THE BATTLE OF NEIGHBORHOODS

Best location for a seafood restaurant
in Paris, France

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PROBLEM STATEMENT

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- I will try to find the best place to open a new seafood restaurant in Paris.
- Paris is divided into 20 districts (called "arrondissement" in French). Each of these districts is divided in 4 neighborhoods (called "quartier" in French). Consequently, Paris is divided in 80 neighborhoods.
- The “best place” to open a seafood restaurant can be defined as follows:
  - At least one of the following criteria is met regarding competition:
    - Where there is no or few competition in the seafood restaurant category
    - Where the competition is on another range of price (cheaper or more premium)
    - Where the competition is poorly rated
  - The population density is high enough to have enough clients (I ignore the impact of tourism for the sake of simplicity)
- I will try to answer the following questions:
  1. How many seafood restaurants are there in Paris?
  2. Where are the best seafood restaurants of Paris located?
  3. Where are they located? In which neighborhood / district?
  4. In which neighborhood and/or borough should I open a seafood restaurant?

DATA COLLECTION

DATA ABOUT THE CITY OF PARIS

- I used the Opendata website of Paris in order to obtain:
  - A dataframe with the following data:
    - Number of the neighborhood,
    - Official number of the neighborhood according to a national format,
    - Name of the neighborhood,
    - Number of the district,
    - Area of the neighborhood.
  - A GeoJSON of all the neighborhoods
- I also used the Wikipedia page of the quarters of Paris to obtain the following data:
  - Population of each neighborhood
- Then I merged both dataframes to obtain the data I needed regarding the neighborhoods of Paris.

DATA ABOUT THE RESTAURANTS

- I used Foursquare to obtain the data about the seafood restaurants in Paris.
- I used the "search" method to obtain:
  - the list of restaurants for each neighborhood (based on the coordinates of the center of the neighborhood and a radius of 1500 meters which should cover all the neighborhoods (except part of the 2 forests that are at the West and East extremities of the City and contain few restaurants),
  - for each restaurant, its id, its name and its location.
- Because all the neighborhoods have different sizes and I use only one radius, I had to remove duplicates and check in which neighborhood belong each restaurant. I was able to perform this last step by using the GeoJSON obtained previously.

METHODOLOGY

DATA VISUALIZATION AND ANALYSIS REGARDING NEIGHBORHOODS OF PARIS

- In order to better understand the neighborhood of Paris, I created:
  - A choropleth map of Paris with the population of each neighborhood to understand where the population is mainly situated,
  - A choropleth map of Paris with the density of each neighborhood to take into account the size of each neighborhood,
  - A scatter plot of the population vs the area per neighborhood,
  - A bar chart of the density of population per neighborhood,
  - A bar chart of the density of population per district.

DATA VISUALIZATION AND ANALYSIS REGARDING RESTAURANTS

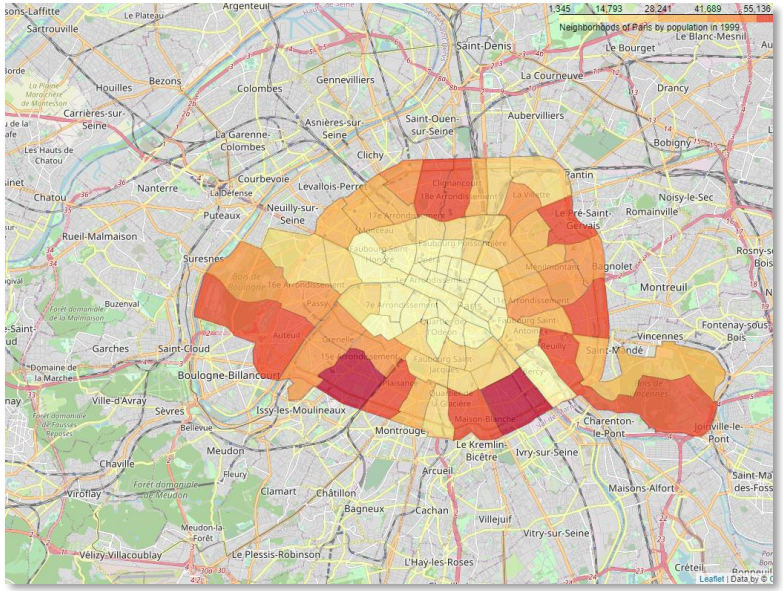
- In order to better understand the location of restaurants, I created:
  - A map of the seafood restaurants to see their location,
  - A bar chart of the number of seafood restaurants per neighborhood,
  - A bar chart of the number of seafood restaurants per neighborhood and per million inhabitant,
  - A bar chart of the population for the neighborhoods without seafood restaurant,
  - A map representing the rating, the price and whether seafood restaurant is their primary category for each seafood restaurant,
  - A scatter plot of price vs. rating of seafood restaurants,
  - A bar chart of the average rating of seafood restaurants per neighborhood,
  - A scatter plot of the average rating vs. the number of seafood restaurants of each neighborhood,
  - A bar chart of the average price of seafood restaurants per neighborhood.

