Paris Restaurant Analysis

Oscar Bourat

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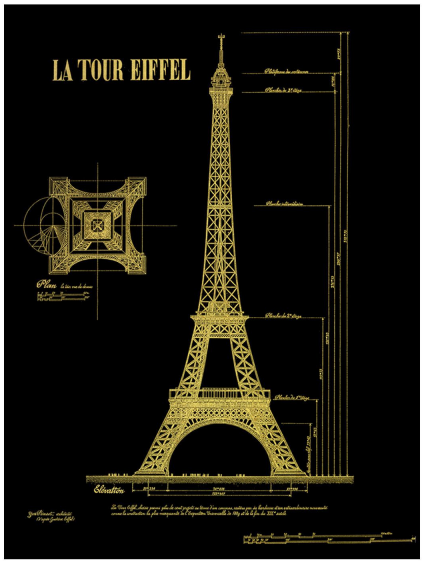

Introduction

France is definitively the country of food and drinks.

Having lived in Paris for a big part of my life, I somehow realized that each neighborhood have a singularity regarding food. Each neighborhood has a diverse range of cuisine from all around the world, but it seems that some neighborhoods are more keen to have a particular type of cuisine than others.

Thinking about this, it raises some interesting questions for someone that wants to open a food business:

- What are the more and less common specialities of food in the city of Paris ?

- What is each neighborhood food "speciality" and why ? Can we find some clusters and patterns ?

- When opening a restaurant, in which area should we open this new business depending on the type of food ? Can we find the best location for each type of food ?

We are going to look for answers to these questions in this analysis.

This analysis is aimed for new investors who want to open their first restaurant or a new business in Paris. It can give them better knowledge about the food diversity in the city and help them find the best location in order to make their investment successful and maximize the chance of profitability of their future businesses.

Data

The city of Paris is basically segmented into 20 districts that each has a postal code going from 75001 to 75020. We are first going to use this districts to define our areas of analysis and see if we can correctly map the city this way. We are also going to use open data that we can find on the web to see the more convenient way to conduct our analysis. We are going to adapt our approach to maximize the meaning of our results.

- The coordinates of each district will first be obtained using the **pgeocode** library, which is easy to use and return coordinates of the location with a postal code as input

- Depending of the results, we also have a detailed official dataset of Paris neighborhoods coming from the website **Paris Data** which contains official datasets regarding the city

- The information about restaurants such as name, location and type of food will be obtained with the **Foursquare API** and loaded in **Pandas** dataframes to conduct further analysis

- For each neighborhood we will be getting the list of restaurants in a 1000m radius and conduct analysis on this data to define the particularities of each neighborhood regarding food preferences. We will try to find the best locations for our restaurant using K-Neighbors clustering with **Numpy** and **Scikit Learn**

Methodology

Neighborhoods locations

Let's start with a first approach by defining a dataframe which each row containing the data about the district name and the postal code (Paris has 20 district going from postal code 75001 to 75020). Using pgeocode, we get the latitude and longitude of each postal code and append it to the dataframe.

	District	Postal Code	Latitude	Longitude
0	District 1	75001	48.8592	2.34525
1	District 2	75002	48.8655	2.34570
2	District 3	75003	48.8637	2.35515
3	District 4	75004	48.8601	2.34975
4	District 5	75005	48.8448	2.34795

***Figure 1**: Postal code dataframe*

Now we get the coordinates of Paris using Geolocator, and plot the coordinates of our district using Folium :

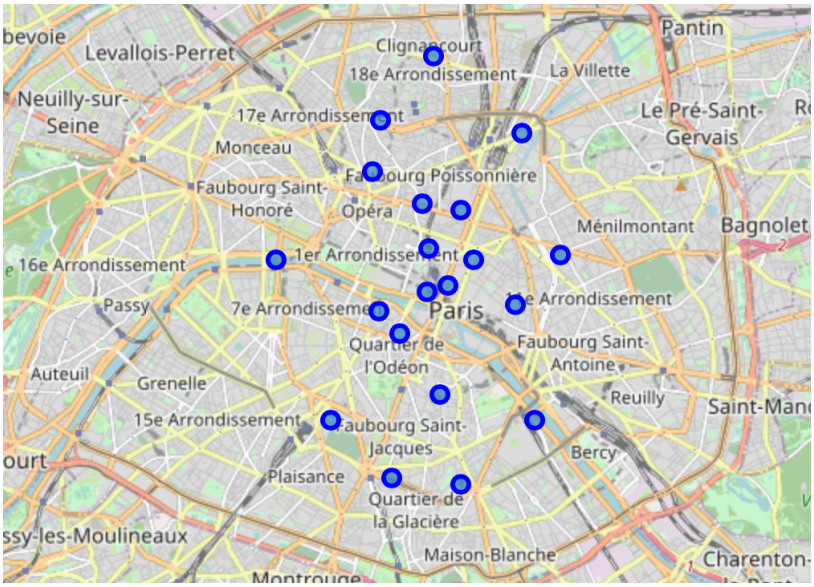

***Figure 2**: Map of postal codes*

As we can see on the map, we have two problems here:

- We don't have enough data points to cover the entire Paris area
- Those points are not equally distributed around the map

Therefore, we will need to consider other options to correctly map our Paris neighborhoods.

Luckily, the city of Paris has a website "Paris data" (link) that contains a public dataset of all administrative neighborhoods of Paris with all the information we need. We import the file and create a dataset with this data:

	Neighborhood Number	Neighborhood Name	District	Perimeter	Surface	Geometry	Latitude	Longitude
0	15.0	Arsenal	4.0	2878.559656	4.872649e+05	{"type": "Polygon", "coordinates": [[[2.368512...	48.851585175	2.36476795387
1	18.0	Jardin-des-Plantes	5.0	4052.729521	7.983894e+05	{"type": "Polygon", "coordinates": [[[2.364561...	48.8419401934	2.35689388962
2	39.0	Porte-Saint-Martin	10.0	3245.891413	6.090347e+05	{"type": "Polygon", "coordinates": [[[2.363917...	48.8712446509	2.36150364735
3	43.0	Roquette	11.0	4973.010557	1.172087e+06	{"type": "Polygon", "coordinates": [[[2.379720...	48.8570640408	2.38036406173
4	46.0	Picpus	12.0	18261.910318	7.205014e+06	{"type": "Polygon", "coordinates": [[[2.411249...	48.8303592424	2.42882681508

***Figure 3**: Neighborhood dataframe*

If we visualize our neighborhoods on the map, we have a much complete set of 80 neighborhoods covering the entire area of the city. We will use these locations to conduct our analysis :

