

Potential Fitness Facility Location in Paris

Applied Data Science Capstone by IBM/Coursera

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Introduction

As society continues to thrive, more and more of people's attention and effort are put into having a healthy lifestyle and taking care of their own body. Like any other big city, Paris has plenty of fitness facilities such as gym, swimming pool, yoga studios across its neighbourhoods, thus the competition for piece of cake in the industry is really high.

This project is aimed to find a proper location for a new fitness facility in the city of Paris. Among other factor, the location of a fitness centre is crucial for its long turn success and the goal of this project is to provide a way to satisfy this need and help those who are interested in entering the industry.

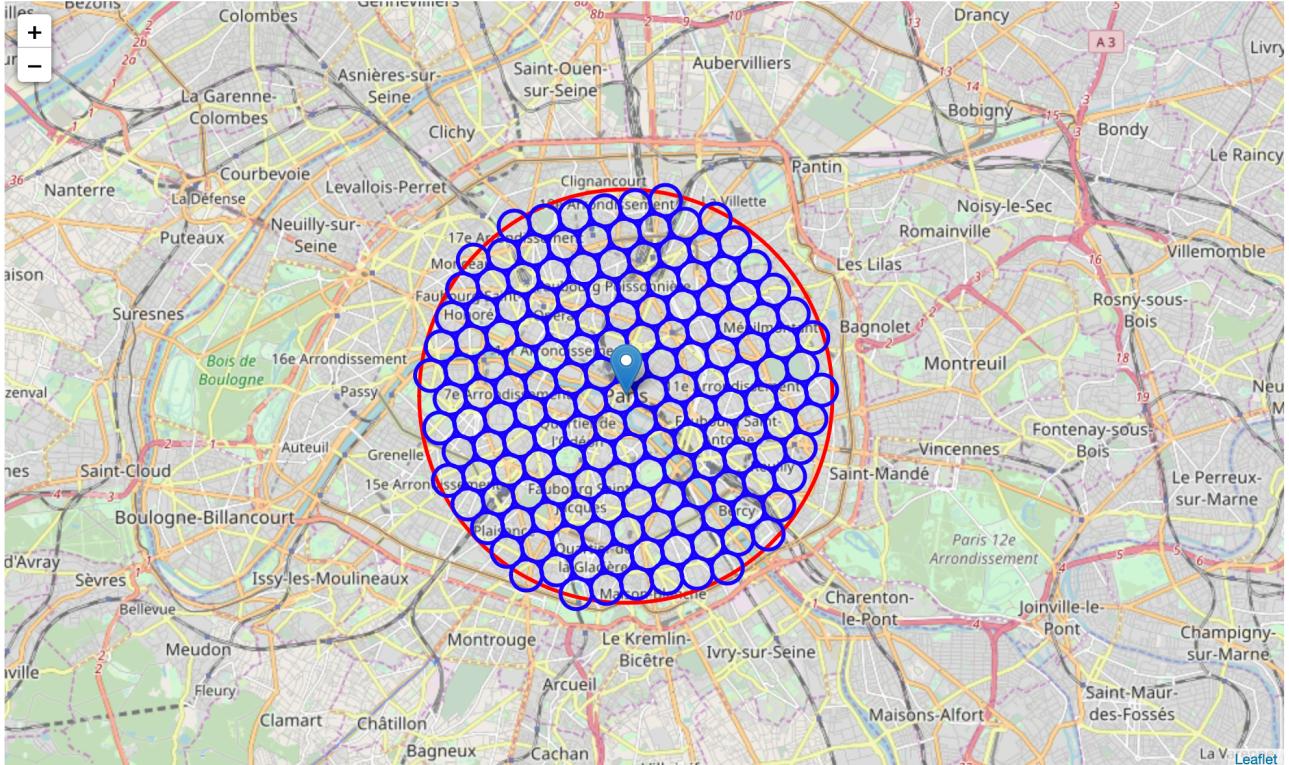
Data

The employed strategy to solve the above-described business problem is to find the areas within a 4 km of distance from the centre of Paris that has the less target venue density. For this, Foursquare Places API was being employed to obtain location, category and name of the fitness venues within the target area.

