

Formula 1 Analytics

RAFAEL COELHO



THIS PROJECT WAS BUILT WITH THE FOLLOWING TOOLS:



STREAMLIT



PANDAS



NUMPY



PLOTLY



UMAP



PYTHON



SCIKIT LEARN

FastF1 | Streamfy | Matplotlib

Formula 1 Analytics is a portfolio project developed by taking historical data from all Formula 1 seasons, since 1950. You can take some important informations about the most important motorsport in the world.

This tool has the following features:

OVERVIEW: Dive into F1's storied history, circuits, and legendary drivers. A rich tapestry of data awaits!

INSIGHTS: Delve into detailed track performance, constructor strategies, and driver skills. It's where data tells the story of speed and strategy.

SEASONS: Experience each F1 season with in-depth analyses. From telemetry data to lap analysis, get closer to the action.

AI SPACE: The future of F1 analytics is here! Combining advanced ML with vast datasets for revolutionary insights and predictions.



Formula 1 Analytics

Author: Rafael Silva Coelho

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- Insights
- Seasons
- AI Space
- About Us



Formula 1 Analytics

OVERVIEW

Dive into the heart of Formula 1 racing with our comprehensive Overview section. Here, you'll find a rich collection of data covering every aspect of the sport's storied history. Explore detailed information about the iconic circuits where history was made, learn about the constructors who engineered cutting-edge racing machines, delve into the profiles of legendary drivers who have become household names, and revisit every race that has contributed to the legacy of Formula 1. This section is your gateway to understanding the evolution and grandeur of one of the most thrilling sports in the world.

INSIGHTS

The Insights section is a treasure trove for Formula 1 enthusiasts and statisticians alike. Here, we delve deeper into the analytics of the sport, offering specific and detailed data about circuits, constructors, drivers, and champions. Whether you're looking for intricate details about track performance, constructor strategies, driver skills, or championship journeys, this section provides a wealth of data, enabling a deeper understanding and appreciation of the finer nuances of Formula 1 racing. It's perfect for those who love to analyze and uncover patterns and stories behind the numbers.

SEASONS

Formula 1 Analytics | Overview

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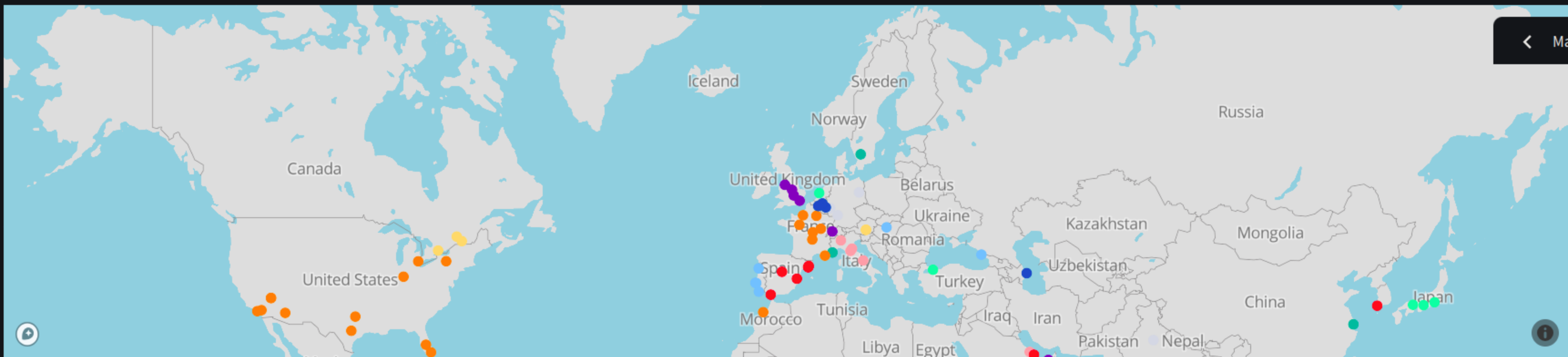
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Circuits Constructors Drivers Races

Circuits

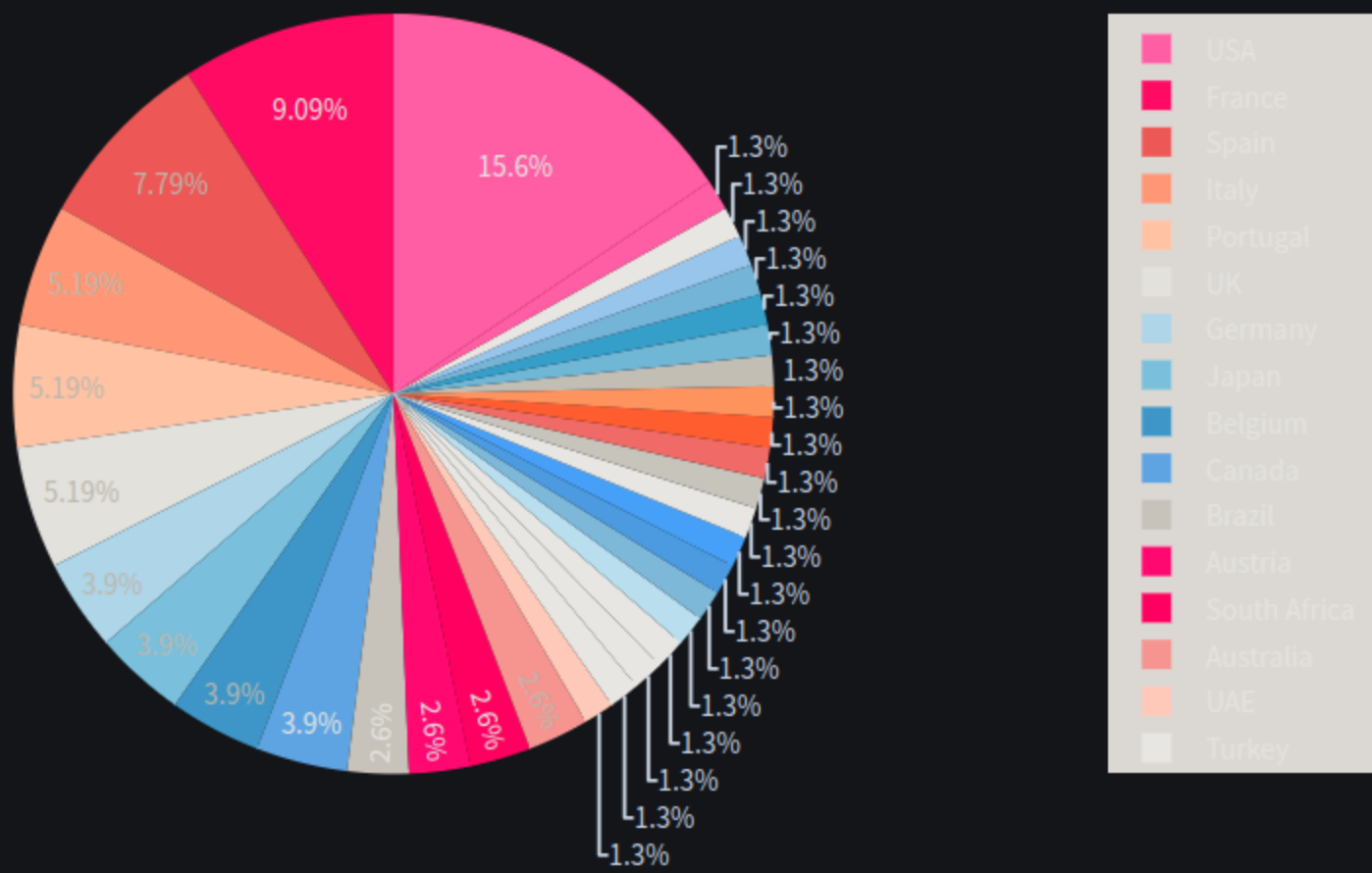
All circuits used by Formula 1 (1950-2023)



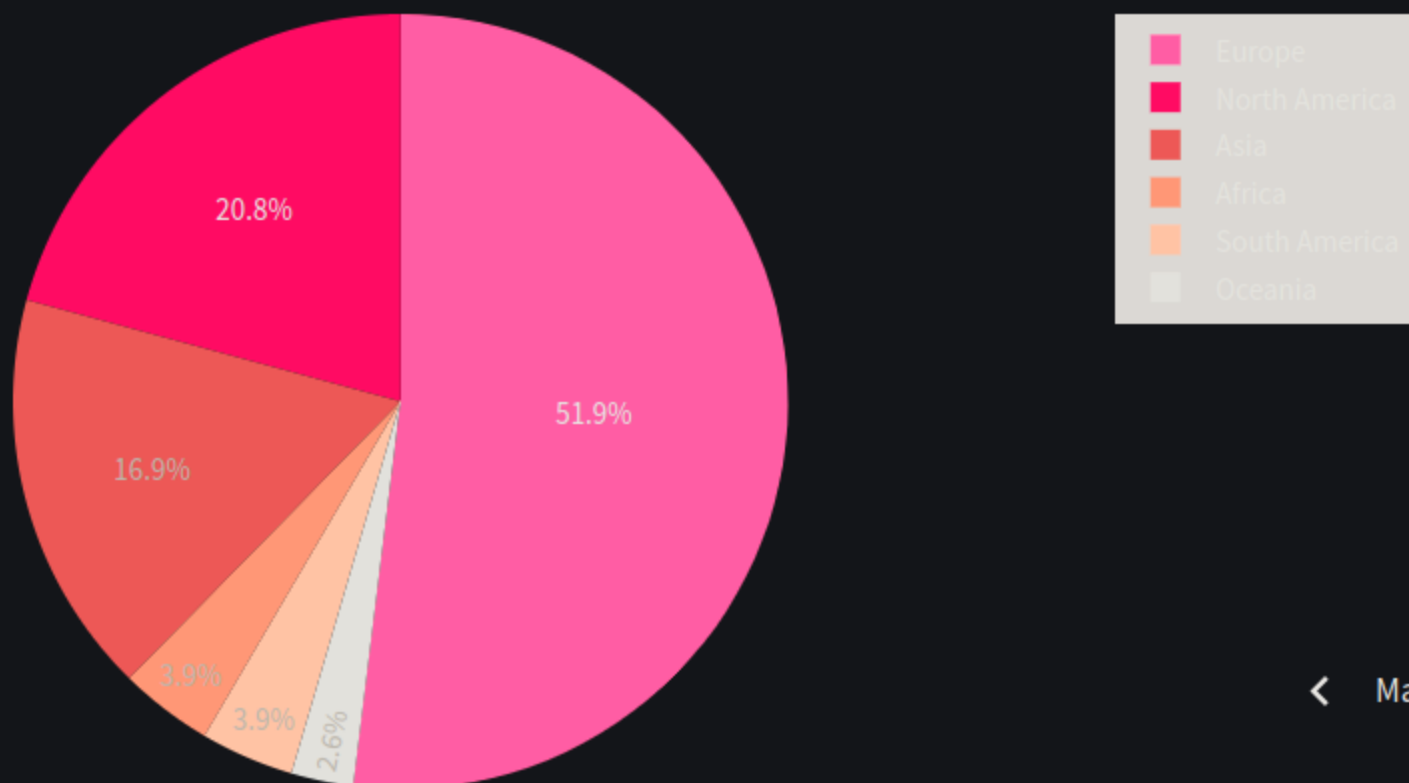
Amount of F1 circuits by country (1950-2023)



Percentage of circuits by country (1950-2023)



Percentage of circuits by continent (1950-2023)



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Circuits

Constructors

Drivers

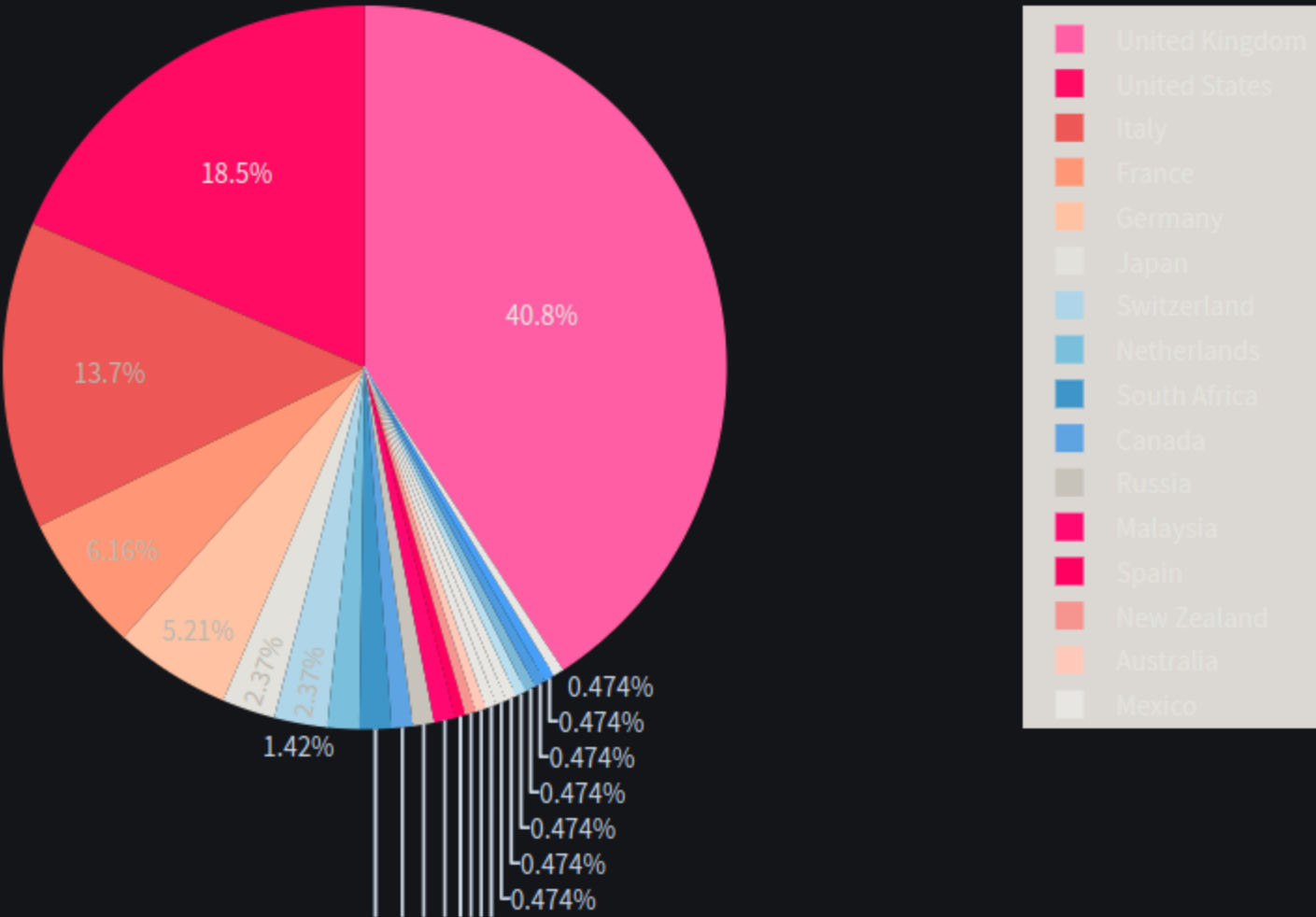
Races

Constructors

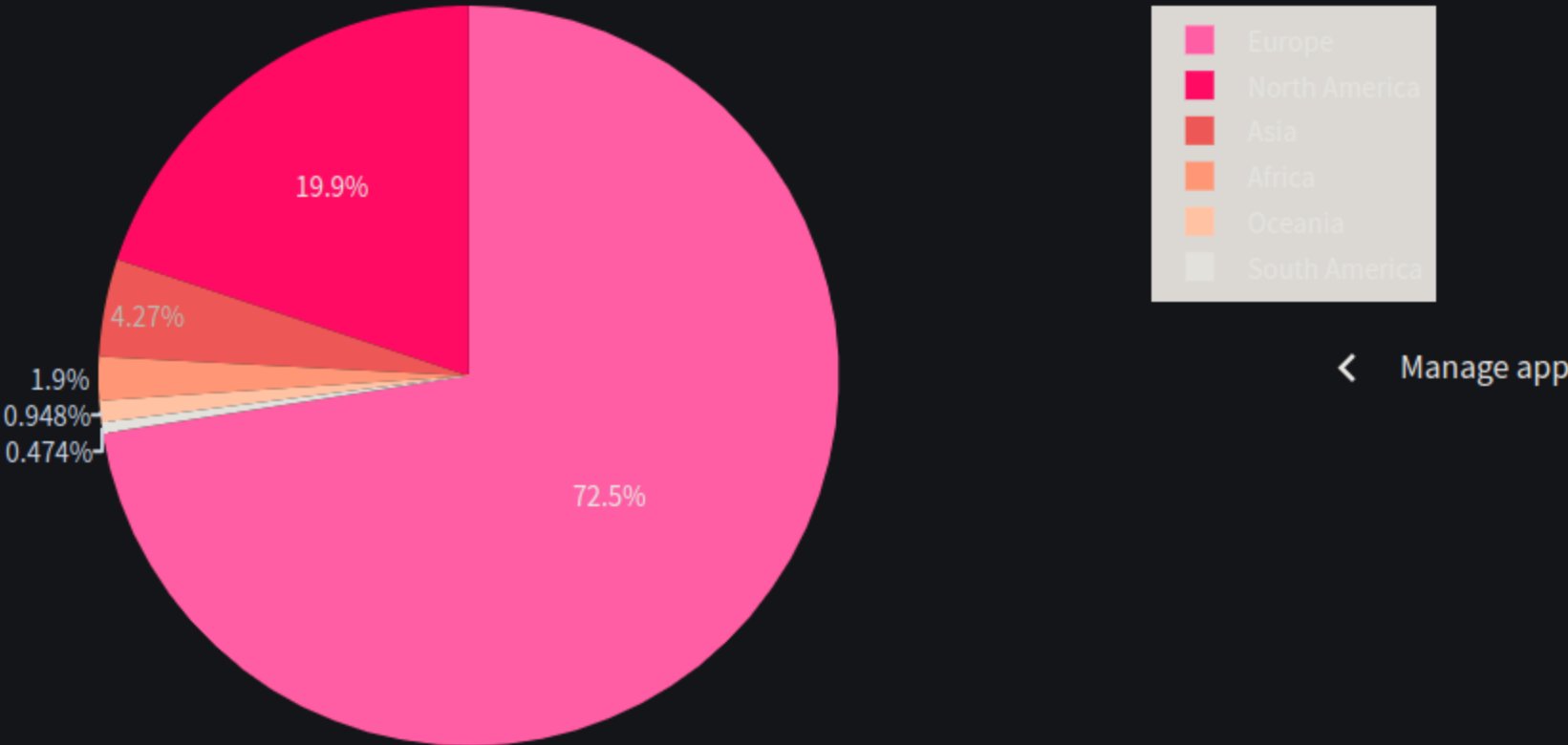
Amount of constructors by country (1950-2023)



