WAY TO PARIS!

Eco-Friendly edition 😁

How to go to Paris with minimal environmental impact?

Project by
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Project Goal

Our goal is to know how it is more sustainable to move and discover new places.

We want to compare the carbon footprint of a trip from Madrid to Paris (round trip) by train, plane and in different brands/models of cars.

In addition, we will take into account the hours that we would need to be able to choose the most sustainable and efficient way of doing tourism.

Data

We have obtained the data from two APIs:

1. Carbon Interface
2. OpenChargeMap

Hypothesis

1. CO_2 emissions: gas car > plane > train > hybrid car > electric car
2. Older cars > newer cars
3. Faster =/ cheaper =/ eco-friendly 😅

Let's go to Paris!

APIs | Carbon Interface

Vehicle Estimate Response


```
{
  "data": {
    "id": "6108d711-be04-4dc4-93f9-43d969fd5273",
    "type": "estimate",
    "attributes": {
      "distance_value": 100.0,
      "vehicle_make": "Toyota",
      "vehicle_model": "Corolla",
      "vehicle_year": 1993,
      "vehicle_model_id": "7268a9b7-17e8-4c8d-acca-57059252afe9",
      "distance_unit": "mi",
      "estimated_at": "2021-01-10T15:24:32.568Z",
      "carbon_g": 37029,
      "carbon_lb": 81.64,
      "carbon_kg": 37.03,
      "carbon_mt": 0.04
    }
```


Flight Estimate Response


```
{
  "data": {
    "id": "d60edacc-cf6c-4da7-b5de-c538de4ce5ee",
    "type": "estimate",
    "attributes": {
      "passengers": 2,
      "legs": [
        {
          "departure_airport": "SFO",
          "destination_airport": "YYZ"
        },
        {
          "departure_airport": "YYZ",
          "destination_airport": "SFO"
        }
      ],
      "estimated_at": "2020-07-24T02:25:50.837Z",
      "carbon_g": 1077098,
      "carbon_lb": 2374,
      "carbon_kg": 1077,
      "carbon_mt": 1,
      "distance_unit": "km",
      "distance_value": 7454.15
    }
```


Train Estimate Response

```python
def calculate_train_emissions(distance_km, train_type='electric', passengers=1):
    emission_factors = {'electric': 0.02, 'diesel': 0.14}  # in kg CO2 per km per passenger
    factor = emission_factors.get(train_type.lower(), 0.02)
    return distance_km * factor * passengers

# Example usage for a 3,600 km train trip (round trip)
train_distance_km = 3600  # Distance in kilometers
train_emissions = calculate_train_emissions(train_distance_km, train_type='electric', passengers=3)
print(f"Train emissions for {train_distance_km} km: {train_emissions:.2f} kg CO₂")
```

APIs | Cleaning Data

Carbon Interface

1. From the "Carbon Interface" API, we did the clean-up from the API directly.

2. We only had to indicate the number of passengers, the kilometres to travel and the means of transportation we wanted.

3. We save the information in the data frame (.csv) that we downloaded already had the data and columns that we wanted to work with.

Return trip

By plane

Distance

2600 kilometres

Time

4 hours of travel

CO_2

465.65 kg for 3 people

By car

Distance

2800 kilometres

Time

28 hours of travel

CO_2

From 0 kg (electric)
to 1535.8 kg (gas - supercar)