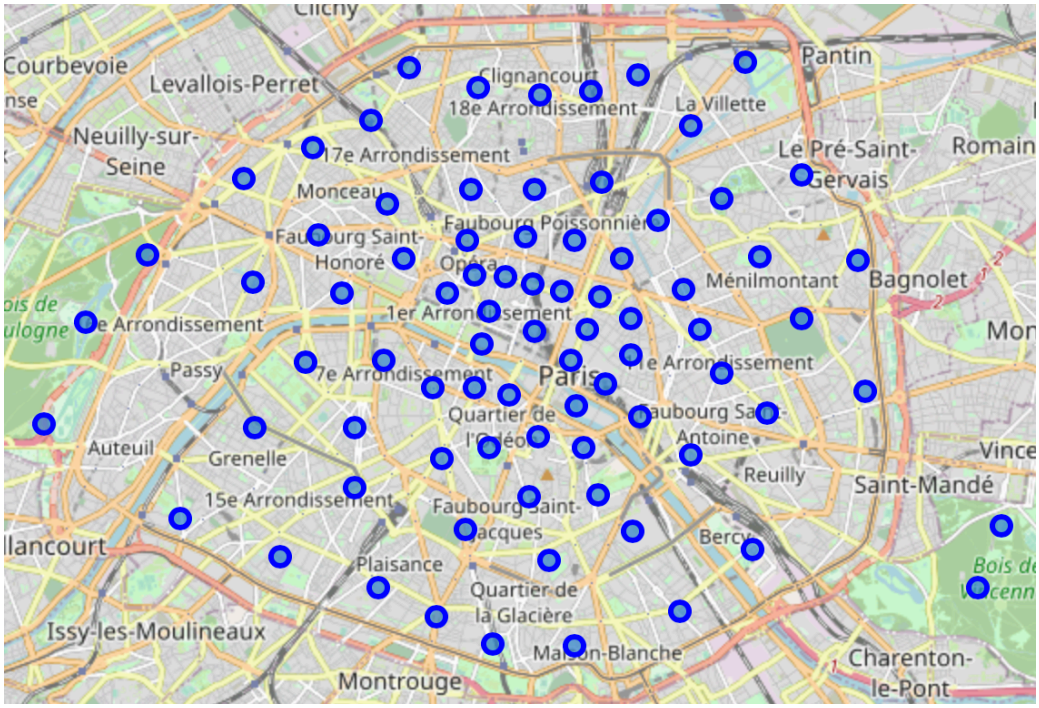

***Figure 4**: Neighborhood map*

Aggregation Analysis

Getting restaurant data

For each neighborhood we are making a request using the foursquare API to get the list of Venues in a radius of 1000m. We then remove duplicates and filter our list of values to eliminate the businesses that we are not interested in. The list contains the following :
'Shop', 'Supermarket', 'Room', 'Bar', 'Store', 'Café', 'Coffee', 'Tea', 'Bakery', 'Grocery', 'Hotel', 'Cocktail', 'Pub', 'Club', 'Lounge', 'Butcher', 'Boutique', 'Bookstore', 'Playground', 'Other Nightlife', 'Deli / Bodega'

We eliminate as well 'Restaurant' since it is a general term and doesn't give us particularity of such restaurants. After filtering we have a data dataframe with a list of 90 restaurant categories on which we can run our analysis.

Aggregation analysis results

categories	count
French Restaurant	175
Fast Food Restaurant	61
Italian Restaurant	54
Japanese Restaurant	36
Chinese Restaurant	27

***Figure 5**: Most common type of restaurants in Paris*

We can observe that the five most common types of restaurants in Paris are French Restaurants, Fast Foods, Italian Restaurant, Japanese Restaurant and Chinese.

There is a lot of Italian restaurant as well as Chinese and fast food, which is quite common in big cities around the world, but what is interesting here is the huge popularity of Japanese restaurants, which is not really common in other cities. It is really a particularity of Paris where Japanese culture and food is really popular. We could maybe compare this trend to Indian restaurants in London which are also really popular there.

Let's see the least common type of restaurants in the capital to see what we can find out as well :

categories			
Tapas Restaurant	1		
Scandinavian Restaurant	1	Malay Restaurant	1
Soba Restaurant	1	New American Restaurant	1
Cantonese Restaurant	1	Falafel Restaurant	1
Caucasian Restaurant	1	Persian Restaurant	1
Tibetan Restaurant	1	Ethiopian Restaurant	1
Szechuan Restaurant	1	Provençal Restaurant	1
Cambodian Restaurant	1	Dim Sum Restaurant	1
Syrian Restaurant	1		
Modern European Restaurant	1		
Alsatian Restaurant	1		
Gluten-free Restaurant	1		
Kurdish Restaurant	1		

Figure 6: Least common types of restaurants in Paris

We can see that least common restaurants are most of the type specific regional restaurants that are not largely known (Tibetan, Kurdish, Malay, Dim Sum, Corsican, Provencal, Caucasian, Shanxi...) but there are also some surprising observations that we can make.

It seems that eastern European and northern countries food are not well represented and thus, not very popular compared to Mediterranean food which is much more present. In general, there seem to be a bigger audience for Mediterranean, Asian and American food than these categories.

Now it should be interesting to see the most common type of restaurant in each neighborhood. Maybe we can learn something valuable as well.

Neighborhood Analysis

Let's group our restaurants by neighborhoods and visualize the most popular type of restaurant for each neighborhood. We regenerate our dataframe assigning the restaurant to each neighborhood. We assign each type of restaurant as category and a color and we plot the result using Folium.

ɪrhood umber	Neighborhood Name	District	Perimeter	Surface	Geometry	Latitude	Longitude	pop_rest	rest_num
15.0	Arsenal	4.0	2878.559656	4.872649e+05	{"type": "Polygon", "coordinates": [[[2.368512...	48.851585175	2.36476795387	French Restaurant	3
18.0	Jardin-des-Plantes	5.0	4052.729521	7.983894e+05	{"type": "Polygon", "coordinates": [[[2.364561...	48.8419401934	2.35689388962	French Restaurant	5
39.0	Porte-Saint-Martin	10.0	3245.891413	6.090347e+05	{"type": "Polygon", "coordinates": [[[2.363917...	48.8712446509	2.36150364735	Burger Joint	3
43.0	Roquette	11.0	4973.010557	1.172087e+06	{"type": "Polygon", "coordinates": [[[2.379720...	48.8570640408	2.38036406173	French Restaurant	5
46.0	Picpus	12.0	18261.910318	7.205014e+06	{"type": "Polygon", "coordinates": [[[2.411249...	48.8303592424	2.42882681508	French Restaurant	3

Figure 7: *Updated dataframe with most popular restaurant type in each neighborhood*