Percentage of constructors by country (1950-2023)



Percentage of constructors by continent (1950-2023)





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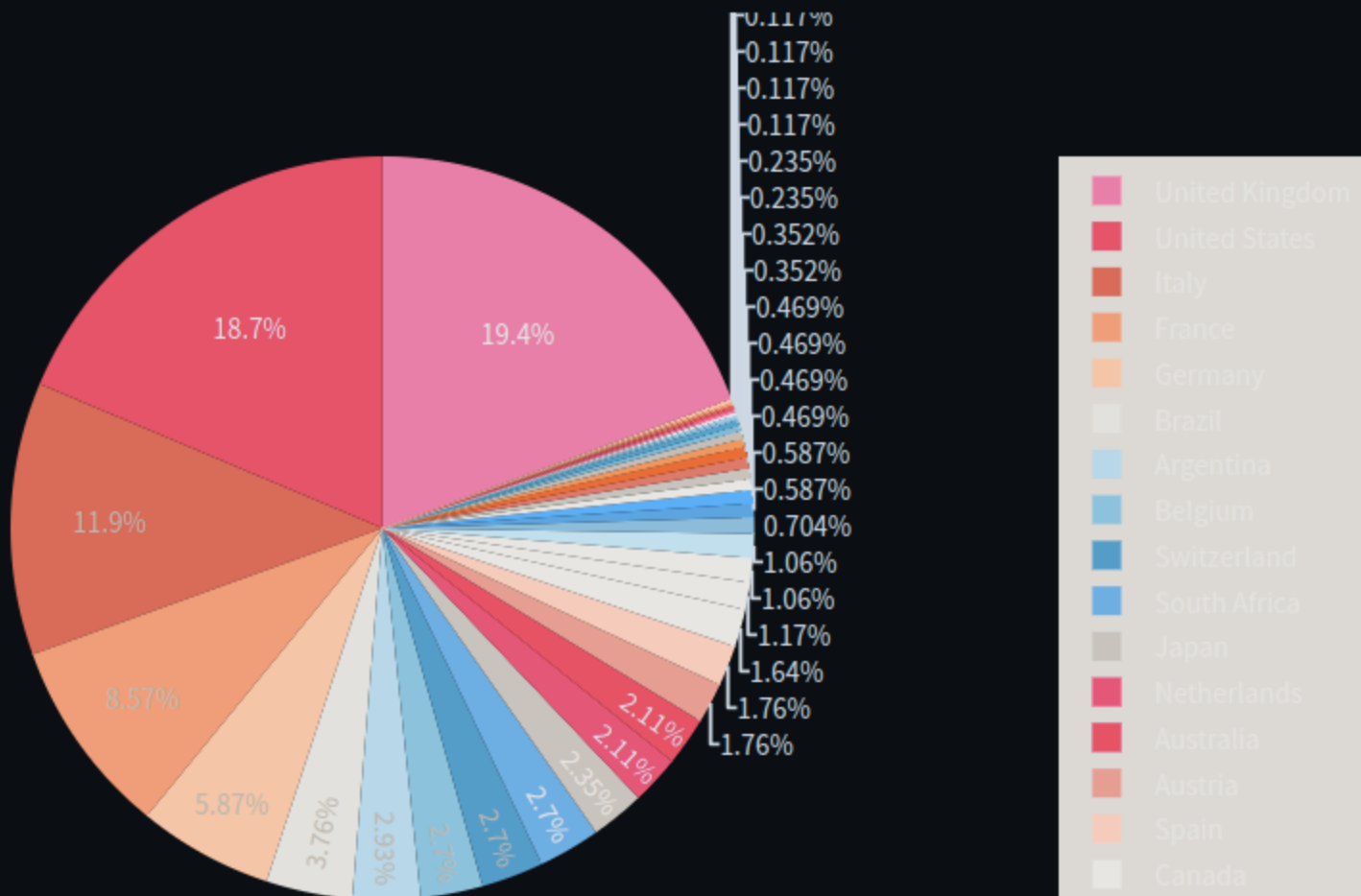
Circuits Constructors Drivers Races

Drivers

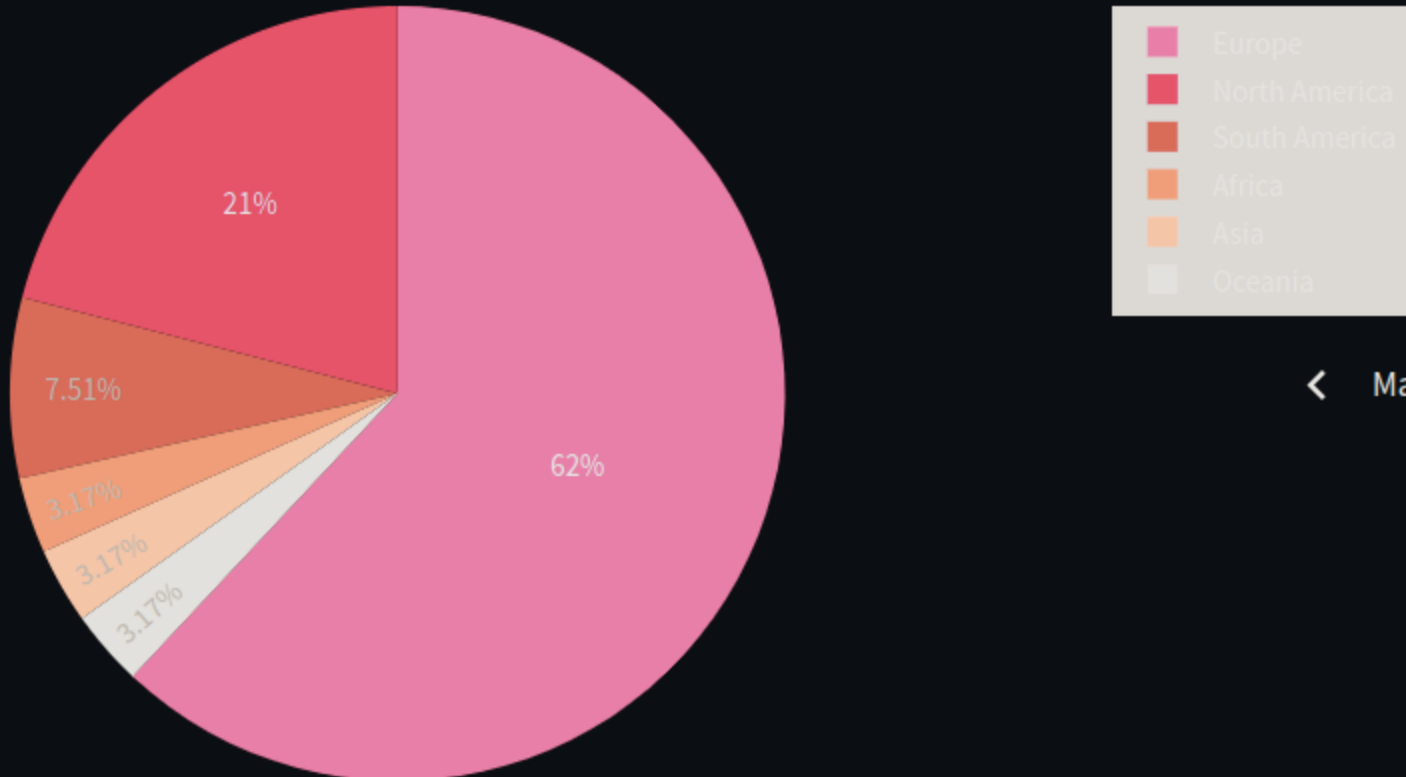
Amount of drivers by country (1950-2023)



Percentage of drivers by country (1950-2023)



Percentage of drivers by continent (1950-2023)



About the drivers

Country			Continent					
Choose an option			Choose an option					
	Country	Continent	Name	Number	Code	Date of birth	Age	URL (about the driver)
0	United Kingdom	Europe	Lewis Hamilton	44	HAM	1985-01-07	38	http://en.wikipedia.org/wiki/Lewis_Hamilton
1	Germany	Europe	Nick Heidfeld	\N	HEI	1977-05-10	46	http://en.wikipedia.org/wiki/Nick_Heidfeld
2	Germany	Europe	Nico Rosberg	6	ROS	1985-06-27	38	http://en.wikipedia.org/wiki/Nico_Rosberg
3	Spain	Europe	Fernando Alonso	14	ALO	1981-07-29	42	http://en.wikipedia.org/wiki/Fernando_Alonso
4	Finland	Europe	Heikki Kovalainen	\N	KOV	1981-10-19	42	http://en.wikipedia.org/wiki/Heikki_Kovalainen



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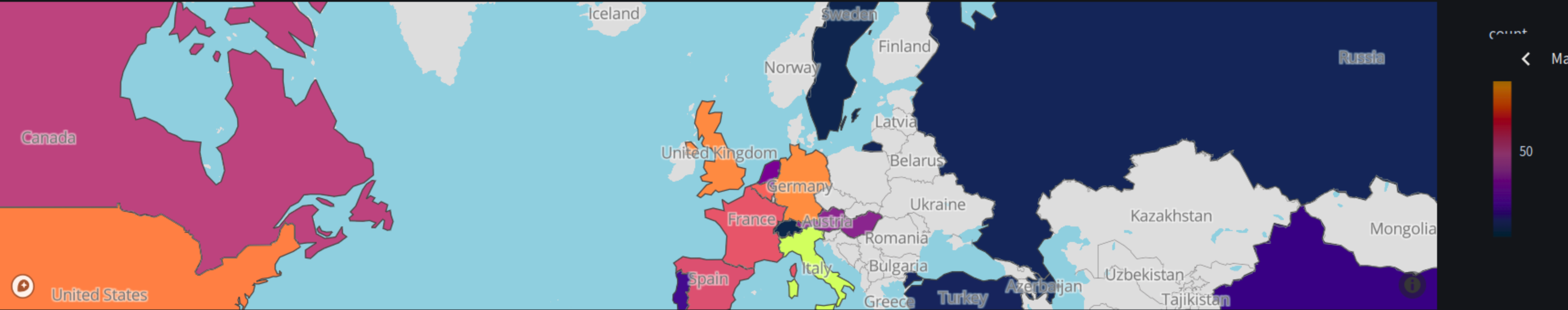
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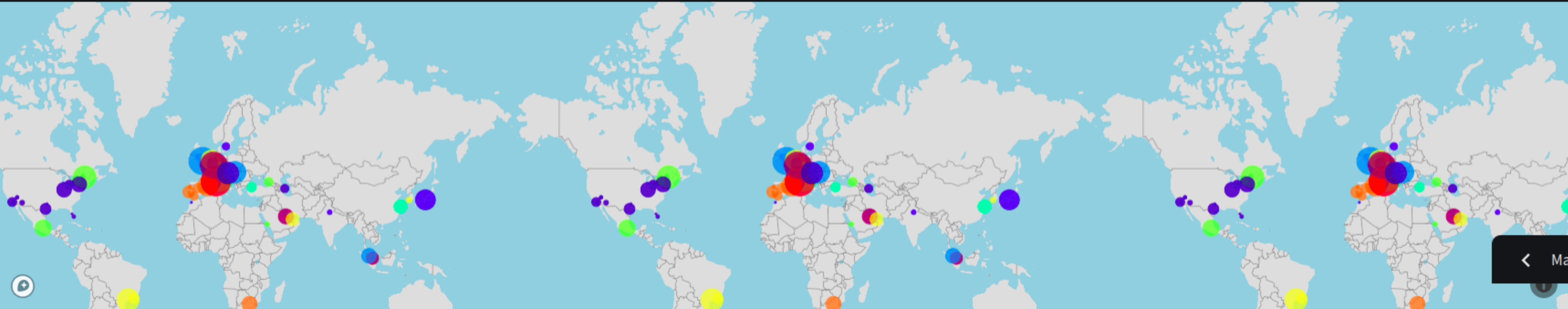
Circuits Constructors Drivers Races

Races

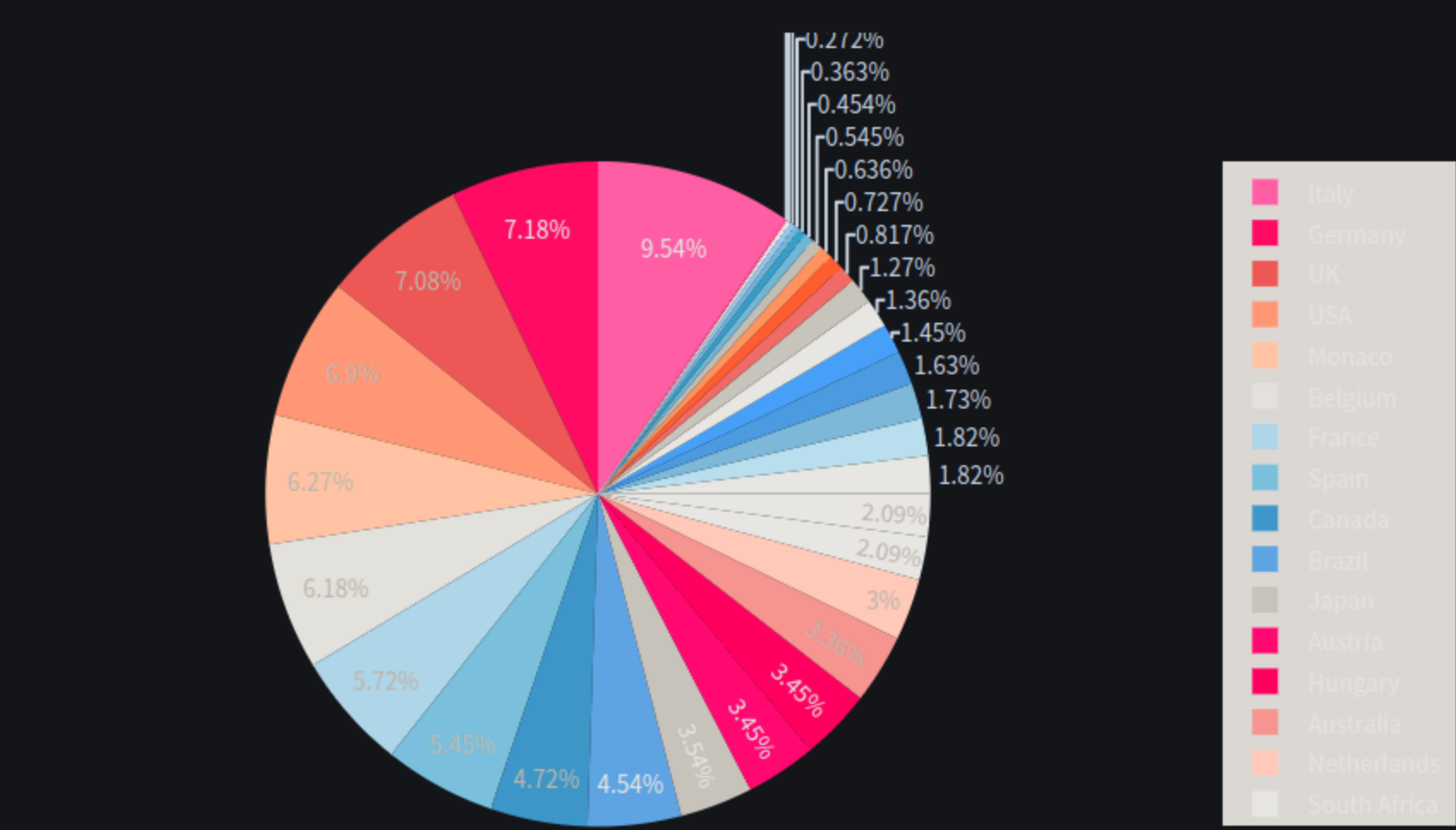
Amount of races by country (1950-2023)



