most common venue). This will help me to choose location for opening a new restaurant. Similar structured boroughs may handle same type of venue.

	Borough	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	Barking and Dagenham	Bus Stop	Park	Turkish Restaurant	Martial Arts School	Supermarket	Chinese Restaurant	Golf Course	Grocery Store	Gym / Fitness Center	Discount Store
1	Barnet	Park	Pub	Fish & Chips Shop	Bus Stop	Grocery Store	Electronics Store	Café	Flower Shop	Flea Market	Fish Market
2	Bexley	Pub	Clothing Store	Hotel	Coffee Shop	Fast Food Restaurant	Supermarket	Pharmacy	American Restaurant	Bowling Alley	Mexican Restaurant
3	Brent	Coffee Shop	Hotel	Bar	Sporting Goods Shop	Indian Restaurant	Clothing Store	Café	Pizza Place	Grocery Store	American Restaurant
4	Bromley	Clothing Store	Pub	Coffee Shop	Gym / Fitness Center	Supermarket	Bar	Portuguese Restaurant	Electronics Store	Park	Burger Joint
5	Camden	Coffee Shop	Hotel	Café	Pub	Breakfast Spot	Bakery	Plaza	Bookstore	Cocktail Bar	Garden
6	Croydon	Coffee Shop	Pub	Hotel	Italian Restaurant	Clothing Store	Indian Restaurant	Platform	Mediterranean Restaurant	Fast Food Restaurant	Park
7	Ealing	Coffee Shop	Pub	Italian Restaurant	Bakery	Park	Café	Burger Joint	Pizza Place	Indian Restaurant	Thai Restaurant
8	Enfield	Pub	Coffee Shop	Clothing Store	Café	Supermarket	Grocery Store	Optical Shop	Gift Shop	Indian Restaurant	Department Store
9	Greenwich	Grocery Store	Pub	Coffee Shop	Supermarket	Clothing Store	Plaza	Pier	Pharmacy	Bakery	Hotel
10	Hackney	Pub	Café	Coffee Shop	Brewery	Bakery	Park	Vegetarian / Vegan Restaurant	Cocktail Bar	Pizza Place	Vietnamese Restaurant
11	Hammersmith and Fulham	Pub	Café	Coffee Shop	Indian Restaurant	Gastropub	Japanese Restaurant	Park	Sandwich Place	Thai Restaurant	Italian Restaurant
12	Haringey	Pub	Clothing Store	Fast Food Restaurant	Turkish Restaurant	Café	Bakery	Coffee Shop	Pharmacy	Park	Chinese Restaurant
13	Harrow	Coffee Shop	Platform	Indian Restaurant	Clothing Store	Pharmacy	Sandwich Place	Fast Food Restaurant	Park	Burrito Place	Bus Stop
14	Havering	Coffee Shop	Pub	Clothing Store	Shopping Mall	Supermarket	Grocery Store	Café	Furniture / Home Store	Park	Fast Food Restaurant
15	Hillingdon	Coffee Shop	Pub	Clothing Store	Fast Food Restaurant	Pharmacy	Italian Restaurant	Gym	Grocery Store	Bar	Supermarket
16	Hounslow	Indian Restaurant	Coffee Shop	Hotel	Clothing Store	Grocery Store	Fast Food Restaurant	Bus Stop	Discount Store	Supermarket	Pub
17	Islington	Pub	Café	Park	Gastropub	Coffee Shop	Bakery	Cocktail Bar	French Restaurant	Ice Cream Shop	Boutique
18	Kensington and Chelsea	Café	Pub	Coffee Shop	Juice Bar	Restaurant	Italian Restaurant	Garden	Hotel	Burger Joint	Clothing Store
19	Kingston upon Thames	Coffee Shop	Café	Pub	Burger Joint	Thai Restaurant	Clothing Store	Italian Restaurant	Park	Department Store	Gym / Fitness Center
20	Lambeth	Coffee Shop	Pub	Caribbean	Pizza Place	Cocktail Bar	Tapas Restaurant	Market	Music Venue	Gym / Fitness	Beer Bar

I will use the Venue Category list to find the distribution of the Mexican and Latin American restaurant in the boroughs.

