CLUSTERING LOCATIONS OF TOP 100 RESTAURANTS OF CANCUN WITH A MACHINE LEARNING APPROACH

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1. Introduction

a. Background

Mexico occupies the eighth place among the tourist destinations visited in the world (UNWTO, 2016), Quintana Roo holding the first place in the tourism industry in the country. On the other hand, small and medium enterprises or SMES in Mexico bring around 72% of the jobs, and get an approximate of 52% of the Gross Domestic Product (GDP) of the country (CONDUSEF, 2019), and for Quintana Roo the GDP contribution from SMES to the state is about 83% (Canirac, 2014). However, the bankruptcy index of SMES grows up to 80% after 5 years of operations (El Universal, 2016) which can be explained by many factors of failures. In Quintana Roo, the sector that has more participation in the GDP is the "food and beverages" SMES with a contribution of 21.3% in the state (INEGI,2014). According to the UNWTO, the city that gives more GDP among others is Cancun with 7.1% (La Jornada Maya, 2018).

b. Problem

The relevance of Tourism industry in Cancún in regards of SMES concern has worried local and foreign stakeholders on how to invest properly in this region. According to a diagnosis proposal tool for SMES of "Food and beverages"(Hernandez L., et. al, 2018), a strategic factor that could endure the life cycle of the companies is the location.

Machine Learning (ML) algorithms have improved the way of how to analyze information and take decisions. For example, Google Analytics can classify the segmentation of clients that are more likely to buy a certain product with ML algorithms. Then, ML algorithms could have the capacity to recognize by clusters the kind of businesses that are in a certain region given their own information and the places that are around.

c. Interest

Therefore, in the presented capstone project, clusters of the most popular restaurants in Cancun are going to be defined as a result of a ML algorithm, so that investors or market researches can take a decision or review options to take into account from the results.

2. Data acquisition and cleaning

   a. Data cleaning and feature selection

Most of restaurant stats, GPS localizations, restaurant categories and so on can be found in a trusted advertising website for tourists like TripAdvisor, which is the one that was used for the project for the first two data sets. The data was manually obtained and saved in an excel document from the Top 100 of restaurants in Cancun in a certain day (May 11th 2019) in order to analyze it without dynamic misinterpretations, because TripAdvisor changes day by day due to dynamic rating and feedback. Furthermore, Foursquare API was used to obtain the venues that are around of the defined restaurants which brought the second data set by scrapping with the data features of the name of the venue, the category of the venue and the GPS localizations, where the last data set obtained from Foursquare was on May 19th 2019, which can be considered if the number of venues increases or decreases in a close future.

The data features that were chosen from TripAdvisor are the categories of the restaurants, the price level category, the ranking top number, and the GPS localization. No other data feature was obtained because of the lack of consistency. For instance, some restaurants mentioned the price range of an average meal, however, not all restaurants had that information available. The price level category which is divided by Trip Advisor ($=Low, $$-$$$=Medium, $$$$=High) was used, where an approximate of the price levels into range prices are the next: a Low level is around $200.00MNX and below, a Medium level gets from $200.00 MNX to $1000.00 MNX, and the High level goes from $1000.00MNX and above.

After obtaining manually the data in Excel, text needed to be analyzed to not modify after opening the file in Jupyter notebook, since some issues were happening in the restaurant category divided by commas. Thus, I used Excel functions to prepare the data as a one hot encoding technique should have. At the end, two files were saved in a CSV format, one for the model preparation with a shape of 100 files and 41 columns (Table 1), and the other to describe the data with a shape of 100 files and 6 columns (Table 2).

(100, 41)

	Top	Restaurant	Longitude	Latitude	Price_RgLv	Apto para vegetarianos	Argentina	Asiática	Bar	Brasilera	...	Opciones sin gluten	Opciones veganas	Parrilla	Peruana	Pizzería	Sopas	Sudamerican
0	1	Sakura Sunset	21.053990	-86.781944	High	1	0	1	0	0	...	1	1	0	1	0	0
1	2	Restaurante Careyes	21.083757	-86.772370	High	0	0	0	0	0	...	1	1	0	0	0	0
2	3	Restaurante Benazuza	21.078350	-86.774950	High	1	0	0	0	0	...	0	0	0	0	0	0
3	4	Tora Cancún	21.086130	-86.773790	High	1	0	1	0	0	...	1	1	0	0	0	0
4	5	The White Box	21.144170	-86.785180	High	1	0	0	0	0	...	1	1	0	0	0	0

Table 1. First data set sample for the model preparation and analysis.

(100, 6)

	Top	Restaurant	Longitude	Latitude	Price_RgLv	Category
0	1	Sakura Sunset	21.053990	-86.781944	High	Japonesa, Peruana, Mariscos, Asiática, Fusión,...
1	2	Restaurante Careyes	21.083757	-86.772370	High	Fusión, Mariscos, Apto para vegetarianos, Opci...
2	3	Restaurante Benazuza	21.078350	-86.774950	High	Apto para vegetarianos, Opciones veganas, Opci...
3	4	Tora Cancún	21.086130	-86.773790	High	Japonesa, Mariscos, Internacional, Sushi, Asiá...
4	5	The White Box	21.144170	-86.785180	High	Mariscos, Apto para vegetarianos, Opciones veg...

Table 2. Second data set sample for data description.

Finally, Foursquare API was used to scrap the venues that are 500 m of radius around of each restaurant with a limit of 30 venues. From the obtained information, a data set of 2,801 files and 7 columns were obtained with the new information of the venues as can be seen in Table 3.

(2801, 7)

	Restaurant	Restaurant Latitude	Restaurant Longitude	Venue	Venue Latitude	Venue Longitude	Venue_Category
0	Sakura Sunset	21.05399	-86.781944	Playa - Beach	21.052433	-86.781982	Beach
1	Sakura Sunset	21.05399	-86.781944	La Palapa	21.056148	-86.780853	Restaurant
2	Sakura Sunset	21.05399	-86.781944	Playa / Beach	21.054080	-86.780930	Beach
3	Sakura Sunset	21.05399	-86.781944	The Black Hole	21.053874	-86.781452	Molecular Gastronomy Restaurant
4	Sakura Sunset	21.05399	-86.781944	The box	21.053787	-86.781654	Tapas Restaurant
5	Sakura Sunset	21.05399	-86.781944	Sakura Sunset	21.054065	-86.781977	Peruvian Restaurant
6	Sakura Sunset	21.05399	-86.781944	Playa - Beach	21.056191	-86.780839	Beach
7	Sakura Sunset	21.05399	-86.781944	Moonlight Trattoria Pizza	21.053935	-86.781665	Italian Restaurant
8	Sakura Sunset	21.05399	-86.781944	Cafe Solaris	21.054938	-86.781410	Mexican Restaurant
9	Sakura Sunset	21.05399	-86.781944	La Piazza	21.055571	-86.780749	Italian Restaurant

Table 3. Third data set sample of all the obtained venues.

3. Exploratory Data Analysis

Folium library was used to plot the Top 100 restaurants in Cancun for only visualization. The illustration shows that most of the restaurants are near the center of the city or near a hotel or resort (See Illustration 1).
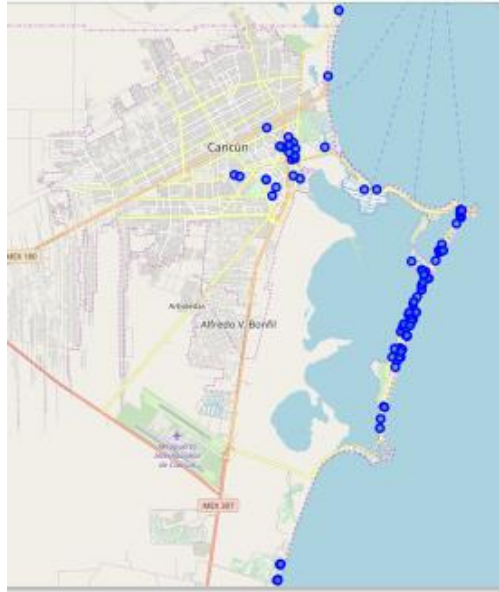
Illustration 1. Map of Cancún with the Top 100 restaurants.

a. Frequency of the features

In order to discover if any feature has a preference among others, the frequency of each feature was analyzed. The first one was the level of the price, which is divided in 3 categories (High, medium, and low) as can be seen in the Table 4.

Lv. of the Price	Price_RgLv
High	42
Medium	49
low	9

Table 4. Level of the price categories.