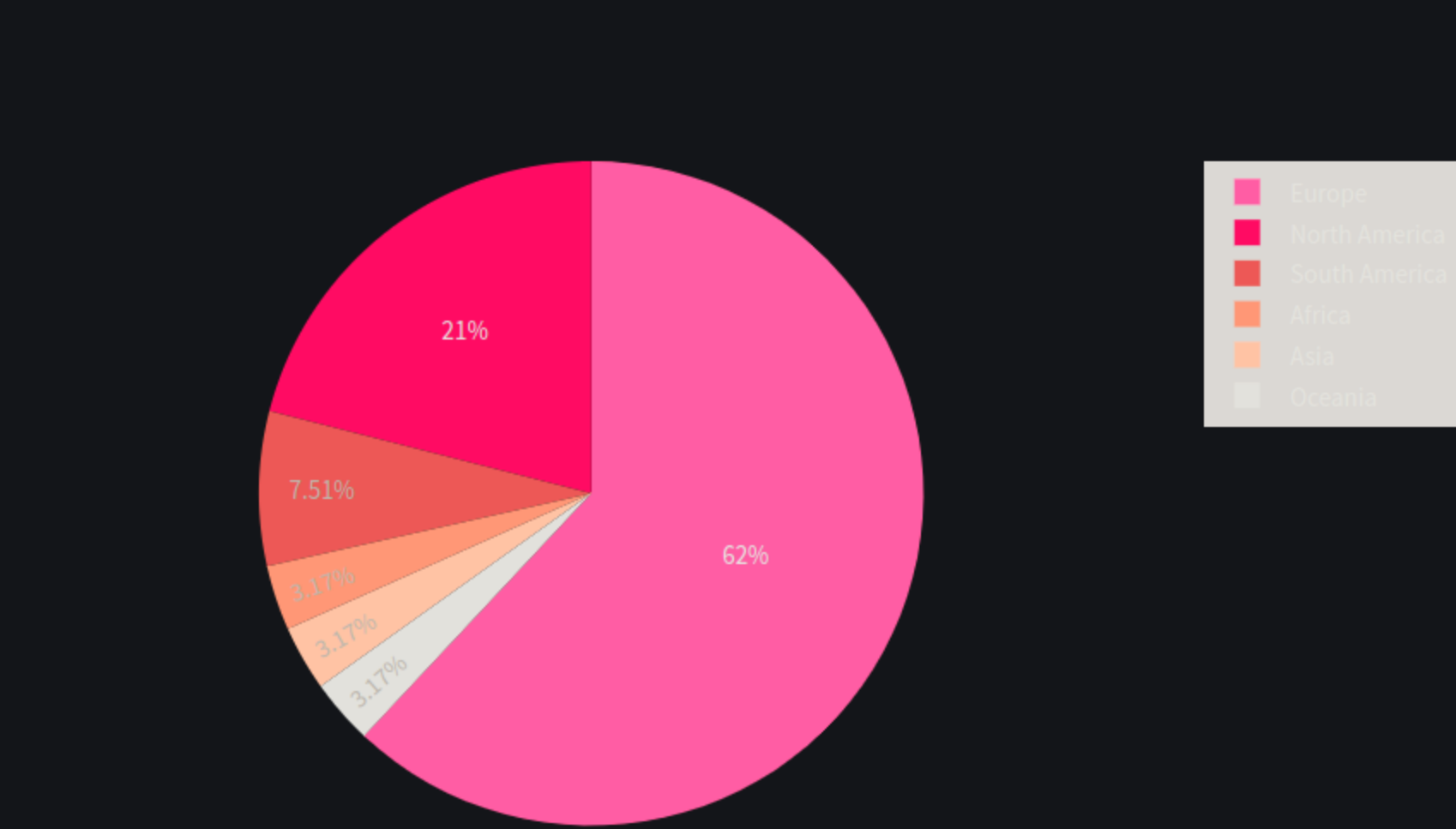
Amount of races by circuit (1950-2023)



Percentage of races by country (1950-2023)

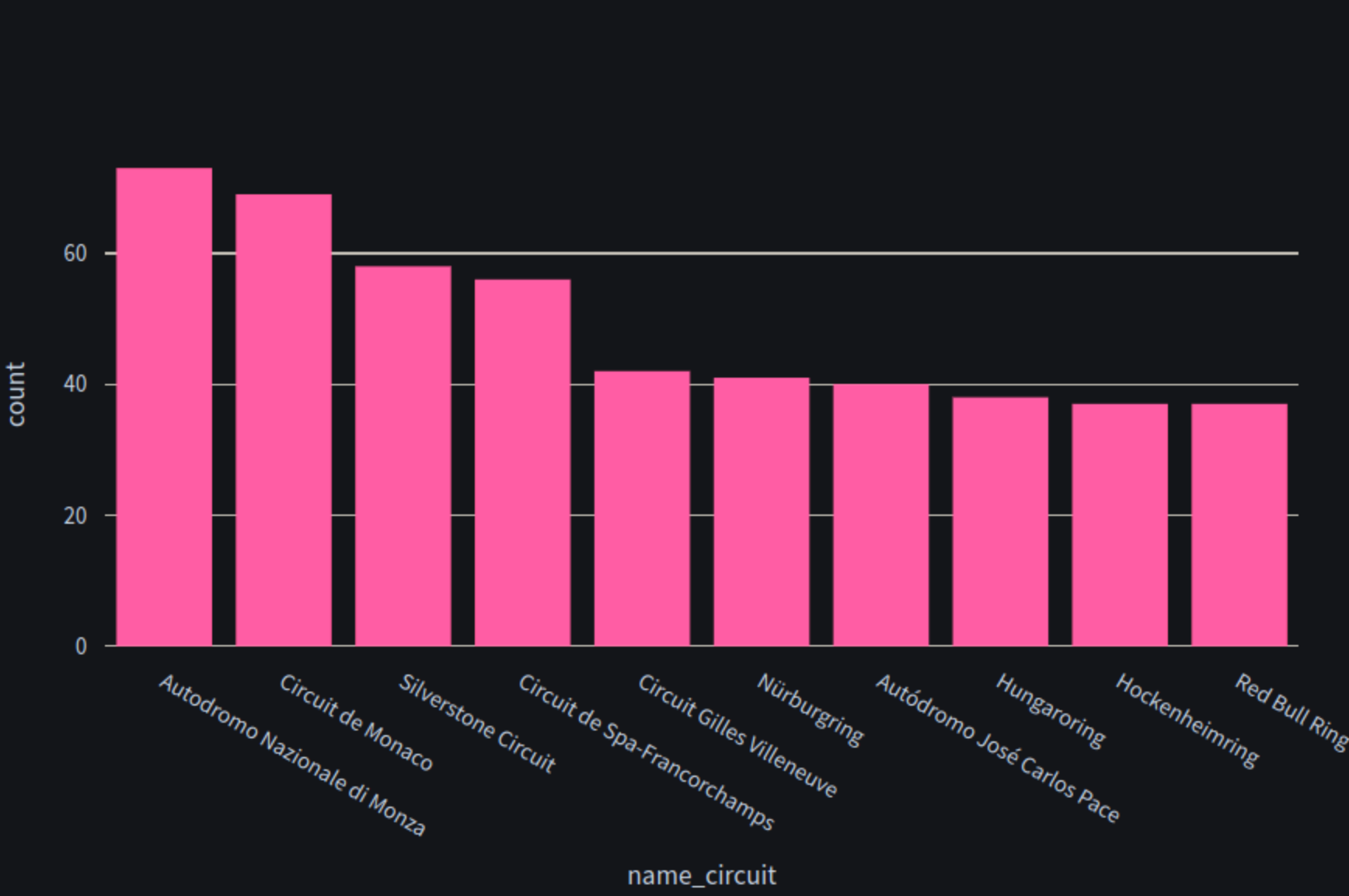


Percentage of races by continent (1950-2023)

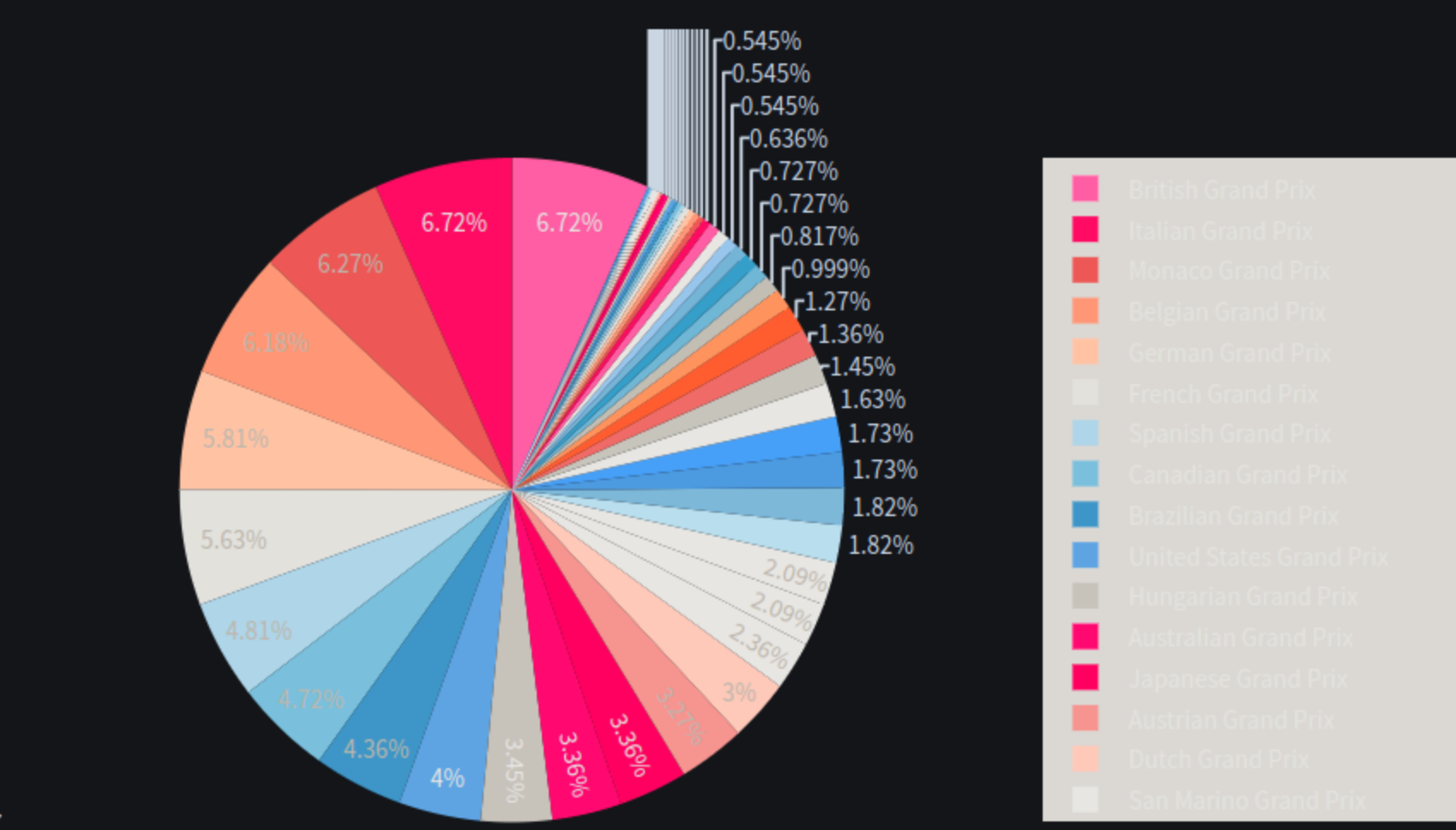


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Top 10 Races (1950 - 2023)



Percentage of Grand Prix (1950-2023)



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About the races

About the races								
Grand Prix		Year		Circuit		Location		Continent
Choose an option		Choose an option		Choose an option		Choose an option		Choose an option
	Grand Prix	Year	Date	Circuit	Location	Country	Continent	About (Race)
0	Abu Dhabi Grand Prix	2023	2023-11-26	Yas Marina Circuit	Abu Dhabi	UAE	Asia	https://en.wikipedia.org/wiki/2023_Abu_Dhabi_Grand_Prix
1	Las Vegas Grand Prix	2023	2023-11-19	Las Vegas Strip Street Circuit	Las Vegas	USA	North America	https://en.wikipedia.org/wiki/2023_Las_Vegas_Grand_Prix
2	São Paulo Grand Prix	2023	2023-11-05	Autódromo José Carlos Pace	São Paulo	Brazil	South America	https://en.wikipedia.org/wiki/2023_S%C3%A3o_Paulo_Grand_Prix
3	Mexico City Grand Prix	2023	2023-10-29	Autódromo Hermanos Rodríguez	Mexico City	Mexico	North America	https://en.wikipedia.org/wiki/2023_Mexico_City_Grand_Prix
4	United States Grand Prix	2023	2023-10-22	Circuit of the Americas	Austin	USA	North America	https://en.wikipedia.org/wiki/2023_United_States_Grand_Prix
5	Qatar Grand Prix	2023	2023-	Losail International	Al Daaven	Qatar	Asia	https://en.wikipedia.org/wiki/2023_Qatar_Grand_Prix

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Formula 1 Analytics | Insights



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Circuits Constructors Drivers Champions

