APPLIED DATA SCIENCE CAPSTONE

London vs Paris: A comparative analysis of venues and weather

Submitted by:

Kevin Jubal NKENKO

15 December 2019

IDM DATA SCIENCE SPECIALIZATION

I-   Introduction

1. Background

Among the best cities to visit in Europe, Paris and London are two historical cities that are well rated. It is sure that, we can't have the same criteria to state how much we like a city more than another. The reasons can be very diverse from one person to another. Something is certain, if not let's make it an assumption, what people may like in a city is mainly about how they can enjoy there: food, drink, art, culture, park, nightlife and so on... To put in a nutshell, people may be interested in the type of activities they can have. One can relevantly wonder if London and Paris meet this expectation. We will not discuss demography data in this project.

Furthermore, as far as tourism is concerned, weather is also an important subject. The impact of weather on tourism may depends on various parameters such as precipitation, sun, temperature, most common day condition. We must also take into account that the weather preference can differ with the kinds of activities that a tourist may pursue. You know what? Never mind! To make it simple and less theoretical, Let's just assume that a blue sky is most appreciated than a grey one. A most spread idea is that London has a very bad weather and it rains pretty much there. For people who want to enjoy outdoors under the sun, this might not be a positive intel if they are planning to travel there. Is it only a 'cliché'? This leads us to the problem of this study.

2. Problem

The main problem we will discuss is to what extent Paris is different of London. We are going to argue how similar and dissimilar London and Paris are.

3. Hypothesis

It is widely believed that it rains too much in London. Let's say it rains more in London than in Paris. Let also say as rumours run that Paris and London are very different.

4. Interest

The topic may interest anyone particularly prospective tourists who want to know the two cities and decide where to go for holidays for instance.

5. Methodology

To achieve our goal, our work will consist in two big parts. Firstly, we are going to explore both cities in order to discover the kind of attractions/stuffs one can enjoy in London and Paris. We will discuss whether the repartition of venues is quite the same in both cities or not. Then we are going to analyze and compare the weather is both cities.

II-   Materials and methods

1. Type of analysis

For our study, we will go through a descriptive analysis. Indeed, since we want to present a quantitative description/comparison of our cities, we will describe the data and the information they are conveying. Of course, we are going to use graphics analysis to support our study.

2. Data

The data we will need for this project are:

- list of venues of interest in both cities: We are going to leverage on the Foursquare API to get the information we need. It is very important that for each place we get the category that we can aggregate on.
- Historical weather data for last year: We will need for each day in 2018, the temperature, precipitation amount, presence of sun and the global day condition. We will use the world weather online API to get our data.

  a. Foursquare API

We will use the foursquare API to get the venues within 2000 meters for each town. We will set the limit of venues to 1000 just to make sure that we get all the venues available in the area. The sample of the response is a JSON that looks like the following:

```json
{
  "meta": {
    "code": 200,
    "requestId": "5ac51d7e6a607143d811cecb"
  },
  "response": {
    "venues": [
      {
        "id": "5642aef9498e51025cf4a7a5",
        "name": "Mr. Purple",
        "location": {
          "address": "180 Orchard St",
          "crossStreet": "btwn Houston & Stanton St",
          "lat": 40.72173744277209,
          "lng": -73.98800687282996,
          "labeledLatLngs": [
            {
              "label": "display",
              "lat": 40.72173744277209,
              "lng": -73.98800687282996
            }
          ],
          "distance": 8,
          "postalCode": "10002",
          "cc": "US",
          "city": "New York",
          "state": "NY",
          "country": "United States",
          "formattedAddress": [
            "180 Orchard St (btwn Houston & Stanton St)",
            "New York, NY 10002",
            "United States"
          ]
        },
        "categories": [
          {
            "id": "4bf58dd8d48988d1d5941735",
            "name": "Hotel Bar",
            "pluralName": "Hotel Bars",
            "shortName": "Hotel Bar",
            "icon": {
              "prefix":
"https://ss3.4sqi.net/img/categories_v2/travel/hotel_bar_",
              "suffix": ".png"
            },
            "primary": true
          }
        ],
        "venuePage": {
          "id": "150747252"
        }
      }
    ]
  }
}
```

The result will be a JSON that from which we are going to extract the categories. We will need to redefine the categories so that we don't end up with 30 categories.

We could simply use the category selected but to make it simple to aggregate with less detailed category, we will get the category in the prefix.