As can be seen in the graph below (See Illustration 2) the category that has almost half of the participation in all restaurants is the Medium level, followed by the High level, and finishing with the Low level with the lowest frequency of 9 out of 100 restaurants.
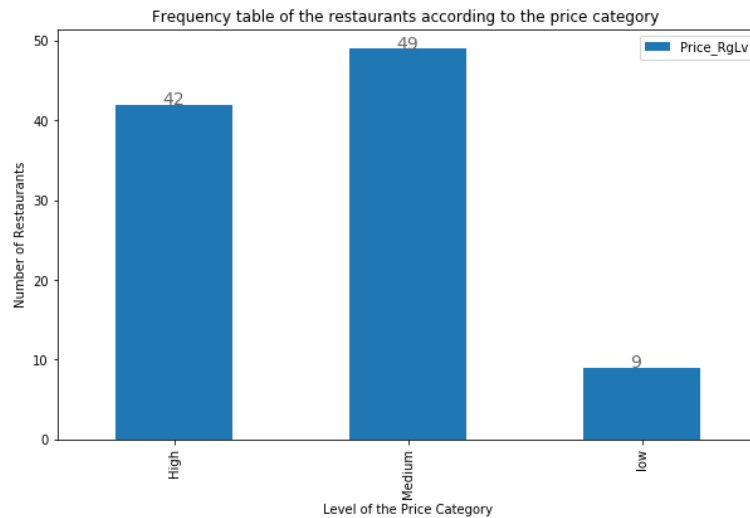
Illustration 2. Graph of the frequency of the price level categories.

Secondly, it was found that the total number of unique categories of restaurants are 36, where most of the restaurants have vegan and vegetarian options, and menus with gluten. Then, Mexican, Latin, International and Seafood cuisines were the next most popular options among others. (See Table 5 and Illustration 3)

Restaurant Category	Num_rest
Apto para vegetarianos	84
Opciones sin gluten	69
Opciones veganas	64
Mexicana	43
Mariscos	29
Latina	19
Internacional	19
Italiana	17
Caribeña	11
Europea	10
Bar	9
Asiática	8
Estadounidense	7
Japonesa	7
Fusión	7

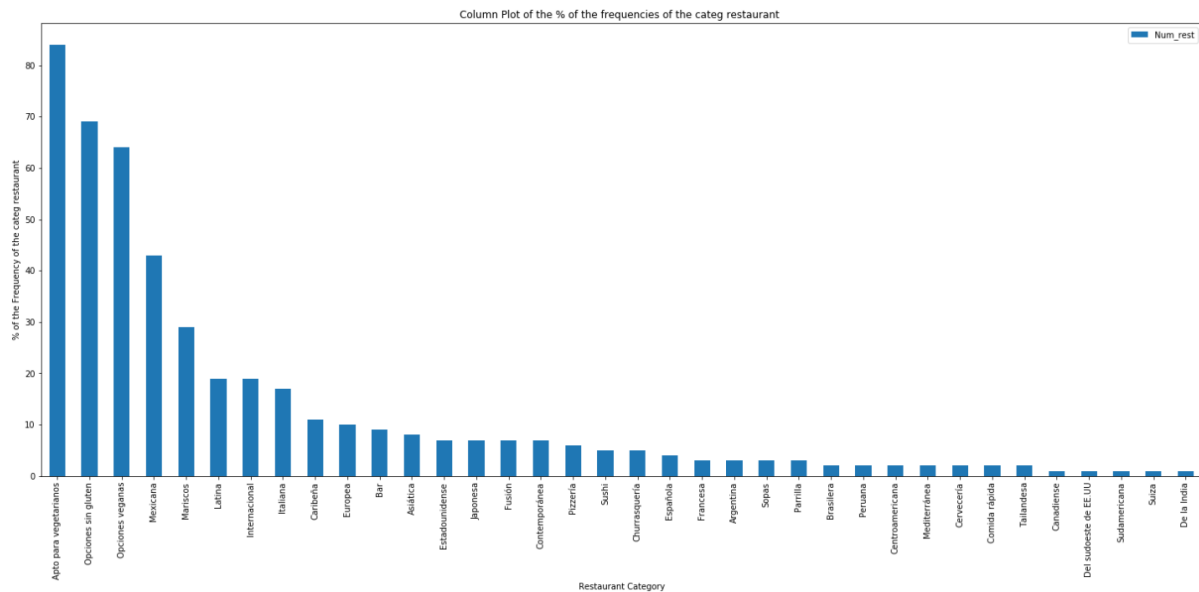Table 5. Top 15 Frequency of restaurant categories.

Illustration 3. Graph plot of the frequencies of all restaurant categories.

After grouping all venues into a list and counting its respective frequency, the next table was obtained (See Table 6) by dividing the frequency of each venue and the total of venues scrapped (2801). The total number of the unique venues (154) were plotted into a graph (Illustration 4). It was seen that most of the venues that are around were beaches, similar restaurants, resorts, and hotels.

(154, 1)

Venue Category type	Venue_Category percentage
Beach	7.604427
Mexican Restaurant	6.961799
Resort	5.855052
Seafood Restaurant	5.176723
Italian Restaurant	5.069618

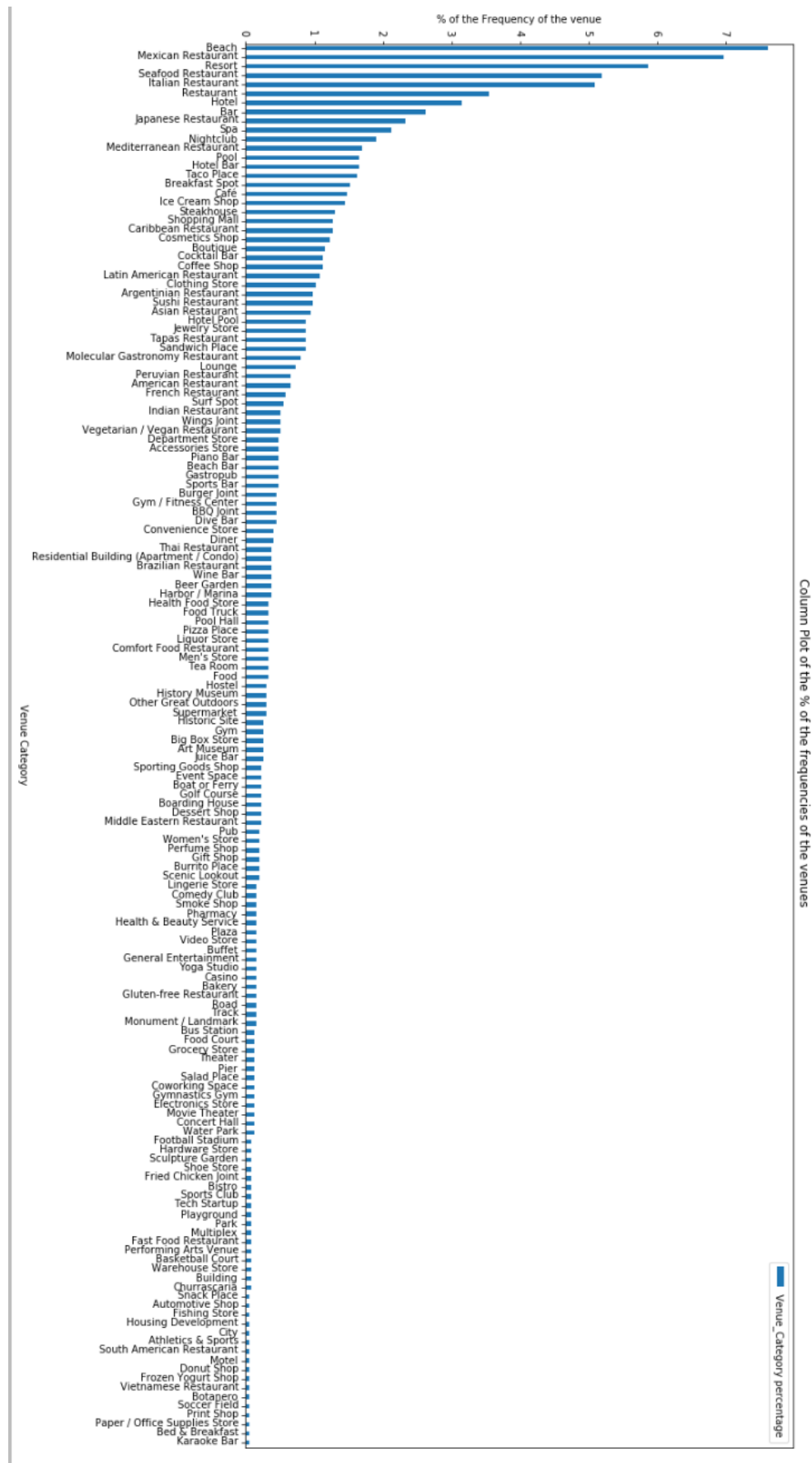Table 6. Venue category percentage of participation.

Illustration 4. Horizontal graph of the participation of each venue in all restaurants.

The description of the information given is merely general and it needs to be classified according to the kind of restaurant that analysts need to research. In this case, all restaurants are being considered as if they were one cluster and perhaps not many decisions can be taken from that, therefore, analysts need to see if the information applies.

4. Machine Learning model

a. Model preparation

From the features of restaurant categories and price level category, one hot encoding technique was used to transform the category into an array of 1 and 0. (Table 7).

	Restaurant	High	Medium	low
0	Sakura Sunset	1	0	0
1	Restaurante Careyes	1	0	0
2	Restaurante Benazuza	1	0	0
3	Tora Cancún	1	0	0
4	The White Box	1	0	0
5	Restaurante Chianti	1	0	0
6	Black Hole	1	0	0
7	Restaurante Condimento	0	1	0
8	Samura Japanese Cuisine & Bar	0	1	0
9	Deli Barlovento	0	0	1

Table 7. Sample of the table of 1 and 0 of price level category.