Circuits

Autodromo Enzo e Dino Ferrari

Country

Italy ×

⌵

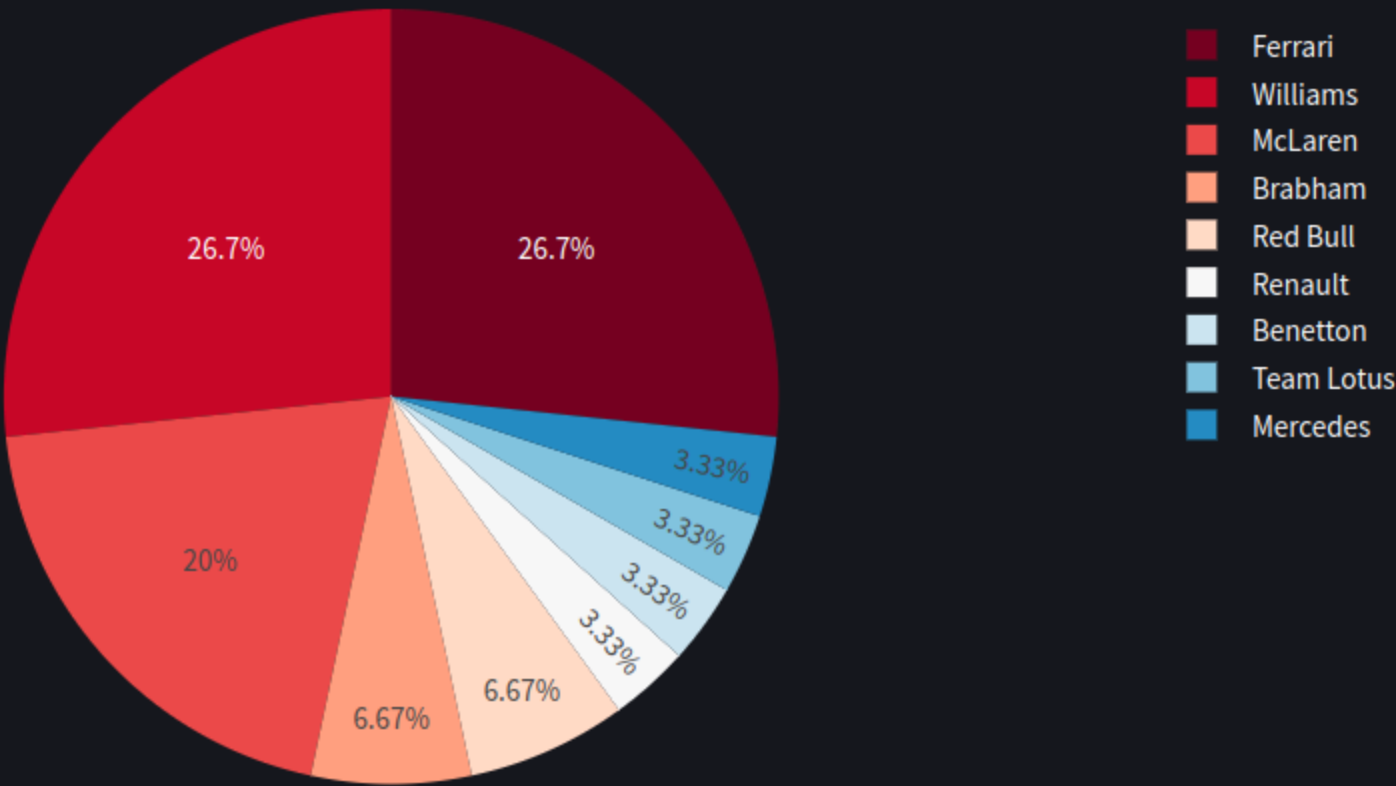
Circuit

Autodromo Enzo e Dino Ferrari

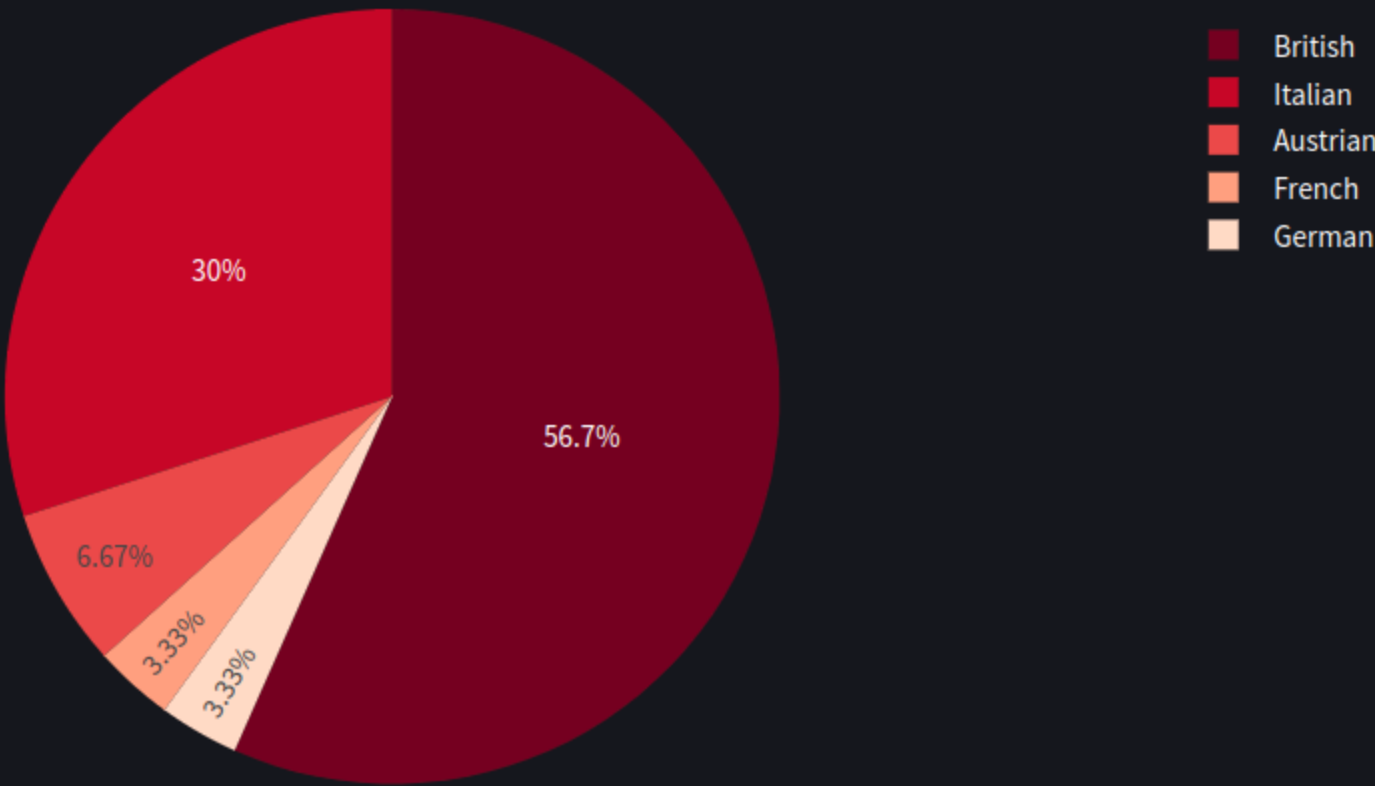
⌵

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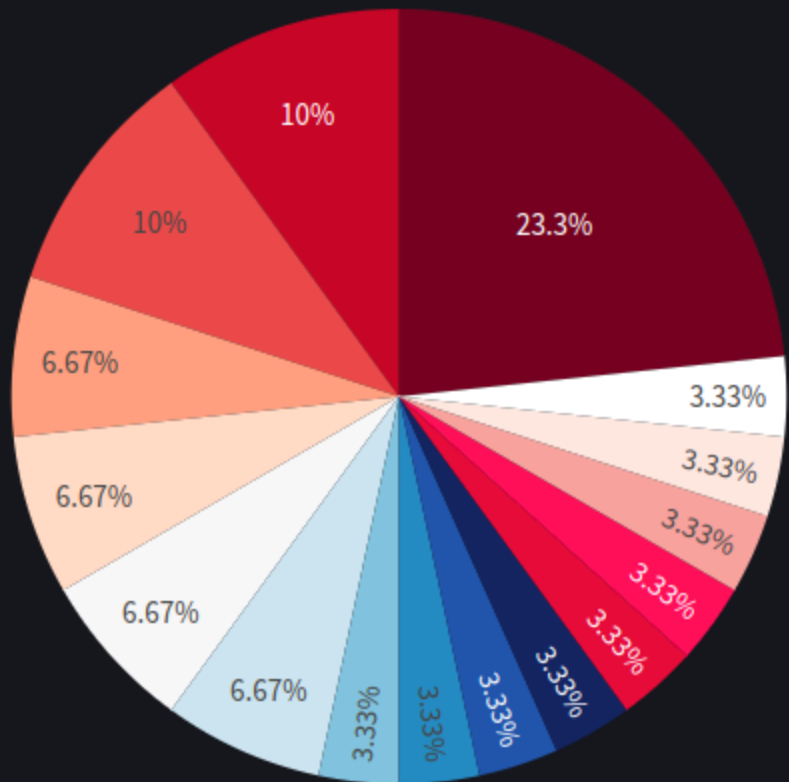
Winning constructors in this circuit



Nationality of the winning constructors in this circuit

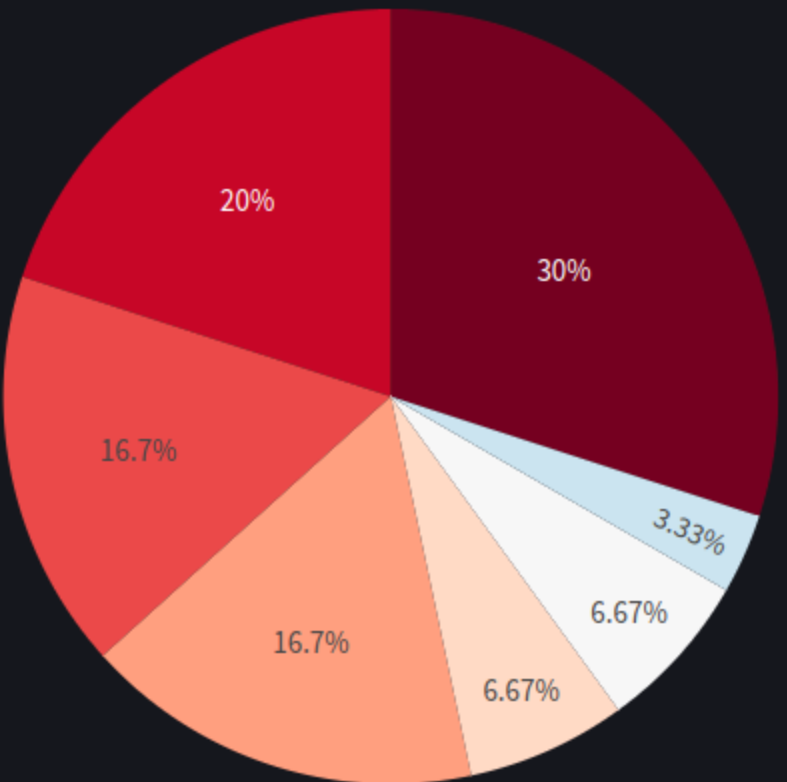


Winning drivers in this circuit



- Michael Schumacher
- Alain Prost
- Ayrton Senna
- Damon Hill
- Nigel Mansell
- Nelson Piquet
- Max Verstappen
- Fernando Alonso
- Ralf Schumacher
- David Coulthard
- Heinz-Harald Frentzen
- Riccardo Patrese
- Elio de Angelis
- Patrick Tambay
- Didier Pironi
- Lewis Hamilton

Nationality of the winning drivers in this circuit



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The fastest laps in this circuit - Autodromo Enzo e Dino Ferrari

Fastest lap in this circuit

Driver

Lewis Hamilton

Constructor

Mercedes

Season

2020

Fastest Lap

63

Fastest Lap Time

1:15.484

Fastest Lap Speed (km/h)

234.121

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	year	round	name_race	date	driver_name	constructor_name	position	fastestLap	fastestLapTime	fastestLapSpeed
0	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Lewis Hamilton	Mercedes	1	63	1:15.484	234.121
1	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Valtteri Bottas	Mercedes	2	63	1:15.902	232.831
2	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Alexander Albon	Red Bull	15	63	1:16.177	231.991
3	2,021	2	Emilia Romagna Grand Prix	2021-04-18	Lewis Hamilton	Mercedes	2	60	1:16.702	230.403
4	2,021	2	Emilia Romagna Grand Prix	2021-04-18	Max Verstappen	Red Bull	1	60	1:17.524	227.960
5	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Daniel Ricciardo	Renault	3	62	1:17.552	227.878
6	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Max Verstappen	Red Bull	None	44	1:17.637	227.628
7	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Daniil Kvyat	AlphaTauri	4	62	1:17.666	227.543
8	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Sebastian Vettel	Ferrari	12	44	1:17.767	227.248
9	2,020	13	Emilia Romagna Grand Prix	2020-11-01	Lando Norris	McLaren	8	63	1:18.069	226.368

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Circuits Constructors Drivers Champions

Constructors

Red Bull

Nationality

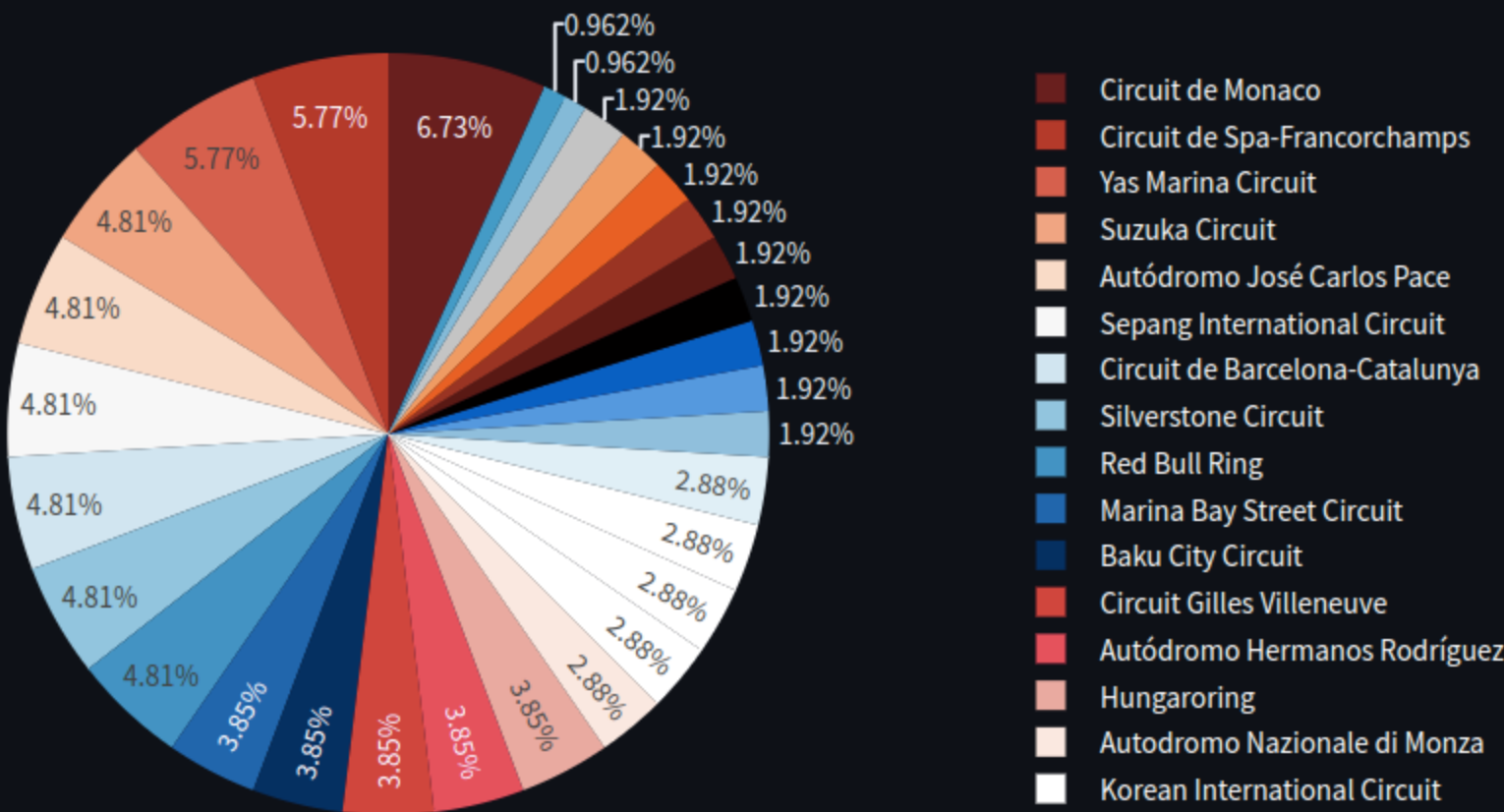
Austrian

Constructor

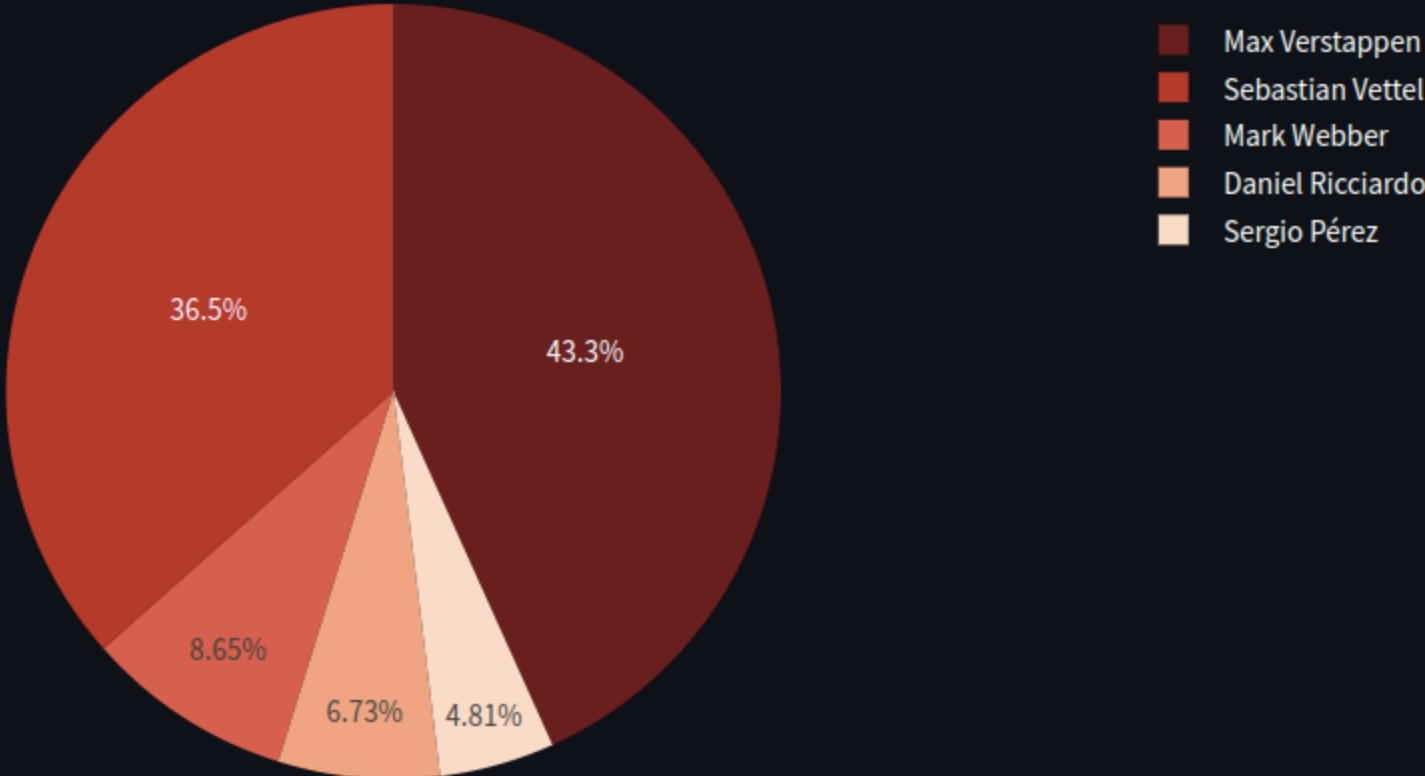
Red Bull

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Circuits most won by this constructor