Given that Foursquare Places API does its searches for a circular area around a given location, the target area of Paris was divided into regularly spaced grids of 300 m of radius so it can be efficiently covered and all its fitness venues information can be obtained. A total of 161 locations were obtained. Geographical coordinates, as well as other information of the 'neighbourhoods' are shown in Tab 1. Their borders are shown in the folium map in Fig 1.

The location coordinates of the centre of Paris, as well as of several other locations in the city were obtained by employing Geocoders Nominatim.

	Neighborhood	Latitude	Longitude	X	Y	Dist_from_center
0	Neighborhood 0	48.822311	2.338401	-428335.065403	5.485502e+06	3973.663297
1	Neighborhood 1	48.823201	2.346376	-427735.065403	5.485502e+06	3772.267223
2	Neighborhood 2	48.824091	2.354352	-427135.065403	5.485502e+06	3659.234893
3	Neighborhood 3	48.824980	2.362328	-426535.065403	5.485502e+06	3642.801120
4	Neighborhood 4	48.825869	2.370304	-425935.065403	5.485502e+06	3724.244890



Tab 1. Geographical coordinates, its projections on a Cartesian 2D plane, as well as the distance from the centre of Paris of the ‘neighbourhoods’ into which the target area of Paris is divide.

Fig 1. Folium map of the target area of Paris, limited by the red circle and divided into circular ‘neighbourhoods’ of 300m of radius.

The next step is to use Foursquare Place API to retrieve target venues for every each location. For this, we first create an URL with user credentials, target venue category id obtained from Foursquare’s website, location coordinates, the area of search(set to be 300m) and the maximum number of venues that we want to obtain for each location, which is set to be 10 given the relatively search radius. Once the URL is created, GET request is used to obtain the venues.

Though a venue category id containing all the sporting facilities was provided. The obtained results still has some other type of venues that does fit our interests. A list that contains all types of fitness related categories is used to filter the results. A total of 384 venues were obtained, Tab 2. shows the first 5 of them.

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Distance	Venue Category
0 Neighborhood 0	48.822311	2.338401	Gymnase Doisneau	48.821612	2.334537	293	Gym / Fitness Center
1 Neighborhood 1	48.823201	2.346376	L'Appart Fitness	48.823928	2.345256	115	Gym / Fitness Center
2 Neighborhood 1	48.823201	2.346376	Les Cercles de la Forme Tolbiac	48.824682	2.348173	210	Gym / Fitness Center
3 Neighborhood 1	48.823201	2.346376	Gym Suedoise Guyton	48.824638	2.348005	199	Gym
4 Neighborhood 2	48.824091	2.354352	Taekwon-Do ITF Paris	48.825147	2.351495	240	Martial Arts Dojo

Tab 2. Information regarding the first 5 fitness-related venues obtained by employing Foursquare Places API. Venue name, category, location information of the venue, as well as about the neighbourhood it belongs to.

Analysis

Visualisation is employed as the main tool to identify proper location for a new fitness centre. In special the folium map. In Fig 2. a folium map of Paris is being presented together with all the venues previously obtained marked as circles.