Nonetheless, the venues data set was extensive after using the one hot encoding technique. Therefore, the average of each venue for each restaurant was calculated. At the end, the three kind of main categories (price, restaurant and venues) were merged in a table (See Table 8).

	Restaurant	Apto para vegetarianos	Argentina	Asiática	Bar_x	Brasilera	Canadiense	Caribeña	Centroamericana	Cervecería	...	Track	Vegetarian / Vegan Restaurant	Video Store	Vietnamese Restaurant	Warehouse Store	Water Park	Wine Bar	Wings Joint	Women's Store	Yoga Studio
0	Sakura Sunset	1	0	1	0	0	0	0	0	0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000000
1	Restaurante Careyes	0	0	0	0	0	0	0	0	0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000000
2	Restaurante Benazuza	1	0	0	0	0	0	0	0	0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000000
3	Tora Cancún	1	0	1	0	0	0	0	0	0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000000
4	The White Box	1	0	0	0	0	0	0	0	0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.033333

5 rows × 193 columns

Table 8. Merged table of all categories for the data modeling.

b. Model election and the optimal parameter

K-means algorithm was selected because IBM Data Science Specialization course suggested the option. Then, the Elbow method was used in order to calculate the optimal K variable to choose the number of clusters for the model.

Firstly, a range from 2 to 50 k-clusters were used to visualize the peak of the sudden fall of the elbow curve. (See Illustration 5)
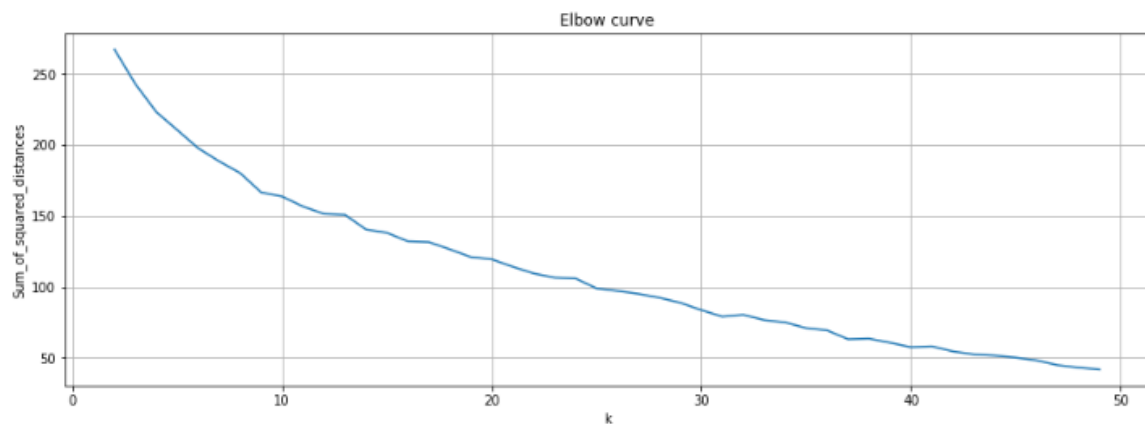

Illustration 5. Elbow curve within a range from 2 to 50 k-clusters.

Then, another plot was illustrated (See illustration 6) to see which K-cluster was the optimal. In the final analysis, the K-optimal number of clusters was 7.
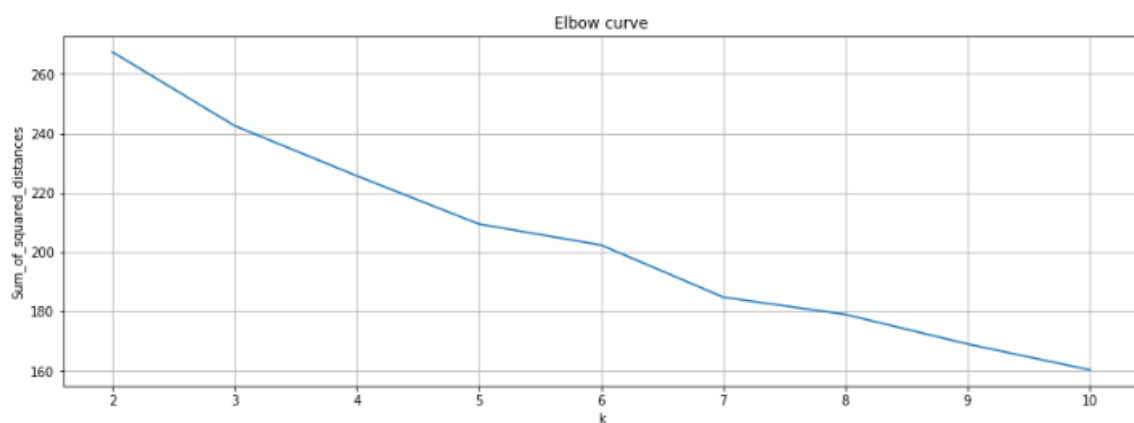

Illustration 6. Elbow curve within a range from 2 to 10 k-clusters.

c. Results

Seven clusters were obtained for all restaurants, and merged into a table that has the descending order of the avg. of the top 10 venues of each restaurant, and the main data of the Table 2. (See Table 9).

	Top	Restaurant	Longitude	Latitude	Price_RgLv	Category	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	1	Sakura Sunset	21.053990	-86.781944	High	Japonesa, Peruana, Mariscos, Asiática, Fusión,...	3	Beach	Resort	Mexican Restaurant	Hotel	Molecular Gastronomy Restaurant	Italian Restaurant	Dive Bar	Sushi Restaurant	Tapas Restaurant	Peruv Restaur
1	2	Restaurante Careyes	21.083757	-86.772370	High	Fusión, Mariscos, Apto para vegetarianos, Opci...	4	Resort	Mexican Restaurant	Italian Restaurant	Latin American Restaurant	Beach	Pool	Tapas Restaurant	Other Great Outdoors	Bar	Mediterrane Restaur
2	3	Restaurante Benazuza	21.078350	-86.774950	High	Apto para vegetarianos, Opciones veganas, Opci...	2	Beach	Mexican Restaurant	Italian Restaurant	Seafood Restaurant	Bar	Breakfast Spot	Lounge	Food	Gastropub	Casl
3	4	Tora Cancún	21.086130	-86.773790	High	Japonesa, Mariscos, Internacional, Sushi, Asiá...	0	Resort	Latin American Restaurant	Italian Restaurant	Pool	Seafood Restaurant	Mexican Restaurant	Beach	Tapas Restaurant	Cocktail Bar	Other Gr Outdo
4	5	The White Box	21.144170	-86.785180	High	Mariscos, Apto para vegetarianos, Opciones veg...	0	Mexican Restaurant	Resort	Beach	Boat or Ferry	Hotel	Beach Bar	Pub	Sculpture Garden	Food Court	Mediterrane Restaur

Table 9. With the clusters label and the main features with the top 10 venues.

The new map with the labeled clusters resulted into the next image (See illustration 7).
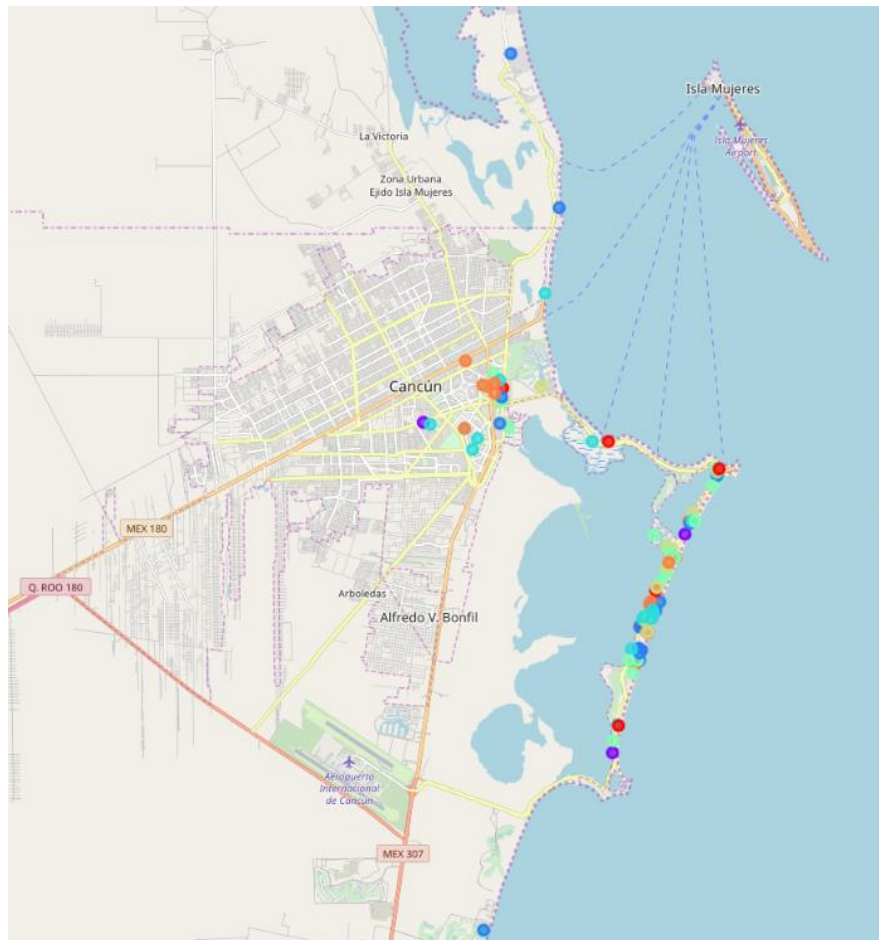

Illustration 7. New map with the 7 defined clusters.