Winning drivers by this constructor



The fastest laps by cars of this constructor - Red Bull

Fastest lap by this constructor

Driver

Alexander Albon

Circuit

Bahrain International Circuit

Season

2020

Fastest Lap

52

Fastest Lap Time

0:57.056

Fastest Lap Speed (km/h)

223.548

	year	round	name_race	circuit_name	date	driver_name	position	fastestLap	fastestLapTime	fastestLapSpeed
0	2,020	16	Sakhir Grand Prix	Bahrain International Circuit	2020-12-06	Alexander Albon	6	52	0:57.056	223.548
1	2,020	2	Styrian Grand Prix	Red Bull Ring	2020-07-12	Max Verstappen	3	70	1:06.145	235.010
2	2,021	9	Austrian Grand Prix	Red Bull Ring	2021-07-04	Max Verstappen	1	62	1:06.200	234.815
3	2,023	9	Austrian Grand Prix	Red Bull Ring	2023-07-02	Max Verstappen	1	71	1:07.012	231.970
4	2,022	11	Austrian Grand Prix	Red Bull Ring	2022-07-10	Max Verstappen	2	62	1:07.275	231.063
5	2,020	2	Styrian Grand Prix	Red Bull Ring	2020-07-12	Alexander Albon	4	67	1:07.299	230.981
6	2,017	9	Austrian Grand Prix	Red Bull Ring	2017-07-09	Daniel Ricciardo	3	69	1:07.442	230.491
7	2,018	9	Austrian Grand Prix	Red Bull Ring	2018-07-01	Max Verstappen	1	70	1:07.442	230.491
8	2,019	9	Austrian Grand Prix	Red Bull Ring	2019-06-30	Max Verstappen	1	60	1:07.475	230.378
9	2,018	9	Austrian Grand Prix	Red Bull Ring	2018-07-01	Daniel Ricciardo	None	46	1:07.591	229.983

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CircuitsConstructorsDriversChampions

Drivers

Alain Prost

Nationality

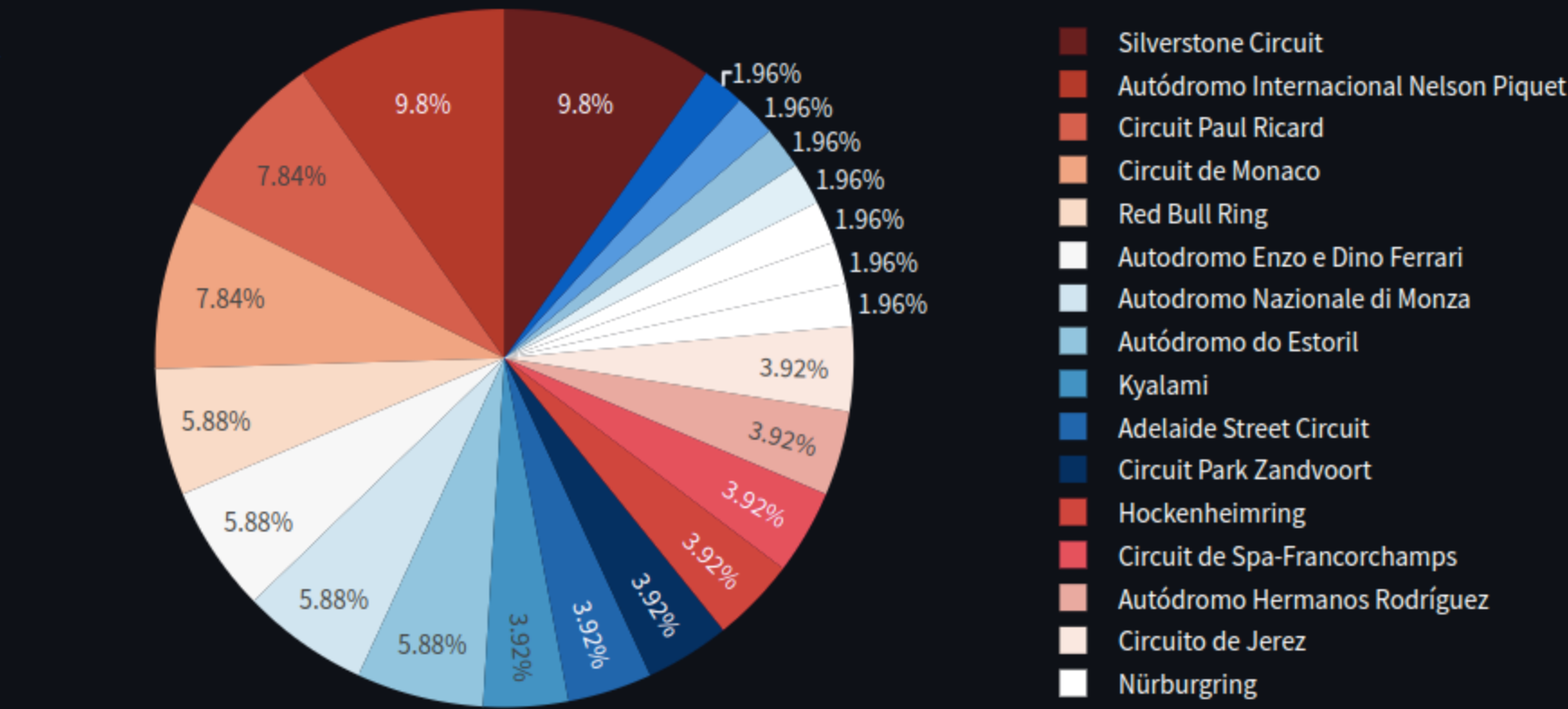
French

Driver

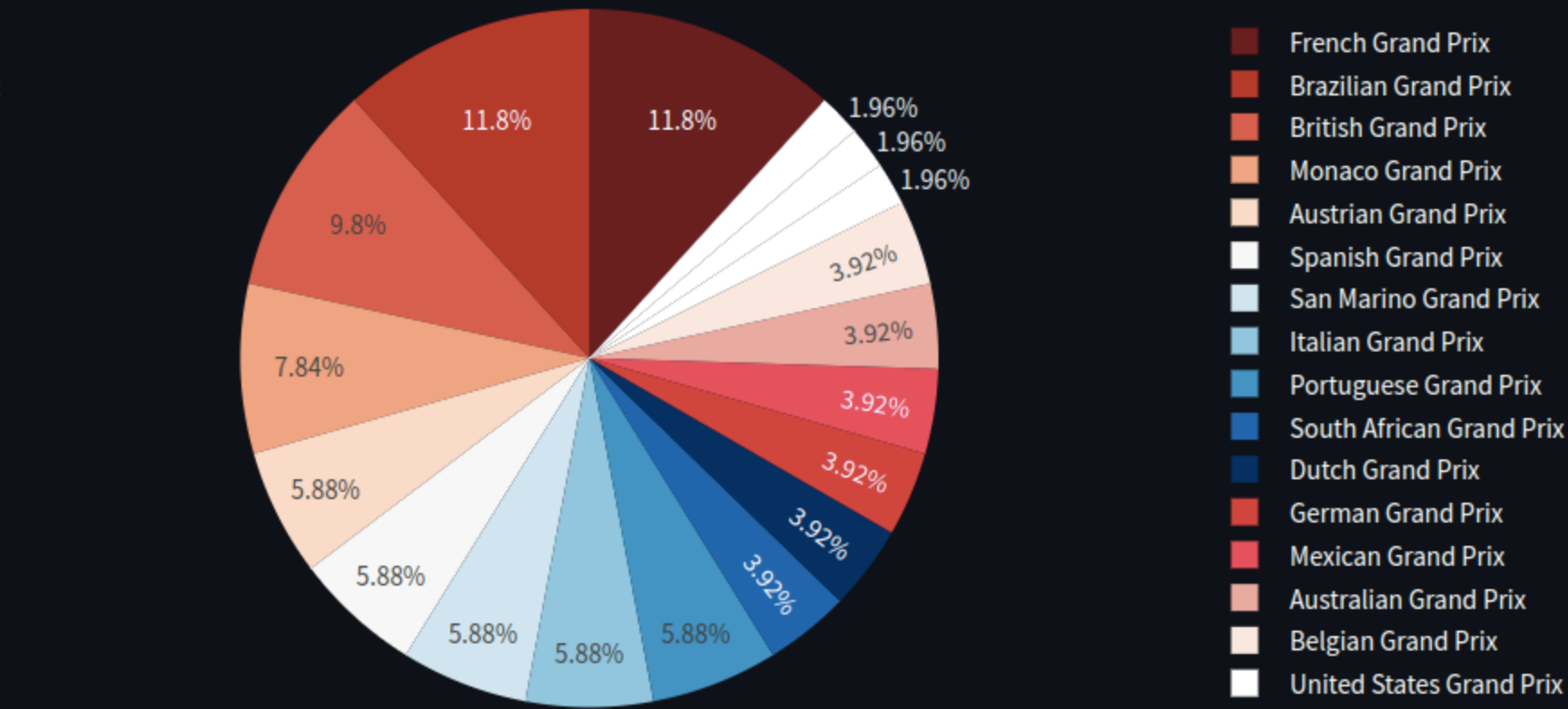
Alain Prost

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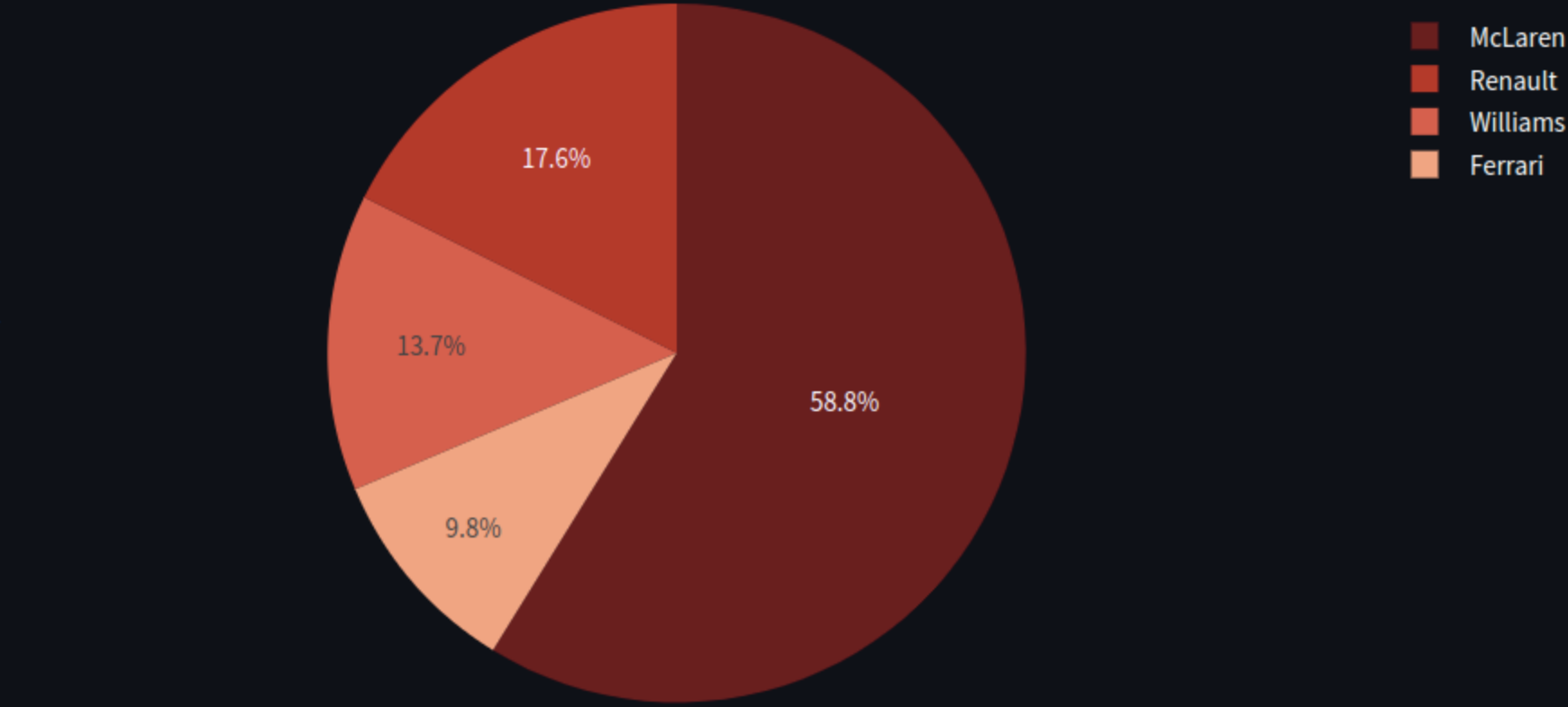
Circuits most won by this driver



Grand Prix most won by this driver



Constructor winning by this driver



The fastest laps by cars of this driver - Alain Prost

Fastest lap by this driver										
	year	round	name_race	circuit_name	date	constructor_name	position	fastestLap	fastestLapTime	fastestLapSpeed
empty										