Neighborhood Analysis results

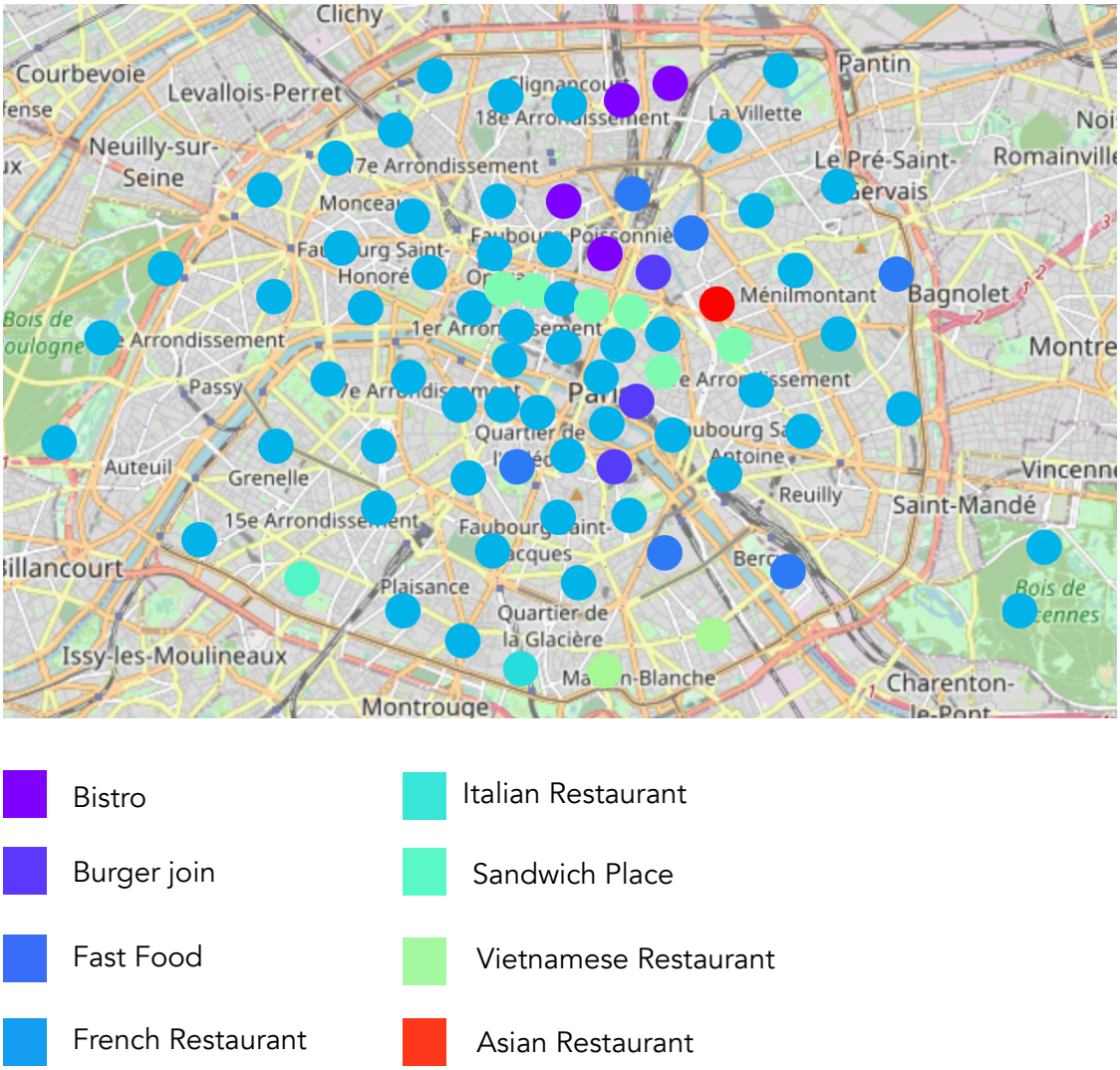

***Figure 8**: Most popular type of restaurant in each neighborhood*

We can make the following observations:

- Fairly enough, most of the neighborhoods have French restaurant as their most common type of restaurant. Especially left shore of Paris where almost every neighborhood most common restaurant is **French restaurant**, which exceptions of **Odéon**, **Salpêtrière** and **Saint Victor** which are student areas and thus where **Fast Food** and **Burger Joins** are more popular and **Maison-Blanche** where Vietnamese is the most popular thanks to Vietnamese communities living in this neighborhoods

- Right shore seems more diverse and gives room to other type of food

- **Asian restaurants** are the most popular around **Folie Méricourt**

- **Sandwich places** seem to be the most popular on the right shore in the historical center of the city. It is common for Parisian workers to take a sandwich at lunch when in a hurry. It seems that this type of restaurant is really popular in the first 5 districts but not so much in other parts of the city, where the classical french restaurant is more frequent there

- **Italian restaurants** and **Japanese restaurants** are really popular but never the more frequent in any district
- **Vietnamese restaurants** are the most popular in the 13th district around Maison Blanche. There is in fact a big community of Vietnamese people in this area of the city.

Now that we see French restaurant takes a big part of the city. If we drop french restaurants from the list in our analysis, we can also come up to more meaningful results regarding food diversity :

