Data Visualization
Process book

A visual exploration of Formula 1 and its history

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1 – Introduction

F1 racing is the most prestigious league that exists in the racing world. Indeed, the FIA (Fédération Internationale Automobile) recognizes leagues from go-kart to F3, F2 up to F1 which is the pinnacle of automobile racing.

The first race was in 1950 and had 7 grand-prix. Out of those 7 circuits, 4 are still used today which are Monza, Monaco, Spa and Silverstone.

In the past 70 years, F1 as marked history as one of the most competitive and exclusive sport that ever existed. Some teams have disappeared within years of existence whereas some have reigned without mercy for years.

The same goes for pilots such as Ayrton Senna, Michael Schumacher or Lewis Hamilton who became icons of their times and marked the history of the sport.

On the other hand, Data visualization aims uncovering insights about data through visual objects. Creating a new layer of abstraction more suited for human cognition than raw data. It is used for a wide variety of reasons, such as communication, exploration and understanding.

The increasing amount of data generated by humankind makes data visualization critically important. The following presents the process we went through to build our own visualization project as part of the COM-480 Data Visualization class at EPFL.

2 – Data

We found a very detailed data set of formula 1 results on Kaggle. The exploratory data analysis confirmed the quality and the potential of the data set we decided to work on.

The data set consists of multiple csv files. The main ones contain information about the circuits, the races, the constructors, and the drivers. Additional tables depict the diverse relationships between them.

3 – Intentions

Before starting to build the website, we had to determine our intention, what journey we wanted for our end user. We distinguished two possible directions. The first one was to present very detailed results, statistical analysis, and technical data.

The second one was to take advantage of the long time covered by the data set to give a large overview of the sport. The official formula 1 website already providing very detailed data about specific races, constructors, pilots, and cars, we settled for a global representation of the entire history of the discipline. Rather than being ultra-specific about one point, we wanted Formula 1 fans to be able to come to our website and enjoy the bigger picture of their passion and carried this intention throughout the project.

4 – Visualizations

4.1 – The Timeline

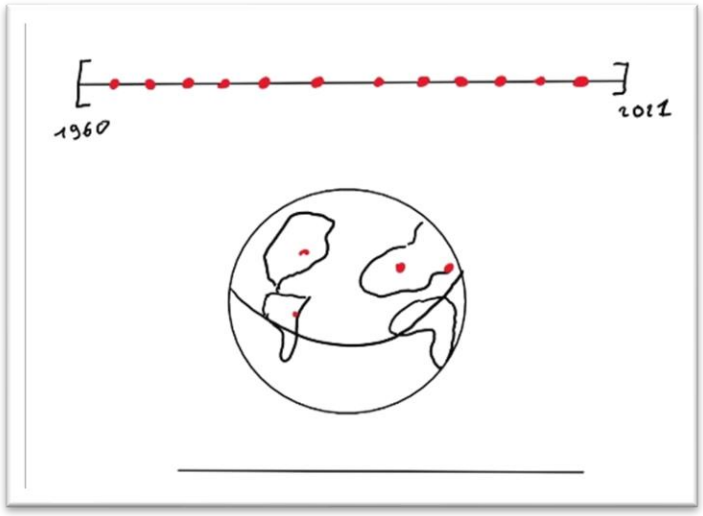
Now that we had a clear idea of our message, we started discussing the interface. Guided by our message, the first things that came up were a timeline at the top of the page along with a map of the world.

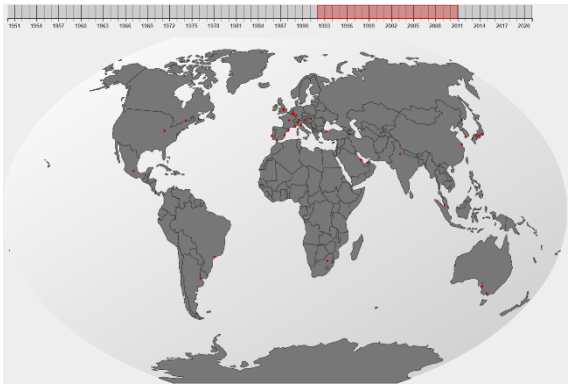
It is the core of our website; it consists in a timeline covering the range of race years [1950-2021] which has a sticky feature for it to always be on display for the user. The user can select a time range and the website will consequently adapt to it.

