**Milestone 2**

**Overview**

For our project, ***COVID-19 Impact through Data Visualization***, we aim to provide a comprehensive understanding of the pandemic's impact on society through three main aspects: COVID-19 cases and deaths, flights to assess travel in Europe, and the impact of COVID-19 on employment. We already implemented more than a minimum viable product (MVP) for our visualization. Go and check our page at <index.html>. For this reason, we will not include sketches anymore in our description, as we passed this phase, but rather expand on how our current visualization will look in the end and how the real data will be incorporated into it.

**Design and implementation**

We use a combination of Bootstrap, JavaScript libraries, CSS and HTML. Note that our data is not yet bound to the visualization. We divide the website in the following manner:

1. A fixed-at-the-top navigation bar with 4 links (Summary, Cases, Employment and Flights), that serves as the menu with shortcuts for the 4 sections of our website.
2. Four sections that are linked to the aspects that we want to analyze related to COVID. They are split in the following way:
   1. The first section and the starting point of our website is the Summary. It will display the total COVID deaths and cases through 2 lazy loading increment counters (simple Javascript).
   2. The second section (Cases) is represented by the COVID numbers throughout the world. In this part we first display a slider created using an SVG component and D3 simple slider tool. This slider will span from 2020 to 2023 and will be sampled monthly (monthly ticks). The current positions of the slider will display the month and the year. You can either select a specific month of a year by dragging it or you can simply let it automatically run through all the timesteps. This is done through a play/pause button represented at the left side of the slide bar. It will be connected with the monthly COVID statistics and the globe described in the following paragraph. We display a complex interactive 3D globe using Globe GL. It has the options to be hovered, zoomed in and out and rotated. It will incorporate monthly COVID statistics, from 2020 to 2023, selected by the aforementioned slider. For the data that will be displayed on it, we will compute the total monthly deaths per 1000 people and then the total monthly COVID related deaths per 1000 people, and express the percentage of the COVID related deaths from the total deaths. We will use a heatmap for this and we will choose a suitable color palette to show the increase or the decrease in the percentage, throughout the timespan. While the slider automatically runs, you can rotate the globe and better observe different parts of the world. We map the world’s countries on the globe using predefined GeoJSON formatted data and make use of the Polygons Layer from Globe GL to define each country’s location and appearance. At a hover of a country, and while a particular month is selected, the country’s borders will rise above the original surface of the earth, to better highlight it, and a pop-up card with more monthly information will appear. This pop-up card will contain the country’s flag, total monthly COVID deaths, cases and, probably, recovered people and vaccination numbers.
   3. The third section, Employment, will showcase the impact of COVID-19 on global employment through interactive infographics created with SVG (using fontawesome components) and Javascript. We'll focus on statistics related to the number of working hours lost, and use visual aids (such as infographics displaying 5 out of 100 people) to underscore the significance of this impact.
   4. The last section (Flights) will show the impact on flights on the European continent during a period of 4 years (from 2018 to 2021). We use an embedded tiled map from OpenStreetMap through the Leaflet library, that is draggable and zoomable. On this map will pin the airports based on their locations (latitude, longitude) by using some colored bubbles. On a zoomed-out level, we will display a bubble per country and as you zoom-in/zoom-out the map, the bubbles will dynamically increase/decrease, showing more/less airports. We will do this by adding/removing a Layer with more/less markers depending on the zoom level. The color of the bubbles will be represented by a palette related to the number of total flights in that location. At each location, by using the Marker Layer methods from Leaflet library, we will display, on click, a detailed chart that contains 4 time series (one across each year) with the total number of flights for that specific airport (months on x axis and years on the y axis; the label will appear at the end of each line).

**Useful courses**

Many courses proved, or will prove, useful to our project. We used course 1 (Basic Web Development) and the links associated with it to better understand the DOM, create the first draft of the project and to properly structure the HTML and CSS files. We found useful the documentation about the SVG when creating the SVG group and the required transformations for the slider. Courses 2 and 3, about JavaScript helped/will help us with the interaction with the DOM from JavaScript and structuring the code in an object-oriented manner. Lectures 4 and 5 help us to use D3 to load our data, bind it to the visualization, dynamically manipulate the DOM, build some visualizations (the charts for the flights map) and define interactions and layering at the map/globe level. Lecture 6 and help us to choose the right color palette for the heatmaps in our globe and bubbles on the map, make use of visual pop-out to attract attention when hovering over the globe and design our flight charts not to look cluttered. The course on Maps helped us to design the COVID globe and the map with the airport locations. We will use the Storytelling course to structure our narrative in a proper way.

**Extra ideas that may enhance the visualizations but could be dropped**

TODO: Anyone (NOT ME hehe)