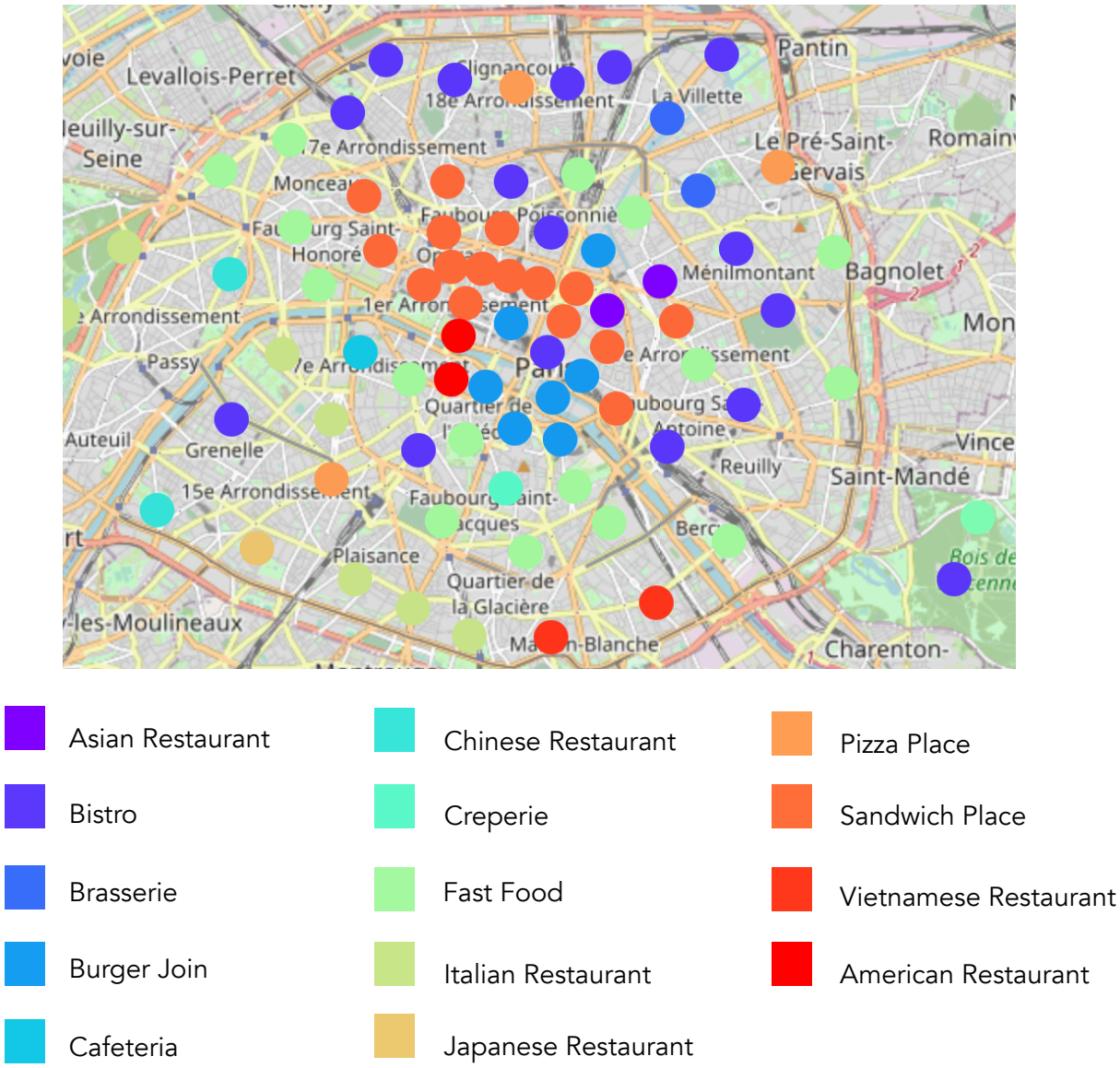

***Figure 9**: Most popular type of restaurant in each neighborhood (French restaurant excluded)*

Now we clearly have additional clusters to analyze on which we can base our choice to see the trends of each food type in different Paris neighborhoods:

- **Sandwich places** are really popular on right shore in historical districts (1,2,3,11,17)
- **Burger Joins** are popular among student districts (4,5,6)
- **American restaurants** are popular around the seine (1,5)
- **Asian** and **Fast Foods** are more popular in peripheral districts (8,10,12,13,17,20)
- **Italian** restaurants are the most popular on left shore in center as well as peripheral areas. This corresponds to the latin district of Paris (7,14, 16, 18, 19)
- **Vietnamese** restaurants are the most popular in the south of the city (13)
- **Chinese** restaurants are more popular in the west of the city (15, 16)
- **Japanese** restaurants are particularly popular in the 15th district

Now we have a better understanding of the specificity of Paris and the food particularity of each neighborhood. We can use this knowledge to find the best locations for our new restaurant.

Location Analysis

Let's find the best possible location for each of the first five more popular type of food. We start by creating a heatmap with the location of all our restaurants, to see the density of restaurant in Paris :

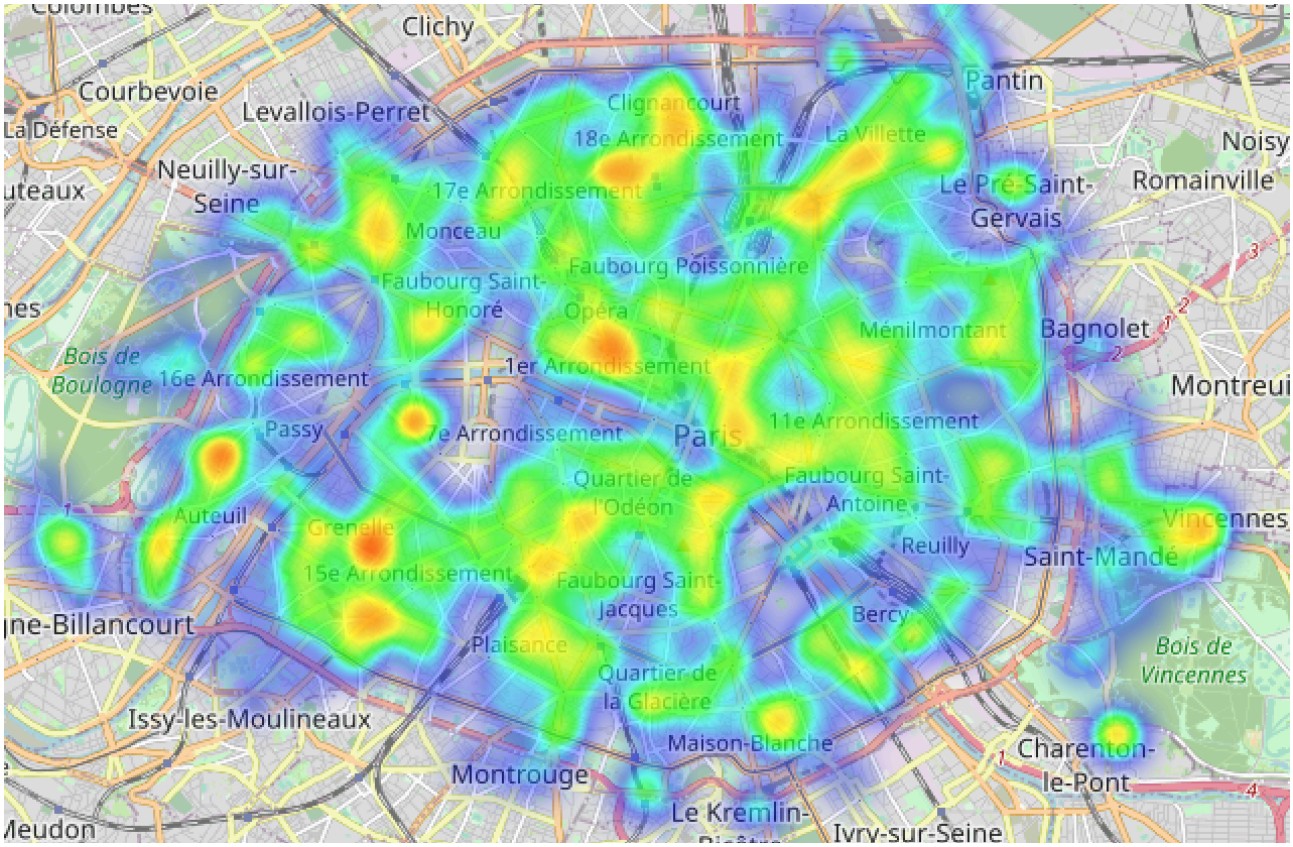

***Figure 10**: Heatmap of restaurant density*

We can see the highest density of restaurants is around **Opera** and the 1st district, the 2th around **Les Halles**, around **Grenelle** in the 15th district. We also have clusters around **Odeon**, **Clignancourt** and the 18th, **La Villette**, **Auteuil** and **Vincennes**.

We can see as well that there is a low density around **Invalides**, because there is a military reserve in this area, as well as the **Champ de Mars** with the **Tour Eiffel**, so not much space for restaurants actually. Around **Bercy** we have concert halls an national monuments so a lack of space as well.