Once that the clusters were obtained in tables and plotted in maps (See Anexes section), the information was analyzed in order to name the cluster. However, it is important to mention that the action of naming the clusters is based on the author's observation from the obtained tables.

Cluster	Name of the cluster
0	Specialized seafood cuisine
1	Mexican and Seafood cuisines near to hotels and
2	Seafood and Italian restaurants near to the beach
3	French, japanese, and other cuisines near to coffee shops and bars
4	Variety of restaurants closer to shopping malls and night clubs
5	Italian food near to shopping malls
6	Mexican local food with a medium level price of preference

Table 10. Names of the clusters.

5. Conclusion and discussion

Seven clusters defined how Small and Medium Enterprises of "Food and beverages" should be labeled with the k-means algorithm. The results are clearly an insight for decision makers and researchers with the main features that the author thought and searched that have consistency where the name of the clusters can be discussed with experts of the area.

Although the data was stored in a certain day, the same process can be used when a considered amount of time has passed because the data set may be obsolete, therefore, if the same process is wanted to be done again, it should not vary if it is in the same tourism season, but then if the season is different, the clustering model could give different clusters. Not to mention that Foursquare is also dynamic, so it could also affect the model when the time passes. In a nutshell, the presented information gives only a real approach about the most popular restaurants in Cancún in May of 2019.

Nonetheless, the data that was used for the model may not have other features that might be desired that could affect the clustering model such as the range of prices, the age of the restaurant, the rating of the service, the number of the people that attends each restaurant per day, the nationality of the people that are clients, and so forth.
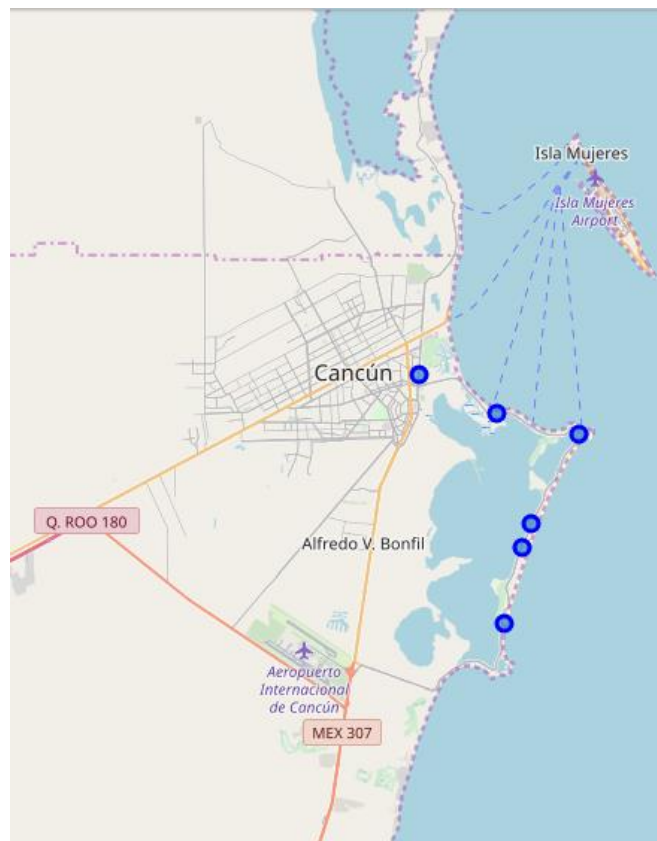
6. Future directions

For next researches in this topic or related areas, it is recommended to always use data that can be available and not dynamic due to lack of consistency on the features. Furthermore, the model could be more precise if an adaptive web scrapping program can be used in TripAdvisor website to get the information of the majority of the available restaurants.
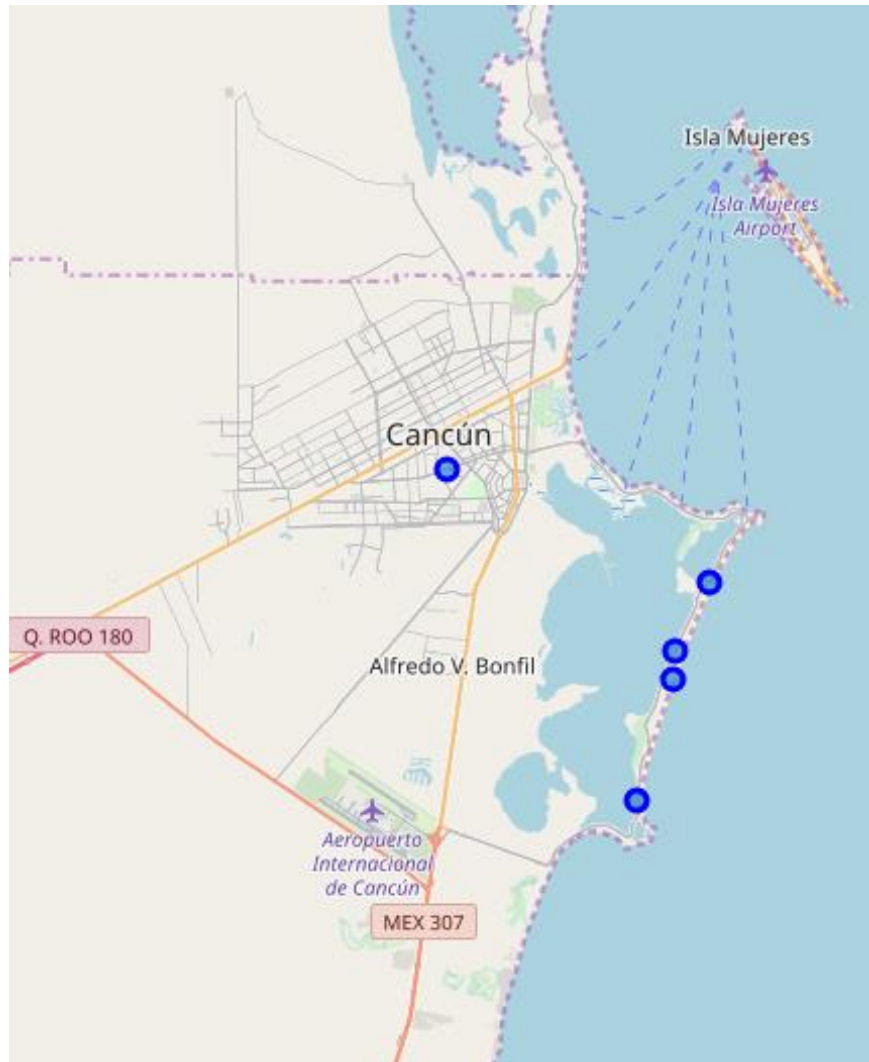
7. Annexes

a. Cluster 0 Table and Map.

	Restaurant	Price_RgLv	Category	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
3	Tora Cancún	High	Japonesa, Mariscos, Internacional, Sushi, Asiá...	0	Latin American Restaurant	Resort	Italian Restaurant	Pool	Mexican Restaurant	Seafood Restaurant	Beach	Sushi Restaurant	Other Great Outdoors	Cocktail Bar
4	The White Box	High	Mariscos, Apto para vegetarianos, Opciones veg...	0	Mexican Restaurant	Beach	Resort	Boat or Ferry	Hotel	Yoga Studio	Steakhouse	Bar	Beach Bar	Food Court
6	Black Hole	High	Fusión, Opciones sin gluten	0	Beach	Hotel	Resort	Molecular Gastronomy Restaurant	Mexican Restaurant	Italian Restaurant	Hotel Bar	Tapas Restaurant	Coffee Shop	Pool
26	DU MEXIQUE By Sonya Grimond	High	Mexicana, Francesa, Apto para vegetarianos, Op...	0	Breakfast Spot	Seafood Restaurant	Italian Restaurant	Japanese Restaurant	Taco Place	Health Food Store	Comfort Food Restaurant	Coffee Shop	Cocktail Bar	Health & Beauty Service
37	Agua Santa Restaurante-Bar	Medium	Italiana, Pizzería, Mariscos, Internacional, F...	0	Italian Restaurant	Beach	Mexican Restaurant	Breakfast Spot	Spa	Sports Bar	Latin American Restaurant	Surf Spot	Resort	Seafood Restaurant
99	Calypso´s Mexican Restaurant	Medium	Mexicana, Latina, Mariscos, Apto para vegetari...	0	Beach	Nightclub	Bar	Ice Cream Shop	Japanese Restaurant	Mexican Restaurant	Sandwich Place	Resort	Spa	Bus Station

b. Cluster 1 Table and Map.

