# FORMULA 1 VISUALIZATION

## PROCESS BOOK

Data Visualization Course | Xavier Ogay, Colin Pelletier and Yahya Hadi

# INTRODUCTION

Colin's strong passion for Formula 1 is contagious, inspiring Xavier and Yahya to dive into the exciting world of motorsports. As we explored this thrilling sport, we saw its potential to interest even those who are new to it. Our project aims to introduce Formula 1, giving a glimpse into its rich history and exciting competitions. By sharing key facts, we hope to spark curiosity and encourage people to learn more about this dynamic sport.

During our brainstorming sessions, we thought about what aspects of Formula 1 would most captivate our audience. We realized we needed to create an engaging story that would guide users through the various facets of Formula 1. We carefully selected content to highlight the sport's top achievements, including the most successful drivers and teams, and the Hall of Fame featuring five legends who have made a lasting impact. Our goal was not just to provide information, but to immerse users in the world of Formula 1. Using innovative visuals, like an interactive world map of circuits and a dynamic graph showing the relationship between teams and drivers over the past 14 years, we aimed to make the sport come alive in an engaging way. With each click, users begin a thrilling journey, discovering the triumphs and challenges that have shaped Formula 1 into the amazing spectacle it is today. Welcome to our Formula 1 journey—where every twist and turn promises to leave you excited and wanting more.

# VISUALIZATION DESIGNS

Once we crafted the narrative for our project, the next step was to conceptualize the visualizations that would bring our story to life. We designed five interactive visualizations, each offering a unique way for users to engage with the content, whether through animations, hovering over graph curves, or clicking on pilot images. Our aim was to leverage these interactive elements to enhance user engagement and make the content more enticing to explore.

## LEADERBOARD

The leaderboard presents a bar chart showcasing the top 10 drivers and constructors based on their number of wins since the inception of Formula 1. Users can animate the chart to witness the evolution of teams and drivers over the years, gaining insights into the most renowned figures in the sport's history.

## HALL OF FAME

Following a glance at the statistics, we offer users a deeper dive into the achievements of the top five most successful drivers of all time—those with the most championship wins. Using a spider chart, we provide a comprehensive visualization of their overall performance, supplemented with additional statistics and information. This approach ensures that even newcomers to the sport can grasp the significance of these legendary figures.

## CIRCUITS MAP

The circuits map showcases a world map marked with circuit locations. Users can click on each marker to access detailed information such as circuit length, layout, and the driver with the fastest lap. To enhance interactivity, we display the circuit name when users hover over a marker and implement a zoom feature for regions where multiple circuits are clustered for a seamless exploration experience.

## SEASON VISUALIZATION

While initially considering a detailed analysis of the intense 2021 battle between Lewis Hamilton and Max Verstappen, we opted for a broader approach tailored to newcomers to the sport. Our line chart illustrates the evolution of driver points across seasons, allowing users to hover over the graph to view specific race results and points earned by each driver since 1950.

## DRIVERS AND TEAMS RELATIONSHIP

In order to comprehend the intricate dynamics between drivers and teams—such as which teams frequently hire multiple pilots and which drivers switch teams most frequently—we employ a neighborhood graph. This interactive visualization enables users to select either a team or a driver and maneuver them across the graph for detailed analysis. By doing so, users can explore the vast network of relationships within Formula 1, encountering numerous names and gaining a deeper understanding of the sport's roster throughout its history.

# IMPLEMENTATION AND CHALLENGES

The project architecture utilizes multiple React components, each representing a distinct visualization that can integrate into larger visual compositions. These components are organized within React pages, enhancing task distribution among team members and simplifying the implementation of various visualizations. Styling for both the individual components and the overall website was accomplished using CSS, providing a consistent and appealing visual theme throughout the project. Data manipulation and extraction were critical due to our need to handle CSV files loaded with details about constructors, drivers, and races. For this purpose, Python programming was employed to parse and distill meaningful insights from our datasets, setting the stage for visualization. To convert this processed data into engaging and interactive visual graphics, we adopted D3.js

## LEADERBOARD

The leaderboard presents two race bar charts showcasing the top 10 most successful drivers and constructors throughout the years, based on the number of wins. To make this visualization possible, we had preprocessed data in a manner that would make the development and the linking of the data to the visualization easy. For both drivers and constructors we organized the data in csv files and sorted it to reflect the ranking of drivers and constructors based on their historical performance. Animations and transitions are implemented using React Spring, adding a fluid motion that helps in illustrating the changes in rankings over time. This approach not only enhances the visual appeal but also makes the data more understandable by highlighting trends and shifts in performance across different years. The user can either click on the play button and start the animation or slide the progress bar to check for a particular year Additionally, our choice of the inferno color scale from the D3.js library for visual encoding effectively maps numerical data to visual dimensions and colors for the DriverLeaderBoard. This choice helps convey information vividly, allowing viewers to quickly comprehend comparative and absolute performance metrics.

