



CAPSTONE PROJECT - THE BATTLE OF LISBON NEIGHBORHOODS

Coursera IBM Data Science
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Introduction

- Lisbon is Portugal's amazing capital and one of Europe's most charismatic and vibrant cities.
- Lisbon offers a rich and varied history as a holiday destination, a buzzing nightlife and a glorious year-round climate.
- The post-crisis evolution of Lisbon and the corresponding tourism boom demonstrate the dramatic impact of overtourism and its lasting ramifications.



Data Section

- Since gastronomy is a considerable point between Lisbon and Portugal, data collection for analysis should be carefully and organized.
- In order to make the analysis with the best possible results, we started by creating a dataframe with the boroughs of Lisbon as well as their geographical data and the number of population in each.

	Borough	Population	Area(km ²)	Latitude	Longitude
0	Ajuda	15 617	288	38.707500	-9.198333
1	Alcântara	13 943	5,07	38.706389	-9.174167
2	Alvalade	31 813	534	38.746944	-9.136111
3	Areeiro	20 131	174	38.740278	-9.128056
4	Arroios	31 653	213	38.728889	-9.138889
5	Avenidas Novas	21 625	299	38.738889	-9.145833
6	Beato	12 737	2,46	38.734722	-9.105833
7	Belém	16 528	10,43	38.700000	-9.200000
8	Benfica	36 985	803	38.751111	-9.202222
9	Campo de Ourique	22 120	165	38.715278	-9.166944
10	Campolide	15 460	277	38.726389	-9.163333
11	Carnide	19 218	369	38.760833	-9.183611

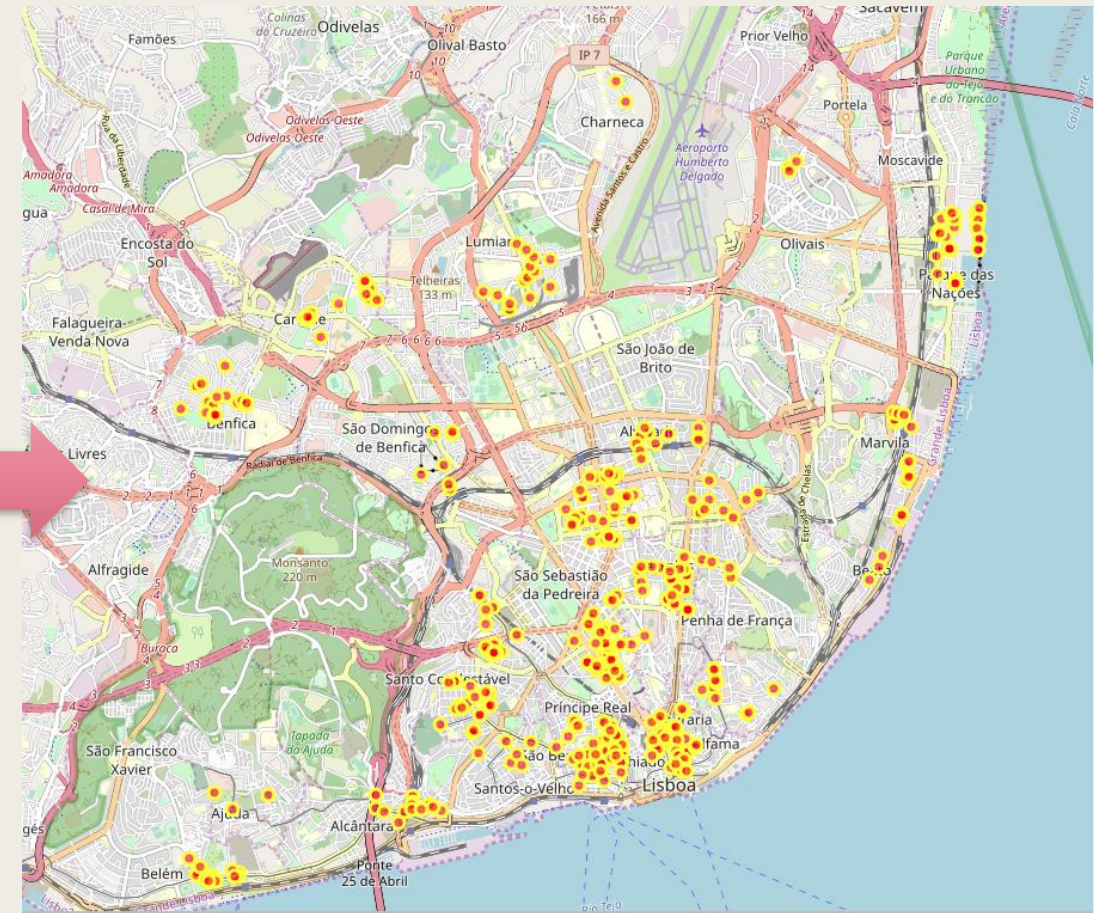
12	Estrela	20 128	4,60	38.713333	-9.160000
13	Lumiar	45 605	657	38.765278	-9.158611
14	Marvila	37 793	7,12	38.745278	-9.104167
15	Misericórdia	13 044	2,19	38.711389	-9.148056
16	Olivais	33 788	809	38.773611	-9.117500
17	Parque das Nações	21 025	544	38.768056	-9.093889
18	Penha de França	27 967	2,71	38.730000	-9.131667
19	Santa Clara	22 480	336	38.785278	-9.145000
20	Santa Maria Maior	12 822	3,01	38.712778	-9.135556
21	Santo António	11 836	149	38.724167	-9.145000
22	São Domingos de Benfica	33 043	429	38.743611	-9.170000
23	São Vicente	15 339	1,99	38.719444	-9.126389