	Borough	Latitude	Longitude	VenueName	VenueId	VenueLatitude	VenueLongitude	VenueDistance	VenueCategory
32	Bexley	51.4549	0.1505	Cafe Mojito	4c2ba839b34ad13a6922eace	51.457206	0.139611	797	Mexican Restaurant
33	Brent	51.5588	-0.2817	Las Iguanas	5269785811d21ed3ff95f5fc	51.556443	-0.283967	305	Latin American Restaurant
34	Camden	51.5290	-0.1255	Decimo	5da273c41be55d000714136f	51.529627	-0.124469	99	Mexican Restaurant
35	Islington	51.5416	-0.1022	El Inca Plebeyo	55f9e045498ec7b6616f0f9c	51.539989	-0.096824	413	Latin American Restaurant
36	Islington	51.5416	-0.1022	Wahaca	519e1eb3498ef909d6824120	51.536015	-0.103972	633	Mexican Restaurant
37	Kingston upon Thames	51.4085	-0.3064	Las Iguanas	4fc8ab7fe4b042a57f02c0d2	51.407440	-0.307500	140	Latin American Restaurant
38	Kingston upon Thames	51.4085	-0.3064	Chez Lalee	4b76f668f964a520026f2ee3	51.409030	-0.307023	73	Mexican Restaurant
39	Lambeth	51.4607	-0.1163	El Rancho De Lalo	4d02335b18ff8cfaae50c357	51.462187	-0.111650	362	Latin American Restaurant
40	Lambeth	51.4607	-0.1163	Jalisco	527eb0fd11d2fd345506fd47	51.462112	-0.111410	373	Mexican Restaurant

I will also use ratings and likes of restaurants in the boroughs. It may help me to find location with bad rating restaurants which may need a new restaurant.

	Borough	Latitude	Longitude	VenueName	VenueId	VenueLatitude	VenueLongitude	VenueDistance	VenueCategory	VenueRating	VenueLikes
0	Bexley	51.4549	0.1505	Cafe Mojito	4c2ba839b34ad13a6922eace	51.457206	0.139611	797	Mexican Restaurant	5.8	6
1	Brent	51.5588	-0.2817	Las Iguanas	5269785811d21ed3ff95f5fc	51.556443	-0.283967	305	Latin American Restaurant	7.4	36
2	Camden	51.5290	-0.1255	Decimo	5da273c41be55d000714136f	51.529627	-0.124469	99	Mexican Restaurant	7.5	8
3	Islington	51.5416	-0.1022	El Inca Plebeyo	55f9e045498ec7b6616f0f9c	51.539989	-0.096824	413	Latin American Restaurant	8.3	30
4	Islington	51.5416	-0.1022	Wahaca	519e1eb3498ef909d6824120	51.536015	-0.103972	633	Mexican Restaurant	8.4	194
5	Kingston upon Thames	51.4085	-0.3064	Las Iguanas	4fc8ab7fe4b042a57f02c0d2	51.407440	-0.307500	140	Latin American Restaurant	7.5	47
6	Kingston upon Thames	51.4085	-0.3064	Chez Lalee	4b76f668f964a520026f2ee3	51.409030	-0.307023	73	Mexican Restaurant	7.1	14
7	Lambeth	51.4607	-0.1163	El Rancho De Lalo	4d02335b18ff8cfaae50c357	51.462187	-0.111650	362	Latin American Restaurant	8.0	22
8	Lambeth	51.4607	-0.1163	Jalisco	527eb0fd11d2fd345506fd47	51.462112	-0.111410	373	Mexican Restaurant	7.1	24