For instance, from `"prefix":"https://ss3.4sqi.net/img/categories_v2/travel/hotel_bar_"`, we will extract `travel`.

b. World Weather Online API

World Weather Online Offers Weather Data and API for Businesses and Developers. Historical Weather is available as one off download or via our API by using a variety of search queries to receive historical weather data. The data is got as a JSON with:

- date for which the weather is forecasted,
- location specific sunrise and sunset in the local time,
- day max and min temperature in °C (Celsius) and °F (Fahrenheit),
- hourly temperature in °C (Celsius) and °F (Fahrenheit),
- wind speed in mph (miles per hour), knots, meter per sec and kmph (kilometer per hour),
- 6-Point compass wind direction,
- a unique weather condition code,
- weather description text,
- weather symbol image URL,
- precipitation in millimeter (mm) and inches,
- humidity in percentage (%),
- visibility in kilometer (km) and miles,
- pressure in millibar (mb) and inches,
- cloud cover in percentage (%).

Here is a sample of the JSON:

```
{'date': '2018-01-01',
 'astronomy': [{'sunrise': '08:06 AM',
   'sunset': '04:02 PM',
   'moonrise': '03:48 PM',
   'moonset': '07:00 AM',
   'moon_phase': 'Waxing Gibbous',
   'moon_illumination': '97'}],
 'maxtempC': '8',
 'maxtempF': '46',
 'mintempC': '6',
 'mintempF': '43',
 'avgtempC': '7',
 'avgtempF': '44',
 'totalSnow_cm': '0.0',
 'sunHour': '6.8',
 'uvIndex': '3',
 'hourly': [{'time': '24',
   'tempC': '8',
   'tempF': '46',
   'windspeedMiles': '12',
   'windspeedKmph': '19',
   'winddirDegree': '250',
```

```
    'winddir16Point': 'WSW',
    'weatherCode': '113',
    'weatherIconUrl': [{'value':
'http://cdn.worldweatheronline.net/images/wsymbols01_png_64/wsymbol_0001_sunny.png
'}],
    'weatherDesc': [{'value': 'Sunny'}],
    'precipMM': '0.4',
    'precipInches': '0.0',
    'humidity': '71',
    'visibility': '10',
    'visibilityMiles': '6',
    'pressure': '998',
    'pressureInches': '30',
    'cloudcover': '32',
    'HeatIndexC': '7',
    'HeatIndexF': '45',
    'DewPointC': '2',
    'DewPointF': '36',
    'WindChillC': '4',
    'WindChillF': '39',
    'WindGustMiles': '18',
    'WindGustKmph': '29',
    'FeelsLikeC': '4',
    'FeelsLikeF': '39',
    'uvIndex': '3'}]}
```

As a matter of fact, we cannot say immediately what is the day condition. We have only the `weatherCode`. So, we will use another file to get the description of each weather code.

```
WeatherCode     Condi
tion    DayIcon NightIcon
395     Moderate or heavy snow in area with thunder
        wsymbol_0012_heavy_snow_showers   wsymbol_0028_heavy_snow_showers_night
392     Patchy light snow in area with thunder     wsymbol_0016_thundery_showers
        wsymbol_0032_thundery_showers_night
389     Moderate or heavy rain in area with thunder
        wsymbol_0024_thunderstorms        wsymbol_0040_thunderstorms_night
386     Patchy light rain in area with thunder     wsymbol_0016_thundery_showers
        wsymbol_0032_thundery_showers_night
377     Moderate or heavy showers of ice pellets  wsymbol_0021_cloudy_with_sleet
        wsymbol_0037_cloudy_with_sleet_night
374     Light showers of ice pellets     wsymbol_0013_sleet_showers
        wsymbol_0029_sleet_showers_night
371     Moderate or heavy snow showers    wsymbol_0012_heavy_snow_showers
        wsymbol_0028_heavy_snow_showers_night
368     Light snow showers       wsymbol_0011_light_snow_showers
        wsymbol_0027_light_snow_showers_night
365     Moderate or heavy sleet showers   wsymbol_0013_sleet_showers
        wsymbol_0029_sleet_showers_night
362     Light sleet showers      wsymbol_0013_sleet_showers
        wsymbol_0029_sleet_showers_night
359     Torrential rain shower    wsymbol_0018_cloudy_with_heavy_rain
        wsymbol_0034_cloudy_with_heavy_rain_night
356     Moderate or heavy rain shower     wsymbol_0010_heavy_rain_showers
        wsymbol_0026_heavy_rain_showers_night
353     Light rain shower         wsymbol_0009_light_rain_showers
        wsymbol_0025_light_rain_showers_night
```