## HALL OF FAME

The visualization depicted in the "Hall of Fame" image is designed to highlight the skills and achievements of iconic racing drivers, integrating both statistical and graphical elements to enhance viewer engagement. The primary component of this visualization is a spider (or radar) chart that quantitatively represents various attributes such as durability, strength, speed, and intelligence of the pilots. This multi-dimensional display allows for a comparative analysis at a glance, showing how each driver stacks up against others in different skill areas. Additionally, when click on a particular driver, for example Lewis Hamilton, a we provide textual information detailing the most important career highlights and records, thereby personalizing the data presentation.

# CIRCUITS MAP

This visualization contains two parts: the map and the circuit information. To implement the circuit map, we used the react-simple-maps (RSM) library. It provides a set of tools to display a map and its components such as markers and annotations. It also includes zoom. Using this library provided a very handy first draft of the map. Our job then was to understand how to work with it properly and to extend its map capabilities. Several things were added/changed. First, we made the markers clickable, change their color depending on whether they are selected, and display the circuit name on hover. Then we added a zoom factor so that the markers and text become smaller as you zoom in on the map. To add interactivity, we added an automatic zoom on the marker to better see the area around the circuit. Initially, we recentered the map at the marker coordinates, but through experimentation we found that it was much more fluid to zoom only to a certain zoom factor. This allows the user to select different markers without the map moving when it doesn't need to.

The main difficulty with this visualization was figuring out how to properly scale the map in the web page. While the library is very useful, it is poorly documented. With the markers, we had to edit svg inside the library components (for example, the markers are custom svg components inside a <Marker> tag of the library), and the interaction between the CSS, the react components, and the SVG was not obvious. For example, we started by defining the map width with the same width as the parent component. But some internal margins are defined in the react-simple-map library, and this caused the parent component to grow infinitely, and the map within it as well. Once we understood where this was coming from, we fixed it by using margins inside the parent component.

# SEASON VISUALIZATION

We started by implementing it in D3.js, which would make the code quite long. After some research, we realized that it was possible to implement it in react-plotly. After that, the main goal was to convert our original Python Plotly code to react-plotly. Once that was done, we designed a slider bar to dynamically change the years. In this case, it was very important to dynamically load the graph data according to the year, as rendering everything at once would make the visualization extremely slow and inefficient.

# DRIVERS AND TEAMS RELATIONSHIP

To understand the complex dynamics between riders and teams - such as which teams frequently hire multiple riders and which riders switch teams most often - we use a neighborhood graph. This interactive visualization allows users to select either a team or a driver and maneuver them around the graph for detailed analysis. This allows users to explore the vast network of relationships within Formula One, encountering numerous names and gaining a deeper understanding of the sport's roster throughout its history.
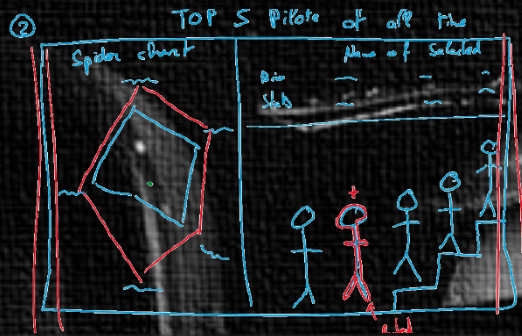
# VISUALIZATION RECAP