EXPLORATORY DATA ANALYSIS

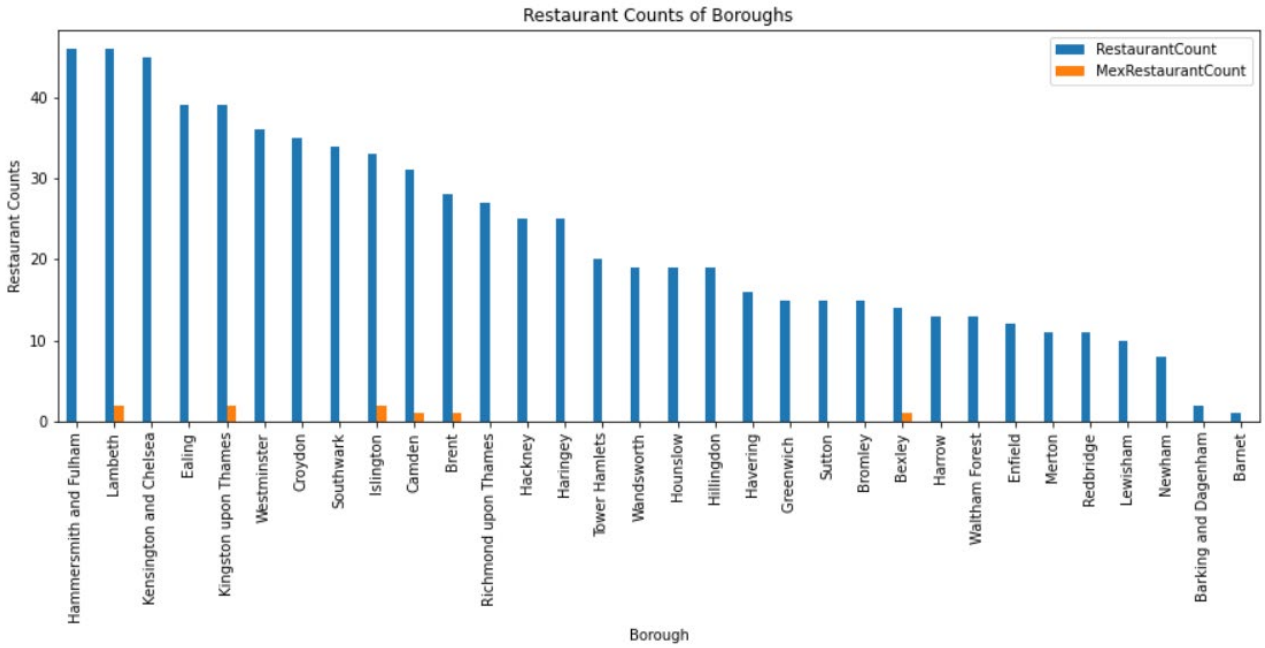
By using Foursquare API, I got venues 1km around center of each neighborhood with limit 100 venue. I merged data with Borough data. Head of the merged data is as below:

	Borough	Latitude	Longitude	VenueName	VenueId	VenueLatitude	VenueLongitude	VenueDistance	VenueCategory
0	Barking and Dagenham	51.5607	0.1557	Central Park	4ac518f8f964a520d6af20e3	51.559560	0.161981	452	Park
1	Barking and Dagenham	51.5607	0.1557	Lara Grill	50baf653183fee49a8b0b4cc	51.562445	0.147178	620	Turkish Restaurant
2	Barking and Dagenham	51.5607	0.1557	Iceland	50b1f711e4b0216227c808d4	51.560578	0.147685	554	Grocery Store
3	Barking and Dagenham	51.5607	0.1557	Shell	50c986cbe4b05a3aac4c5bc6	51.560415	0.148364	508	Gas Station
4	Barking and Dagenham	51.5607	0.1557	B&M Store	513f3d99e4b02bc64cba680d	51.565287	0.143793	969	Discount Store

