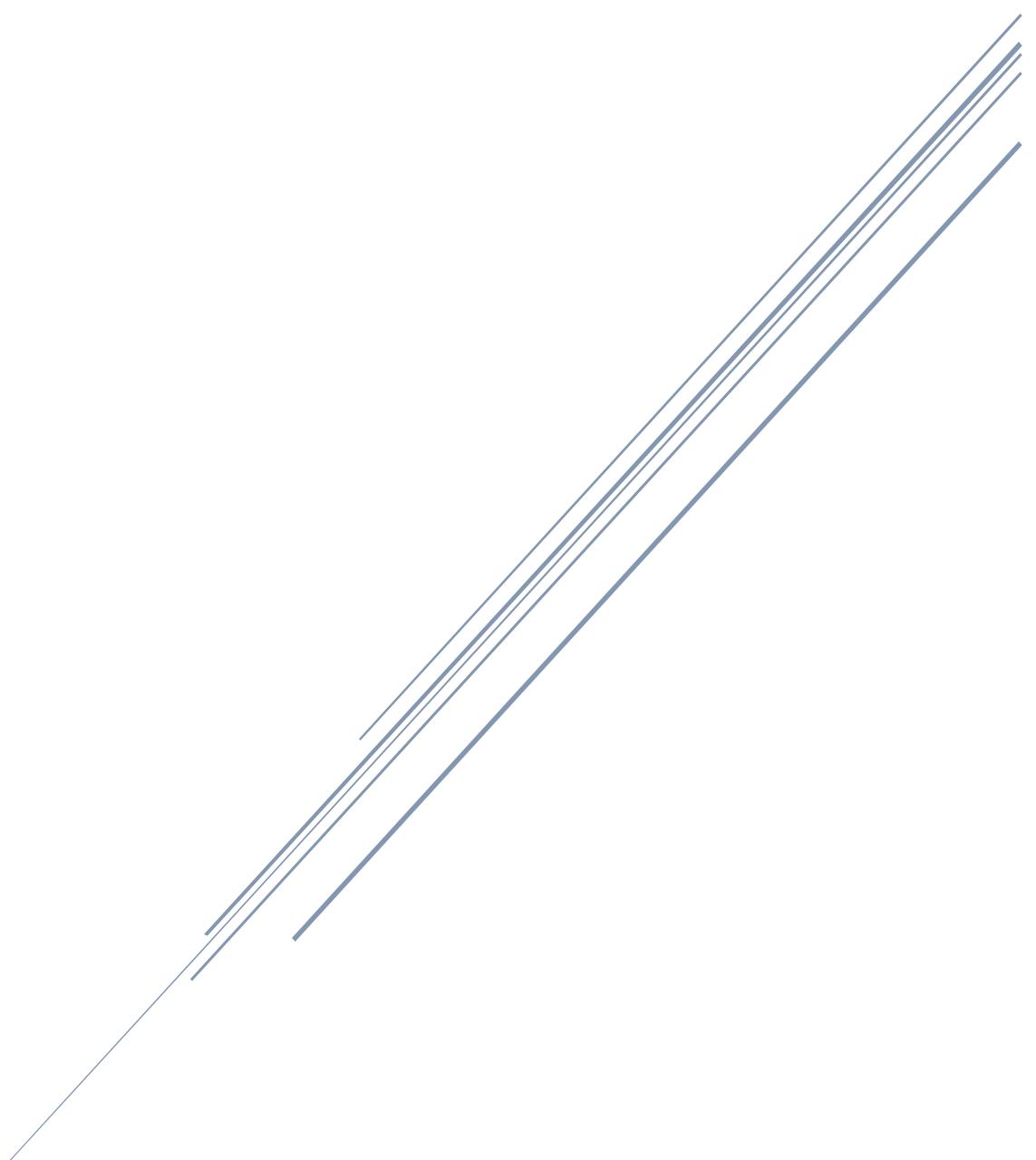


CAPSTONE PROJECT REPORT

Indian Restaurant in Paris



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Capstone Project Report

1 Introduction

This project is a part of the Data Science Specialization Course - IBM

1.1 Background

Paris, the city of love, is one of the major tourist attractions of the world. As per Wikipedia, about 18 million people from round the world visit Paris yearly for tourism generating a huge source of income for the people. And where there's tourists, there be lots of restaurant and other tourist opportunities. Secondly, Paris has a very diverse social status. People from all over the globe come and stay or visit here. It is a cultural center of the world as it has been throughout the history. It has many such cultural centers one of them Louvre Museum, one of the largest museums on planet and home to the most famous painting in the world, The Mona Lisa. We will be concentrating on this Museum in this project.