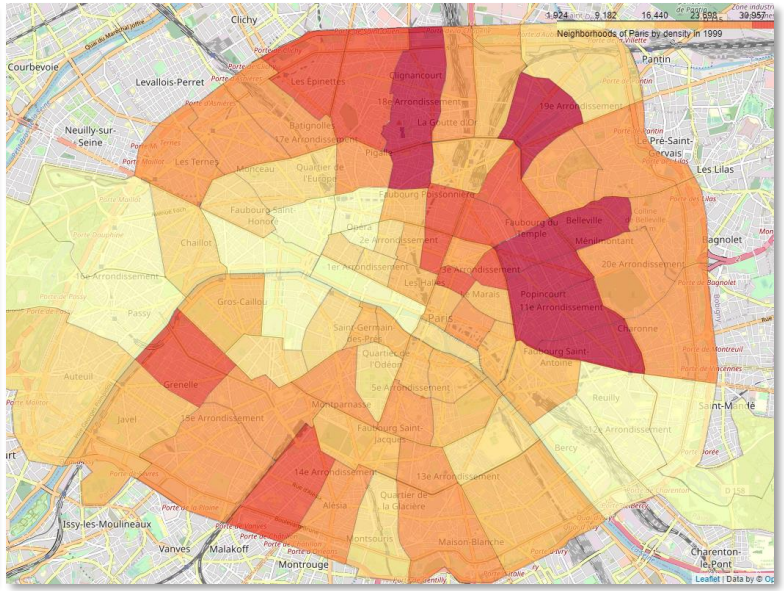
CLUSTERING OF THE RESTAURANTS

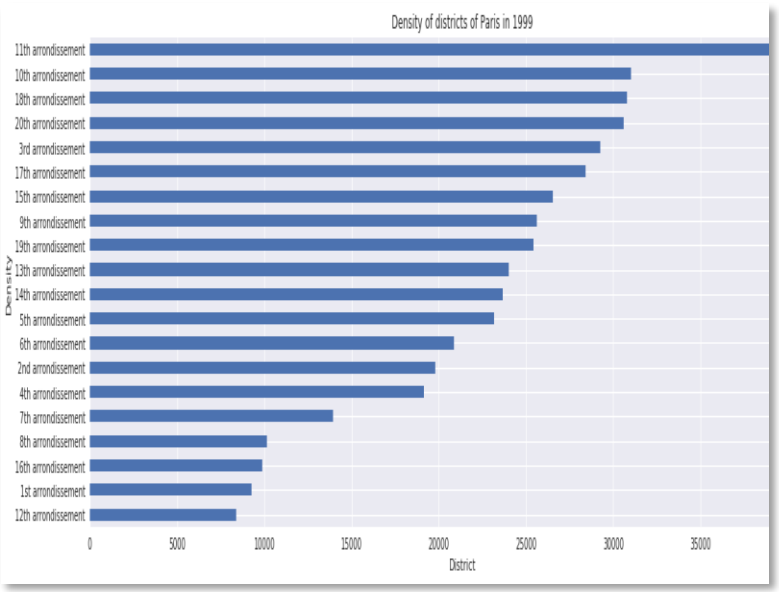
- I clustered the restaurants based on the Density-based spatial clustering of applications with noise (DBSCAN) algorithm.
- The main reasons why I chose this clustering algorithm are:
  - It can find clusters of arbitrary shapes,
  - It is robust to outliers and we may have many outliers in our data,
  - Compared to k-Means, we do not need to specify the number of clusters.
- The best results were obtained with:
  - epsilon = 0.3
  - Minimum sample size of 5
  - Clustering based on latitude, longitude, price and rating
- Nevertheless, it showed lots of outliers so I decided to also cluster the restaurants with the k-Means method and the best results were obtained with 5 clusters.