| 350	Ice pellets	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
338	Heavy snow	wsymbol_0020_cloudy_with_heavy_snow	wsymbol_0036_cloudy_with_heavy_snow_night
335	Patchy heavy snow	wsymbol_0012_heavy_snow_showers	wsymbol_0028_heavy_snow_showers_night
332	Moderate snow	wsymbol_0020_cloudy_with_heavy_snow	wsymbol_0036_cloudy_with_heavy_snow_night
329	Patchy moderate snow	wsymbol_0020_cloudy_with_heavy_snow	wsymbol_0036_cloudy_with_heavy_snow_night
326	Light snow	wsymbol_0011_light_snow_showers	wsymbol_0027_light_snow_showers_night
323	Patchy light snow	wsymbol_0011_light_snow_showers	wsymbol_0027_light_snow_showers_night
320	Moderate or heavy sleet	wsymbol_0019_cloudy_with_light_snow	wsymbol_0035_cloudy_with_light_snow_night
317	Light sleet	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
314	Moderate or Heavy freezing rain	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
311	Light freezing rain	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
308	Heavy rain	wsymbol_0018_cloudy_with_heavy_rain	wsymbol_0034_cloudy_with_heavy_rain_night
305	Heavy rain at times	wsymbol_0010_heavy_rain_showers	wsymbol_0026_heavy_rain_showers_night
302	Moderate rain	wsymbol_0018_cloudy_with_heavy_rain	wsymbol_0034_cloudy_with_heavy_rain_night
299	Moderate rain at times	wsymbol_0010_heavy_rain_showers	wsymbol_0026_heavy_rain_showers_night
296	Light rain	wsymbol_0017_cloudy_with_light_rain	wsymbol_0025_light_rain_showers_night
293	Patchy light rain	wsymbol_0017_cloudy_with_light_rain	wsymbol_0033_cloudy_with_light_rain_night
284	Heavy freezing drizzle	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
281	Freezing drizzle	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
266	Light drizzle	wsymbol_0017_cloudy_with_light_rain	wsymbol_0033_cloudy_with_light_rain_night
263	Patchy light drizzle	wsymbol_0009_light_rain_showers	wsymbol_0025_light_rain_showers_night
260	Freezing fog	wsymbol_0007_fog	wsymbol_0007_fog
248	Fog	wsymbol_0007_fog	wsymbol_0007_fog
230	Blizzard	wsymbol_0020_cloudy_with_heavy_snow	wsymbol_0036_cloudy_with_heavy_snow_night
227	Blowing snow	wsymbol_0019_cloudy_with_light_snow	wsymbol_0035_cloudy_with_light_snow_night
200	Thundery outbreaks in nearby	wsymbol_0016_thundery_showers	wsymbol_0032_thundery_showers_night
185	Patchy freezing drizzle nearby	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
182	Patchy sleet nearby	wsymbol_0021_cloudy_with_sleet	wsymbol_0037_cloudy_with_sleet_night
179	Patchy snow nearby	wsymbol_0013_sleet_showers	wsymbol_0029_sleet_showers_night
176	Patchy rain nearby	wsymbol_0009_light_rain_showers	wsymbol_0025_light_rain_showers_night
143	Mist	wsymbol_0006_mist	wsymbol_0006_mist

```
122    Overcast wsymbol_0004_black_low_cloud      wsymbol_0004_black_low_cloud
119    Cloudy   wsymbol_0003_white_cloud wsymbol_0004_black_low_cloud
116    Partly Cloudy    wsymbol_0002_sunny_intervals
       wsymbol_0008_clear_sky_night
113    Clear/Sunny      wsymbol_0001_sunny       wsymbol_0008_clear_sky_night
```

As there are too many day conditions, we are going to cluster them into five categories: SUNNY, CLOUDY, RAINY, FOGGY, SNOWY…