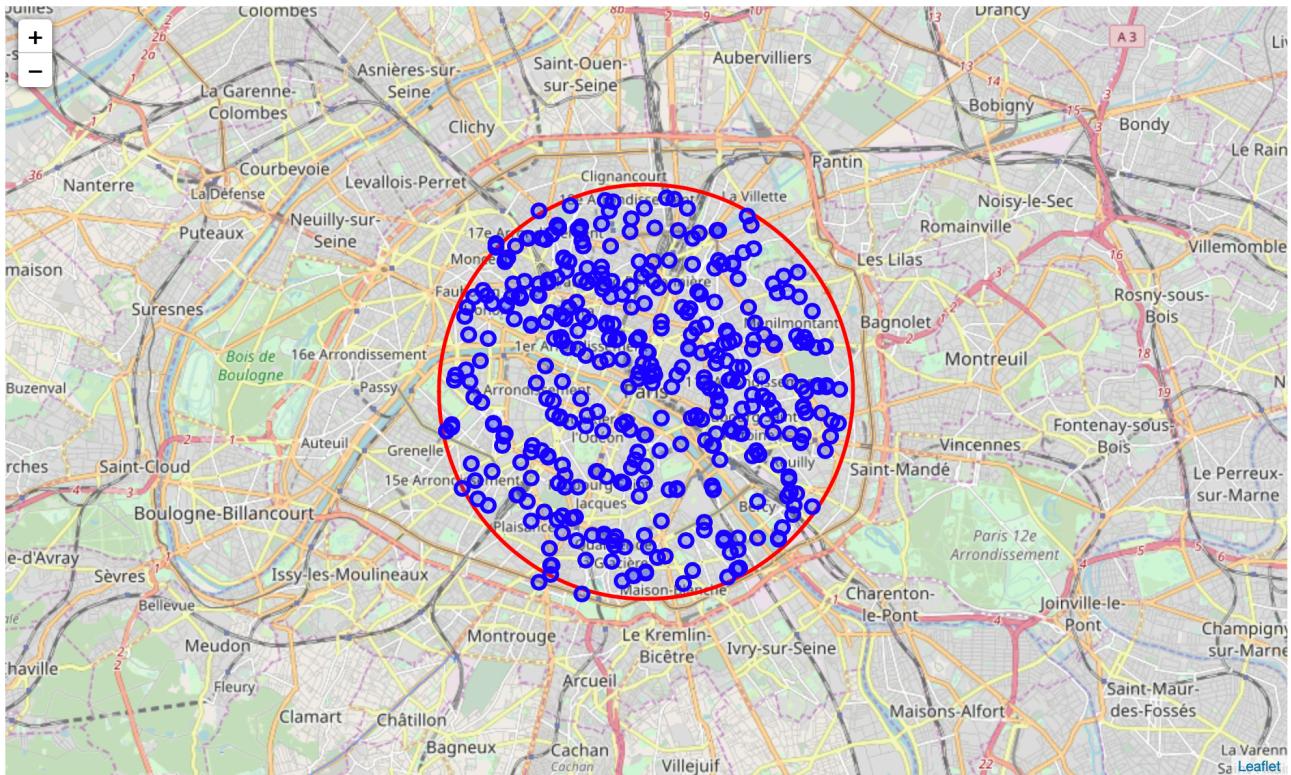


Fig 2. Folium map of Paris, the blue dots represents each venue obtained from Foursquare Place API and the red circle marks 4 km from the centre of the city.

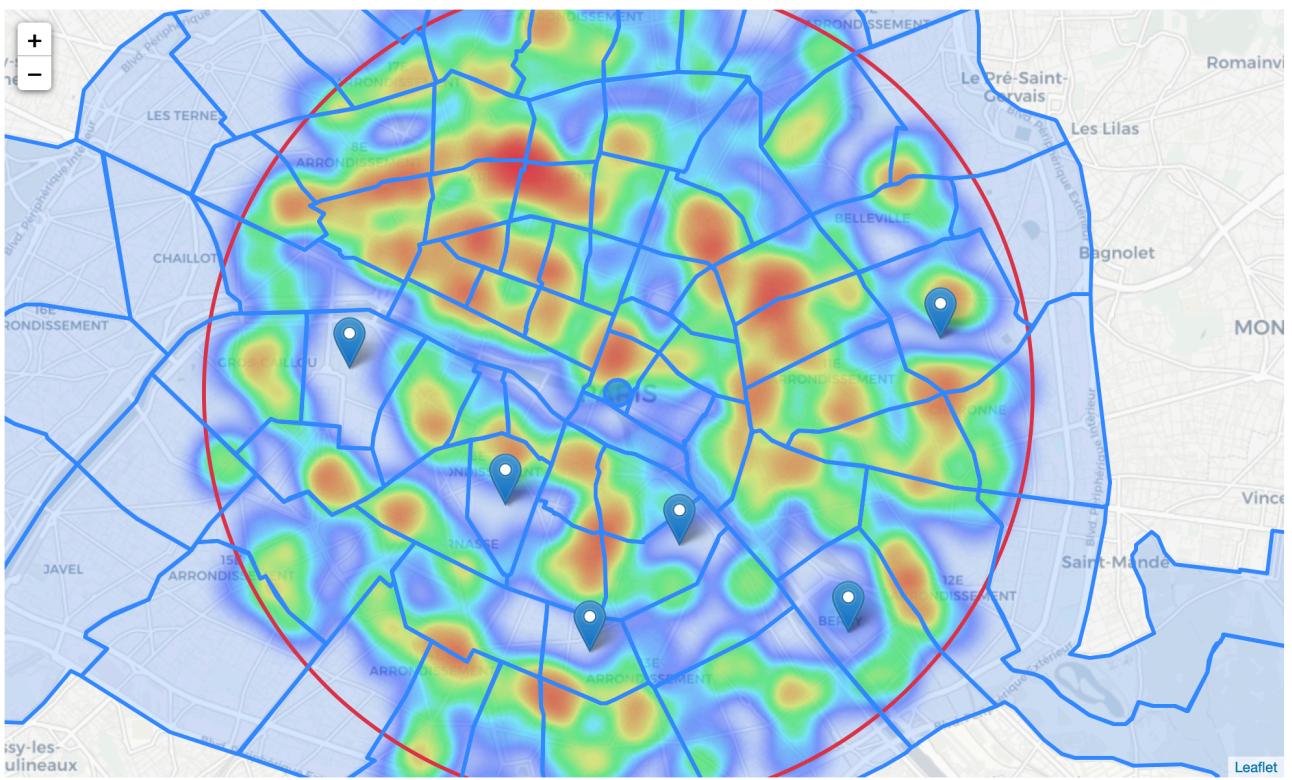
A first approximation suggests that the left side of the "La Seine" river that divides the city has much lower venue density than the right side. To improve this visualisation, let's create a **heatmap** showing the density of venues and also add the borders of Paris' neighbourhoods on top of it. The GeoJSON file that marks the borders of Paris' neighbourhoods is obtained from Paris OpenData. The result is shown on Fig 3.