- Using the date of the boroughs of Lisbon, namely the latitude and longitude variables, a for loop was created to access the Foursquare API and save the data for all the boroughs with places of tourist interest, including hotels, bars, restaurants, historic centers, among others.

	name	id	categories	lat	lng
0	Palácio Nacional da Ajuda	4b0588a3f964a5207bd122e3	Historic Site	38.707653	-9.197758
1	Restaurante Andorinhas	4d9885d59079b1f7a0182d0a	Restaurant	38.704911	-9.199349
2	Páteo Alfacinha	4c532ced72cf0f47267c71d2	Restaurant	38.706537	-9.194202
3	Jardim Botânico da Ajuda	4c8b582be51e6dcb8e7671de	Botanical Garden	38.706430	-9.201222
4	Churrasqueira do Marquês	4c48033e76d72d7fa2043f4d	BBQ Joint	38.703996	-9.199402
...
1001	Mercado de Santa Clara	4e886bc5be7b88449a912b01	Event Space	38.715564	-9.125582
1002	Jardim Botto Machado	4c962b6e82b56dcdbd0f9deaa	Garden	38.715877	-9.123740
1003	Feira da Ladra	4b0588a8f964a520cfd222e3	Flea Market	38.715368	-9.125244
1004	Cafe De Calcada	54d74df1498ec1066a06efaf	Bistro	38.718287	-9.131190
1005	Pastelaria Náná	50952535e4b024b7d7b7e600	Portuguese Restaurant	38.718530	-9.121602