By train

Distance

3600 kilometres

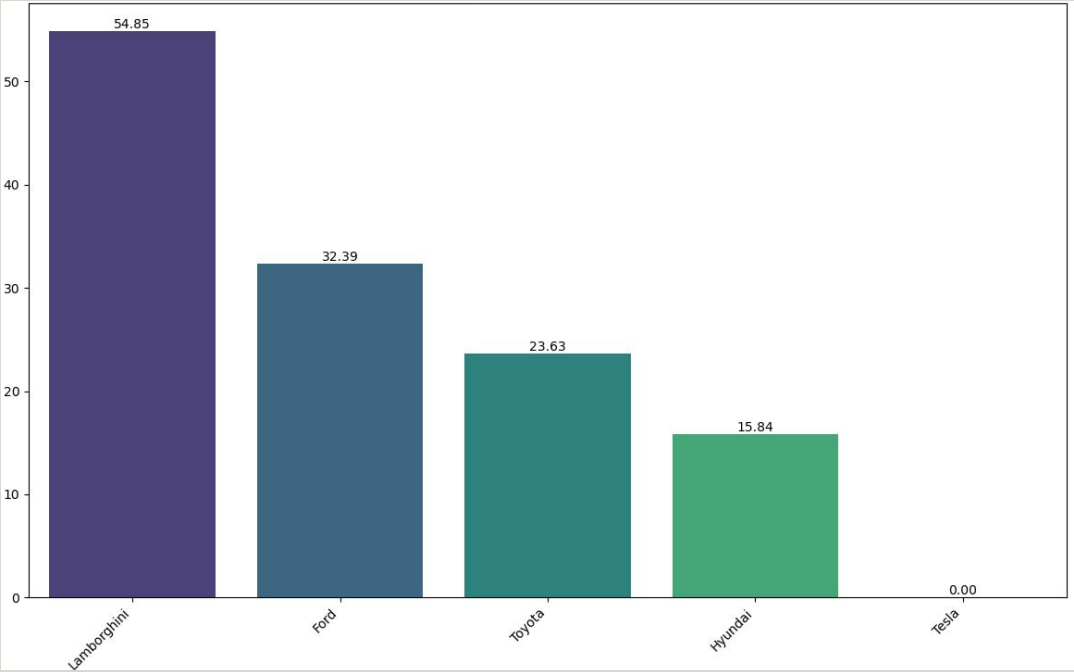
Time

20 hours of travel

CO_2

261 kg for 3 people

Way to Paris by car



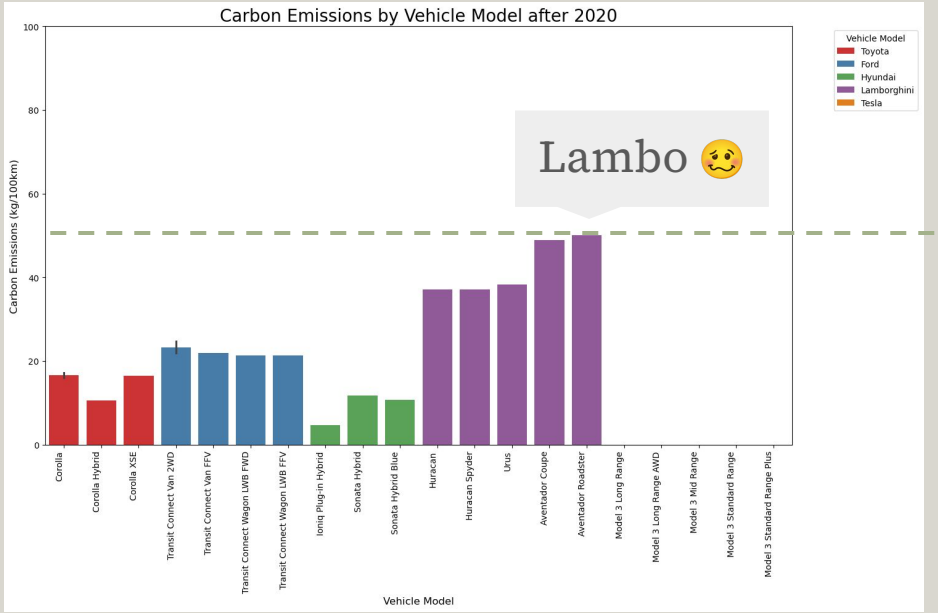
We have 5 car brands options to rent, to go to Paris:

1. Lamborghini (supercar)
2. Ford (regular)
3. Toyota (regular)
4. Hyundai (hybrid)
5. Tesla (electric)

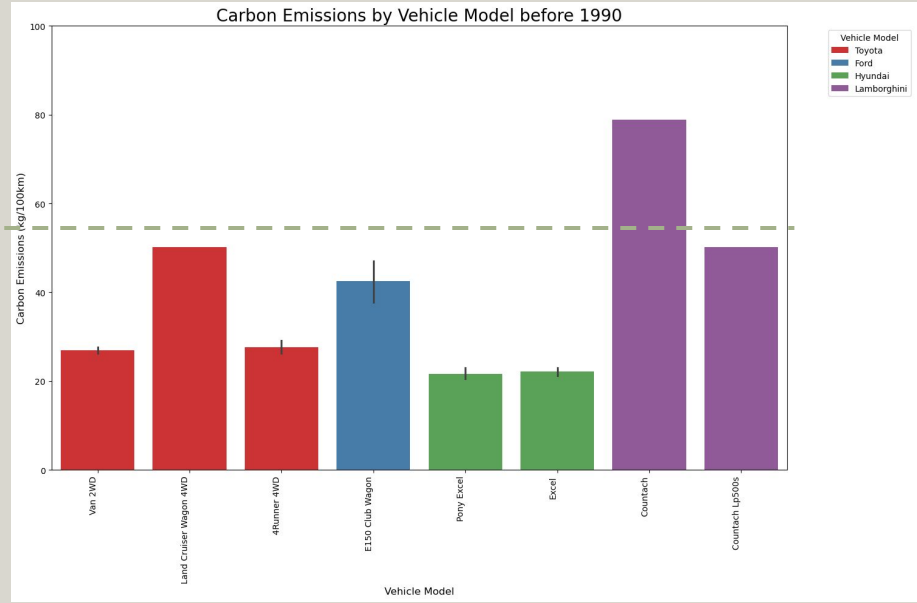
Way to Paris by car

Within the 5 selected brands, we chose cars registered in 2020 (new) or later and before 1990 (old).

New cars (2020 & after)



Old cars (Before 1990)



APIs | Open Charge Map

This API allows you to see the charging points in different countries, but you cannot generate a route between two points in this beta.

You must clean and classify the data, taking into account the cities you are going to pass through.

```
url = "https://api.openchargemap.io/v3/poi/"

params_base = {
    "output": "json",
    "maxresults": 10000,
    "compact": "true",
    "verbose": "false",
    "key": "d1138da0-c7d4-4f81-a2c6-44de7bbd80a0"

}

country_codes = ["ES", "FR"]

data_country = []

for country in country_codes:
    params = params_base.copy()
    params["countrycode"] = country

    response = requests.get(url, params=params)

    if response.status_code == 200:
    data = response.json()
    data_country.extend(data)
    else:
        print(f"Error en la solicitud para {country}: {response.status_code}")

data_chargesmap= pd.DataFrame(data_country)
```

APIs | Cleaning Data

Open Charge Map

1. From the API "OpenChargeMap", we did the clean-up after downloading the data from the API and creating the data frame (.csv).