III-   Results and discussion

1. Venues

Here is a diagram with the numbers of venues in each town grouped by categories.
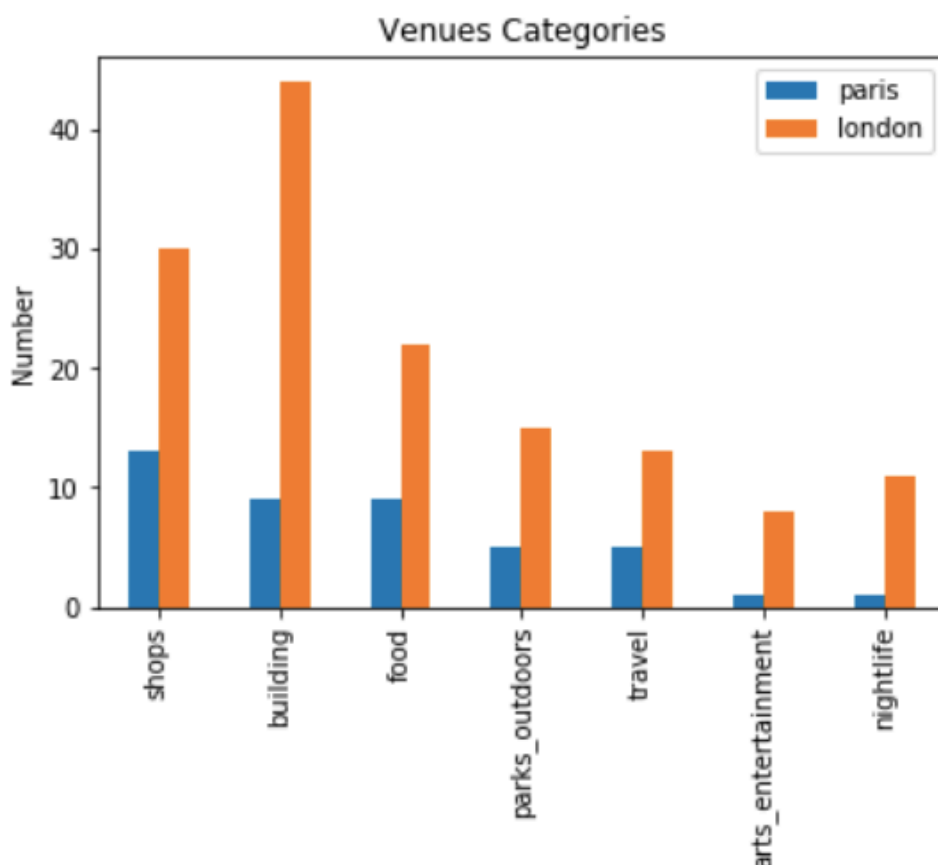
It seems we finally ended up with 7 categories:

- Shops

- Building
- Food
- Parks & outdoors
- Travel
- Arts & Entertainment
- Nightlife

We can see that in each category and all categories taken into account, London has more venues (more than twice) than Paris. So, without going too far from the center of the city (1km) you have more places to explore in London than in Paris. Not talking about the quality, you have more venues in London than in Paris to discover.

That said, it means that in Paris you may have more free spaces in the street to walk and wandering. Isn't that what lovers do?

Let's look at the repartition of venues in each category.
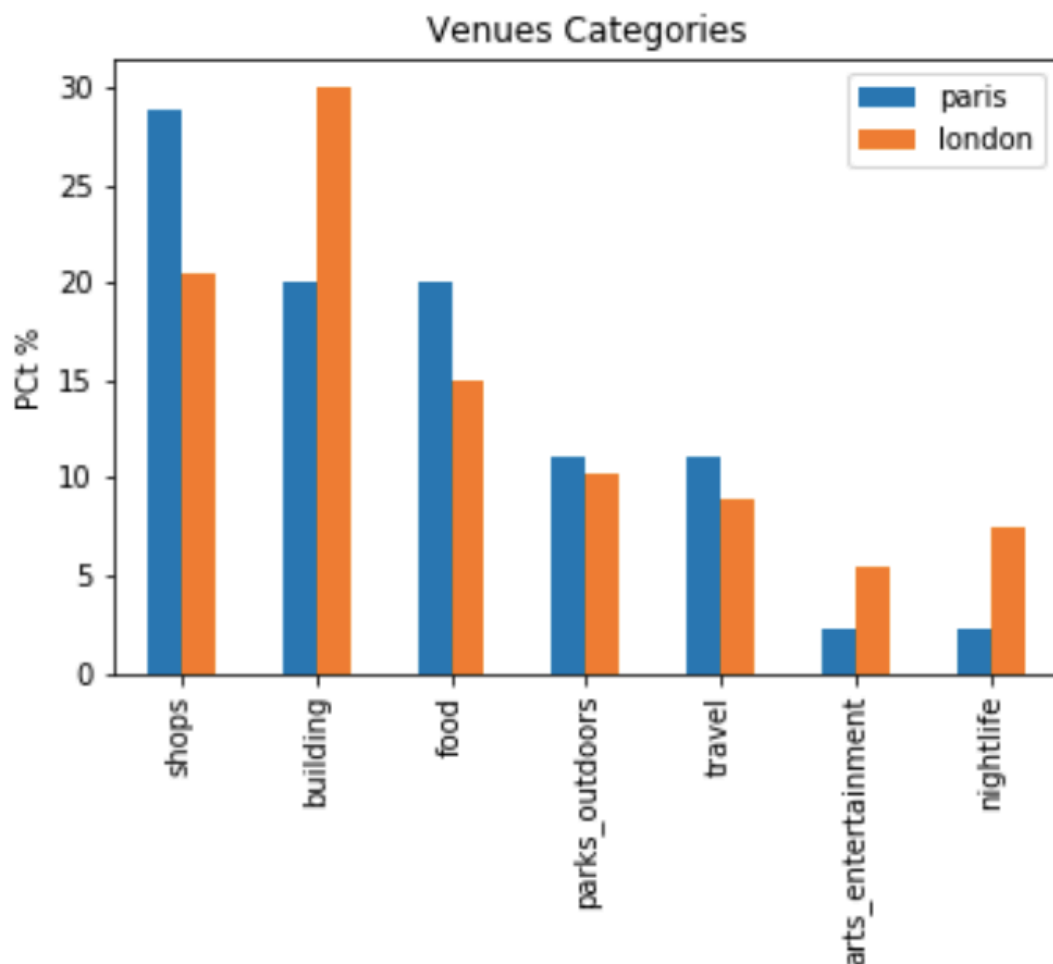
We can note that, whereas London is more populated by building, the most represented category in Paris is Shop. Except from that, the repartition of venues is quite similar, with the other categories being food, Parks & outdoors, travel, art and nightlife.