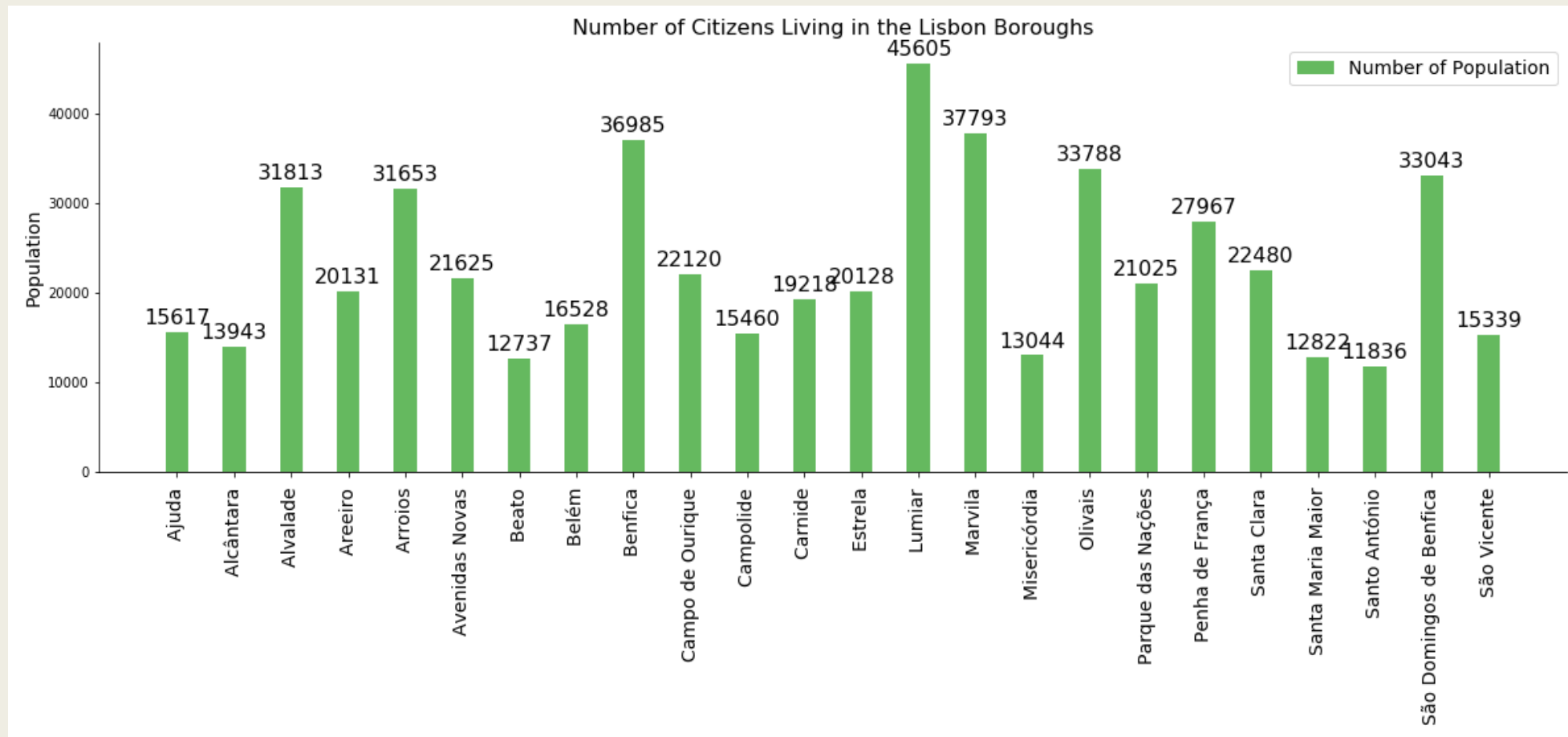
- After Having the dataframe with all touristic places, it was needed to filter only the restaurants/bars or any kind of food/drink places.