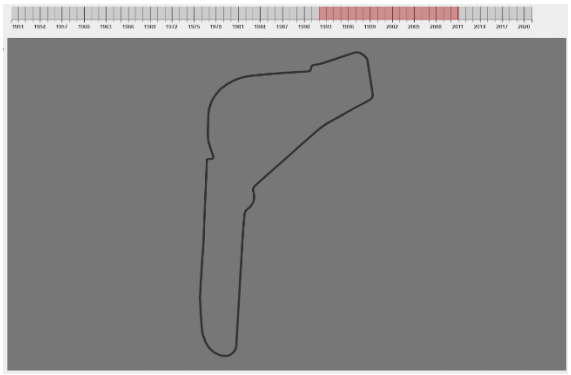
4.2 – The map

We wanted our user to be able to travel freely the formula 1 world, both across time and space. The map shows all the races that took place in the selected time range on the timeline with a red point. A hover on a point shows the details about the race in overlay (name of the race and the total number of races that happened there. A single click on a race shows the shape of the circuit and detailed information are shown in the "in-depth" analysis part of the website**.**

The user can zoom on a specific region by selecting a rectangle to zoom in. A single click in the void de-zooms the map to the overall view.







4.3 – Pilot Ranking

Additionally, we wanted to provide a ranking of pilot by year as every F1 fan has a favorite and want to see how he did for a specific year. Therefore, we placed on the left side of the map, the ranking list of all the pilots for the last year of the timeline selection.

The list shows the number of points each driver score and the number of grand prix won during that season.

If the user clicks on the name of a pilot, he can get detailed information about him in the in-depth analysis part of the website.

If a range of values is selected in the timeline, the result of the last selected season is displayed.

Driver standings of season 2008

Driver	Points	Wins
Lewis Hamilton	98	5
Felipe Massa	97	6
Kimi Räikkönen	75	2
Robert Kubica	75	1
Fernando Alonso	61	2
Nick Heidfeld	60	0
Heikki Kovalainen	53	1
Sebastian Vettel	35	1
Jarno Trulli	31	0
Timo Glock	25	0
Mark Webber	21	0

4.4 – Team ranking

The team ranking, as the pilot ranking is placed aside to the map. It is on the right side and shows the ranking of the team for the last year of the timeline selection.

If the user clicks on the name of a team, he can get detailed information about it in the in-depth analysis part of the website.

As for the pilots ranking, if a range of values is selected in the timeline, the result of the last selected season is displayed.

Constructor standings of season 2015

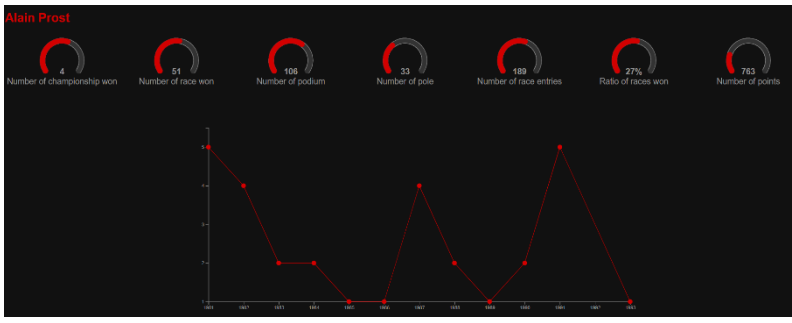
Constructor	Points	Wins
Mercedes	703	16
Ferrari	428	3
Williams	257	0
Red Bull	187	0
Force India	136	0
Lotus F1	78	0
Toro Rosso	67	0
Sauber	36	0

4.5 – In-depth analytics

- ### Pilots

For the pilot we provide his ranking in the time selected time range to see changes in change. A hover on points shows detailed information per year. We also provide also key metrics such as:

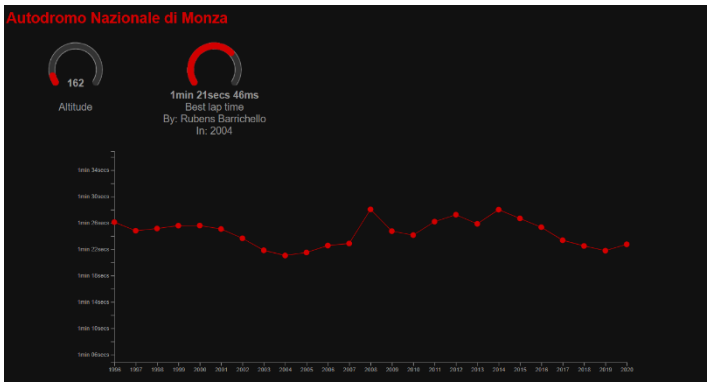
- **The number of championships won.**
- **The number of races won.**
- **The number of podiums.**
- **The number of poles in the starting grid.**
- **The number of races entered.**
- **The ratio of race won.**
- **The number of points won.**



- ## Grand prix

For the teams, we provide the ranking per team based on the selected time range and also the exact time when hovering over a point. An interesting fact is to see that the lap time did not necessarily improve with years. Indeed, the FIA regularly changes the rules concerning the vehicles to keep the small teams competitive but also to prevent team from putting their drivers at risk.