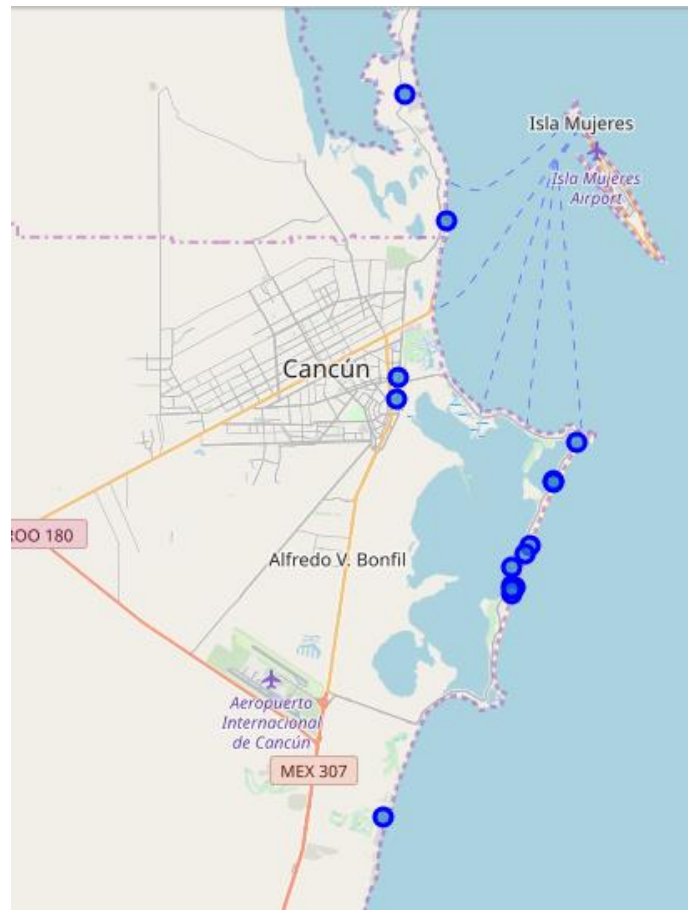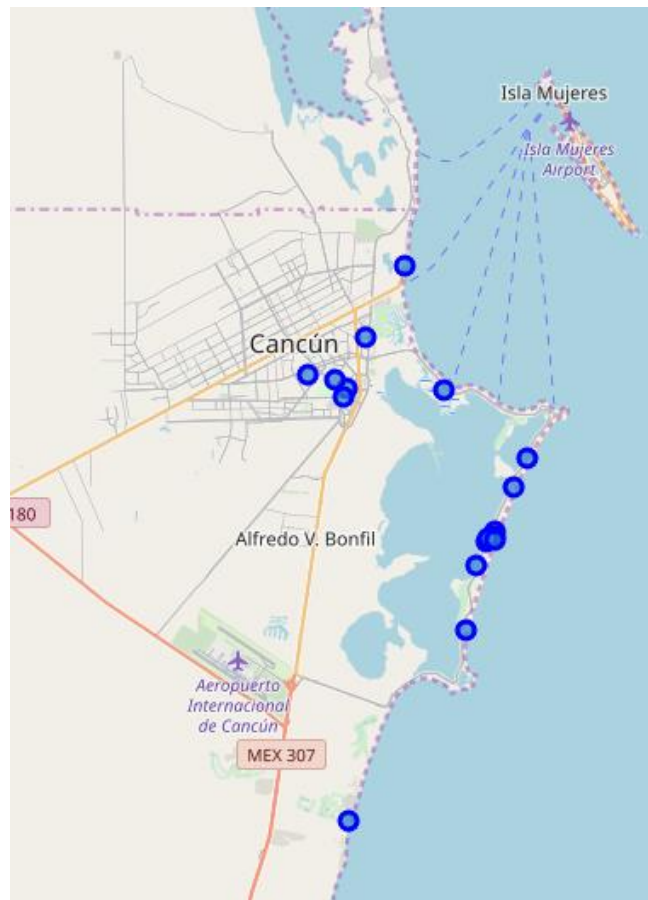|	Restaurant	Price_RgLv	Category	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
5	Restaurante Chianti	High	Italiana, Apto para vegetarianos, Opciones veg...	1	Resort	Beach	Hotel	Italian Restaurant	Asian Restaurant	Mexican Restaurant	Spa	Sports Bar	Hotel Bar	Jewelry Store
33	Harry's	High	Mariscos, Churrasquería, Contemporánea, Apto p...	1	Beach	Mediterranean Restaurant	Resort	Mexican Restaurant	Hotel	Japanese Restaurant	Hotel Bar	Seafood Restaurant	Spa	Molecular Gastronomy Restaurant
55	RESTAURANTE NAVIOS	Medium	Mexicana, Caribeña, Mariscos, Apto para vegeta...	1	Hotel	Resort	Seafood Restaurant	Bar	Beach	Mexican Restaurant	Sushi Restaurant	Mediterranean Restaurant	Burger Joint	Middle Eastern Restaurant
58	Vegan Planet	Medium	Mexicana, Internacional, Apto para vegetariano...	1	Taco Place	Italian Restaurant	Shopping Mall	Seafood Restaurant	Boutique	Clothing Store	Fried Chicken Joint	Pizza Place	Mexican Restaurant	Yoga Studio
65	Naos Restaurant	Medium	Mexicana, Estadounidense, Apto para vegetarian...	1	Resort	Mexican Restaurant	Beach	Latin American Restaurant	Pool	Italian Restaurant	Tapas Restaurant	Food	Spa	Japanese Restaurant

c. Cluster 2 Table and Map.

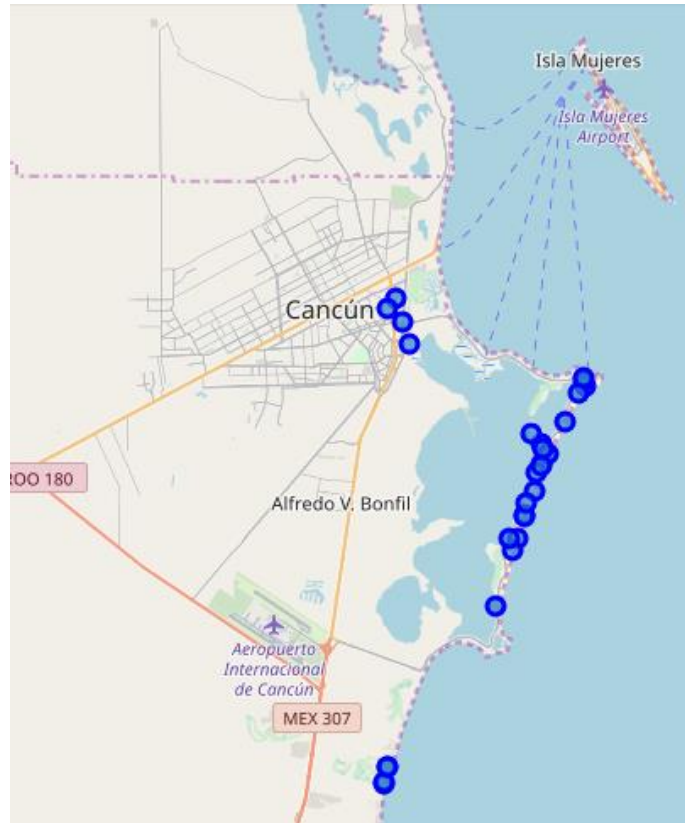|	Restaurant	Price_RgLv	Category	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
2	Restaurante Benazuza	High	Apto para vegetarianos, Opciones veganas, Opci...	2	Beach	Italian Restaurant	Mexican Restaurant	Seafood Restaurant	Bar	Hotel Bar	Lounge	Food	Event Space	Gastropub
12	Rosa Negra	High	Mexicana	2	Resort	Italian Restaurant	Seafood Restaurant	Mexican Restaurant	Latin American Restaurant	Pool	Tapas Restaurant	Food	Spa	Japanese Restaurant
16	Flamingos Seafood Kitchen	Medium	Mexicana, Caribeña, Latina, Mariscos, Apto par...	2	Coffee Shop	Bed & Breakfast	Seafood Restaurant	Bar	French Restaurant	Food Truck	Food Court	Food	Fast Food Restaurant	Event Space
19	Maki Taco	Medium	Mexicana, Japonesa, Sushi, Asiática, Apto para...	2	Beach	Seafood Restaurant	Italian Restaurant	Mexican Restaurant	Bar	Hotel Bar	Breakfast Spot	Lounge	Food	Resort
29	Casitas	High	Mariscos, Contemporánea, Apto para vegetariano...	2	Beach	Mediterranean Restaurant	Resort	Mexican Restaurant	Japanese Restaurant	Italian Restaurant	Hotel Bar	Seafood Restaurant	Spa	Molecular Gastronomy Restaurant
38	Pina Colada Restaurant	Medium	Mexicana, Mariscos, Apto para vegetarianos, Op...	2	Beach	Seafood Restaurant	Resort	Mexican Restaurant	Italian Restaurant	Bar	Lounge	Event Space	Gastropub	Surf Spot
39	El Granero Grill & Drinks	low	Mexicana, Bar, Apto para vegetarianos, Opcione...	2	Nightclub	Beach	Bar	Mexican Restaurant	Japanese Restaurant	American Restaurant	Big Box Store	Clothing Store	Ice Cream Shop	Sandwich Place
45	Chic Cabaret & Restaurant Costa Mujeres	High	Internacional, Fusión	2	Hotel	Hotel Bar	Italian Restaurant	Spa	Seafood Restaurant	Beach	Japanese Restaurant	Gym	French Restaurant	Dessert Shop
46	Locanda Paolo	High	Italiana, Mariscos, Europea, Fusión, Apto para...	2	Italian Restaurant	Breakfast Spot	Health Food Store	Seafood Restaurant	Taco Place	Health & Beauty Service	Japanese Restaurant	Cosmetics Shop	Coffee Shop	Diner
56	Secrets The Vine Cancun	High	Bar, Mariscos, Apto para vegetarianos, Opcione...	2	Beach	Resort	Mediterranean Restaurant	Japanese Restaurant	Hotel	Mexican Restaurant	Spa	Hotel Bar	Piano Bar	Caribbean Restaurant
63	Restaurante Italian Dos Lunas	Medium	Italiana, Apto para vegetarianos	2	Beach	Seafood Restaurant	Mexican Restaurant	Italian Restaurant	Taco Place	Tapas Restaurant	Breakfast Spot	Lounge	Resort	Gastropub
64	Outback Steakhouse	Medium	Estadounidense, Bar, Apto para vegetarianos	2	Resort	Italian Restaurant	Seafood Restaurant	Café	Hotel Pool	Steakhouse	Beach	Gastropub	Lounge	Molecular Gastronomy Restaurant
69	Outback Sports Bar	Medium	Estadounidense, Bar	2	Resort	Steakhouse	Italian Restaurant	Beach	Café	Seafood Restaurant	Hotel Pool	Lounge	Sports Bar	Spa
79	Pizzeria Luna Rossa	Medium	Italiana, Pizzería, Europea, Apto para vegetar...	2	Department Store	Italian Restaurant	Ice Cream Shop	Yoga Studio	Salad Place	Shopping Mall	Brazilian Restaurant	Seafood Restaurant	Lingerie Store	Scenic Lookout
96	Momo	High	Japonesa, Sushi, Asiática, Apto para vegetaria...	2	Hotel Bar	Japanese Restaurant	Mexican Restaurant	Seafood Restaurant	Lounge	Bus Station	Concert Hall	Boarding House	Café	Steakhouse