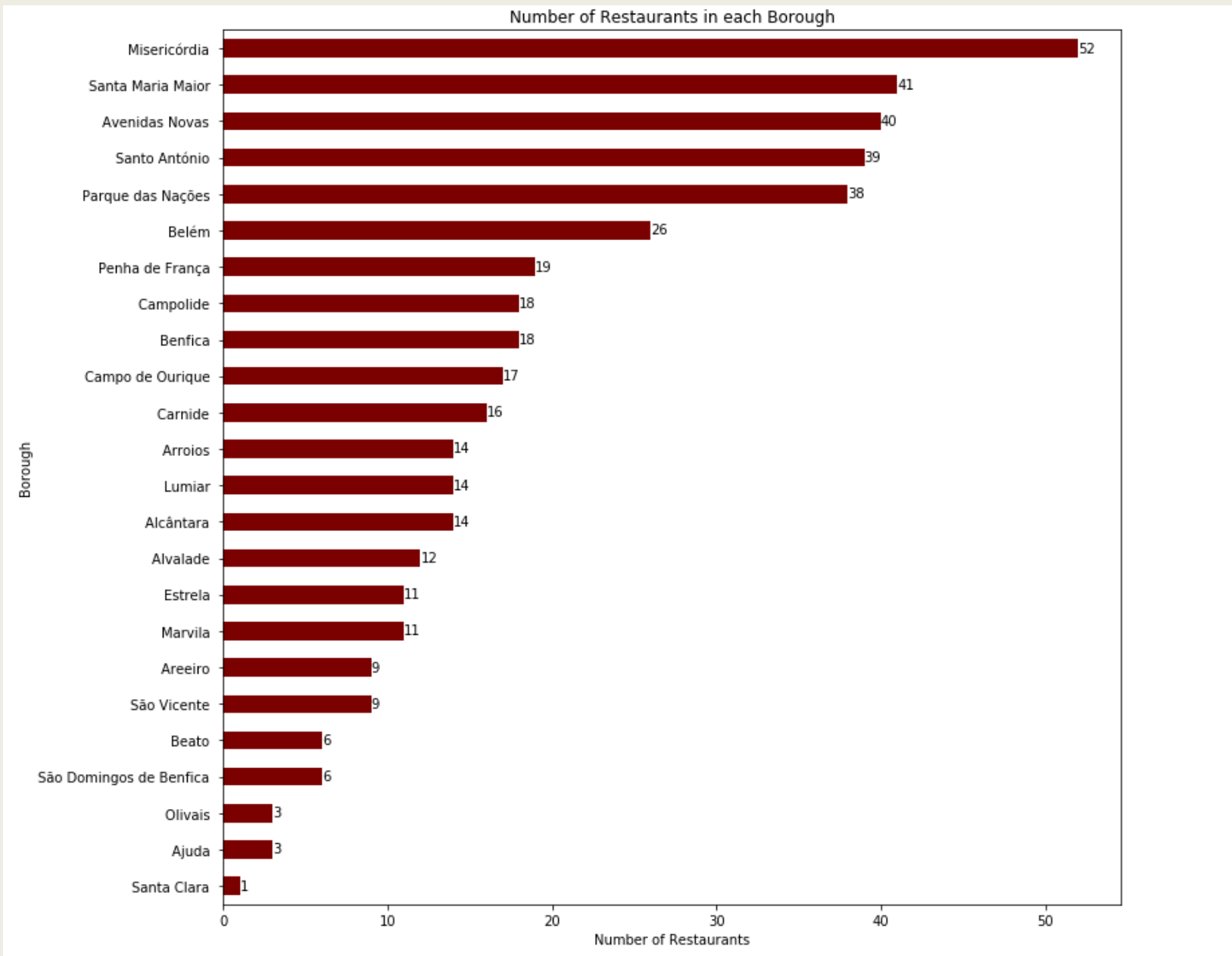
	Places	ID	Categories	Latitude	Longitude
0	Restaurante Andorinhas	4d9885d59079b1f7a0182d0a	Restaurant	38.704911	-9.199349
1	Páteo Alfacinha	4c532ced72cf0f47267c71d2	Restaurant	38.706537	-9.194202
2	Estufa Real	4b0588a4f964a520ced122e3	Restaurant	38.706840	-9.201975
3	Alcântara 50	50899fb2e4b0167a9c2eddf4	Portuguese Restaurant	38.705462	-9.173533
4	O Palácio	4c5c82867735c9b6507f8c72	Seafood Restaurant	38.706357	-9.173442
...
433	Penalva da Graça	4f89e174e4b00a6262549ad1	Seafood Restaurant	38.720722	-9.130070
434	Taproom Oitava Colina	5b4928789f8a9f002c28cc08	Beer Bar	38.718390	-9.131880
435	O Cardoso do Estrela de Ouro	4c892b94a0ffb60c7f4228c5	Portuguese Restaurant	38.720650	-9.130091
436	Tazza In Giro	5a09ef5d2619ee11bd25fffc	Vegetarian / Vegan Restaurant	38.715800	-9.125121
437	Pastelaria Náná	50952535e4b024b7d7b7e600	Portuguese Restaurant	38.718530	-9.121602



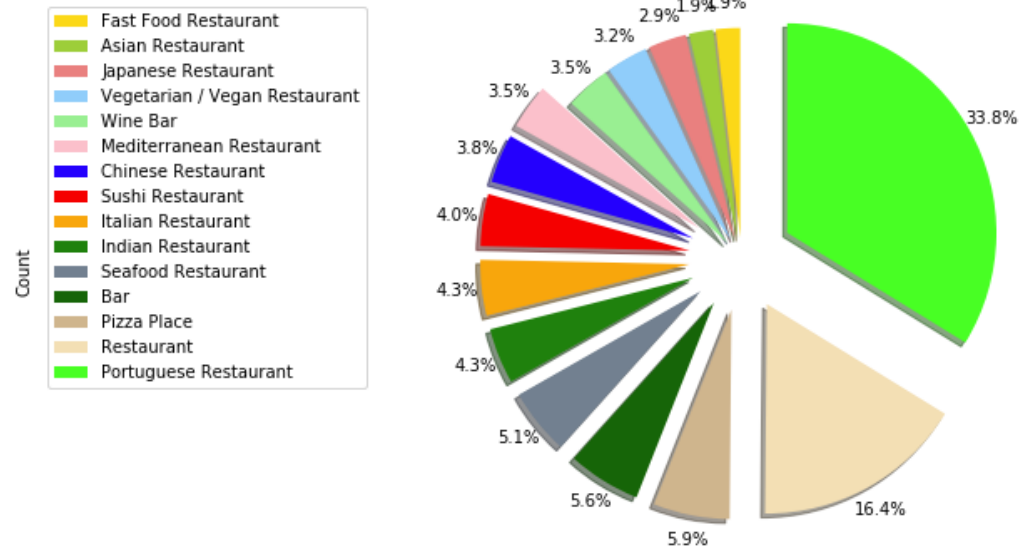
Methodology section

- After getting the data sets "clean", it was created some data visualizations in order to better interpret and study the results.