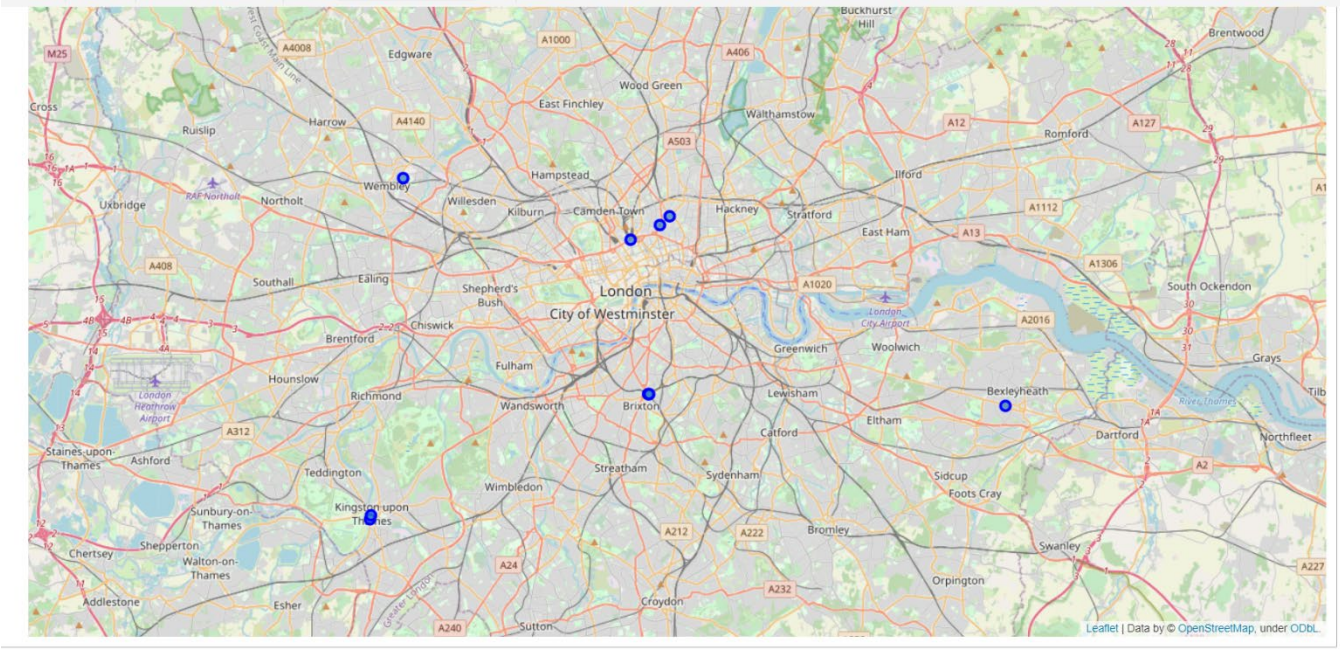
I was interested in the Mexican restaurants, and found out that in London there are:

```
Total number of restaurants: 722
Total number of Mexican restaurants: 9
Percentage of Mexican restaurants: 1.25%
```