d. Cluster 3 Table and Map.

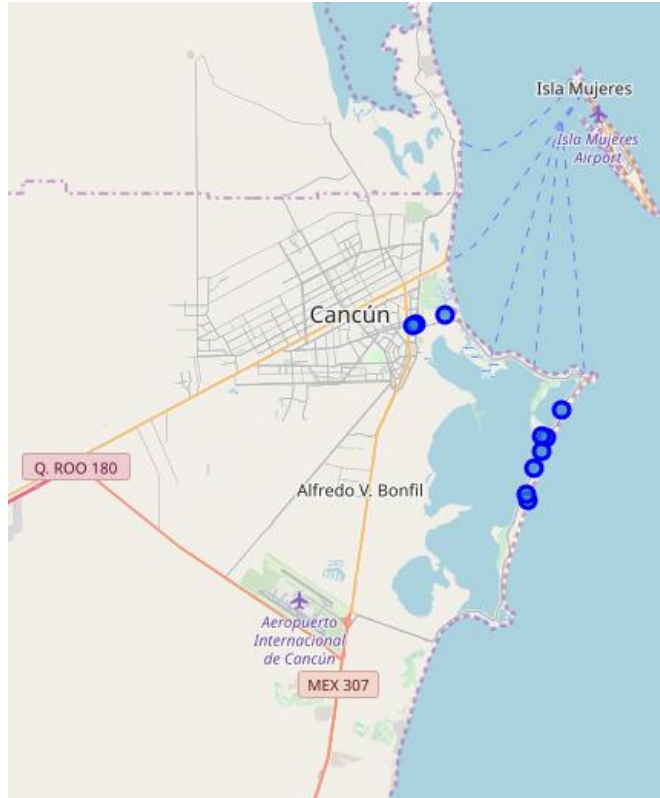|	Restaurant	Price_RgLv	Category	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Sakura Sunset	High	Japonesa, Peruana, Mariscos, Asiática, Fusión,...	3	Beach	Hotel	Resort	Molecular Gastronomy Restaurant	Mexican Restaurant	Italian Restaurant	Hotel Bar	Tapas Restaurant	Coffee Shop	Pool
8	Samura Japanese Cuisine & Bar	Medium	Japonesa, Sushi, Asiática, Mariscos, Internaci...	3	Café	Convenience Store	Mediterranean Restaurant	Italian Restaurant	Breakfast Spot	Seafood Restaurant	Supermarket	Sushi Restaurant	Caribbean Restaurant	Ice Cream Shop
9	Deli Barlovento	low	Mexicana, Comida rápida	3	Resort	Mexican Restaurant	Hotel	Beach	Boat or Ferry	Yoga Studio	Bar	Beach Bar	Coffee Shop	Convenience Store
17	Les Cepages Restaurant	High	Francesa, Europea, Contemporánea, Internaciona...	3	Café	Seafood Restaurant	Ice Cream Shop	Fast Food Restaurant	Sandwich Place	Convenience Store	Soccer Field	Paper / Office Supplies Store	Caribbean Restaurant	Bakery
21	Crab House Cancún	High	Mariscos, Internacional, Parrilla, Sopas, Apto...	3	Italian Restaurant	Latin American Restaurant	Resort	Hotel	Mexican Restaurant	Seafood Restaurant	Hotel Bar	Beach Bar	Japanese Restaurant	Mediterranean Restaurant
30	Bovino's Churrascaría	High	Brasilera, Internacional, Apto para vegetarian...	3	Seafood Restaurant	Mexican Restaurant	Gym / Fitness Center	Juice Bar	Performing Arts Venue	Taco Place	Sandwich Place	Building	Lounge	Football Stadium
32	MB Restaurant	High	Estadounidense, Mariscos, Apto para vegetarian...	3	Beach	Boutique	Argentinian Restaurant	Seafood Restaurant	Shopping Mall	Pool	Accessories Store	Resort	Burger Joint	Men's Store
52	Arrecifes - Nizuc Brazilian Restaurant/Moon Pa...	High	Churrasquería, Brasilera, Opciones sin gluten	3	Resort	Mexican Restaurant	Pool	Bar	Boarding House	Pub	Sushi Restaurant	Spa	Gift Shop	Beach
57	Nebbiolo Ristorante	High	Italiana, Apto para vegetarianos, Opciones veg...	3	Beach	Resort	Mediterranean Restaurant	Japanese Restaurant	Hotel	Mexican Restaurant	Spa	Hotel Bar	Piano Bar	Caribbean Restaurant
67	La Fonda Del Zancudo	Medium	Apto para vegetarianos, Opciones veganas	3	Breakfast Spot	Seafood Restaurant	Mexican Restaurant	Japanese Restaurant	Sushi Restaurant	Taco Place	Hotel Bar	Bar	Cocktail Bar	Health & Beauty Service
70	Maria Marie Restaurant	High	Francesa, Mexicana, Apto para vegetarianos	3	Italian Restaurant	Seafood Restaurant	Resort	Café	Hotel Pool	Steakhouse	Beach	Gastropub	Lounge	Molecular Gastronomy Restaurant
72	Mar-Bella Rawbar & Grill	Medium	Mexicana, Caribeña, Mariscos, Opciones sin gluten	3	Seafood Restaurant	Hotel	Beach	Housing Development	City	Harbor / Marina	Lighthouse	Food Court	Food	Fast Food Restaurant
77	Ciao	High	Italiana, Apto para vegetarianos	3	Beach	Resort	Spa	Hotel Bar	Mexican Restaurant	Hotel	Mediterranean Restaurant	Japanese Restaurant	Italian Restaurant	Piano Bar
78	Blue Gecko Cantina	low	Mexicana, Apto para vegetarianos, Opciones veg...	3	Beach	Mexican Restaurant	Buffet	Seafood Restaurant	Hotel	Italian Restaurant	Tapas Restaurant	Breakfast Spot	Brazilian Restaurant	Casino
81	Le Fate Ristorante Italiano	Medium	Italiana, Pizzería, Mediterránea, Apto para ve...	3	Italian Restaurant	Taco Place	Sushi Restaurant	Shopping Mall	Clothing Store	Bar	Accessories Store	Boutique	Spa	Seafood Restaurant
86	Fred's House	High	Caribeña, Mariscos, Internacional, Apto para v...	3	Resort	Spa	Hotel Bar	Seafood Restaurant	Latin American Restaurant	Japanese Restaurant	Italian Restaurant	Beach	Mexican Restaurant	Hotel
89	Sedona Grill	Medium	Mexicana, Del sudoeste de EE.UU, Apto para veg...	3	Resort	Beach	Spa	Hotel Bar	Hotel	Seafood Restaurant	Japanese Restaurant	Italian Restaurant	Piano Bar	Pool

e. Cluster 4 Table and Map.