We also included key metrics in gauges (full gauge represents the one with the highest score) such as:

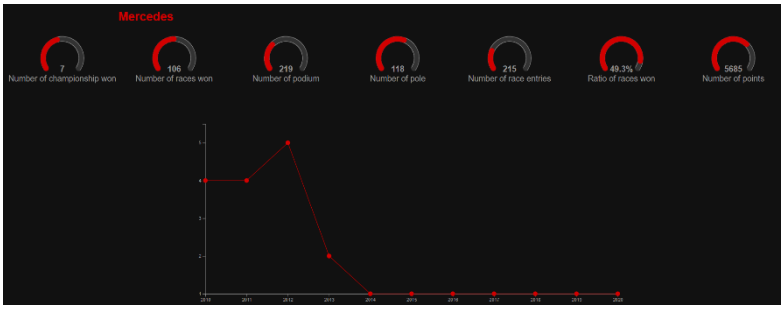


- **The altitude of the grand prix.**
- **The pilot with the best time on the race.**
- **The year of the best lap time.**
- **The best lap time.**

- ## Team

For the team analysis, we give a graph with a graph with the ranking of the team in the selected time range. On hover we get details such as the number of point score during the specific year and the number of wins.

Other key metrics included in the form of gauges in the selected time range are:



- **Number of won championships.**
- **Total number of races won.**
- **The number of podiums of the team**
- **Number of poles starts.**
- **The number of race entries**
- **The ratio of races won.**
- **The total number of points won by the team.**

5 – Website

5.1 – Data Processing

The first step was to produce the actual data to be used by the website. Two tables were needed. The first one relates races and circuits and is displayed in the in-depth view. The second one links pilots and the races and is used in the pilot ranking, team ranking and in-depth analytics.

5.2 – Responsiveness

Throughout the development, we wanted our website to be fully responsive. This was successfully implemented in several ways. First, the content's size is dynamically adapted to the size of the browser window. Secondly, all data displayed on screen is in sync with the brushed part of the timeline and updated in real time. This was achieved by creating an overlay with compiled statistics on mouse overs in the map, generating the plots according to the brushed years and adding the statistics overlay to each plot points. Finally, the page content does not consist of different pages linked to one another. It is rather modulated by the user actions, seamlessly and with very little latency, creating a single consistent interface.

5.3 – Themes

Our website initially only came with a dark theme. We decided to introduce also introduce a light theme. Even though dark themes can enhance the impact of the visual elements and are very popular, light backgrounds are known to be more readable and reduce the strain on the eyes while reading. Therefore, we decided to provide both to the user.

6 – Challenges

The first challenge that we faced was to stay consistent with the website intention towards the user. In the early stages of development, we were trying to maximize the content. Finally, we were able to filter our ideas and focus on quality over quantity.

Secondly, the map came with its own lot of challenges. First, we had to decide of the projection we wanted to use. We initially thought about using a rotating globe, without projection, but it did not fulfill our intention of a global view. We therefore settled for the Winkel tripel projection which is esthetically pleasing and known to have a low distortion.

Finally, maintaining a high level of responsiveness required some additional attention, as the website must process a lot of data in the background. This was mitigated by a preprocessing adapted to end-usage of the data and a proper utilization of JavaScript promises.

7 – Possible improvements

One possible improvement would be to update the data in real-time, after each race. This way, we would have a complete overview of the discipline, from genesis to today, at any time. Secondly, we could add more details about specific races. For example, we could display the number of overtaking, crashes, etc. and their evolution over time. Finally, we could add more detailed information about the drivers, a small bio, a picture, etc. The same could be implemented for constructors with their logo and history.

8 – Peer assesment

The creative process was shared with all the members of the group. All ideas were discussed and improved upon collectively. On the other hand, we defined a specific tasks repartition for the technical part. Two group members were responsible for the backbone of the project, the timeline, the map, the preprocessing, and the plots, while the last one took care of details refinements and additional elements, the gauges, the pilots and constructors tables and plots as well as the light theme. The roles were selected by personal interest and in the end, Pierre and Eliot worked on the task and Thomas on the second one.