2. Weather

a. Temperature
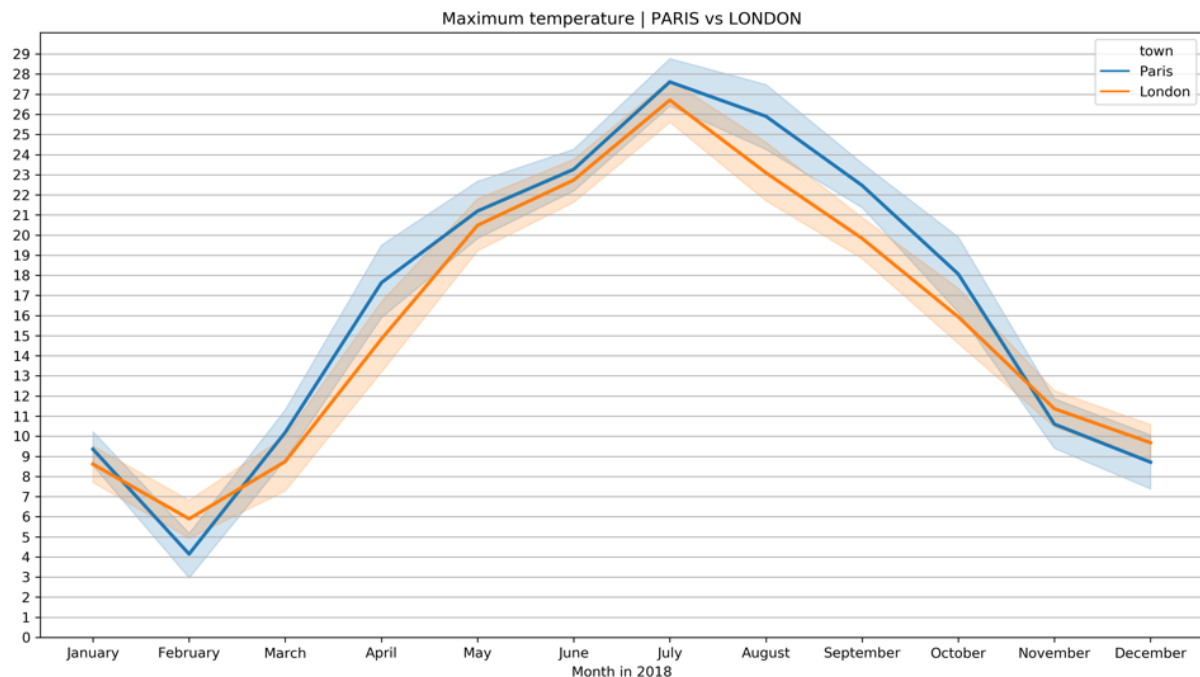

Average temperature | PARIS vs LONDON
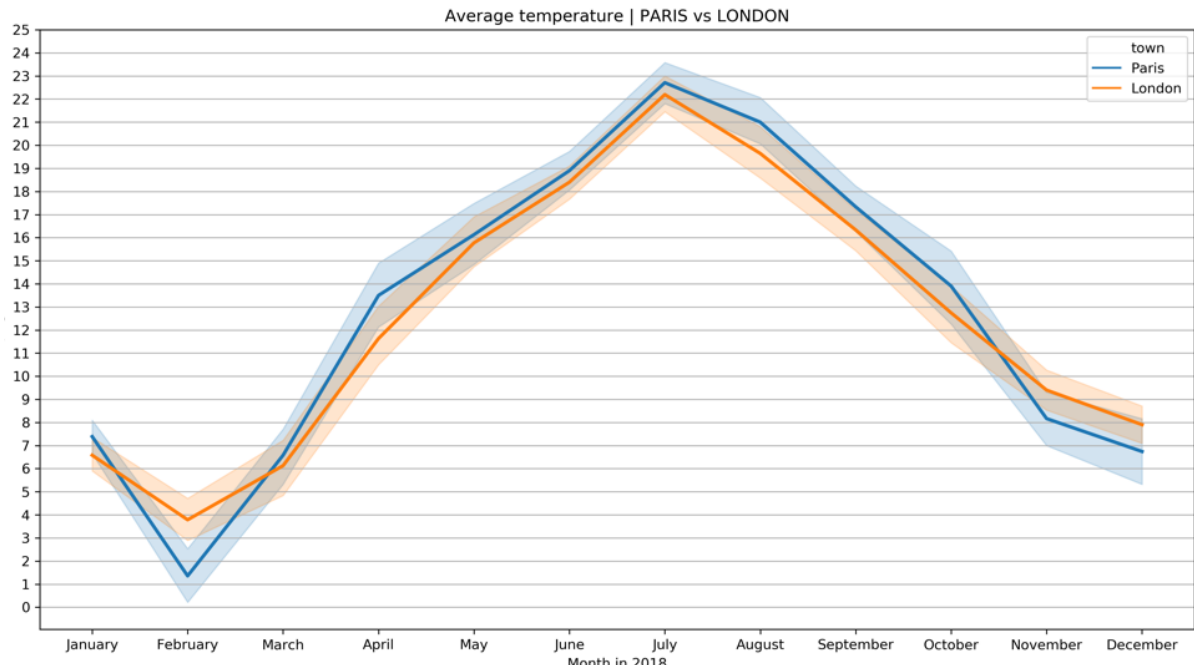
Most of the year, from march to mid-October, the daily average temperature in Paris is greater than in London. However, the difference doesn't exceed 2°C. But in winter from Mid-October to March, London temperature is greater than Paris one with a huge difference of 2.5°C in February.