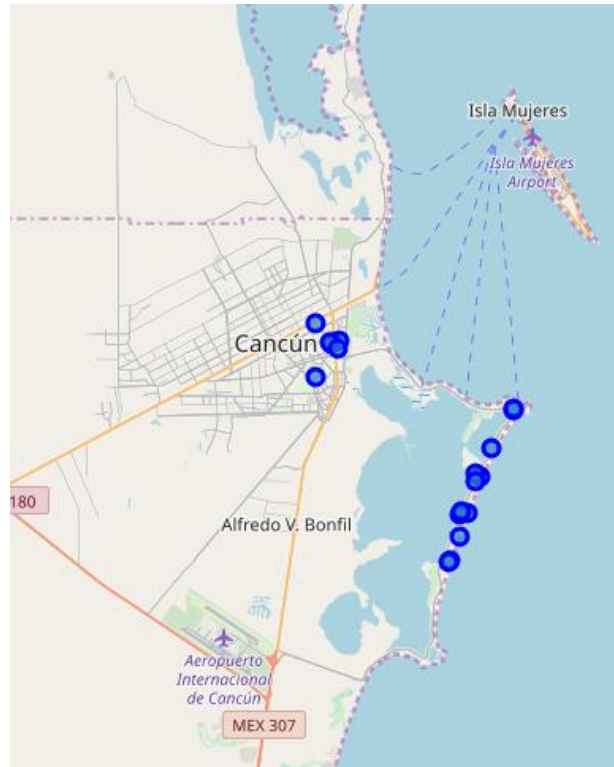|	Restaurant	Price_RgLv	Category	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
1	Restaurante Careyes	High	Fusión, Mariscos, Apto para vegetarianos, Opci...	4	Resort	Mexican Restaurant	Pool	Latin American Restaurant	Italian Restaurant	Beach	Japanese Restaurant	Spa	Cocktail Bar	Other Great Outdoors
14	Taqueria Coapeñitos	low	Mexicana, Comida rápida, Latina, Apto para veg...	4	Seafood Restaurant	Taco Place	Hotel	French Restaurant	Park	Donut Shop	Sushi Restaurant	Sandwich Place	Japanese Restaurant	Italian Restaurant
20	Chuchito Pérez Cancun	Medium	Mexicana, Cervecería, Latina, Contemporánea, A...	4	Nightclub	Beach	Mexican Restaurant	Bar	American Restaurant	Japanese Restaurant	Big Box Store	Wings Joint	Hotel	Clothing Store
22	The Bears Den International Kitchen	Medium	Mexicana, Internacional, Fusión, Canadiense, A...	4	Italian Restaurant	Mexican Restaurant	Caribbean Restaurant	Ice Cream Shop	Breakfast Spot	Shopping Mall	Brazilian Restaurant	Boutique	South American Restaurant	Spa
23	The Club Grill	High	Internacional, Apto para vegetarianos, Opcione...	4	Beach	Mediterranean Restaurant	Resort	Japanese Restaurant	Mexican Restaurant	Italian Restaurant	Breakfast Spot	Molecular Gastronomy Restaurant	Café	Peruvian Restaurant
24	Cancun Lighthouse Marina	Medium	Mexicana, Internacional, Apto para vegetarian...	4	Cosmetics Shop	Accessories Store	Shopping Mall	Ice Cream Shop	Coffee Shop	Lingerie Store	Indian Restaurant	Department Store	Dessert Shop	Clothing Store
27	Tempo by Martin Berasategui	High	Europea, Española, Apto para vegetarianos, Opc...	4	Resort	Mexican Restaurant	Italian Restaurant	Latin American Restaurant	Pool	Beach	Cocktail Bar	Beach Bar	Japanese Restaurant	Mediterranean Restaurant
28	Ruth's Chris Steak House Cancún	High	Estadounidense, Churrasquería, Apto para veget...	4	Mexican Restaurant	Ice Cream Shop	Jewelry Store	Hotel	Seafood Restaurant	Shopping Mall	Boutique	Peruvian Restaurant	Mediterranean Restaurant	Smoke Shop
31	Rino's Pizza Time	Medium	Italiana, Pizzería, Apto para vegetarianos, Op...	4	Italian Restaurant	Breakfast Spot	Health Food Store	Café	Seafood Restaurant	Food Truck	Bar	Supermarket	Comfort Food Restaurant	Coworking Space
34	Hacienda Sisal	Medium	Mexicana, Latina, Centroamericana, Apto para v...	4	Boutique	Mexican Restaurant	Hotel	Ice Cream Shop	Italian Restaurant	Beach	Jewelry Store	Latin American Restaurant	Cosmetics Shop	Comedy Club
36	Los Caporales	High	Mexicana, Latina, Española, Apto para vegetari...	4	Mexican Restaurant	Pool	Beach	Cocktail Bar	Gift Shop	Pub	Resort	Café	Brazilian Restaurant	Boarding House
44	Manglar Buffet Restautant	Medium	Apto para vegetarianos, Opciones veganas, Opci...	4	Pool	Resort	Mexican Restaurant	Cocktail Bar	Gift Shop	Pub	Café	Brazilian Restaurant	Boarding House	Sushi Restaurant
51	Bugambilias	Medium	Mexicana, Apto para vegetarianos, Opciones veg...	4	Hotel Bar	Beach	Resort	Pool	Pool Hall	Nightclub	Café	Scenic Lookout	Bus Station	Seafood Restaurant
53	Gustino	High	Italiana, Apto para vegetarianos, Opciones veg...	4	Beach	Resort	Spa	Seafood Restaurant	Mexican Restaurant	Mediterranean Restaurant	Japanese Restaurant	Hotel Bar	Hotel	Steakhouse
54	Marinero's	Medium	Bar, Mariscos, Apto para vegetarianos, Opcione...	4	Nightclub	Beach	Bar	Mexican Restaurant	Ice Cream Shop	Japanese Restaurant	American Restaurant	Wings Joint	Seafood Restaurant	Sandwich Place
59	Da Vinci	High	Europea, Italiana, Apto para vegetarianos	4	Beach	Resort	Seafood Restaurant	Mexican Restaurant	Italian Restaurant	Bar	Lounge	Event Space	Surf Spot	Tapas Restaurant
60	Pizzeria La Pizzarra	Medium	Italiana, Bar, Pizzería, Apto para vegetariano...	4	Harbor / Marina	Shoe Store	Yoga Studio	Donut Shop	Food Court	Food	Fishing Store	Fast Food Restaurant	Event Space	Electronics Store
61	La Habichuela Centro	High	Mexicana, Caribeña, Mariscos, Internacional, A...	4	Mexican Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Taco Place	Seafood Restaurant	Plaza	Caribbean Restaurant	French Restaurant	Sports Bar	Beer Garden
62	El Conquistador	High	Internacional, Apto para vegetarianos, Opcione...	4	Resort	Beach	Mexican Restaurant	Seafood Restaurant	Italian Restaurant	Food Court	Spa	Caribbean Restaurant	Steakhouse	Surf Spot
66	The Surfin Burrito	low	Mexicana, Caribeña, Latina, Comida rápida, Cen...	4	Nightclub	Beach	Bar	Mexican Restaurant	American Restaurant	Resort	Residential Building (Apartment / Condo)	Clothing Store	Surf Spot	Shopping Mall
71	Hidden Garden	High	Asiática, Tailandesa, Opciones veganas	4	Beach	Boutique	Seafood Restaurant	Argentinian Restaurant	Shopping Mall	Pool	Cosmetics Shop	Liquor Store	Men's Store	Mexican Restaurant
74	Pelicanos	Medium	Caribeña, Mariscos, Apto para vegetarianos, Op...	4	Italian Restaurant	Steakhouse	Hotel Pool	Seafood Restaurant	Café	Resort	Beach	Diner	Spa	Pool Hall
83	La Gondola - Sunrise	High	Italiana, Apto para vegetarianos, Opciones veg...	4	Hotel Bar	Beach	Resort	Pool	Pool Hall	Nightclub	Café	Scenic Lookout	Bus Station	Seafood Restaurant
84	Thai	High	Tailandesa, Apto para vegetarianos, Opciones v...	4	Cosmetics Shop	Accessories Store	Argentinian Restaurant	Shopping Mall	Boutique	Jewelry Store	Department Store	Dessert Shop	Coffee Shop	Pool
88	El Galeon del Caribe	low	Mexicana, Caribeña, Latina, Mariscos	4	Beach	Hotel	Resort	Seafood Restaurant	Burger Joint	Mediterranean Restaurant	Middle Eastern Restaurant	Molecular Gastronomy Restaurant	Spa	Caribbean Restaurant
91	Xkat-Ik	Medium	Mexicana, Latina, Mariscos, Apto para vegetari...	4	Beach	Resort	Mexican Restaurant	Italian Restaurant	Seafood Restaurant	Hotel	Taco Place	Lounge	Brazilian Restaurant	Convenience Store
93	Tequila Grill	Medium	Mexicana, Latina, Apto para vegetarianos, Opci...	4	Mexican Restaurant	Shopping Mall	Jewelry Store	Beach	Hotel	Seafood Restaurant	Ice Cream Shop	Spa	Peruvian Restaurant	Smoke Shop
97	Hanaichi	Medium	Japonesa, Sushi, Asiática, Apto para vegetaria...	4	Beach	Nightclub	Japanese Restaurant	Hotel	Ice Cream Shop	Bar	Seafood Restaurant	Bus Station	Spa	Sandwich Place

f. Cluster 5 Table and Map.