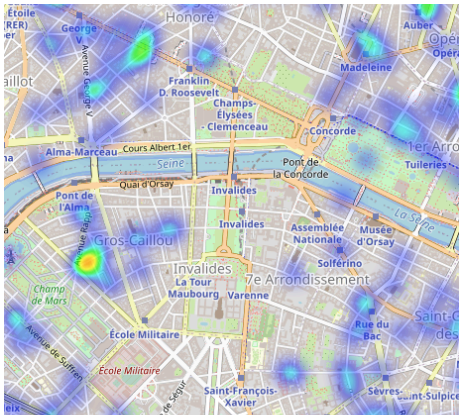

***Figure 11**: Heatmap of Invalides area*

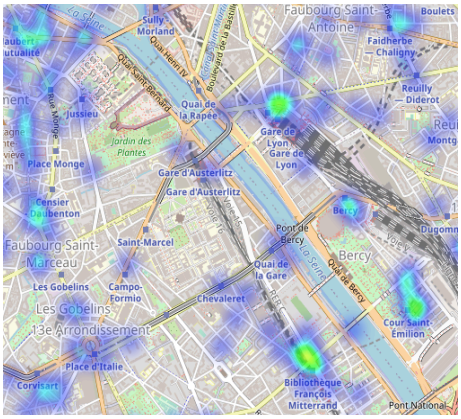

***Figure 12:** Heatmap of Bercy area*

Let's map the locations of each type of restaurants in our heat-map and analyze our results :

French restaurant results

Let's find the best location for a french restaurant. We start to map our restaurants on the heat-map to see what we can find :

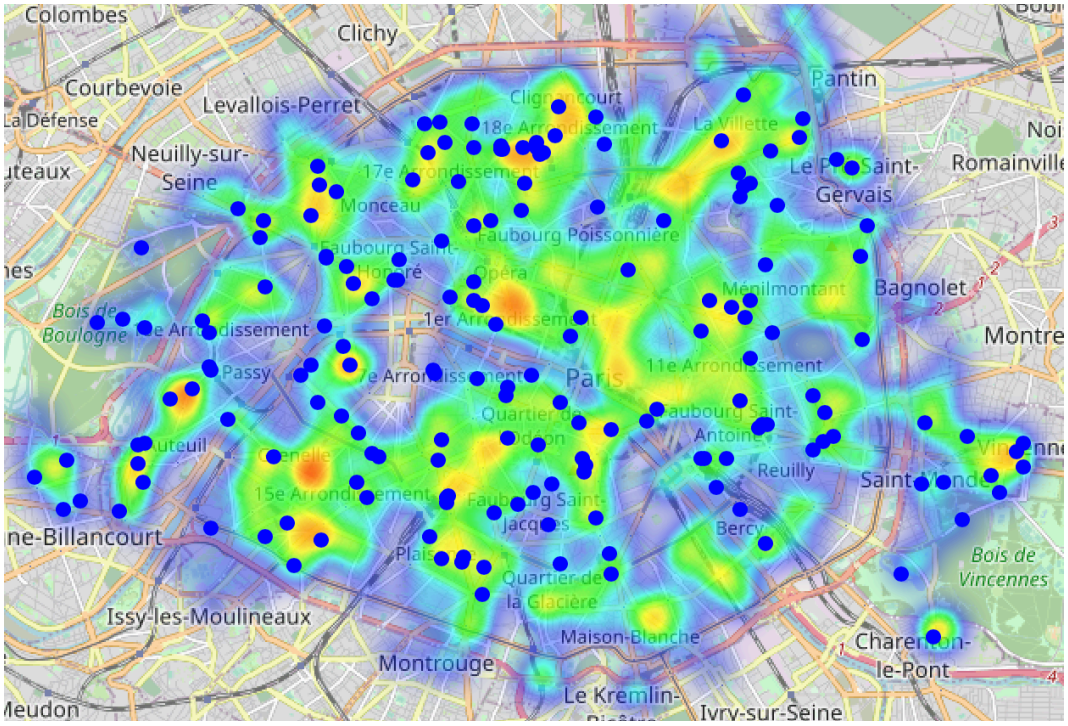

***Figure 13**: French restaurants locations*

French restaurants are common in all Paris area. but there seem to be some room available around the 3rd district as well as **Bercy**. Lets apply k nearest neighbors analysis to define a cluster with our list of french restaurant. Let's calculate the distance of each 80 neighborhoods in our list. The highest distances would be the best candidates for our new restaurant in the city.

	Distance	Neighborhood
73	0.014391	Gare
58	0.012660	La Chapelle
18	0.009647	Salpêtrière
63	0.009551	Vivienne
78	0.009441	Parc-de-Montsouris

***Figure 14**: k nearest neighbors*
French restaurants best locations

The five best locations are mostly peripheral areas with Vivienne being an exception.
Let's focus on the promising first result with the highest distance, the neighborhood **Gare** around the **bibliothèque François Mitterrand**, to define our area:

***Figure 15**: Best French restaurant location*

Looks like a fine location for a french restaurant would be around **Rue de Patay** or **Rue Nationale**. If we try to analyse the results, this area is not already covered because bibliothèque François Mitterrand is a student area with sandwich places as well as fast food, if we refer to our previous neighborhood analysis. There is also companies offices in this area, as well as residential neighborhoods, so we should benefit from all these various potential clients if we open our business here. This is not much a touristic area so we should focus more on classic french bistro food instead of fancy stuff.

We now have a fine perimeter away from other french restaurants that we can prospect on the local adverts.

Let's do this analysis for the four other most popular types of restaurants.

Fast Food results

***Figure 16**: Fast food restaurants locations*

Looks like good areas would be around Ménilmontant, Passy or the 7th district. Let's confirm this with k nearest neighbors analysis :

	Distance	Neighborhood
4	0.018715	Picpus
44	0.018489	Muette
23	0.016154	Invalides
10	0.013309	Ecole-Militaire
53	0.012807	Saint-Germain-l'Auxerrois

***Figure 17**: k nearest neighbors Fast food restaurants best locations*

In contrary from the results of french restaurants, it seems that the best locations are around the city center. This is mainly because fast food is popular on peripheral areas that are in general more popular and thus are more used to eating fast food. Lets focus on Picpus, that seems to be the best candidate for a fast food restaurant :