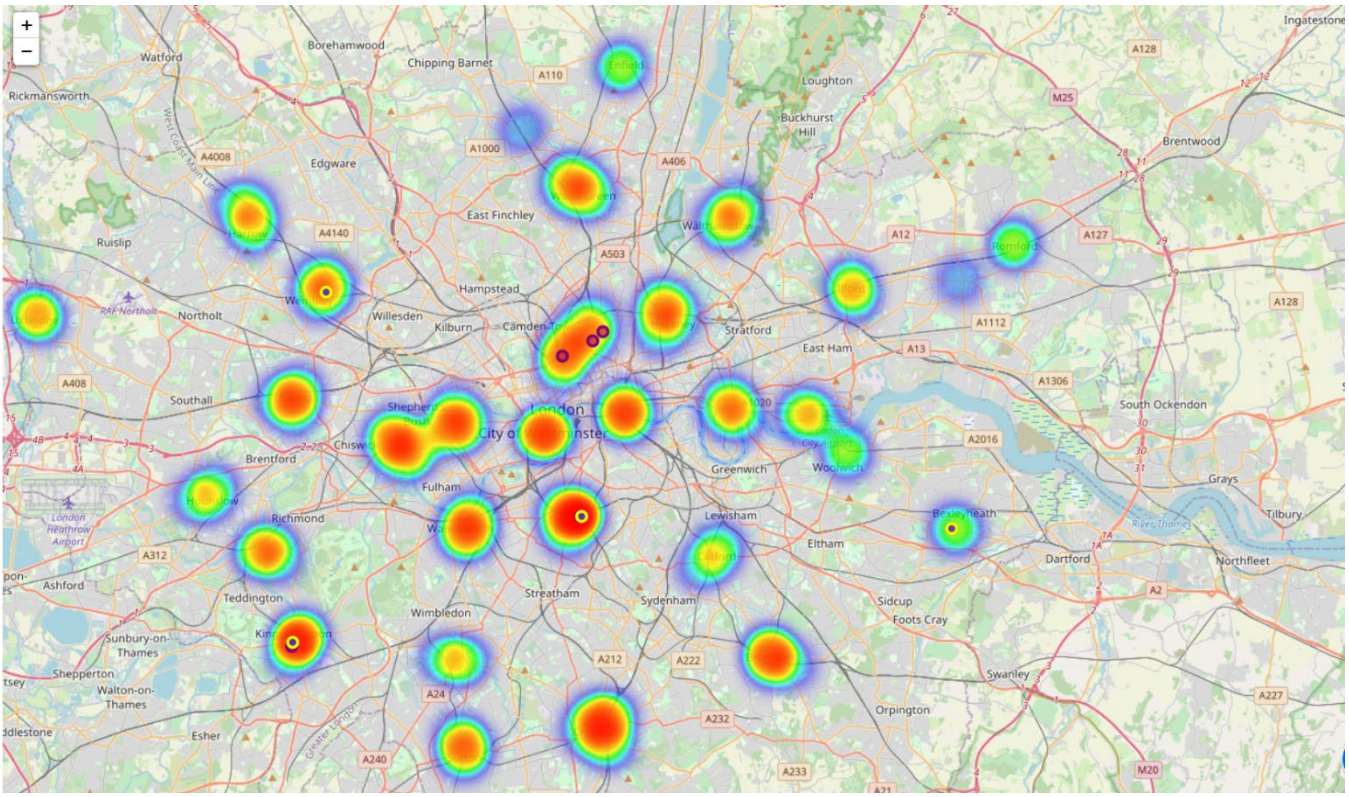
With this data and using a bar graph to visualize the results I got this figure below which shows that 26 boroughs do not have Mexican restaurant.



Then using folium again, I tried to show only the boroughs that have at least one Mexican or Latin/American restaurant, to help me see hoe are they geographically located, and I got the following map:



To use the rating of the Mexican restaurants I drew a heatmap using the Folium library, where I superimposed Mexican restaurants with purple markers and Mexican restaurants with rating less than 7.5 with yellow markers.