	Restaurant	Price_RgLv	Category	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
10	Peter's Restaurante	Medium	Europea, Internacional, Apto para vegetarianos...	5	Italian Restaurant	Breakfast Spot	Seafood Restaurant	Bar	Health Food Store	Road	Food Truck	French Restaurant	Monument / Landmark	Café
15	La Dolce Vita centro	Medium	Italiana, Europea, Apto para vegetarianos, Opc...	5	Italian Restaurant	Food Truck	Breakfast Spot	Café	Monument / Landmark	Bar	Health Food Store	Brazilian Restaurant	Road	Spa
47	Lorenzillo's Restaurant	High	Mariscos, Sopas, Apto para vegetarianos, Opcio...	5	Italian Restaurant	Seafood Restaurant	Asian Restaurant	Hotel	Hotel Pool	Steakhouse	Café	Beach	Mexican Restaurant	Gastropub
48	Cenacolo Puerto Cancún	Medium	Italiana, Europea, Apto para vegetarianos, Opc...	5	Clothing Store	Movie Theater	Coffee Shop	Ice Cream Shop	Jewelry Store	Nightclub	Electronics Store	Road	Food Court	Boutique
49	Cambalache Cancun	High	Churrasquería, Argentina, Sudamericana, Intern...	5	Cosmetics Shop	Accessories Store	Shopping Mall	Beach	Dessert Shop	Resort	Boutique	Lingerie Store	Sporting Goods Shop	Jewelry Store
73	Restaurante Fuego	High	Peruana, Apto para vegetarianos, Opciones sin ...	5	Resort	Mexican Restaurant	Beach	Latin American Restaurant	Pool	Italian Restaurant	Tapas Restaurant	Food	Spa	Japanese Restaurant
80	La Capilla	Medium	Estadounidense, Churrasquería, Argentina, Apto...	5	Latin American Restaurant	Resort	Hotel	Italian Restaurant	Mexican Restaurant	Seafood Restaurant	Beach	Hotel Bar	Beach Bar	Japanese Restaurant
82	Taco y Tequila Cancun	Medium	Mexicana, Apto para vegetarianos, Opciones veg...	5	Cosmetics Shop	Accessories Store	Ice Cream Shop	Shopping Mall	Coffee Shop	Burger Joint	Boutique	Lingerie Store	Perfume Shop	Sporting Goods Shop
87	Casa Rolandi	High	Italiana, Suiza, Mariscos	5	Italian Restaurant	Beach	Mexican Restaurant	Gym / Fitness Center	Surf Spot	Breakfast Spot	Boutique	Latin American Restaurant	Boat or Ferry	Spa
94	La Destileria Cancun	Medium	Mexicana, Latina, Apto para vegetarianos, Opci...	5	Shopping Mall	Ice Cream Shop	Seafood Restaurant	Mexican Restaurant	Jewelry Store	Beach	Smoke Shop	Boutique	Resort	Residential Building (Apartment / Condo)

g. Cluster 6 Table and Map.

	Restaurant	Price_RgLv	Category	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
7	Restaurante Condimento	Medium	Internacional, Mexicana, Japonesa, Mediterráne...	6	Resort	Beach	Mexican Restaurant	Seafood Restaurant	Italian Restaurant	Taco Place	Bar	Caribbean Restaurant	Pool	Surf Spot
11	El Rinconcito de Puebla	low	Mexicana, Cervecería, Bar	6	Mexican Restaurant	Seafood Restaurant	Hostel	Italian Restaurant	Breakfast Spot	Pizza Place	Bar	Burrito Place	Middle Eastern Restaurant	Beer Garden
13	Bacoli Tratoria	Medium	Italiana, Pizzería, Europea, Apto para vegetar...	6	Resort	Beach	Mexican Restaurant	Seafood Restaurant	Italian Restaurant	Bar	Lounge	Caribbean Restaurant	Surf Spot	Tapas Restaurant
18	Fantino	High	Europea, Apto para vegetarianos, Opciones vega...	6	Beach	Mediterranean Restaurant	Resort	Mexican Restaurant	Japanese Restaurant	Hotel Bar	Seafood Restaurant	Spa	Café	Caribbean Restaurant
25	Bubba Gump Shrimp Co	Medium	Estadounidense, Bar, Mariscos, Apto para veget...	6	Italian Restaurant	Seafood Restaurant	Resort	Café	Hotel Pool	Steakhouse	Beach	Gastropub	Lounge	Molecular Gastronomy Restaurant
35	Porfirio's Cancún	High	Mexicana, Latina, Contemporánea, Apto para veg...	6	Beach	Mediterranean Restaurant	Resort	Mexican Restaurant	Hotel	Japanese Restaurant	Hotel Bar	Seafood Restaurant	Spa	Molecular Gastronomy Restaurant
40	Lonchería El Pocito	low	Mexicana	6	Mexican Restaurant	Taco Place	Electronics Store	Pizza Place	Motel	Food Truck	Seafood Restaurant	Dessert Shop	Paper / Office Supplies Store	Convenience Store
41	Mextreme	Medium	Mexicana, Latina, Bar	6	Nightclub	Bar	Beach	Mexican Restaurant	American Restaurant	Japanese Restaurant	Ice Cream Shop	Resort	Clothing Store	Sandwich Place
42	Puerto Madero Cancún	High	Argentina, Latina, Mariscos, Parrilla, Contemp...	6	Beach	Mediterranean Restaurant	Resort	Mexican Restaurant	Japanese Restaurant	Hotel Bar	Seafood Restaurant	Spa	Caribbean Restaurant	Steakhouse
43	Siete	Medium	Latina, Mexicana, Española, Apto para vegetari...	6	Boutique	Beach	Pool	Argentinian Restaurant	Seafood Restaurant	Shopping Mall	Tapas Restaurant	Jewelry Store	Mexican Restaurant	Burger Joint
50	Gory Tacos	low	Mexicana, Latina, Apto para vegetarianos, Opci...	6	Mexican Restaurant	Seafood Restaurant	Hostel	Italian Restaurant	Breakfast Spot	Pizza Place	Bar	Burrito Place	Middle Eastern Restaurant	Beer Garden
68	Restaurant Mole	Medium	Mexicana, Latina, Apto para vegetarianos, Opci...	6	Resort	Mexican Restaurant	Latin American Restaurant	Pool	Beach	Beach Bar	Other Great Outdoors	Cocktail Bar	Nightclub	Caribbean Restaurant
75	Elefanta Indian Cuisine	Medium	De la India, Asiática, Apto para vegetarianos, ...	6	Cosmetics Shop	Accessories Store	Argentinian Restaurant	Shopping Mall	Boutique	Indian Restaurant	Jewelry Store	Liquor Store	Men's Store	Ice Cream Shop
76	El Oasis Mariscos	Medium	Caribeña, Latina, Mariscos, Mexicana, Internac...	6	Mexican Restaurant	Seafood Restaurant	Gym / Fitness Center	Juice Bar	Football Stadium	Italian Restaurant	Performing Arts Venue	Churrascaria	Salad Place	Sandwich Place
85	El Pescado Ciego	Medium	Mariscos, Opciones sin gluten	6	Mexican Restaurant	Breakfast Spot	Seafood Restaurant	Taco Place	Japanese Restaurant	Italian Restaurant	French Restaurant	Cocktail Bar	Health & Beauty Service	Café
90	Labna	Medium	Mexicana, Latina, Española, Apto para vegetari...	6	Mexican Restaurant	Taco Place	Seafood Restaurant	Vegetarian / Vegan Restaurant	Italian Restaurant	Pizza Place	Burrito Place	Middle Eastern Restaurant	Bistro	Beer Garden
92	Casa Tequila	Medium	Mexicana, Latina, Apto para vegetarianos, Opci...	6	Beach	Nightclub	Bar	Ice Cream Shop	Japanese Restaurant	Resort	Big Box Store	Café	Spa	Seafood Restaurant
95	Luum Cocina Creativa	Medium	Mexicana, Internacional, Contemporánea, Apto p...	6	Italian Restaurant	Breakfast Spot	Seafood Restaurant	Taco Place	Mexican Restaurant	French Restaurant	Cosmetics Shop	Coffee Shop	Cocktail Bar	Health Food Store
98	El Fish Fritanga	Medium	Mexicana, Caribeña, Mariscos, Sopas, Apto para...	6	Beach	Boutique	Argentinian Restaurant	Seafood Restaurant	Mexican Restaurant	Shopping Mall	Residential Building (Apartment / Condo)	Liquor Store	Burger Joint	Smoke Shop

8. References

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9. Special thanks

English review: Daniela Mendoza Flores

10. More information

Check my GitHub repository if you are more interested in the used code and data sets.

https://github.com/EmmanuelRTM/IBM_Capstone_project