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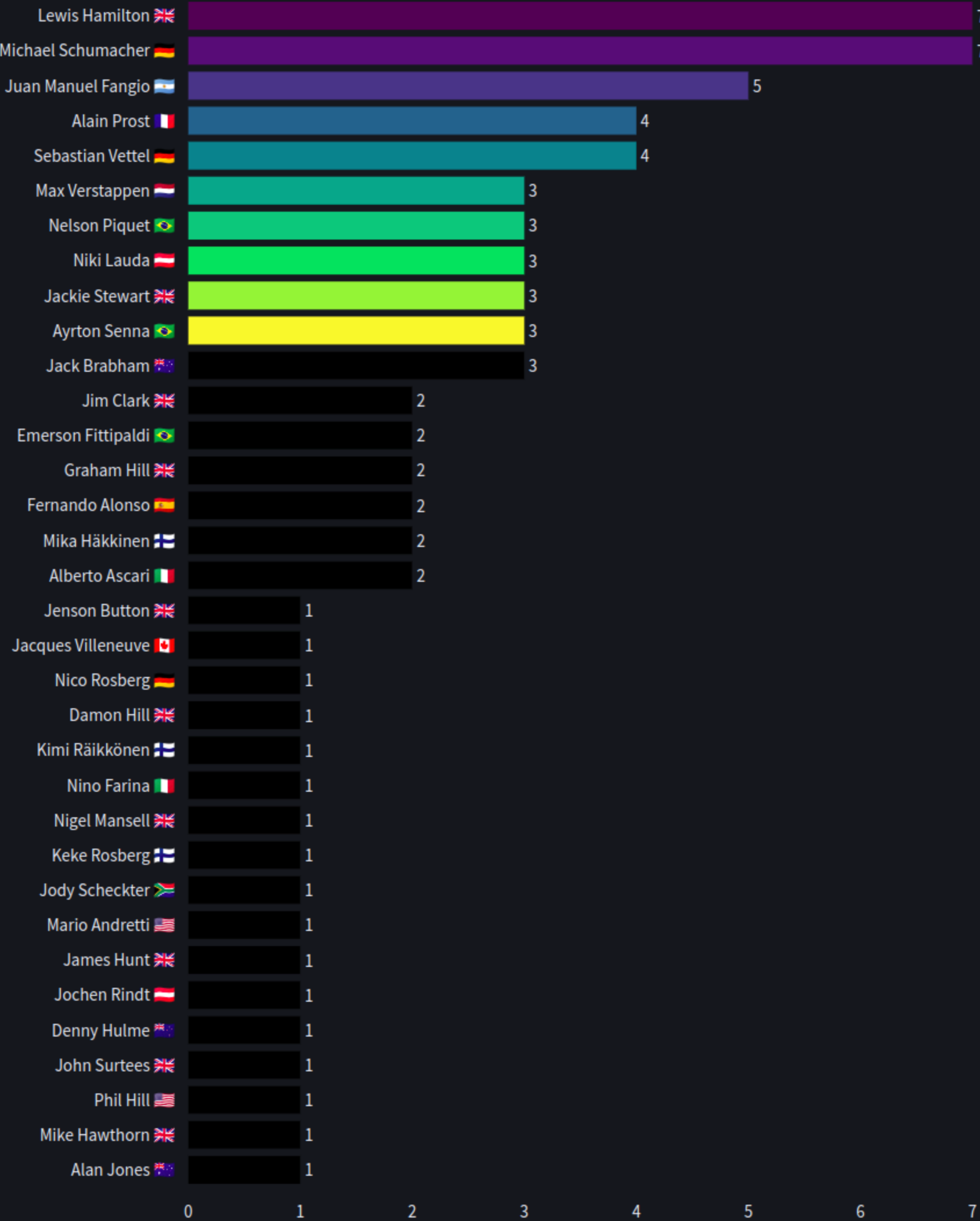
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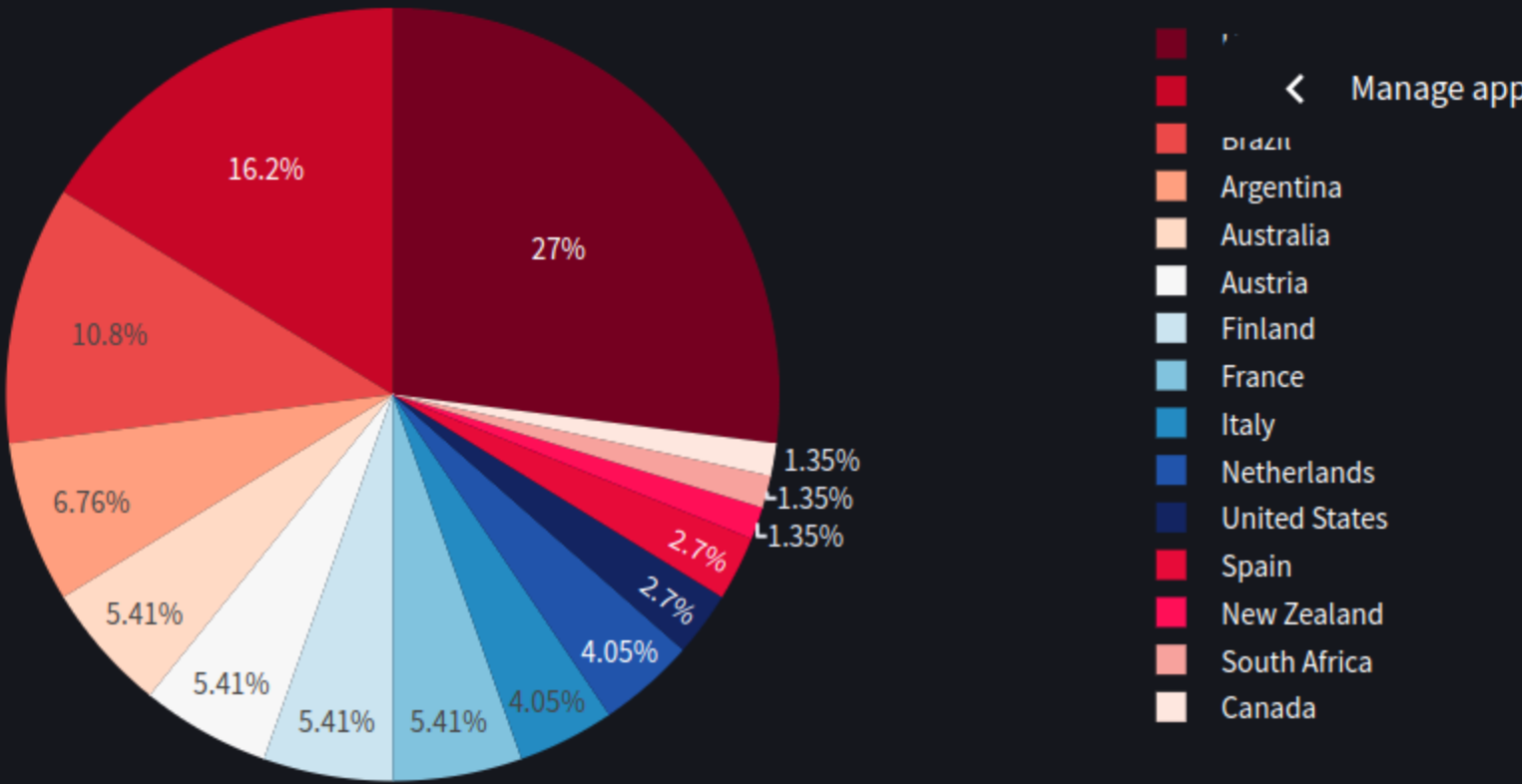
Circuits Constructors Drivers **Champions**