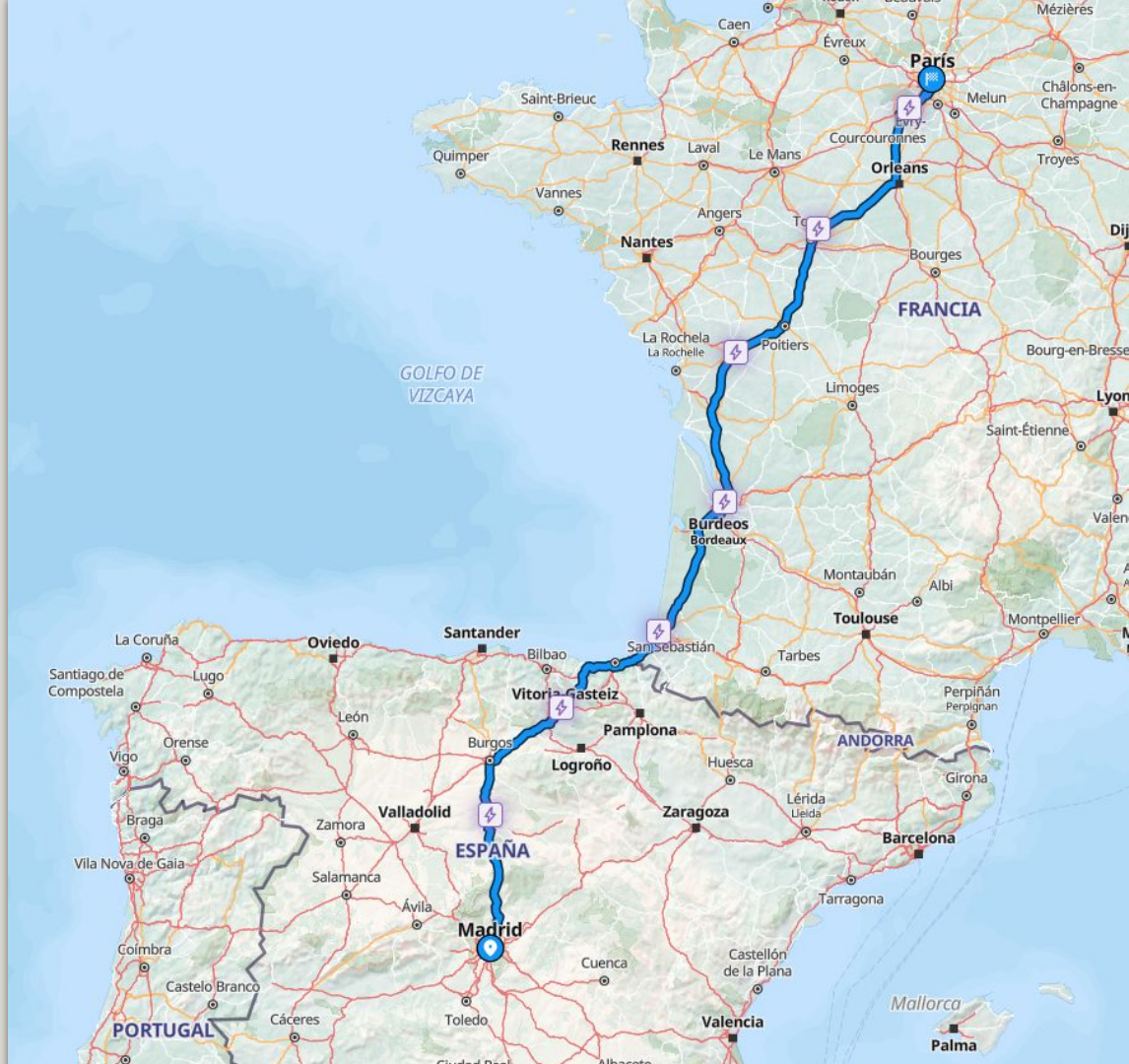
2. The raw data set contained many unnecessary columns, including: address info, UU ID, operator ID, status type ID, general comments...

3. To obtain the cities we needed for our route, we had to separate the information I saw in the same column, into six

Way to Paris by Tesla

Tesla is the car that emits the least CO_2 emissions during our trip. However, when travelling in an electric car, we have to take into account:

1. We have to stop to charge the car approximately 7 times.
2. Our trip will last 3 hours more.



Conclusion

By plane

Distance

2600 kilometres

Time

4 hours of travel

CO_2

465.65 kg for 3 people

By Tesla

Distance

2800 kilometres

Time

34 hours of travel

CO_2

0 kg

By train

Distance

3600 kilometres

Time

20 hours of travel

CO_2

261 kg for 3 people

Future researching paths

1. Is Tesla really so eco-friendly?
   a. Carbon emissions of Tesla's production (car, battery, engine, chips).
   b. Can batteries be easily recycled?

2. Research about the different sources of that electric energy (renewable energies, gas, carbon, nuclear).

3. Investigate different types of aeroplanes and trains (more specific calculations).

4. Price comparison of the different travel options.

Teamwork

Firstly, we spent one day brainstorming to see what data we could focus our project on. After deciding together that we were going to investigate the environment, we divide the tasks and APIs to make it easier to work and more efficient.

Major Obstacles

We had several problems that did not allow us to move forward quickly.

- The first thing would be to upload the python codes to Git in the different branches. The inexperience resulted in errors and conflicts in the commit.
- Another problem was getting the data from the "Climatiq" API. This API, which was more efficient than Carbon Interface, did not allow us to extract the data. Therefore, we had to change the API.
- We try to do Web Scraping, but Google Maps don’t let us

Thank You.

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