RESULTS

DATA VISUALIZATION AND ANALYSIS OF NEIGHBORHOODS OF PARIS





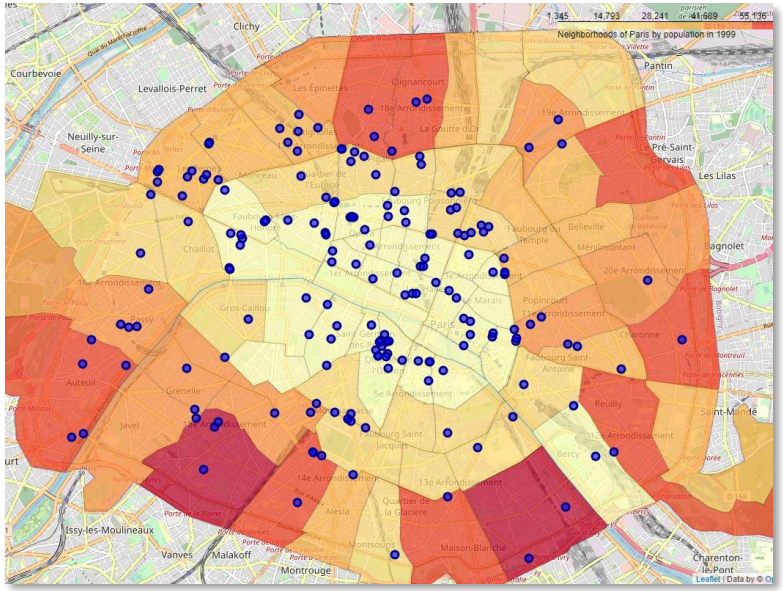


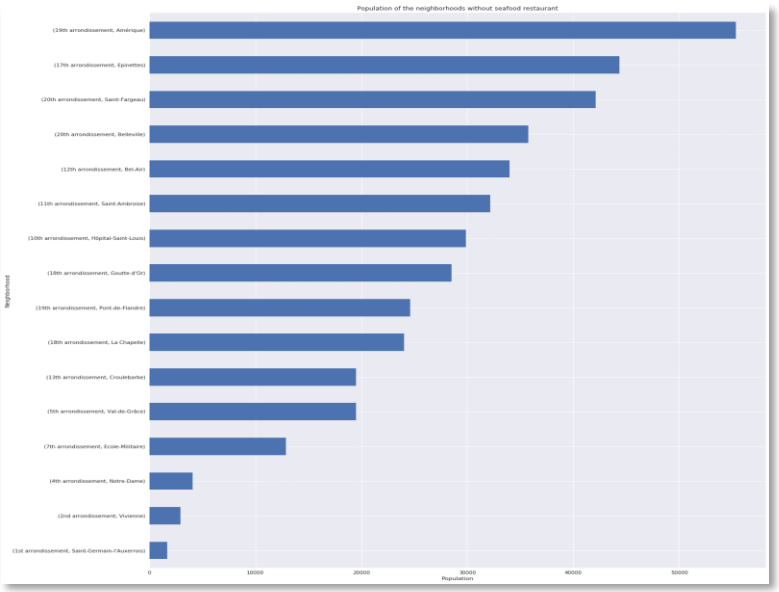
The population of Paris (in number) is mainly situated in the outside part of the city