Champion Drivers

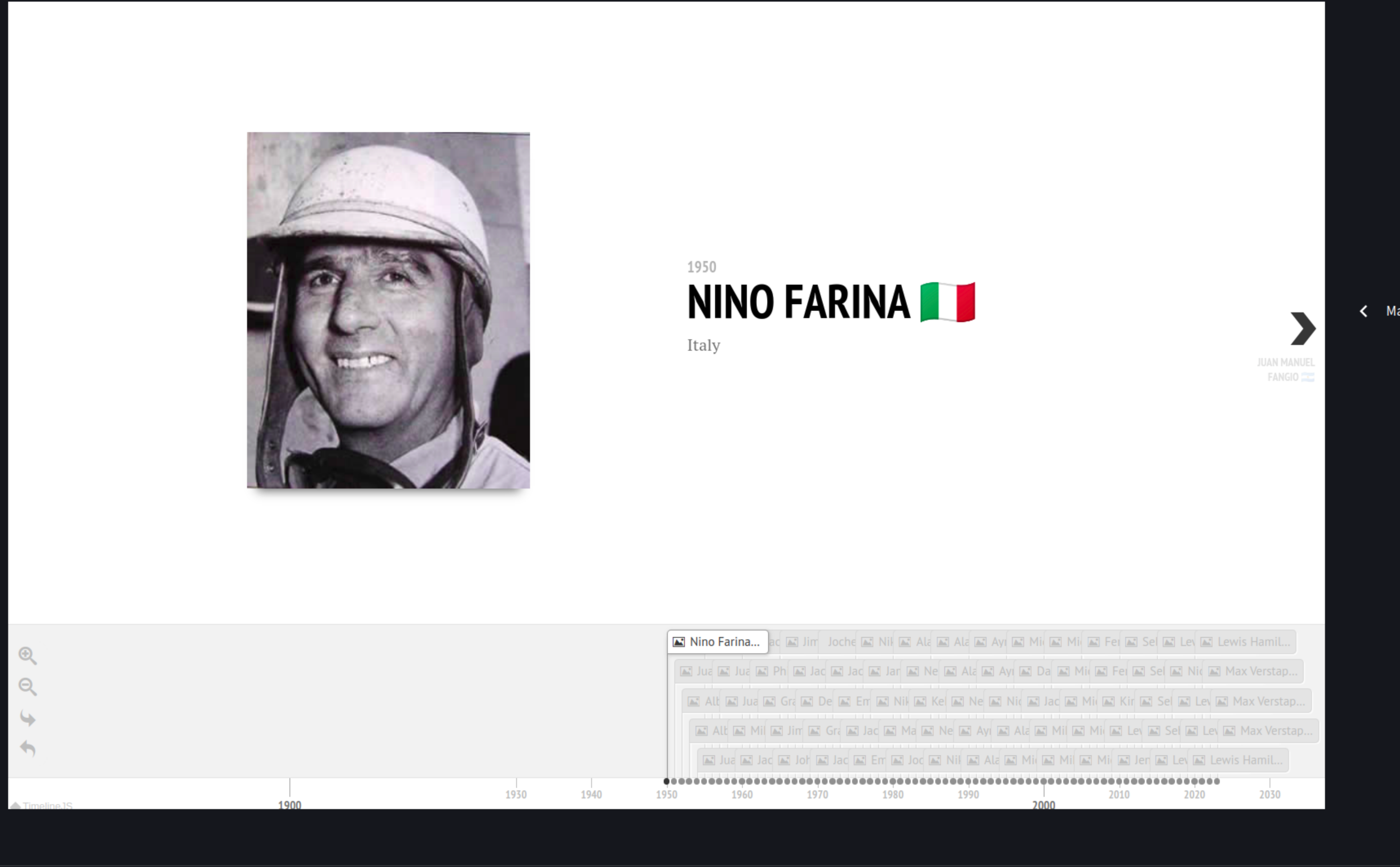
Champion drivers



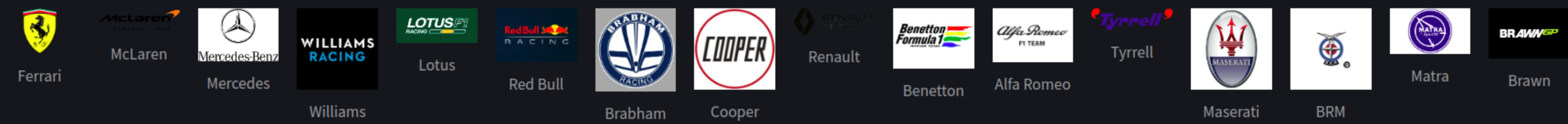
Countries from champion drivers



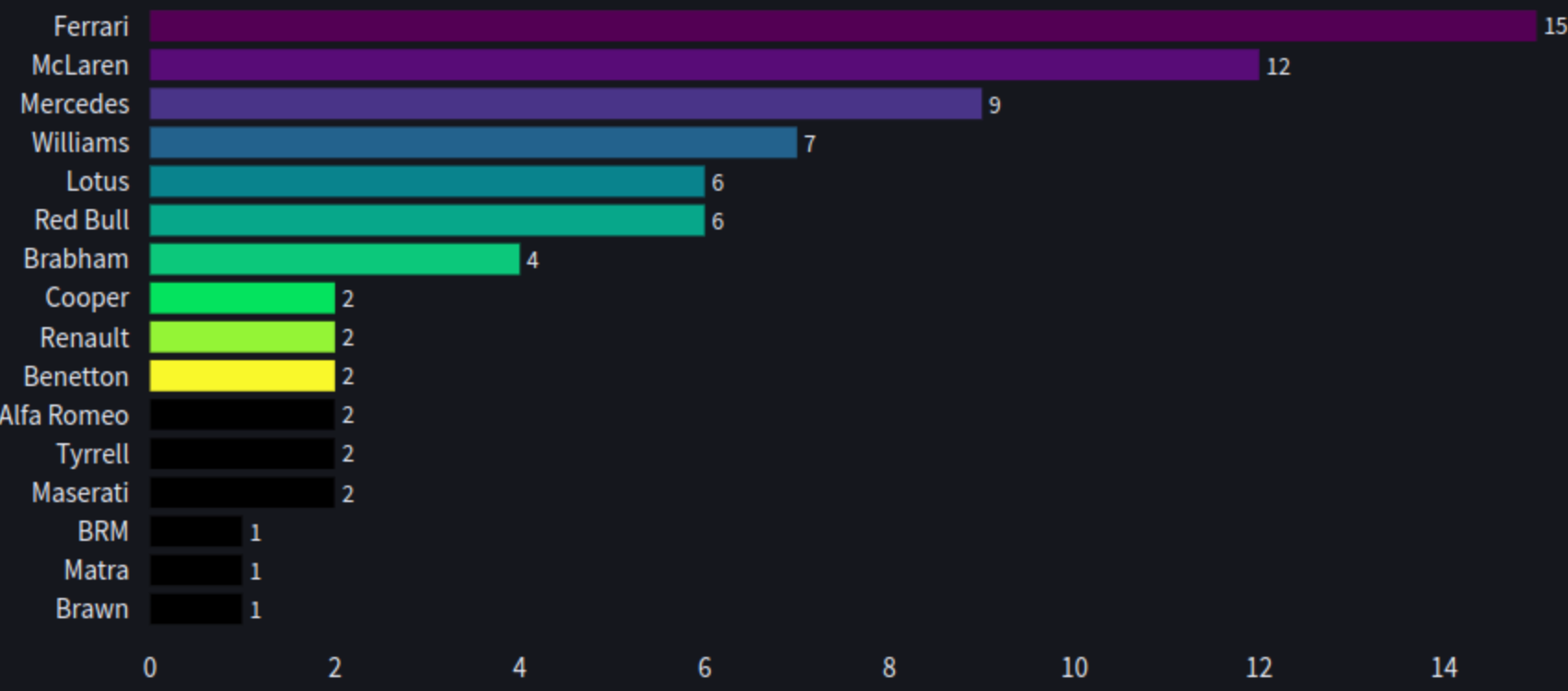
Formula 1 Champions Timeline



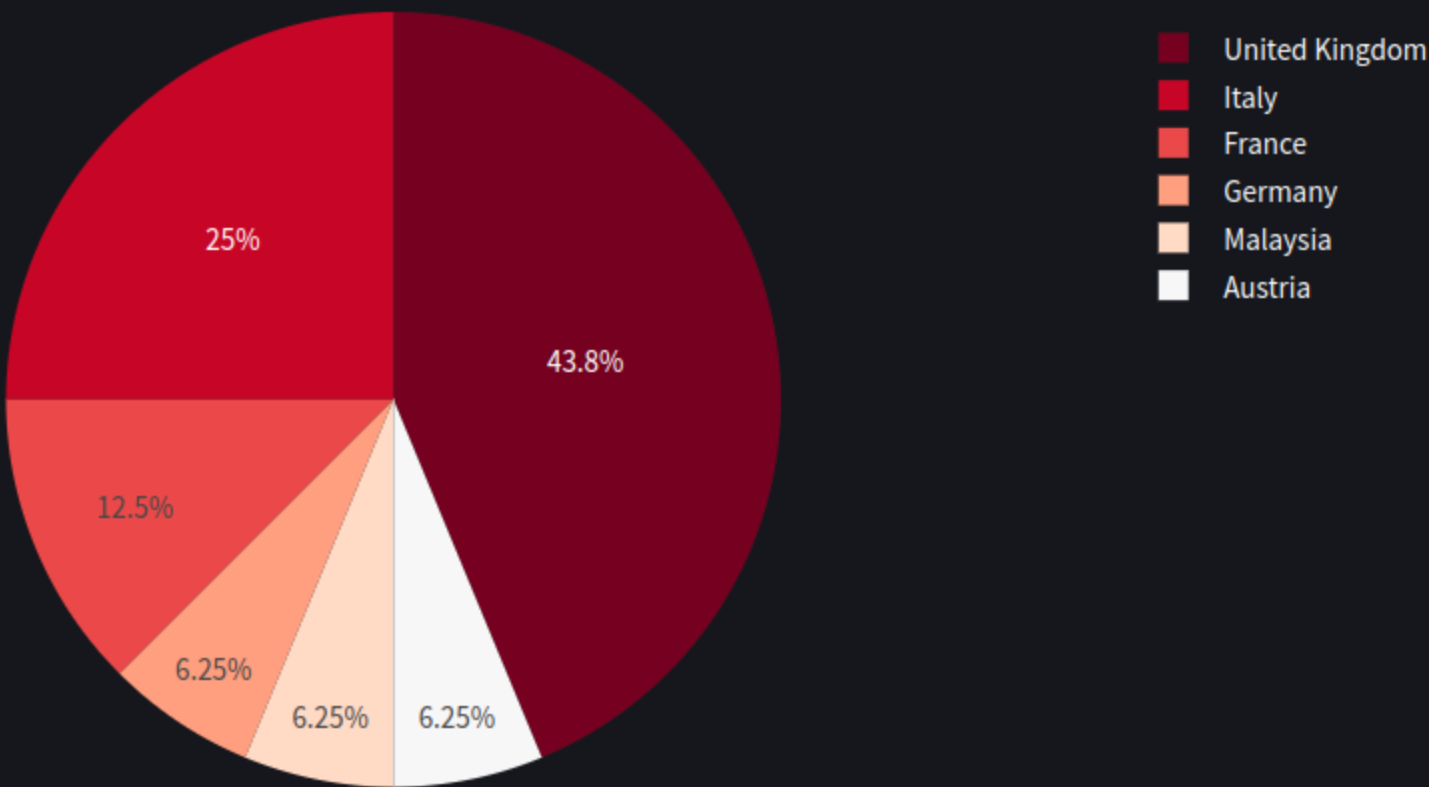
Champion Constructors



Champion constructors



Countries from champion constructors



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Season

2023

Race

Bahrain Grand Prix

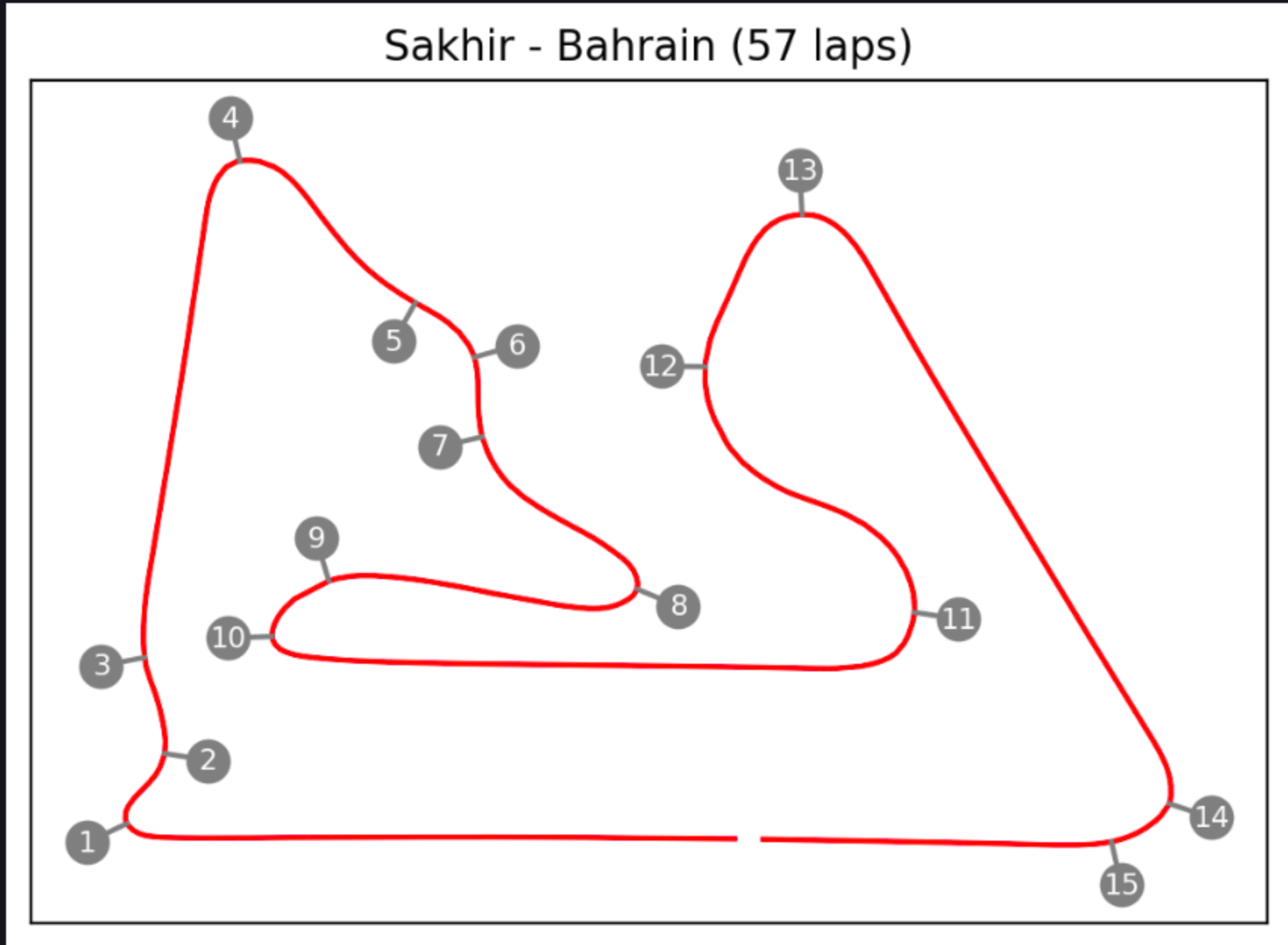
Session

Race

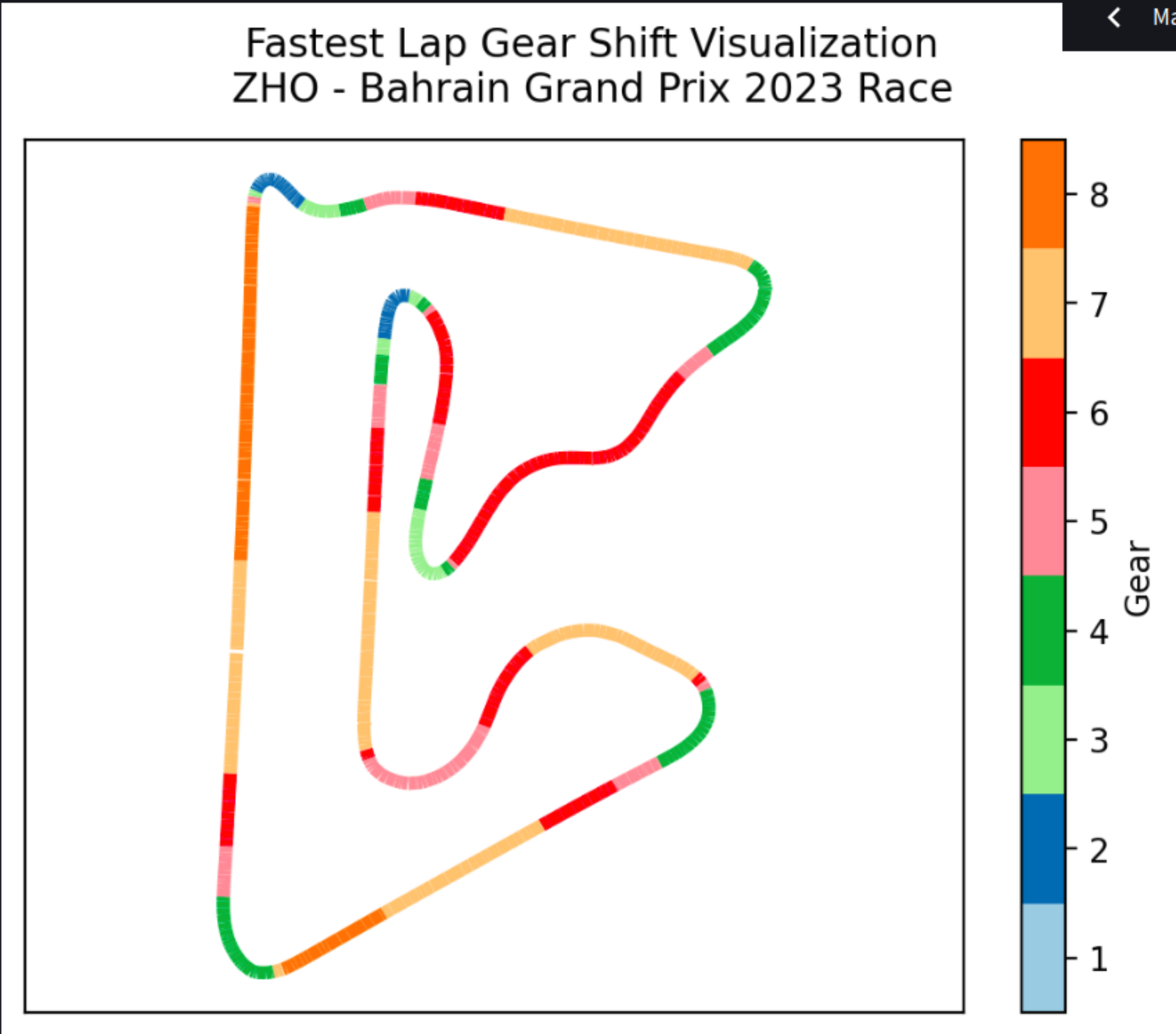
FORMULA 1 GULF AIR BAHRAIN GRAND PRIX 2023

Championship Drivers

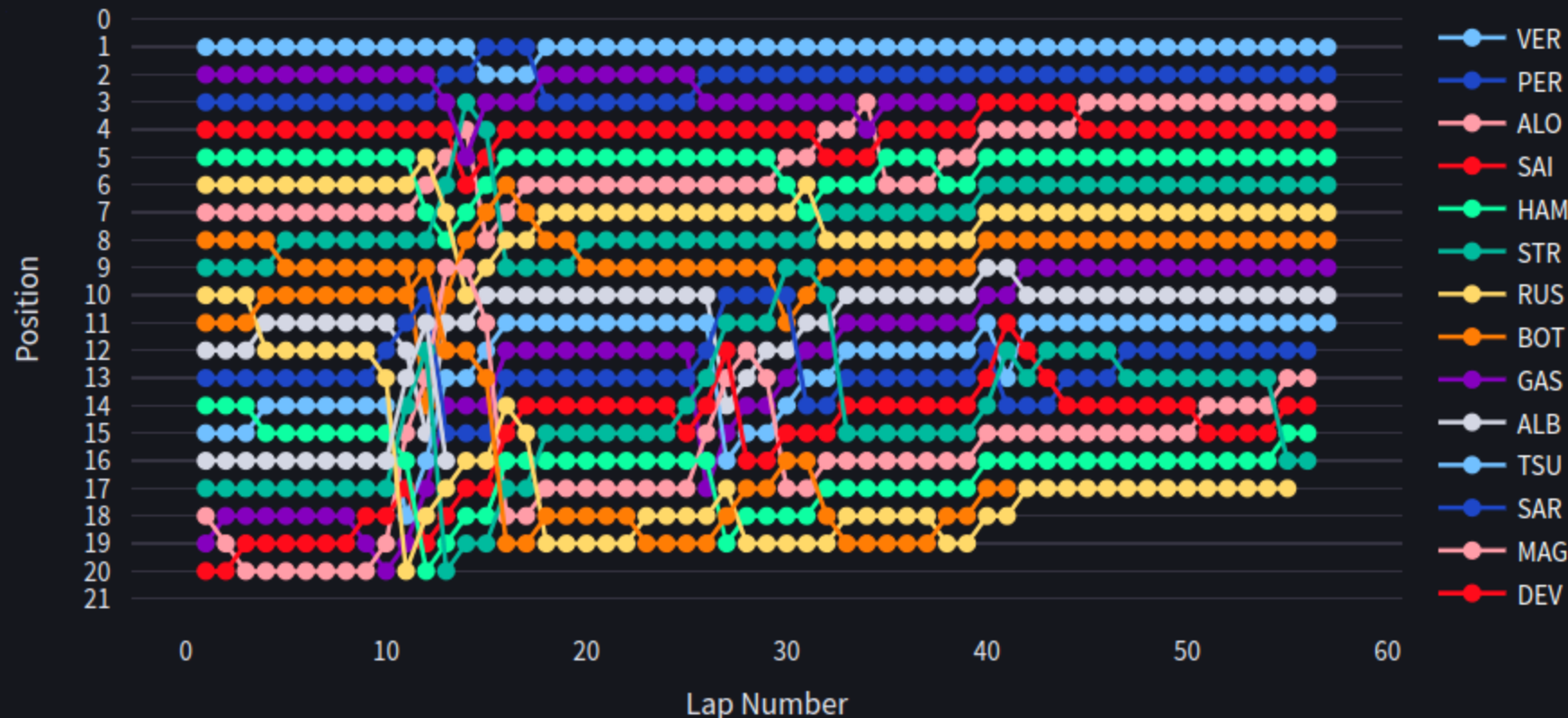
Circuit (track map)



Gear shifts on track



Position changes



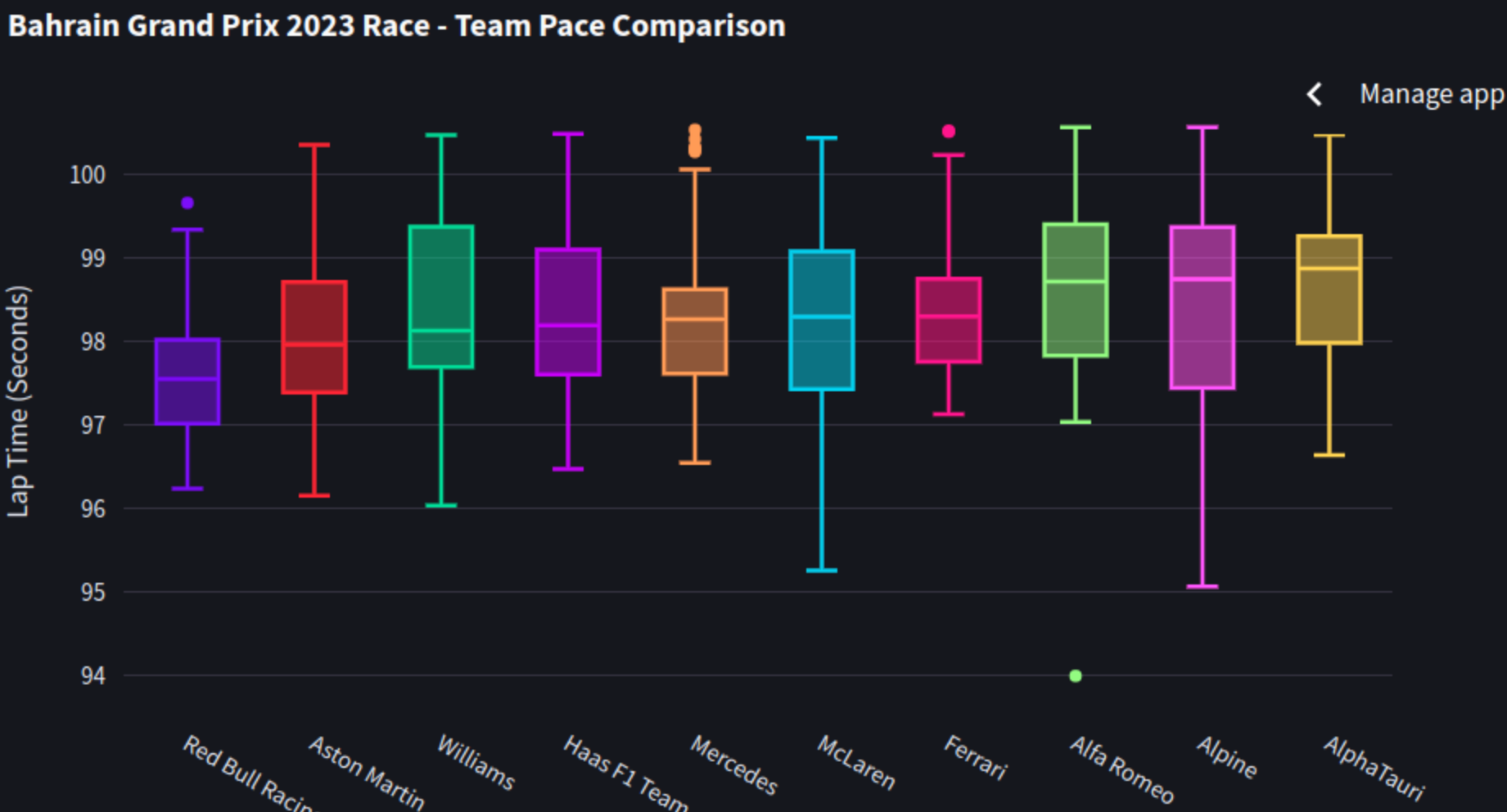
Driver standings (2023)

No information.