When we combine these two factors, we see a great opportunity to share our Indian culture in the form of Indian cuisine and taste in the city of everyone. Not just from a financial perspective but also from the cultural position, setting up an Indian Restaurant in Paris can be a huge success.

1.2 Business Problem

In this project, we will try to find some good options to set up a restaurant in a city. This project specifically targets the city of love, Paris and we wish to setup an Indian Restaurant.

We will try to find locations which are less crowded with restaurants and narrow down the areas having no Indian Restaurants. Another important preference is to keep the restaurant close to the iconic Louvre Museum. This location is preferable not only because of the Museum's importance but also because it is geographically in the centre hub of the city.

1.3 Interest

The project is highly interesting as it allows us to explore the city of Paris, its various boroughs and find a suitable location for an Indian restaurant. It helps develop business values and understand the factors involved.

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2 Data

Some of the important factors underlying in our problem statement which will influence how we gather data are:

- Number of restaurants currently present in a given neighbourhood
- Number of Indian Restaurants in the neighbourhood
- Distance of each Indian Restaurant from each other
- Distance of the neighbourhood from the Louvre Museum

For doing so, we are going to use the regularly spaced grid of locations, centred around the Louvre, to get our neighbourhoods. Following data sources will be needed to extract/generate the required information:

- Centres of candidate areas will be generated algorithmically and approximate addresses of centres of those areas will be obtained using **Tom Maps API reverse geocoding**
- Number of restaurants and their type and location in every neighbourhood will be obtained using **Foursquare API**
- Coordinates of Louvre centre will be obtained using **Geolocator**

2.1 Location Data Gathering

The first and foremost step is to gather the coordinates of the Louvre Museum. This is done using the **Geolocator API**.

The geographical coordinate of Louvre Museum are 48.86114, 2.33802.