As shown in the heatmap, Paris is quite 'hot' when it comes to fitness venues. Several spots with less fitness-related venue density are shown on the map with markers. From left to right, these areas are:

- The area around the 7th arrondissement.
- *Jardin du Luxembourg*
- The area around the neighbourhood called *Croulebarbe*.
- *Jardin des Plantes*
- *Parc de Bercy*
- *Cimetière du Père Lachaise*

With *Jardin du Luxembourg*, *Jardin des Plantes*, and *Cimetière du Père Lachaise* automatically eliminated as location candidates since these places are already in use for public services.

Fig 3. Heatmap of fitness venues in Paris, with its neighbourhood boarders displayed on top. From left to right, the marked areas with less fitness venue density are, 7th arrondissement, Jardin du Luxembourg, Croulebarbe, Jardin des Plantes, Parc de Bercy, and Cimentière de Père Lachaise.



This leaves us with 3 remaining options. The 7th Arrondissement, is probably the most famous borough in Paris with world class attractions like Champ de Mars, Eiffel Tower, numerous museums among others, though finding a spot for a spots facility in the middle of an area like the 7th arrondissement probably won't be easy.

The area of Bercy in the 18th century was known specially for being used as a warehousing area for wine due to its location right beside the Seine river. For two hundred years, the area was the thriving centre of Paris wine trade and a place with a unique life and culture. The area was part of the Paris' plan to revitalise the east part of the city, specially for Bercy, the program includes:

- A 12.5 hectare park:
- 1,500 units of housing, mixing market and subsidised units:
- 113,000 square meters of office space:
- 40,000 square meters of wholesale activities.

The AccorHotels Arena located in Bercy is the third busiest arena in the world.

Situated in the 13th Arrondissement, the area around **Croulebarbe** is mainly a residential neighbourhood with a population of ~20.000 habitants.

Conclusion

Purpose of this project was to identify Paris areas close to its city geographical centre with low density of fitness facilities in order to aid stakeholders in narrowing down the search for optimal location for a new fitness centre.

We first divided the city into circular neighbourhoods so for each one of them the Foursquare API calls can be made, we obtain informations regarding the fitness facilities around every neighbourhood and use a heatmap to identify the areas with less venue density. Few location candidates were quickly spotted and some were eliminated due to unavailability. We were left with three areas to choose from, with each one of them having their own characteristics.

Final decision on optimal location will be made by stakeholders based on specific characteristics of neighbourhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location such as proximity to major roads, real estate availability, prices, social and economic dynamics of every neighbourhood etc.