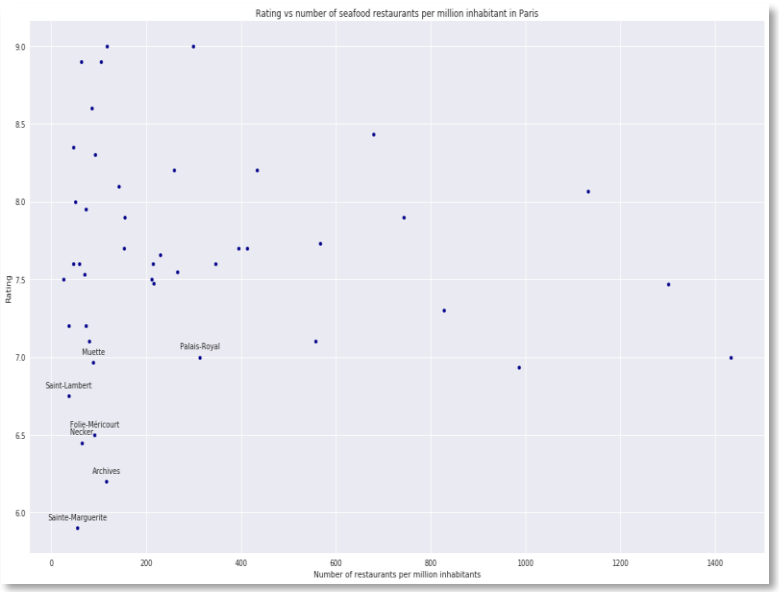
The population of Paris (in density) is mainly situated in the North of the city