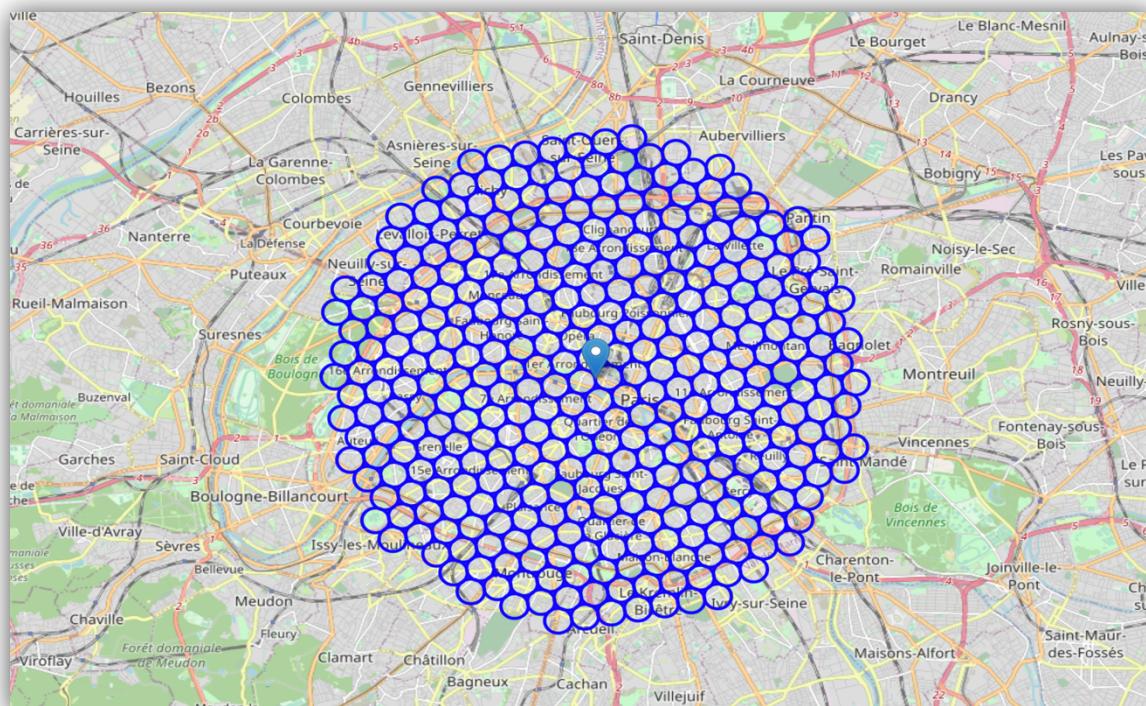


Figure 1. Visualization of the Neighbourhoods around the Louvre Museum

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We, then, create a grid of area candidates, equally spaced, centered around Louvre and within ~6km from Louvre. Our neighborhoods will be defined as circular areas with a radius of 300 meters, so our neighborhood centers will be 600 meters apart. We create a hexagonal grid of cells: we offset every other row, and adjust vertical row spacing so that every cell center is equally distant from all its neighbors. Below in Figure 1, we can see the grids around the Louvre. These neighborhoods are a total of 364.

Once we have the coordinates for these neighborhoods, we then find an approximate address for them. We use the Tom API for this **reverse geocoding**. Once we have the addresses in a list, we then convert them into a Pandas dataframe, and we get our first dataset. Below in Figure 2, we see a snapshot of the dataset containing:

- Address
- Latitude & Longitude
- X & Y Coordinates (Converted form of Latitude & Longitude)
- Distance from the center (Louvre Museum)

	Address	Latitude	Longitude	X	Y	Distance from center
0	39 Villa Moderne, Arcueil, 94110	48.808309	2.326956	-429434.675	5.484093e+06	5992.495307
1	23bis Rue Vaucouleurs, Arcueil, 94110	48.809200	2.334928	-428834.675	5.484093e+06	5840.376700
2	Gentilly, 94250	48.810090	2.342902	-428234.675	5.484093e+06	5747.173218
3	Le Kremlin-Bicêtre, 94270	48.810980	2.350875	-427634.675	5.484093e+06	5715.767665
4	21 Rue de la Convention, Le Kremlin-Bicêtre, 94270	48.811869	2.358849	-427034.675	5.484093e+06	5747.173218
5	Rue Paul Andrieux, Ivry-sur-Seine, 94200	48.812758	2.366823	-426434.675	5.484093e+06	5840.376700
6	1 Cité Pierre et Marie Curie, Ivry-sur-Seine, 94200	48.813646	2.374798	-425834.675	5.484093e+06	5992.495307
7	45 Rue Fénelon, Montrouge, 92120	48.811532	2.313828	-430334.675	5.484612e+06	5855.766389
8	Square Buffalo, Montrouge, 92120	48.812424	2.321801	-429734.675	5.484612e+06	5604.462508
9	Avenue Vladimir Ilich Lénine, Gentilly, 94250	48.813315	2.329774	-429134.675	5.484612e+06	5408.326913

Figure 2. Dataset of the 364 neighbourhoods shown in Figure 1

2.2 Restaurants Data Gathering

Now the next task is to get all the restaurants' data. For this we used the fourscore API. We are interested in venues in 'food' category, but only those that are proper restaurants and not coffee shops, pizza places, bakeries etc. So, we will include in our list only those venues that have 'restaurant' in category name, and we'll make sure to detect and include all the subcategories of specific 'Indian Restaurant' category, as we need info on Italian restaurants in the neighborhood. We gather the Category IDs corresponding to the Indian Restaurants and 'Food' Category from the [Foursquare Website](#).

In the Figure 3, we see the restaurants over the map of Paris. The Indian Restaurants are marked in red color, all other restaurants are in blue. Also, in Figure 4, we see the snapshots of the List of all restaurants and List of Indian Restaurants.

In the Table 1, we highlight a few statistics about the restaurants of Paris.