Minimum temperature | PARIS vs LONDON
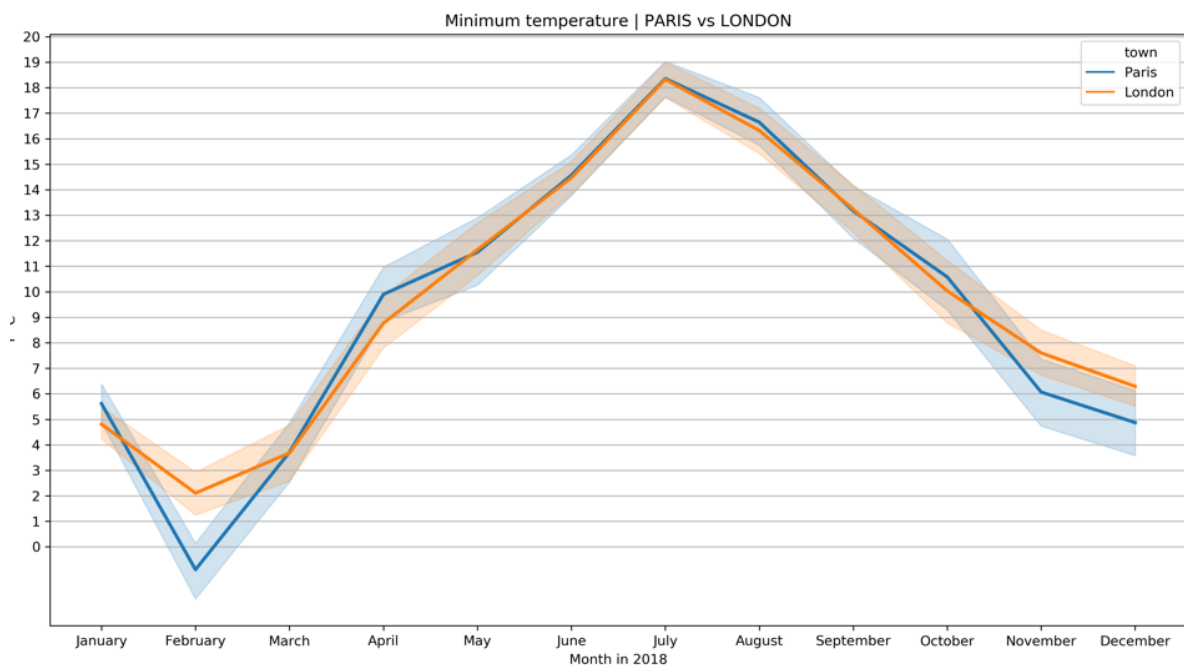
The average daily minimum temperature is quite similar in both cities most of the year. Again here,

from november to march, the minimum temperature in London is Paris is lower than in London. That said, the minimum temperature is slightly greater in Paris as far as april is concerned.