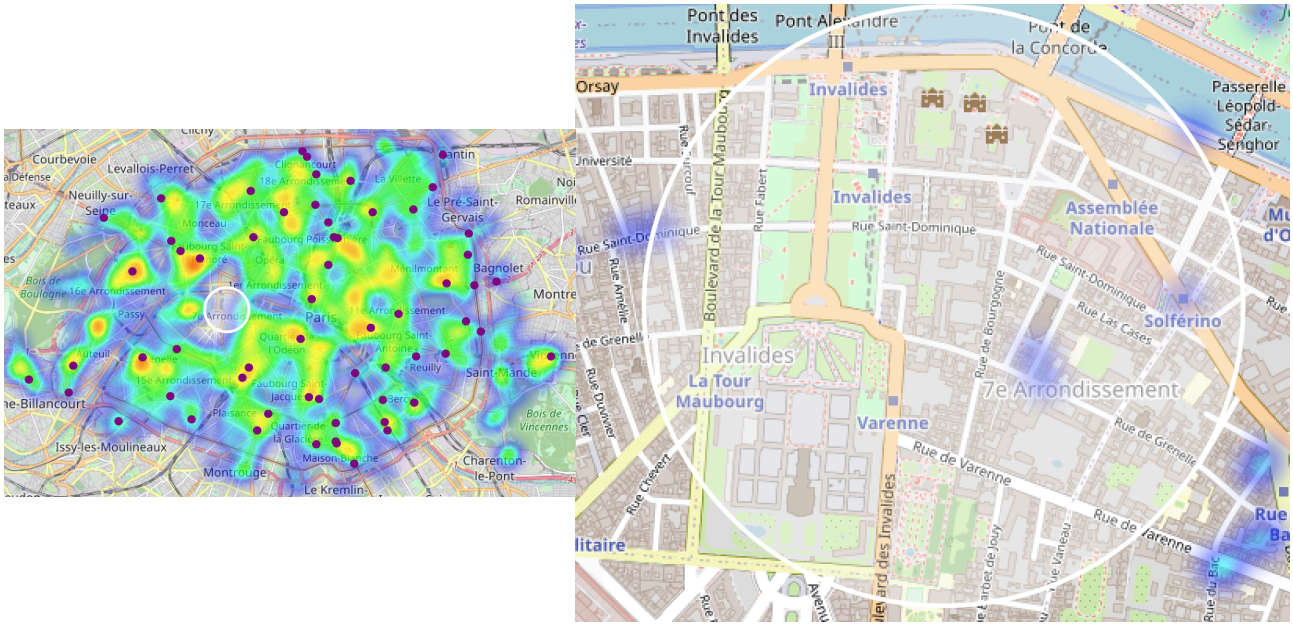

***Figure 18**: Best Fast food restaurant location*

There is not much space for restaurants around Invalides, but if we look at the heatmap, we can see that there are some locations around Solférino that can suit us well. Looks like a fine location for a fast food would be around **Rue de Bourgogne**, **Rue Saint Dominique** or **Rue de Varenne**.
Indeed, Solférino is a student area that should benefit from the opening of a new fast food in the area. In our neighborhood analysis the most common type of food in this area is Cafeterias, so a new fast food should fit well is this environment.
We now have a fine perimeter away from other fast foods that we can prospect on the local adverts.

Italian Restaurant results

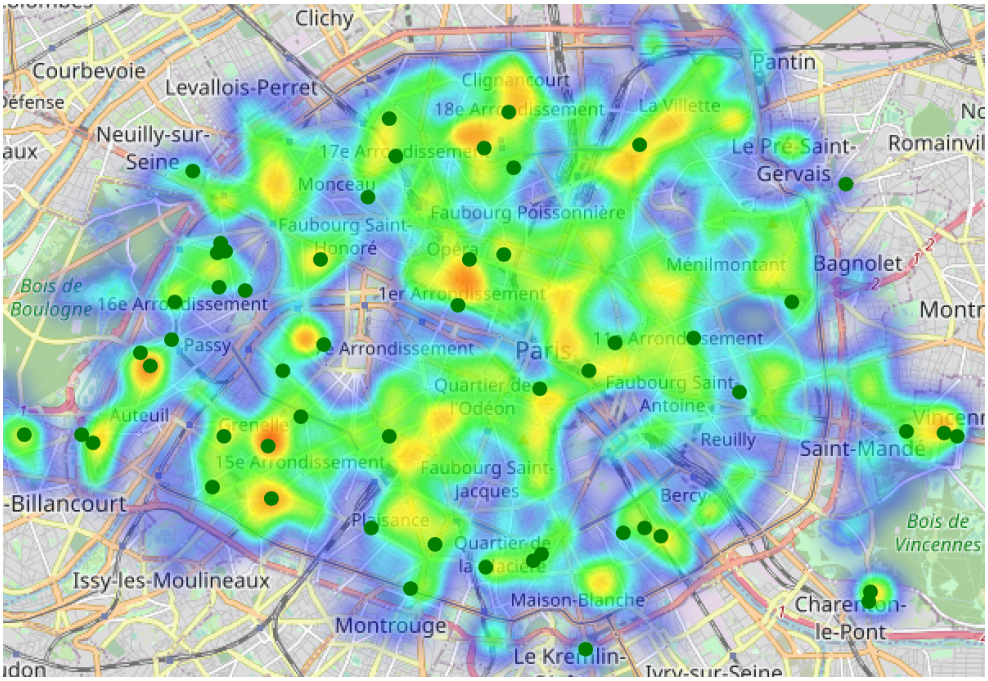

***Figure 19**: Italian restaurants locations*

Good areas would be around **Poissonnière** and **Ménilmontant**. Let's confirm this :

	Distance	Neighborhood
26	0.019558	Amérique
43	0.016836	Pont-de-Flandre
28	0.014871	Odéon
2	0.014371	Porte-Saint-Martin
70	0.013868	Plaine de Monceaux

***Figure 20**: k nearest neighbors*
Italian restaurants best locations

Looks like we mostly have peripheral areas on north east of the city.
Let's focus on Amérique :

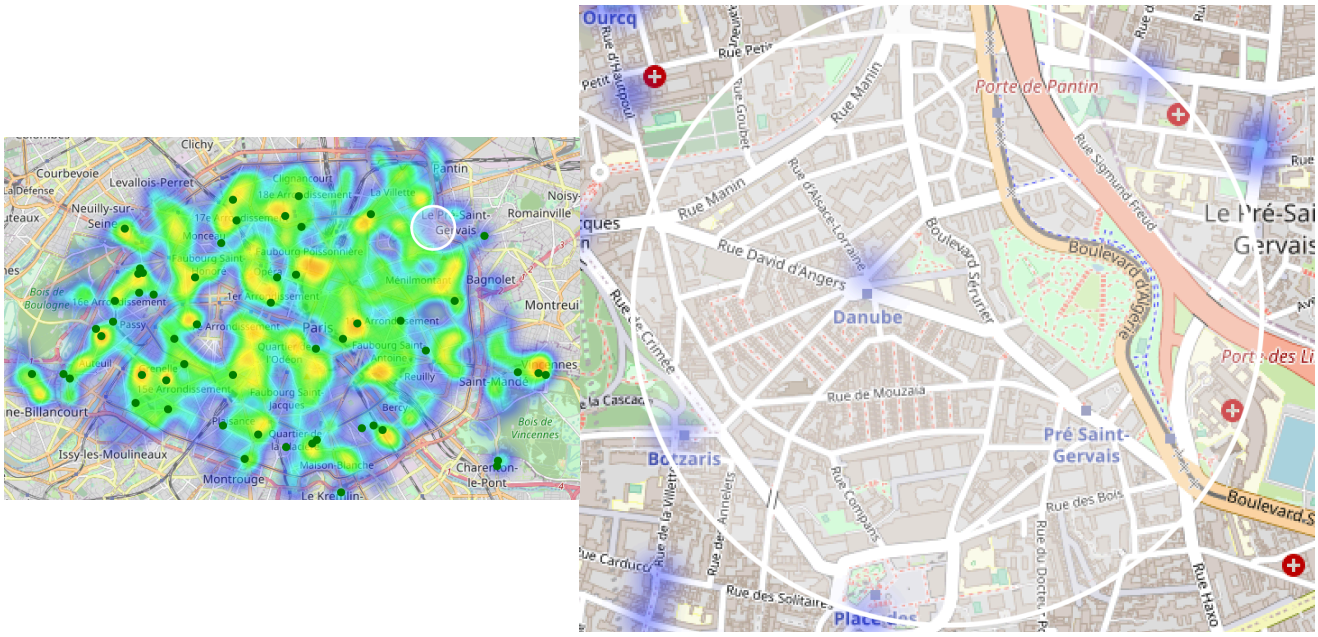

***Figure 21**: Best Italian restaurant location*

Looks like the best location for an Italian restaurant would be around Danube. Probably **Rue de Mouzaka** or **Rue David d'Angers** would be a good pick. This is far from the city center but this area is residential and our business shroud find a good clientele since Italian restaurant is always popular around the city. Moreover, around this area the most popular type of restaurant is Pizza places, so it would be interesting to have a more diverse Italian restaurant that serves specialities from Italy. We now have a great area to search for addresses in the local agencies for our future business.