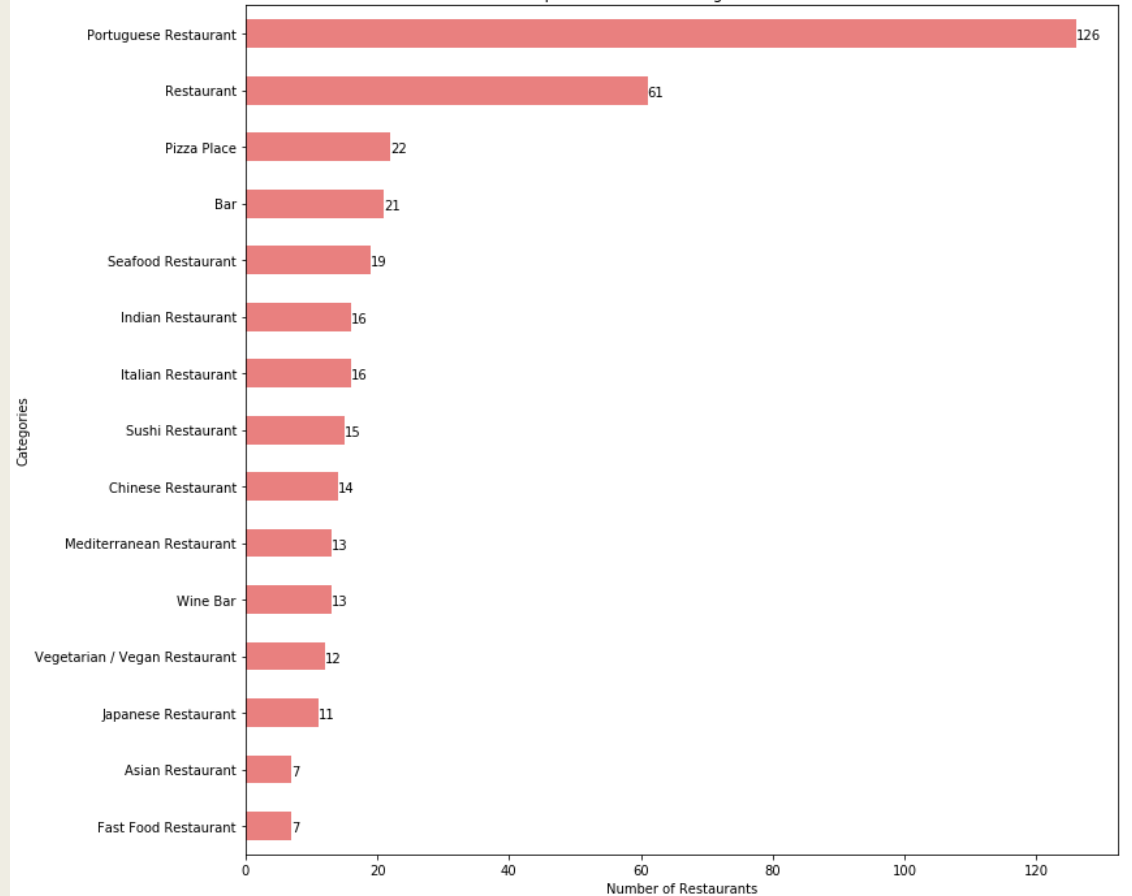




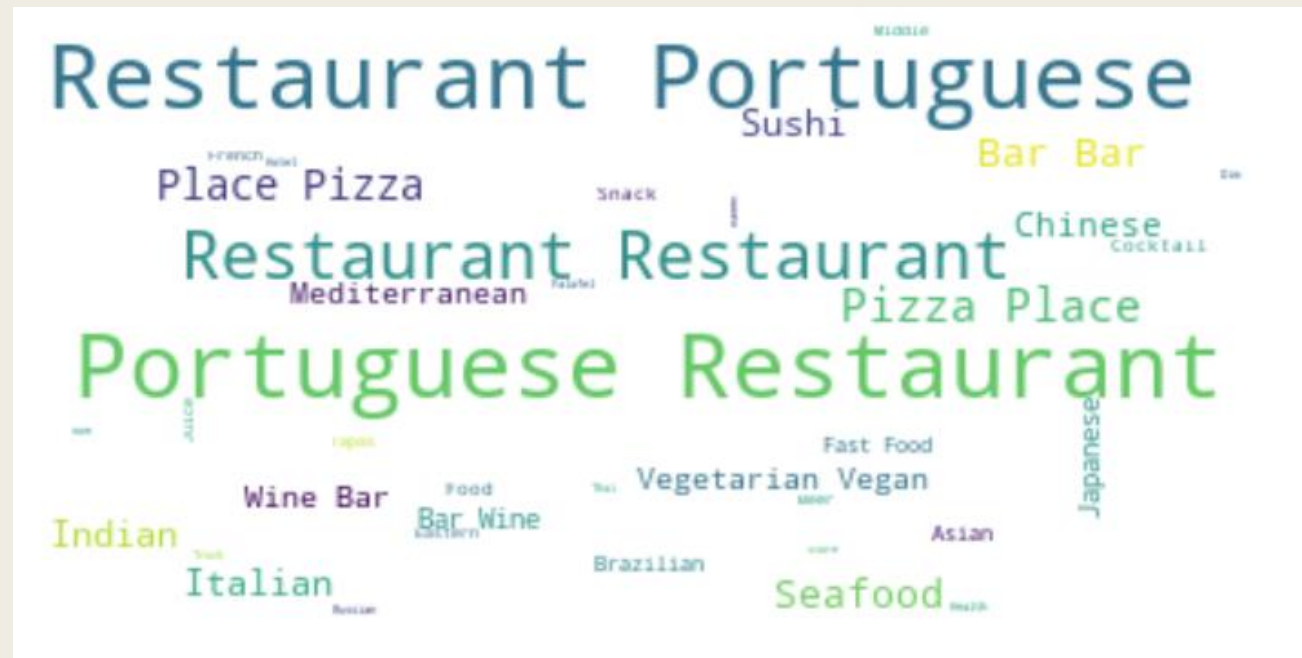
Top 15 Restaurant Categories In Lisbon



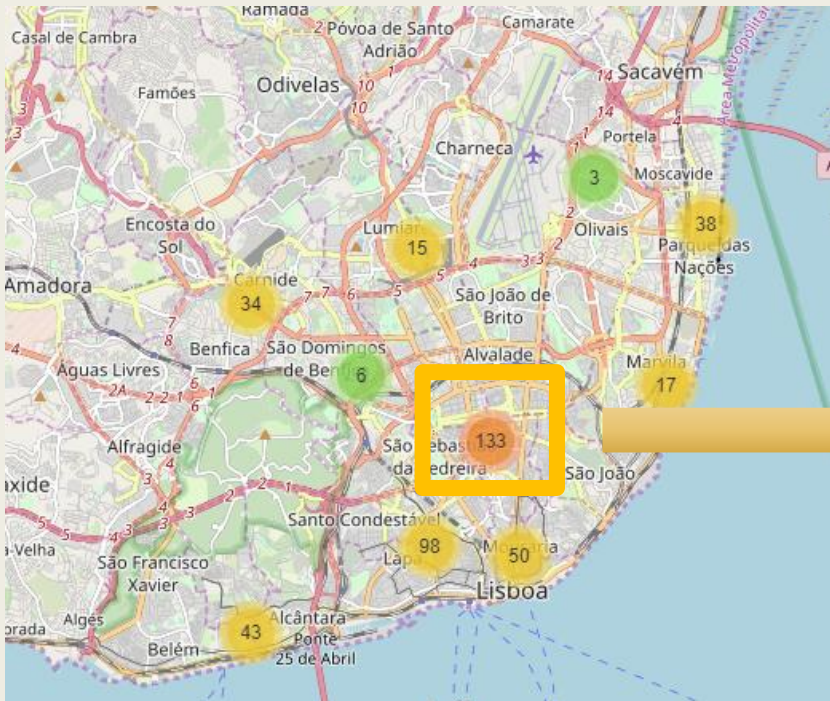
Top 15 Restaurant Categories In Lisbon



- Taking into account an overview of all of Lisbon, the 15 categories with the most established restaurants were filtered. It can be seen that clearly stand out the "Restaurants" which are mainly those traditional restaurants with a high variety, and in the first place the Restaurants specialized in Portuguese food.