Most of the year, the average daily maximum temperature in Paris is greater than in London. Once again, from mid-October to mid-February, this tendency is inverted with higher maximum temperature in London than in Paris.

As far as temperature is concerned, both cities are quite similar. We can conclude that the temperature is higher in Paris than in London most of the year except in Winter.

b. Precipitations
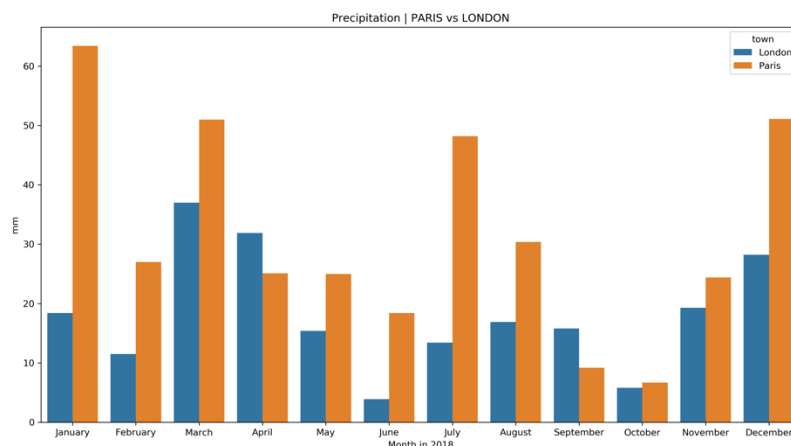
On this graph we can see the monthly amount of precipitation in both cities. Astonishingly, it appears that more rain falls in Paris than in London most of the year. September and April are the only months when precipitations amount in London is greater than in Paris.

c. Sun

Sun hours | PARIS vs LONDON
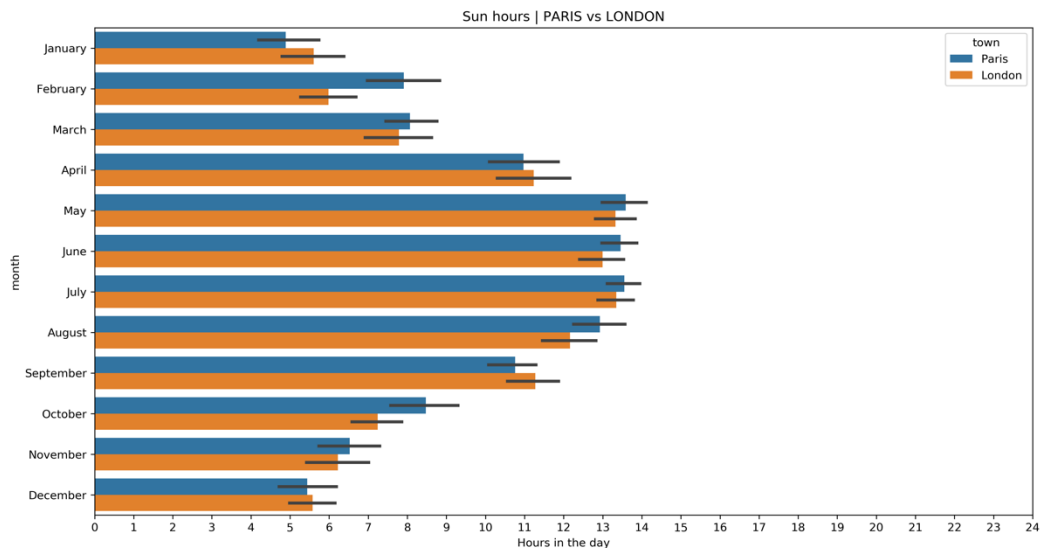
The sun hours are quite the same in both cities throughout the year with a difference that doesn't really exceed one hour. That said, the sun hours in Paris is greater than in London most of the year, except in January, September and December. You are more likely to enjoy a more sun hour in London in December.

d. Day condition

Our API provides many day conditions:

Sunny', 'Partly cloudy', 'Cloudy', 'Overcast', 'Mist',

'Patchy rain possible', 'Patchy snow possible',

'Patchy sleet possible', 'Patchy freezing drizzle possible',

'Thundery outbreaks possible', 'Blowing snow', 'Blizzard', 'Fog',

'Freezing fog', 'Patchy light drizzle', 'Light drizzle',

'Freezing drizzle', 'Heavy freezing drizzle', 'Patchy light rain',

'Light rain', 'Moderate rain at times', 'Moderate rain',

'Heavy rain at times', 'Heavy rain', 'Light freezing rain'

To make it simple, we will cluster them in 5 categories: Sunny, Cloudy, Rainy, Foggy and Snowy.
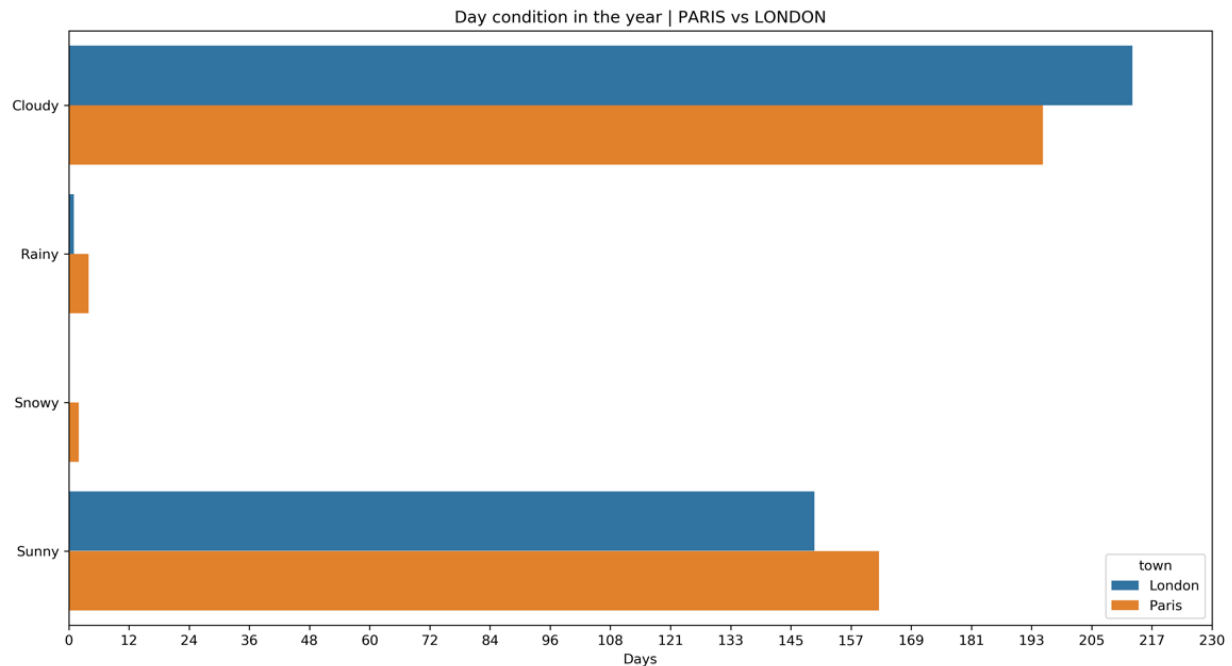
Once again, the day condition are quite similar in both cities through the year. That said, you have more sunny days in Paris than in London. We can note that, most of the year, we have cloudy days is London. We also have. Even if we have more rainy days and even snowy days in Paris but, we have more cloudy days in London than in Paris in the year. That may be the reason, people think that in London rain may be be prone to fall every time.

IV-   Conclusion

To put in a nutshell our mission was to discuss to what extend Paris and London are similar or different as far as the venues and weather are concerned. We used a descriptive analysis of venues with data collected from Foursquare API and weather element from Word Weather Online API. The results was quite surprising. Paris and London are not that different. The venues repartition in category are almost the same. However, venues are more concentrated In London than in Paris. It means you have more free spaces in Paris. The belief that it rains more in London than in Paris is false. The results show that it is the opposite. That said, the sky is mostly cloudy in London than Paris, and we have more sunny days in the year in Paris. May be this cloudy day condition in London is the reason why people thought it will be raining more there. This study is a very simple comparative analysis of Paris and London. It is not really fair to compare Paris and London since they don't have the same size for instance. And as far as the weather is concerned, more data could be used(not only 2018 data) to provide more relevant results.