Japanese Restaurant results

***Figure 22**: Japanese restaurant locations*

It seems like the area around Bastille and Faubourg Saint Antoine would be the best pick for a Japanese restaurant.

K nearest neighbor analysis result :

	Distance	Neighborhood
0	0.026416	Arsenal
46	0.025469	Epinettes
32	0.024916	Saint-Victor
18	0.024148	Salpêtrière
1	0.022164	Jardin-des-Plantes

***Figure 23:** k nearest neighbors Japanese restaurant best locations*

We mostly have areas in the city center. Let's focus on Arsenal:

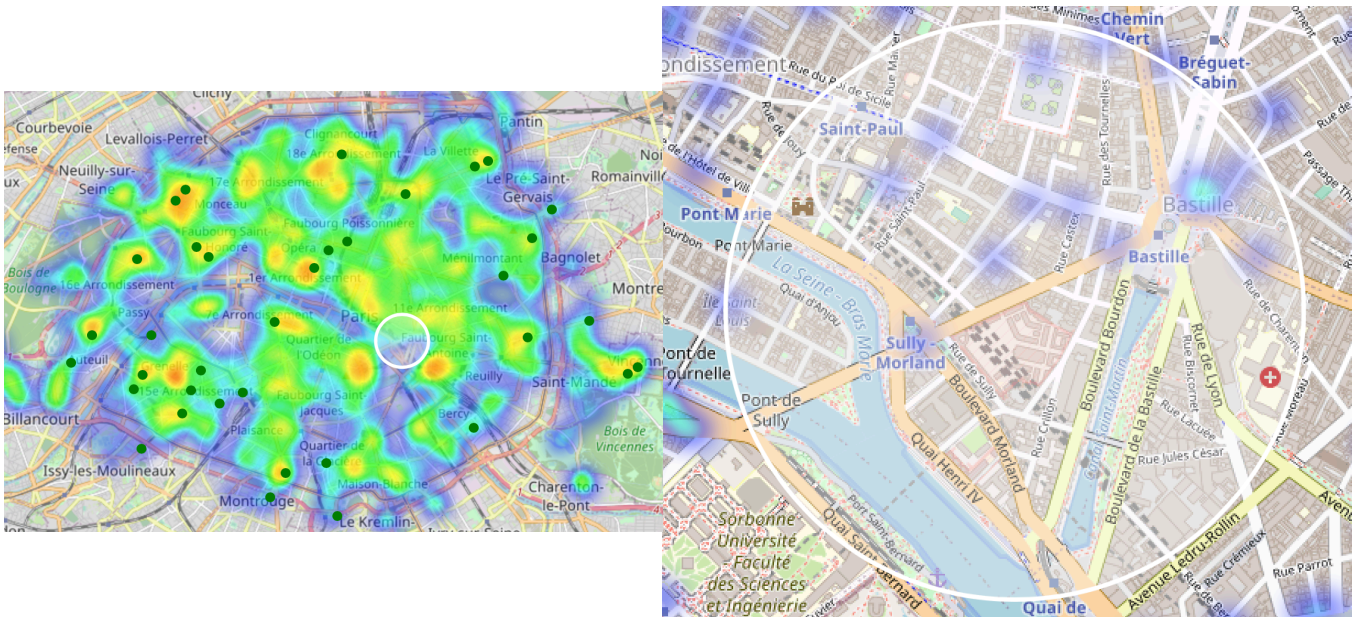

***Figure 24**: Best Japanese restaurant location*

For a Japanese restaurant we should pick a street around Sully-Morland such as **Boulevard Morland** or **Boulevard Bourdon**. Bastille area is a good pick because this area has one of the richest clientele of the city, and Parisians are really into Japanese food, so the clientele should be good without much concurrence.

Chinese Restaurant results

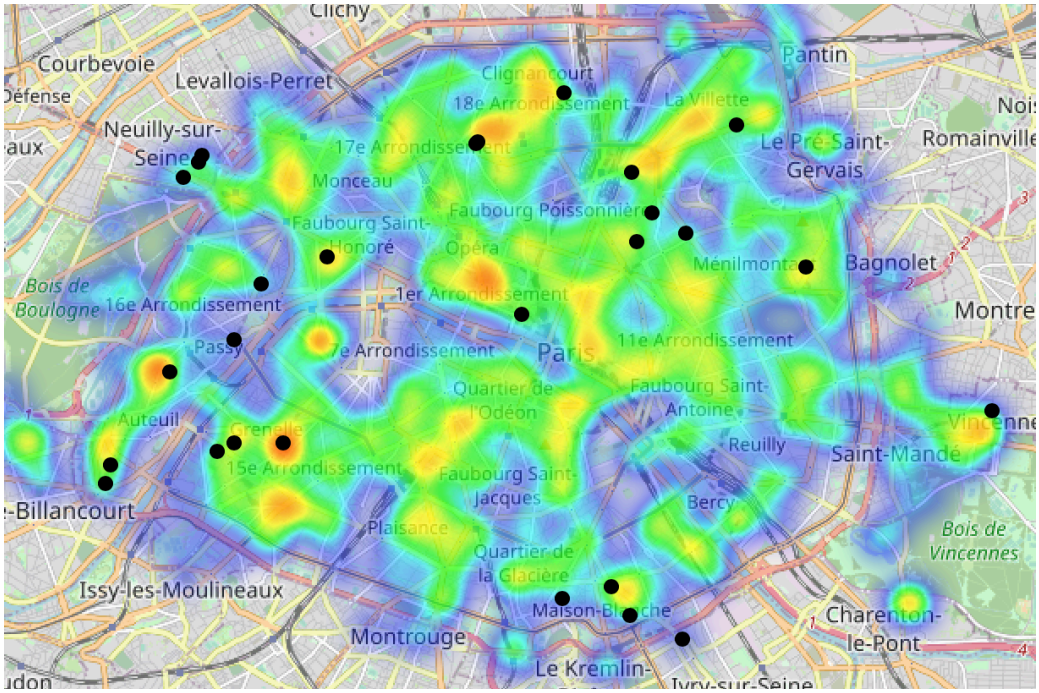

***Figure 25**: Chinese restaurant locations*

Looks like a good location would be around **Odéon** or **Bercy**. Let's run the K nearest neighbor analysis :

	Distance	Neighborhood
5	0.025636	Plaisance
6	0.025452	Quinze-Vingts
42	0.024429	Petit-Montrouge
69	0.023364	Montparnasse
41	0.021430	Notre-Dame-des-Champs