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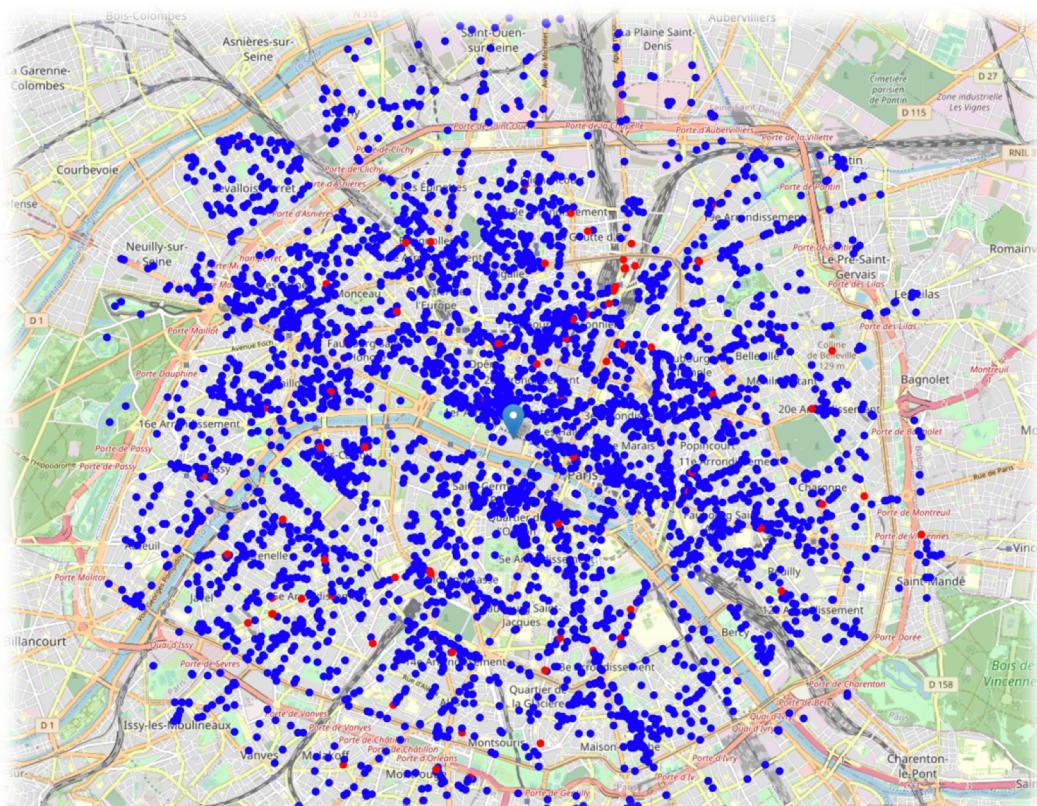