In this section, we analyze the sketches and the actual visualizations. As we can see, we were able to use most of them in the initial expected form.
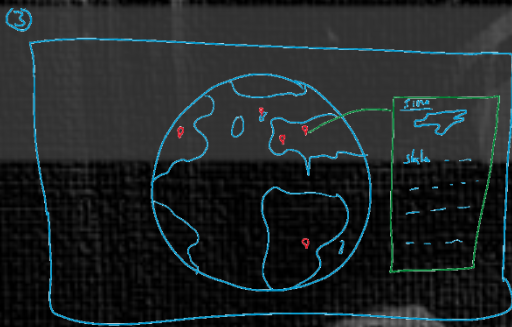
## LEADERBOARD
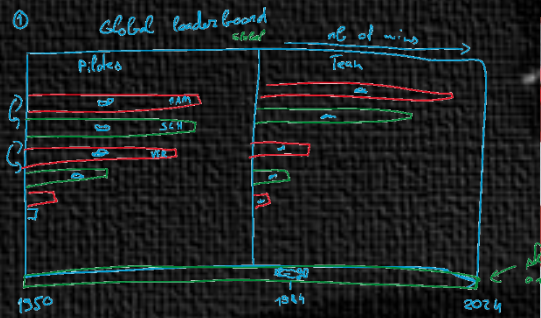


As we can see, we were able to provide a page similar to our expectations.
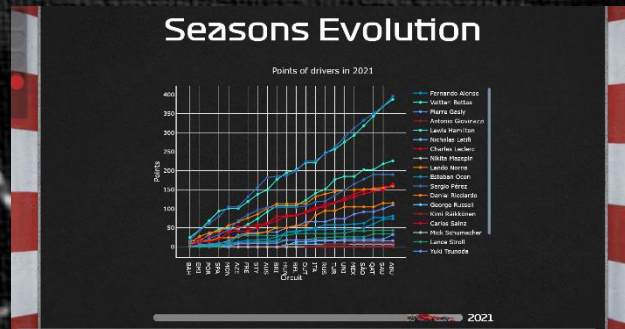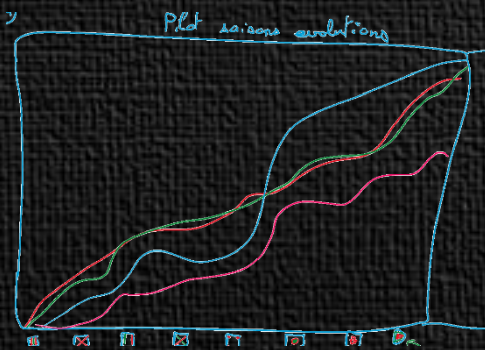
## HALL OF FAME



As we can see, we were able to provide a page similar to our expectations.
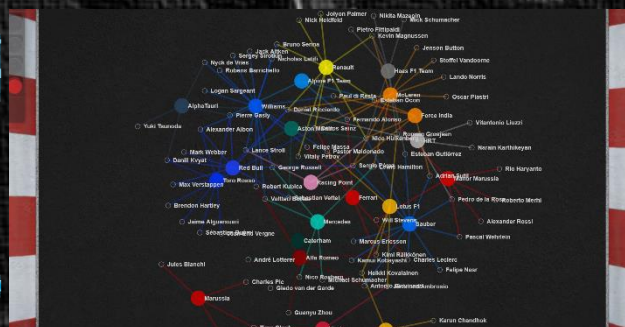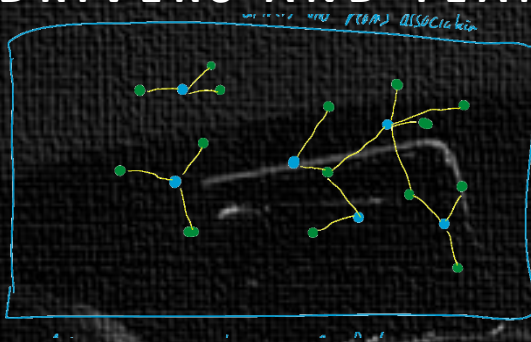
## CIRCUITS MAP



We used a 2D map and changed I to display information horizontally for an easier navigation.

As we can see, we were able to provide a page similar to our expectations.

# DRIVERS AND TEAM RELATIONSHIP




As we can see, we were able to provide a page similar to our expectations.

# PEER ASSESSMENT

### XAVIER

Website :
- React website initial structure
- Leaderboard
- Drivers and Team Relationship
- Hall of Fame

M2 visualization sketches

### COLIN

Website:
- M2 "default components"
- Season Evolution
- Circuits Word Map

Report
Video

### YAHYA

Website:
- M2 "default components"
- Leaderboard initial visualisation

Report: text for a few module implementation