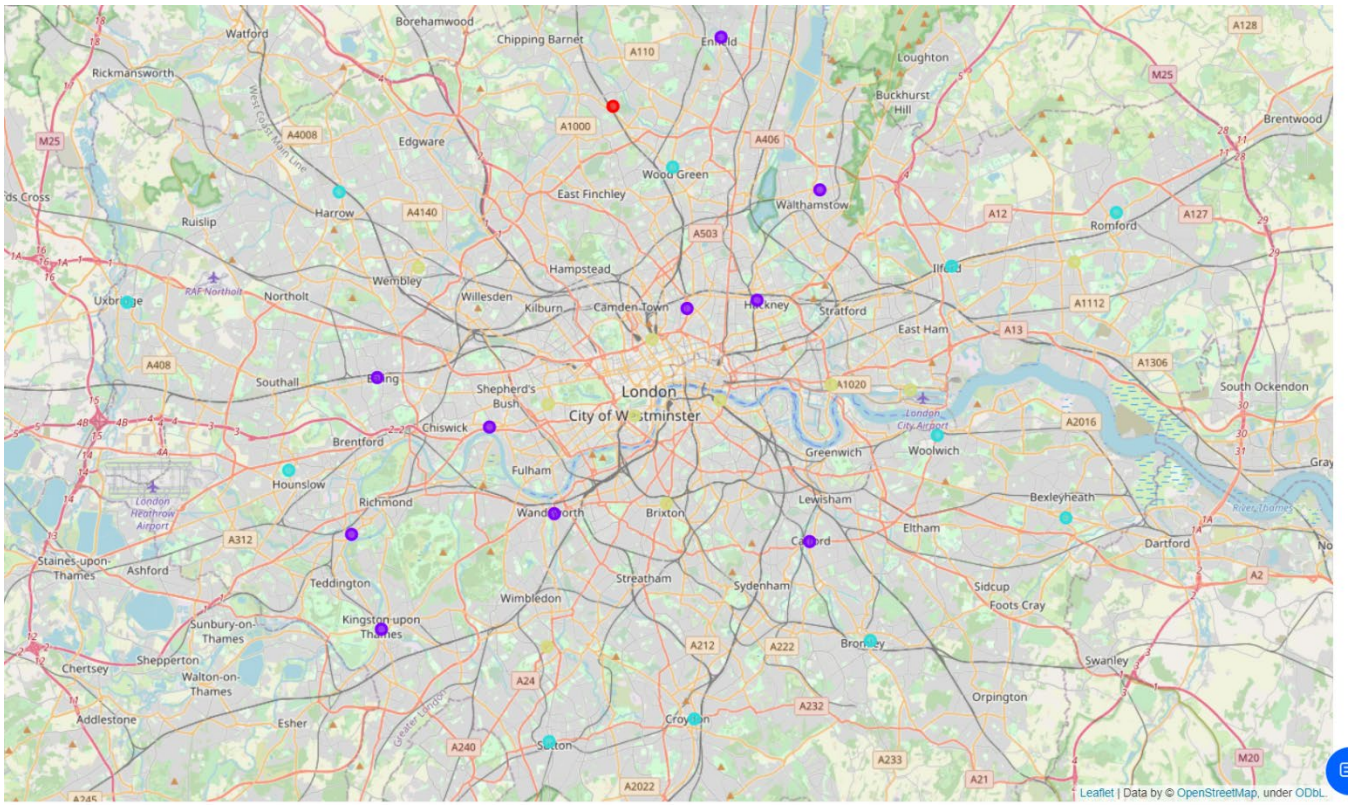


After data visualization I continued with clustering the boroughs using the k-means method from the scikit-learn library. I have categorical variables, so I used one hot encoding and then decided to separate the boroughs in four clusters.

I got these results:

	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	Barking and Dagenham	51.5607	0.1557	3	Bus Stop	Park	Turkish Restaurant	Martial Arts School	Supermarket
1	Barnet	51.6252	-0.1517	0	Park	Pub	Fish & Chips Shop	Bus Stop	Grocery Store
2	Bexley	51.4549	0.1505	2	Pub	Clothing Store	Hotel	Coffee Shop	Fast Food Restaurant
3	Brent	51.5588	-0.2817	3	Coffee Shop	Hotel	Bar	Sporting Goods Shop	Indian Restaurant
4	Bromley	51.4039	0.0198	2	Clothing Store	Pub	Coffee Shop	Gym / Fitness Center	Supermarket
5	Camden	51.5290	-0.1255	3	Coffee Shop	Hotel	Café	Pub	Breakfast Spot
6	Croydon	51.3714	-0.0977	2	Coffee Shop	Pub	Hotel	Italian Restaurant	Clothing Store
7	Ealing	51.5130	-0.3089	1	Coffee Shop	Pub	Italian Restaurant	Bakery	Park
8	Enfield	51.6538	-0.0799	1	Pub	Coffee Shop	Clothing Store	Café	Supermarket
9	Greenwich	51.4892	0.0648	2	Grocery Store	Pub	Coffee Shop	Supermarket	Clothing Store
10	Hackney	51.5450	-0.0553	1	Pub	Café	Coffee Shop	Brewery	Bakery
11	Hammersmith and Fulham	51.4927	-0.2339	1	Pub	Café	Coffee Shop	Indian Restaurant	Gastropub
12	Haringey	51.6000	-0.1119	2	Pub	Clothing Store	Fast Food Restaurant	Turkish Restaurant	Café
13	Harrow	51.5898	-0.3346	2	Coffee Shop	Platform	Indian Restaurant	Clothing Store	Pharmacy
14	Havering	51.5812	0.1837	2	Coffee Shop	Pub	Clothing Store	Shopping Mall	Supermarket
15	Hillingdon	51.5441	-0.4760	2	Coffee Shop	Pub	Clothing Store	Fast Food Restaurant	Pharmacy
16	Hounslow	51.4746	-0.3680	2	Indian Restaurant	Coffee Shop	Hotel	Clothing Store	Grocery Store
17	Islington	51.5416	-0.1022	1	Pub	Café	Park	Gastropub	Coffee Shop
18	Kensington and Chelsea	51.5020	-0.1947	3	Café	Pub	Coffee Shop	Juice Bar	Restaurant
19	Kingston upon Thames	51.4085	-0.3064	1	Coffee Shop	Café	Pub	Burger Joint	Thai Restaurant
20	Lambeth	51.4607	-0.1163	3	Coffee Shop	Pub	Caribbean Restaurant	Pizza Place	Cocktail Bar
21	Lewisham	51.4452	-0.0209	1	Supermarket	Coffee Shop	Park	Pub	Grocery Store
22	Merton	51.4014	-0.1958	3	Café	Supermarket	Park	Fast Food Restaurant	Bus Stop
23	Newham	51.5077	0.0469	3	Hotel	Coffee Shop	Light Rail Station	Airport Lounge	Airport Service
24	Redbridge	51.5590	0.0741	2	Grocery Store	Coffee Shop	Clothing Store	Supermarket	Turkish Restaurant
25	Richmond upon Thames	51.4479	-0.3260	1	Pub	Coffee Shop	Café	Grocery Store	Italian Restaurant
26	Southwark	51.5035	-0.0804	3	Coffee Shop	Hotel	Pub	Bakery	Scenic Lookout
27	Sutton	51.3618	-0.1945	2	Clothing Store	Café	Coffee Shop	Pizza Place	Supermarket

Using folium library, I plot the borough clusters:



RESULTS

From the cluster categories above, we can see that:

Claster 0:

- Has the least restaurants, as it can be seen from the table the 1st, 2nd, 3rd and even 4th most common venues are not restaurant.

Claster 1:
Has a lot of restaurants. Most common type of restaurants that can be noticed are: *Indian*, *Chinese*, Japanese, Thai restaurants, i.e restaurants with Asian cuisine are dominant in this cluster. So the borough in this cluster may not be that interested in Mexican food.

Claster 2: The venues in this cluster have maybe the most restaurants. Which indicate a highly competitive atmosphere. We know that in borough Bexley there is a Mexican restaurant but also in ***Bromley*** borough there is a Portuguese restaurant, so the people around in this area may be interested in this kind of food, and borough Bromley may be a good location for new Mexican restaurant.

Claster 3**:**
The boroughs in this cluster have different kind of restaurants, and it can be said that the cuisines are mixed. We know that borough Lambeth has two Mexican restaurants also we can notice that there is a Caribbean restaurant and Tapas restaurant too. This highly indicates that people in this borough like Mexican/Latin American cuisine but opening a new Mexican restaurant may not be a good idea, considering the competition. In this cluster are 4 out of 6 boroughs that have Mexican restaurant, the borough ***Westminster*** which is in this cluster and is in the very center of the town can be considered as a good location for opening new Mexican restaurant.

CONCLUSION

I have chosen 2 locations for opening new Mexican restaurant:

Westminster

Bromley

I hope this work will help somebody who wants to open a new new Mexican restaurant in London.