Figure 3. All the Paris' Restaurants. Indian Restaurants are in red

Table 1

Total number of restaurants	4329
Total number of Indian Restaurants	87
Percentage of Indian Restaurants	2.01%
Average number of restaurants in neighborhood	10.56868131868132

```
In [20]: print('List of all restaurants')
print('-----')
for r in list(restaurants.values())[:10]:
    print(r)
print('...')
print('Total:', len(restaurants))

List of all restaurants
('4b940307f964a520296134e3', 'Quick Sushi', 48.81050585394434, 2.3286885023117065, 'C.C La Vache Noire - Niveau 2, 94110 Arcueil, France', 322, False, -429266.7242620067, 5484314.520721814)
('4fa10ccde4b008669d96d2cf', "Let's Wok", 48.81083439819573, 2.3282217979431152, 'C.C La Vache Noire - Niveau 3, 94110 Arcueil, France', 298, False, -429294.7103464196, 5484356.69063899)
('5ac7412c67af3a4ce404ef', "Bureau", 48.81050464, 2.327429, '3 place de la Vache Noire, 94110 Arcueil, France', 251, False, -429357.8242302035, 5484334.556001987)
('4b5edc53f964a5204a9ab29e3', 'Hippopotamus', 48.8106372, 2.3271332, '3 place de la Vache Noire, 94110 Arcueil, France', 259, False, -429378.0482272373, 5484348.324237996)
('5662c1b4498e58e748c33670', 'Nabab Kebab', 48.810551779614364, 2.3287796974182124, 'C.C La Vache Noire - Niveau 1, 94110 Arcueil, France', 316, False, -429259.1916501798, 5484318.478938804)
('4c5fe91bd6920a14aa19464', 'Asia Room', 48.810806136409305, 2.3285114765167236, 'C.C La Vache Noire - Niveau 2, 94110 Arcueil, France', 294, False, -429274.0472866639, 5484349.97406332)
('4d99a4f097d0e808de4d0b', 'Restaurant Campanile', 48.805342711452674, 2.325801488414782, '73 avenue Aristide Briand (Hôtel Campanile Paris Sud - Porte d'Orléans)', 94110 Arcueil, France", 3
40, False, -429574.72870214796, 5483778.348859336)
('4dd0e205b1f6e0369473bc763', 'L'Arc', 48.80816262848783, '31 avenue Laplace, 94110 Arcueil, France', 246, False, -429071.48078867455, 5484014.50376338)
('55f00c73498ebabfc1c5e5', "L'Escale", 48.808088458053, 2.3318977653980251, '31 avenue Laplace, 94110 Arcueil, France', 254, False, -429077.2226855974, 5484007.06833752)
('4c9522cd238c6dcba287c755', 'Oishi Sushi', 48.80791186849453, 2.3319916427135468, '31 avenue Laplace, 94110 Arcueil, France', 258, False, -429073.67028003966, 5483986.30288402)
...
Total: 4329

In [21]: print('List of Indian Restaurants')
print('-----')
for r in list(indian_restaurants.values())[:10]:
    print(r)
print('...')
print('Total:', len(indian_restaurants))

List of Indian Restaurants
('53219c1498e4526acab8d5', 'Chez Papa Indien', 48.81545434111303, 2.320712674355254, '90 rue Henri Gincoux, 92120 Montrouge, France', 321, True, -429757.4240626402, 5484961.420431379)
('4ba33edff964a5209f6fe38e3', 'The Himalayan', 48.81937208717873, 2.3233279264080777, '40 avenue Henri Gincoux, 92120 Montrouge, France', 236, True, -429492.64380838524, 5485362.9896114655)
('4d27034fb818a35d974d78a', 'Eat'n'Cure', 48.81838325742825, 2.329831123352051, '7 rue Danton, 92120 Montrouge, France', 202, True, -429035.4911081086, 5485172.945011821)
('4be00bae6920eb713bf85192c', 'Luchkey', 48.82000980471885, 2.305492758509155, '15 ter rue Damicourt, 92240 Malakoff, France', 147, True, -420785.23997125793, 5485654.655573207)
('4d753696a796ea82bce5fa9', 'Palais de Vandan', 48.82402246706412, 2.3283274906819607, '30 rue Paul Fort, 75014 Paris, France', 188, True, -429039.76538765244, 5485816.202716887)
('4b5b3aaef964a5201ca23ae3', 'Saveurs d'Himalaya', 48.8226658492328, 2.343409790390268, '86 rue Brillat-Savarin, 75013 Paris, France', 172, True, -427962.04809475783, 5485479.346370834)
('4acdca13f964a520ea1621e3', 'Suraj', 48.827559165753165, 2.3149407720448987, '121 rue Didot, 75014 Paris, France', 216, True, -429952.4846942476, 5486373.747209753)
('4ba29166f964a5200b532e3', 'Palais de Krishna', 48.83021821922948, 2.353833172988438, '16 rue du Père Guérin, 75013 Paris, France', 28, True, -427058.358369997, 5486187.101193145)
('4c2e4248e307d13ad0410fda', 'Indian House', 48.83419358082272, 2.326344333572904, '27 rue Gassendi, 75014 Paris, France', 287, True, -428994.090302942, 5486967.376892761)
('577f7e0ddc10aac076630be6', 'Sangeet', 48.831969, 2.344264, '64 rue de la Glacière, 75013 Paris, France', 280, True, -427725.3799131891, 5486499.282102409)
...
Total: 87
```

Figure 4. List of all Restaurants and Indian Restaurants

And with this we complete the data gathering process!