***Figure 26**: k nearest neighbors*
Chinese restaurant best locations

Plaisance is not a neighborhood very interesting because it is far from the city center and is not residential, and we want to maximize our customer base. Let's focus our Analysis on **Quinze-Vingts** that has almost the same score as **Plaisance** in the k nearest neighbor analysis:

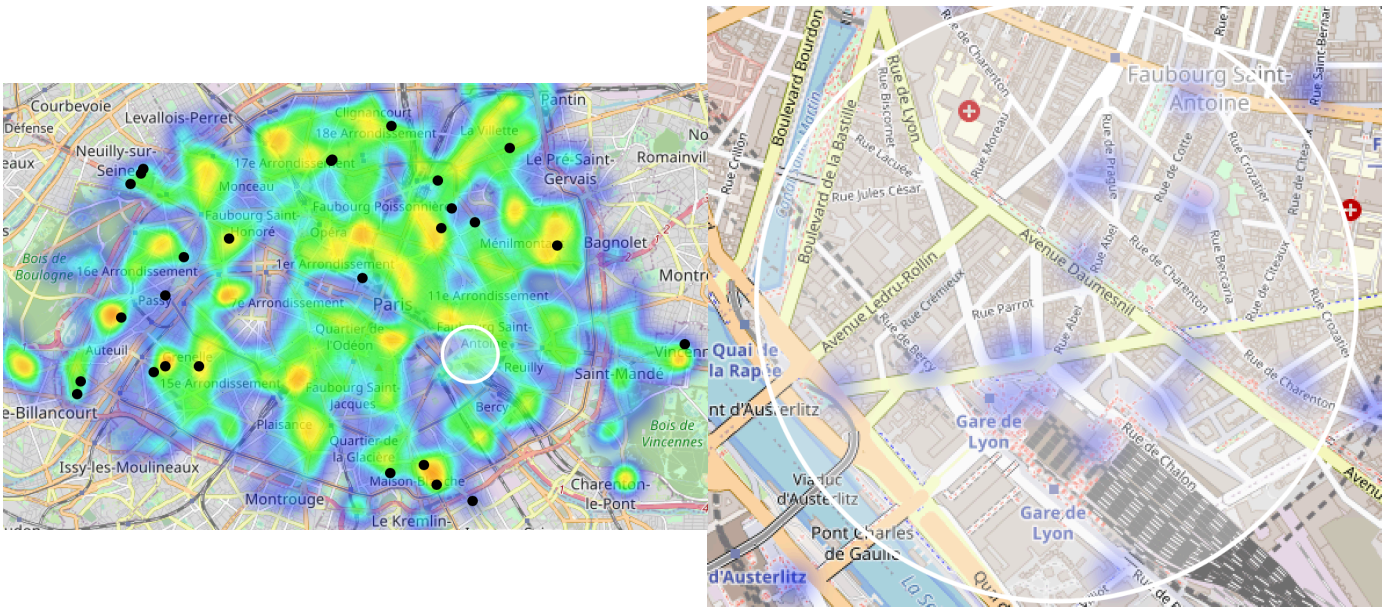

***Figure 27**: Best Chinese restaurant location*

The best location for a Chinese restaurant would be around **Avenue Daumesnil** or **Avenue Ledru-Rollin**. This is a great area because it is residential but there is also a lot of offices nearby, as well as the Gare de Lyon with usually lot of people eating in a restaurant before or after catching a train or between two business meetings. This is why Bistro is the most popular type of restaurant in the area. This neighborhood should benefit from a new Chinese restaurant to add diversity in the area.

Discussion

In our analysis we understood the food diversity in the city of Paris. We first understood the preferences of Parisians regarding food :

- French restaurants are common all around the city and are by far the most popular, by the diversity of the food and the cultural importance of such food.

- Fast foods are also really popular and the second most common type of restaurant. The main reason is because the food is cheap and is popular among students. Fast foods are as well common in every part of the city

- Italian restaurants are very common and popular all around the city but especially on left shore, that corresponds to the latin borough of the city. Rich neighborhoods are particularly fond of Italian food

- Japanese restaurants are the most popular in peripheral areas of the city, but it is a particularity of the city. Indeed, Paris has a huge diversity of Japanese restaurants which is not common for other cities in Europe.

- Chinese restaurants are also popular, but more disparate around the city and more in peripheral areas.

- Particular regional food is the least common which is normal because it speaks to a particular audience that are eager of this food as well as curious people that are willing to try original food and have the money for it.

- Eastern European and northern countries food are not well represented and thus, not very popular compared to Mediterranean food which is much more present. In general, there seem to be a bigger audience for Mediterranean, Asian and American food than these categories. I would recommend to open either a already popular type of restaurant or if the type of restaurant is not common, I would focus more on Mediterranean type of food since it is the most popular and thus the less risky.

There is a reason why neighborhoods contain a greater type of restaurant instead of another. The reason can be cultural, with the presence of communities around the neighborhood. For example, Vietnamese restaurants around Maison Blanche. The reason can also be practical. For instance, there is a huge number of sandwich places around right shore city center. Sandwich places are practical for workers that need a quick meal and also for tourists that need to eat on the go while visiting the city. It is also popular among teenagers and students because it is inexpensive.

If we look at our map, we can see that the most popular type of food around city center is in general consumed quick (Sandwich places, Burger joins, Fast food). This is because the population is very diverse and these type of food have the best appeal among all communities.

To open a new restaurant, we should consider the following approach. All five most popular type of food have the highest probability to be successful on the long term because it pleases to the

highest number of citizens. So to maximize the chance of success we should open one of this restaurant. But where should we consider opening it ?

If we consider opening a very specific type of food that is not the most popular (Vietnamese for instance), we should consider opening it in a neighborhood that is «specialized » in this type of food for different reasons :

- Communities that are interested in this type of food usually live nearby such areas, and therefore the potential public is higher in this areas
- Citizens are aware of the different specialities of each neighborhoods, and if they want this particular type of food they are going to search in this area. For example, if someone wants to eat Vietnamese they might go around Maison Blanche because they will have the best range of options to eat Vietnamese once they go there.

In contrary, if we consider opening a restaurant offering one of the five most popular type of food in Paris, we can realistically consider that these type of food have an appeal to all population in the city center. Therefore we should maximize our potential customer base by opening our restaurant the farthest from other existing restaurants but still around dynamic areas.

Since this analysis is aimed for restaurateurs that want to open their first business and therefore minimize the risk the recommendations would be the following options :

- Opening a **French restaurant** around **bibliothèque Françoise Mitterand**
- Opening a **Fast food restaurant** around **Invalides**
- Opening an **Italian restaurant** around **Danube**
- Opening a **Japanese restaurant** around **Bastille**
- Opening a **Chinese restaurant** around **Gare de Lyon**

Conclusion

In this report we have analyzed the particularities of Paris regarding food consumption and preferences. We tried to understand which are the preferences of each areas and use theses particularities to find the best possible locations to open a new business. Analyzing this data gave us insights about the preferences of Parisians and also helped us understand the cultural specificities of each neighborhood.

We learned which are the more and less common specialities of food in the city and the cultural specificities, and we determined the best location to open a new business for all five most popular type of food in the city.