- Another very important factor is to see the competition of each borough of Lisbon. This requires checking how many restaurants and what types each location has. As such, a map was created with clusters relating to restaurants in Lisbon areas, so that it is possible to have a visual perception of the current situation of the city where each data point mark a cluster.



K-Cluster analysis

- Subsequently, K-Means Clustering was performed the Lisbon boroughs according to which restaurant category used from Foursquare information to experience each borough's opportunity.

	Places	Borough	Likes	Latitude	Longitude	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
0	Restaurante Andorinhas	Ajuda	23	38.704911	-9.199349	1	Restaurant	Wine Bar	Eastern European Restaurant	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food	Fast Food Restaurant
1	Páteo Alfacinha	Ajuda	44	38.706537	-9.194202	1	Restaurant	Wine Bar	Eastern European Restaurant	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food	Fast Food Restaurant
2	Estufa Real	Ajuda	25	38.706840	-9.201975	1	Restaurant	Wine Bar	Eastern European Restaurant	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food	Fast Food Restaurant
3	Alcântara 50	Alcântara	27	38.705462	-9.173533	2	Portuguese Restaurant	Mediterranean Restaurant	Seafood Restaurant	Eastern European Restaurant	Pizza Place	Restaurant	Indian Restaurant	Beer Bar	Sushi Restaurant	Beer Garden
4	O Palácio	Alcântara	86	38.706357	-9.173442	2	Portuguese Restaurant	Mediterranean Restaurant	Seafood Restaurant	Eastern European Restaurant	Pizza Place	Restaurant	Indian Restaurant	Beer Bar	Sushi Restaurant	Beer Garden

Cluster 1

	Borough	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
52	Avenidas Novas	0	Portuguese Restaurant	Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Pizza Place	Asian Restaurant	Fast Food Restaurant	Sushi Restaurant	Brazilian Restaurant	Japanese Restaurant
124	Benfica	0	Portuguese Restaurant	Seafood Restaurant	Restaurant	Asian Restaurant	Sushi Restaurant	Food	Chinese Restaurant	Pizza Place	Dim Sum Restaurant	French Restaurant
142	Campo de Ourique	0	Portuguese Restaurant	Bar	Restaurant	Seafood Restaurant	Italian Restaurant	Japanese Restaurant	Pizza Place	Indian Restaurant	Cantonese Restaurant	Brazilian Restaurant
159	Campolide	0	Restaurant	Portuguese Restaurant	Seafood Restaurant	French Restaurant	Japanese Restaurant	Fast Food Restaurant	Falafel Restaurant	Dim Sum Restaurant	Pizza Place	Health Food Store
177	Carnide	0	Portuguese Restaurant	Sushi Restaurant	Restaurant	Dim Sum Restaurant	Tapas Restaurant	Asian Restaurant	Food	Mediterranean Restaurant	Pizza Place	Food Truck
204	Lumiar	0	Pizza Place	Japanese Restaurant	Fast Food Restaurant	Chinese Restaurant	Restaurant	Vegetarian / Vegan Restaurant	Italian Restaurant	Sushi Restaurant	Wine Bar	Eastern European Restaurant
218	Marvila	0	Restaurant	Portuguese Restaurant	Pizza Place	Argentinian Restaurant	Mediterranean Restaurant	Wine Bar	French Restaurant	Food Truck	Food Service	Food
284	Parque das Nações	0	Portuguese Restaurant	Restaurant	Sushi Restaurant	Chinese Restaurant	Seafood Restaurant	Bar	Hotel Bar	Italian Restaurant	Pizza Place	Falafel Restaurant
422	São Domingos de Benfica	0	Bar	Japanese Restaurant	Food Truck	Seafood Restaurant	Fast Food Restaurant	Portuguese Restaurant	Wine Bar	Eastern European Restaurant	Gay Bar	French Restaurant

Cluster 2

	Borough	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
0	Ajuda	1	Restaurant	Wine Bar	Eastern European Restaurant	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food	Fast Food Restaurant
92	Beato	1	Restaurant	Tapas Restaurant	Cantonese Restaurant	Wine Bar	Eastern European Restaurant	Gay Bar	French Restaurant	Food Truck	Food Service	Food
281	Olivais	1	Restaurant	Chinese Restaurant	Wine Bar	Eastern European Restaurant	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food