11th arrondissement is the most dense

DATA VISUALIZATION AND ANALYSIS REGARDING RESTAURANTS



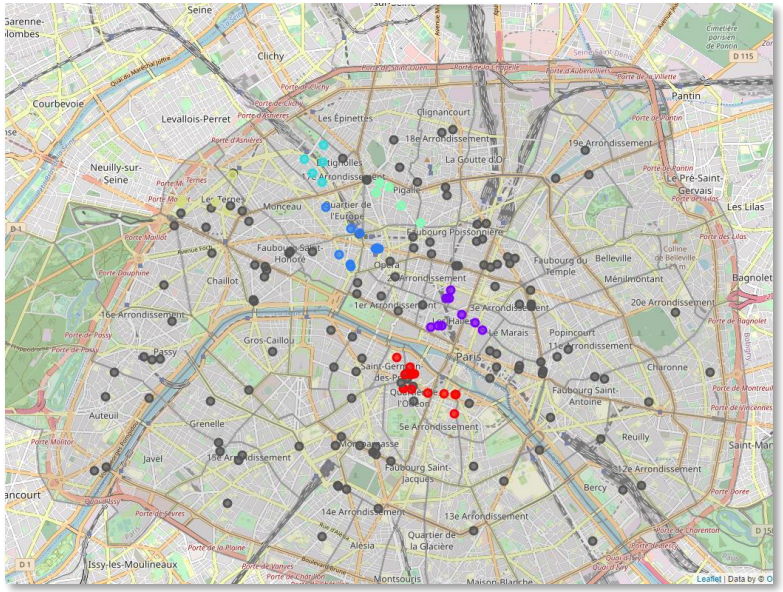




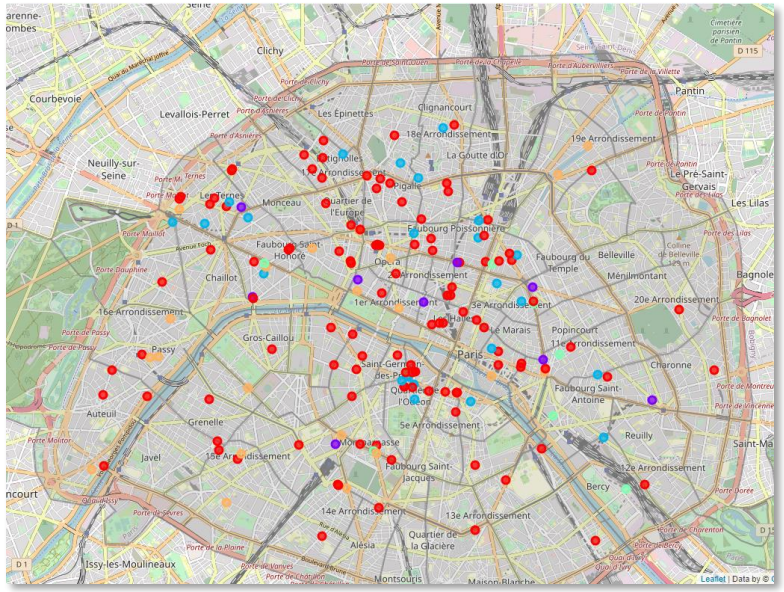
180 seafood restaurants with a high density in the center and West of the City

16 neighborhoods without seafood restaurants, mainly in 19th and 20th arrondissements

Some seafood restaurants are poorly rated in neighborhoods with few seafood restaurants, such as in the 11th arrondissement



DB Scan clustering
Not conclusive



K-Means clustering

DISCUSSIONS

DISCUSSIONS (1/3)

- Neighborhoods with no competition
  - 16 neighborhoods (out of 80, ie. 20%) do not have a single seafood restaurants. Consequently, I could open my new restaurant in one of these.
  - In particular, the following neighborhoods have a high population but no seafood restaurant:
    - Amériques (19th arrondissement)
    - Épinettes (17th arrondissement)
    - Saint-Fargeau (20th arrondissement)
    - Belleville (20th arrondissement)
    - Bel-Air (12th arrondissement)
  - Nevertheless, a further analysis of the typology of the population would be necessary in order to understand the reason why there are no seafood restaurants: seafood restaurants too expensive for this population, this population is not interested in seafood restaurants, business neighborhood, absence of tourists…

DISCUSSIONS (2/3)

- Neighborhoods with poor competition
  - The following neighborhoods evidenced the presence of poorly rated seafood restaurants:
    - Sainte-Marguerite (11th arrondissement)
    - Archives (3rd arrondissement)
    - Necker (15th arrondissement)
    - Folie-Méricourt (11th arrondissement)
    - Saint-Lambert (15th arrondissement)
  - We can see that the 11th arrondissement and 15th arrondissement seem to concentrate seafood restaurants of poor quality.
  - In addition, 11th arrondissement is close to 19th and 20th arrondissement which are districts with few restaurants as we saw in the option 1.
  - Finally, 11th arrondissement is the most dense of Paris.

DISCUSSIONS (3/3)

- Differenciation
  - All the seafood restaurants of Paris have “seafood restaurant” as their primary category. Consequently, one way of differenciating could be to open a restaurant which is not only a seafood restaurant in order to welcome guests that do not like seafood and want to accompany people who want to eat seafood.
  - With the k-Means method, we can see that 2 out of the 9 restaurants of Cluster 1 (expensive price, low rating) and only 1 of the 22 restaurants of Cluster 2 (expensive price, high rating) are situated in the 11th arrondissement.

CONCLUSION

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- Let's try to answer the 4 questions of the Problem Statement:

1. How many seafood restaurants are there in Paris?
   - There are 180 seafood restaurants in Paris.
2. Where are they located? In which neighborhood / district?
   - See the maps above.
3. Where are the best seafood restaurants of Paris located?
   - The best restaurants are the one of the Cluster 2 defined by the k-Means algorithm (the ones in blue). They are mainly situated in the 6th, 17th and 18th arrondissements.
4. In which neighborhood and/or borough should I open a seafood restaurant?
   - All the neighborhoods of 11th arrondissements seem to be a good fit as there are few restaurants and they are poorly noted. In addition, the district is close to the 19th and 20th arrondissement in which there are few to no seafood restaurant.