Cluster 3

	Borough	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
3	Alcântara	2	Portuguese Restaurant	Mediterranean Restaurant	Seafood Restaurant	Eastern European Restaurant	Pizza Place	Restaurant	Indian Restaurant	Beer Bar	Sushi Restaurant	Beer Garden
38	Arroios	2	Portuguese Restaurant	Indian Restaurant	Vegetarian / Vegan Restaurant	Italian Restaurant	Brazilian Restaurant	Chinese Restaurant	Restaurant	Mediterranean Restaurant	Argentinian Restaurant	Falafel Restaurant
229	Misericórdia	2	Portuguese Restaurant	Bar	Wine Bar	Cocktail Bar	Restaurant	Italian Restaurant	Juice Bar	Pizza Place	Brazilian Restaurant	French Restaurant
342	Santa Maria Maior	2	Portuguese Restaurant	Wine Bar	Restaurant	Indian Restaurant	Bar	Mediterranean Restaurant	African Restaurant	Ramen Restaurant	Food Service	Vegetarian / Vegan Restaurant
428	São Vicente	2	Mediterranean Restaurant	Portuguese Restaurant	Indian Restaurant	Vegetarian / Vegan Restaurant	Bar	Beer Bar	Seafood Restaurant	Empanada Restaurant	French Restaurant	Food Truck

Cluster 4

	Borough	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
341	Santa Clara	3	Portuguese Restaurant	Wine Bar	Hotel Bar	Health Food Store	Gay Bar	French Restaurant	Food Truck	Food Service	Food	Fast Food Restaurant

Cluster 5

	Borough	Cluster Labels	1st Most Common Category	2nd Most Common Category	3rd Most Common Category	4th Most Common Category	5th Most Common Category	6th Most Common Category	7th Most Common Category	8th Most Common Category	9th Most Common Category	10th Most Common Category
17	Alvalade	4	Portuguese Restaurant	Bar	Persian Restaurant	Pizza Place	Snack Place	Indian Restaurant	Thai Restaurant	Beer Bar	Eastern European Restaurant	French Restaurant
29	Areeiro	4	Portuguese Restaurant	Asian Restaurant	Italian Restaurant	Chinese Restaurant	Restaurant	Pizza Place	Wine Bar	Eastern European Restaurant	French Restaurant	Food Truck
98	Belém	4	Portuguese Restaurant	Restaurant	Pizza Place	Chinese Restaurant	Fast Food Restaurant	Italian Restaurant	Japanese Restaurant	Juice Bar	Mediterranean Restaurant	French Restaurant
193	Estrela	4	Portuguese Restaurant	Pizza Place	Vegetarian / Vegan Restaurant	Bar	Japanese Restaurant	Restaurant	French Restaurant	Food Truck	Food Service	Food
322	Penha de França	4	Portuguese Restaurant	Snack Place	Chinese Restaurant	Indian Restaurant	Asian Restaurant	Italian Restaurant	Restaurant	Pizza Place	Middle Eastern Restaurant	Bar
383	Santo António	4	Portuguese Restaurant	Restaurant	Pizza Place	Russian Restaurant	Middle Eastern Restaurant	Italian Restaurant	Japanese Restaurant	Brazilian Restaurant	Himalayan Restaurant	Mediterranean Restaurant

- Based on our initial parameters, we were able to discover the best neighbourhood after various analyzes. Now we're going to review all the analyses completed in this project before and finally come to the conclusions about starting up a business as an entrepreneur.

Discussion section and Conclusions

- One option would be to open a restaurant dedicated to Portuguese food in the Olivais region of cluster 2, because despite the tourist trend being "Portuguese Restaurant", this borough has no competition at this level which makes it stand out as a Portuguese restaurant. On the other hand, it is an area with a considered population of 33788, which allows it not to depend exclusively on tourists, so this region stands out from the rest of cluster 2.
- Another opportunity would be to open, for example, a pizzeria in Santa Clara, cluster 4. Because it has no such venture it is one of the most prominent tourist categories.
- In addition to this I would like to highlight, the reward with the efforts, time and money spent. I believe this course with all the topics covered is well worthy of appreciation.
- This project showed me a practical application to solve the real situation with the use of Data Science tools that have an impact on personal and financial impact.