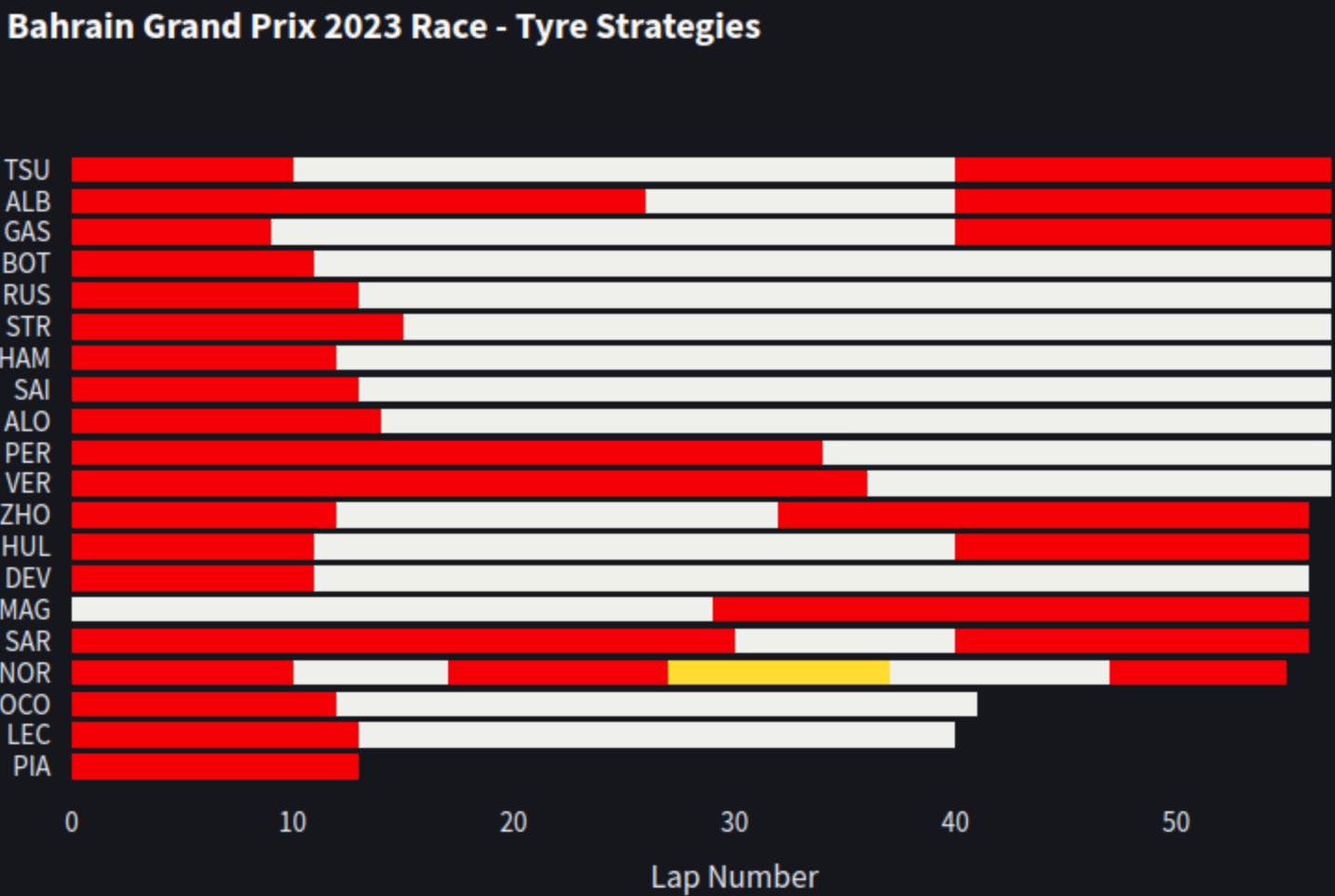
Overlaying speed traces of fastest laps



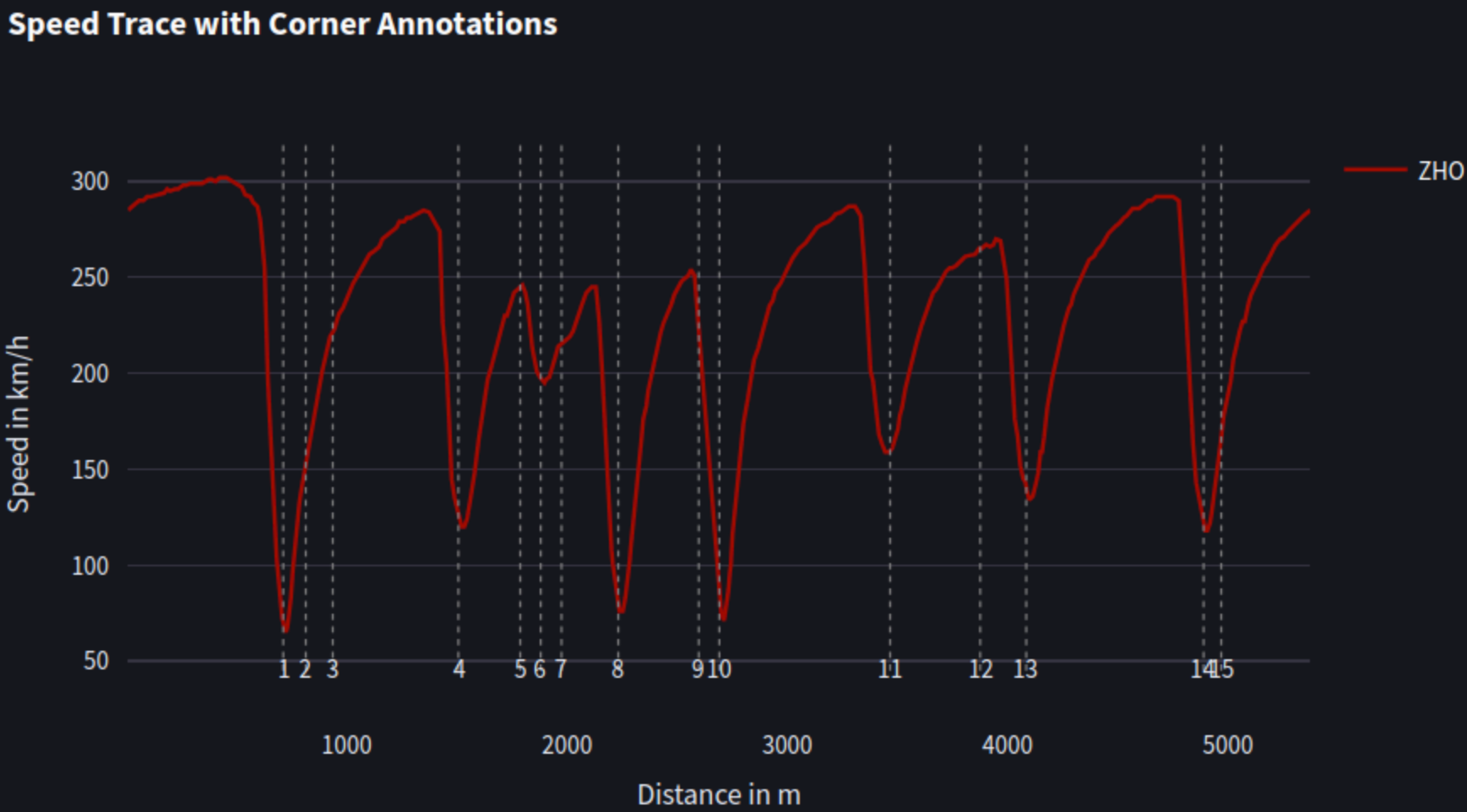
Team pace comparison



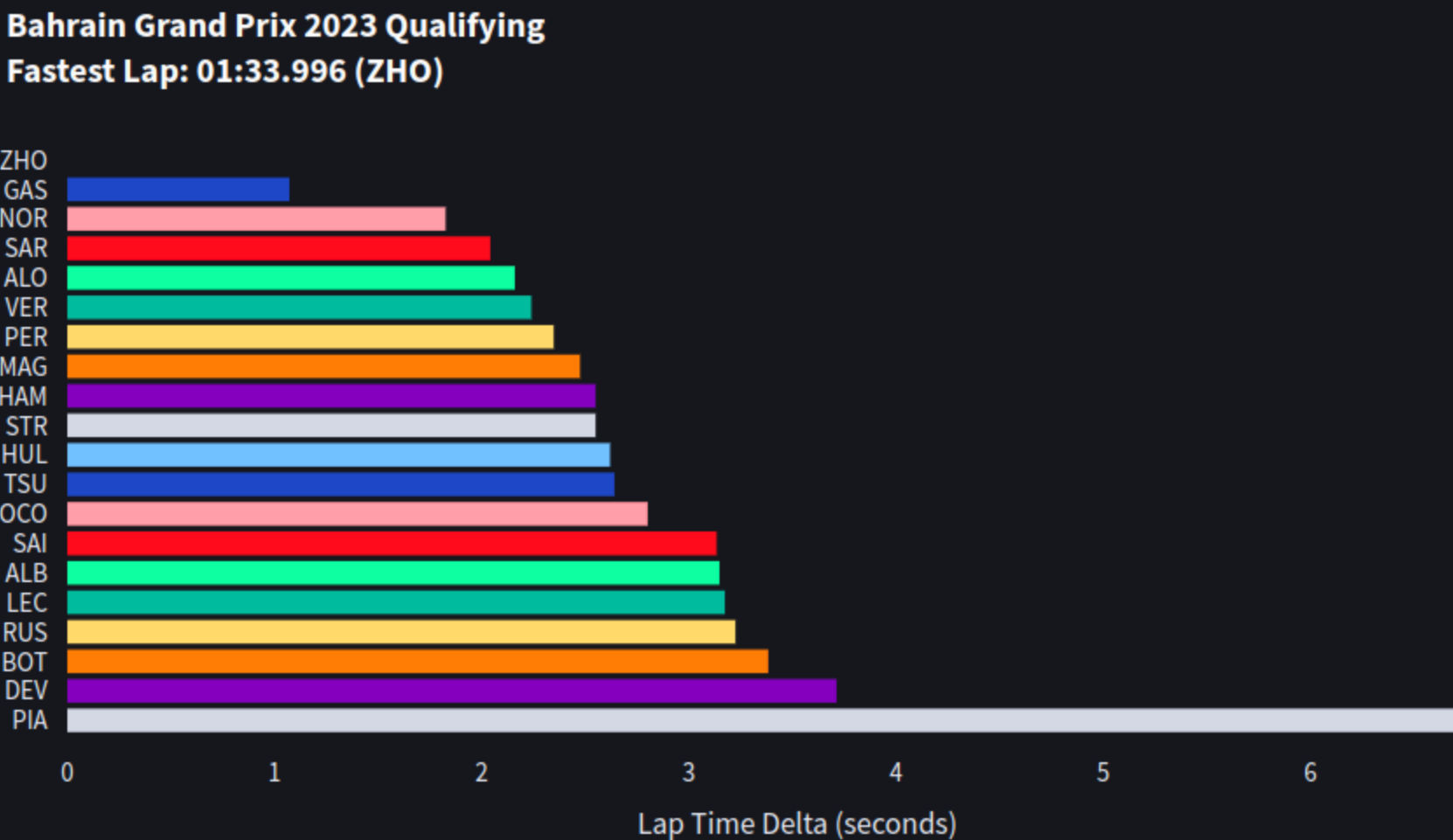
Tyre strategies



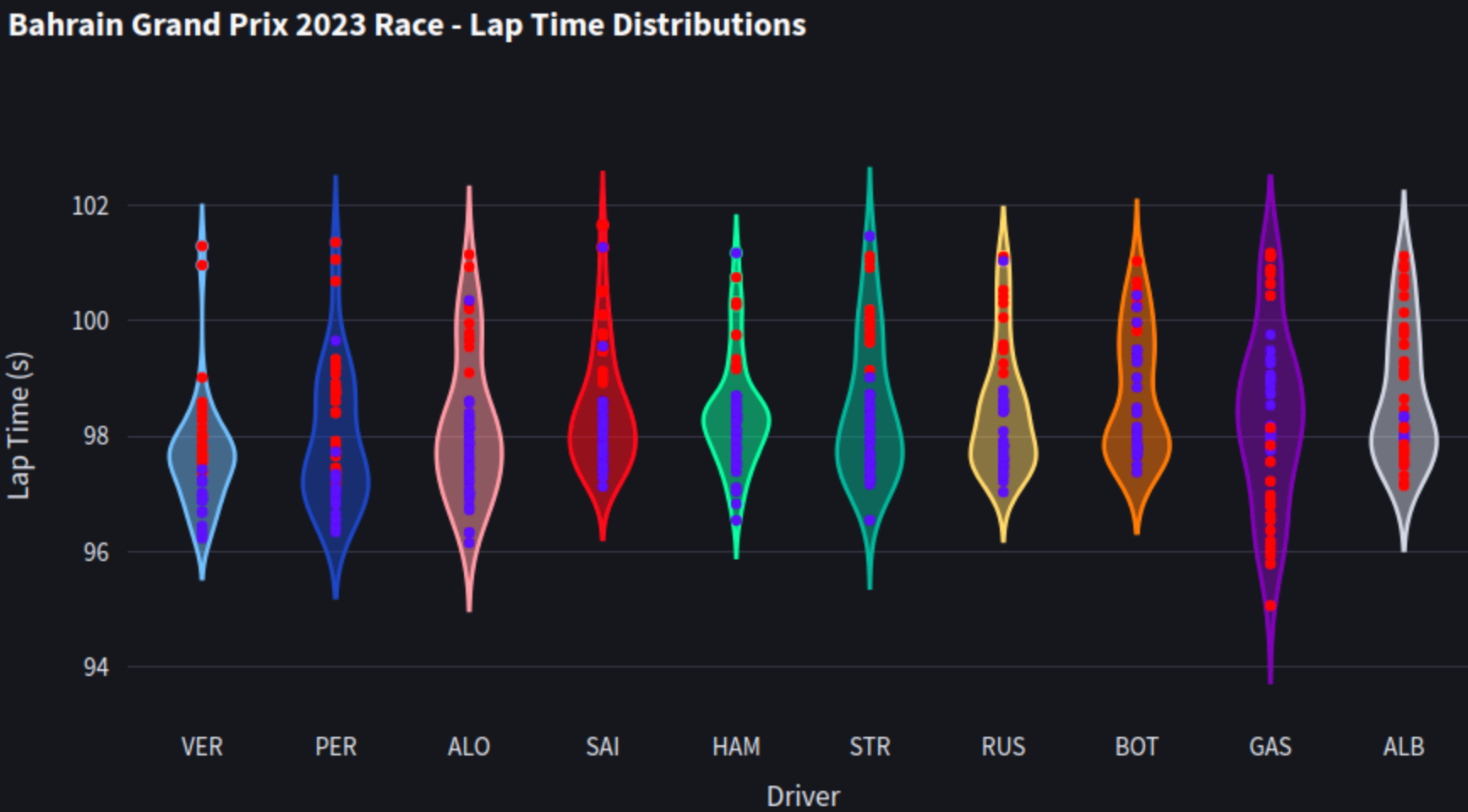
Speed traces with corners (fastest lap)



Qualifying results overview



Driver laptimes distribution



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Season2023

RaceBahrain Grand Prix

SessionRace

FORMULA 1 GULF AIR BAHRAIN GRAND PRIX 2023

- Championship
- Drivers

Driver

Lewis Hamilton

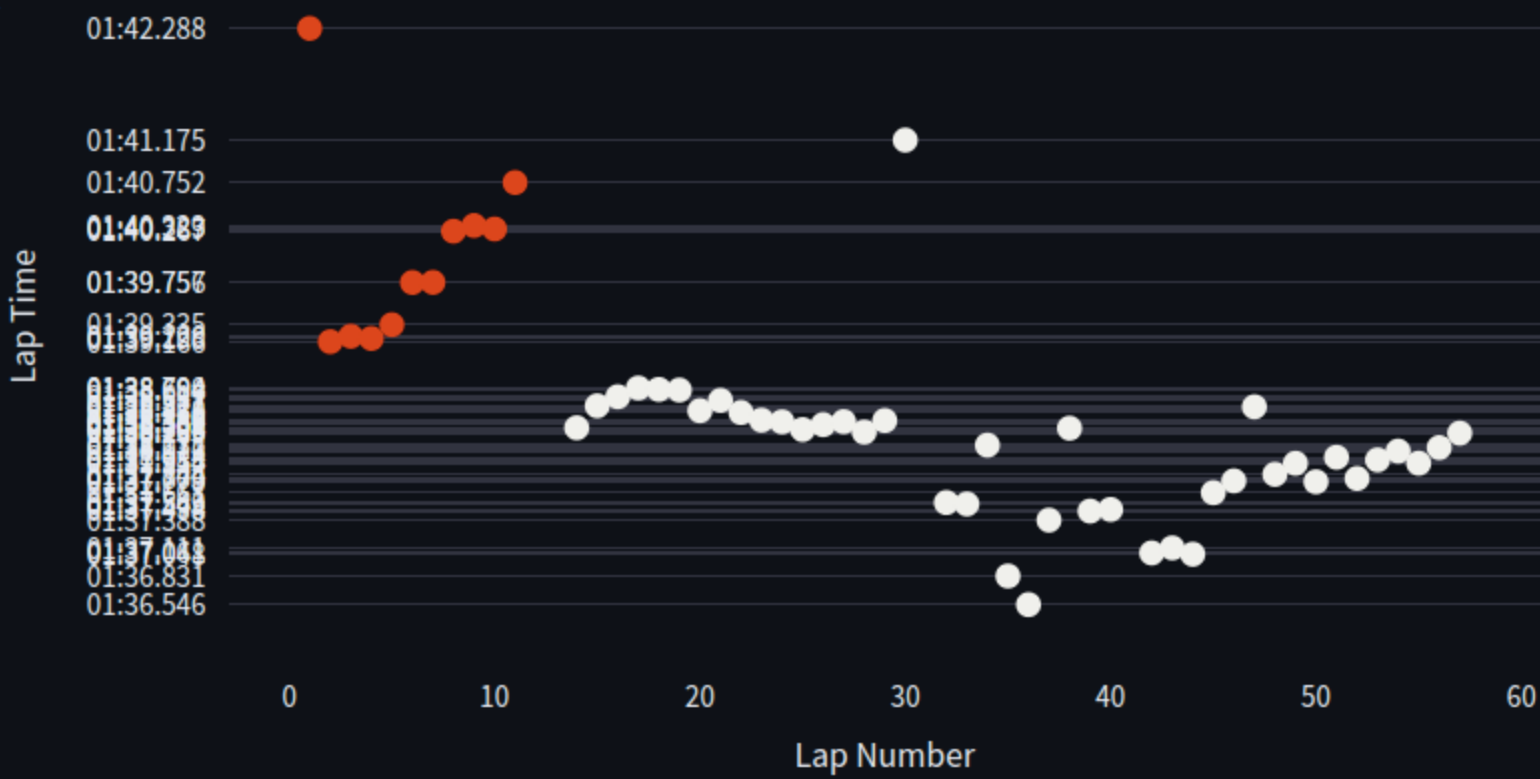
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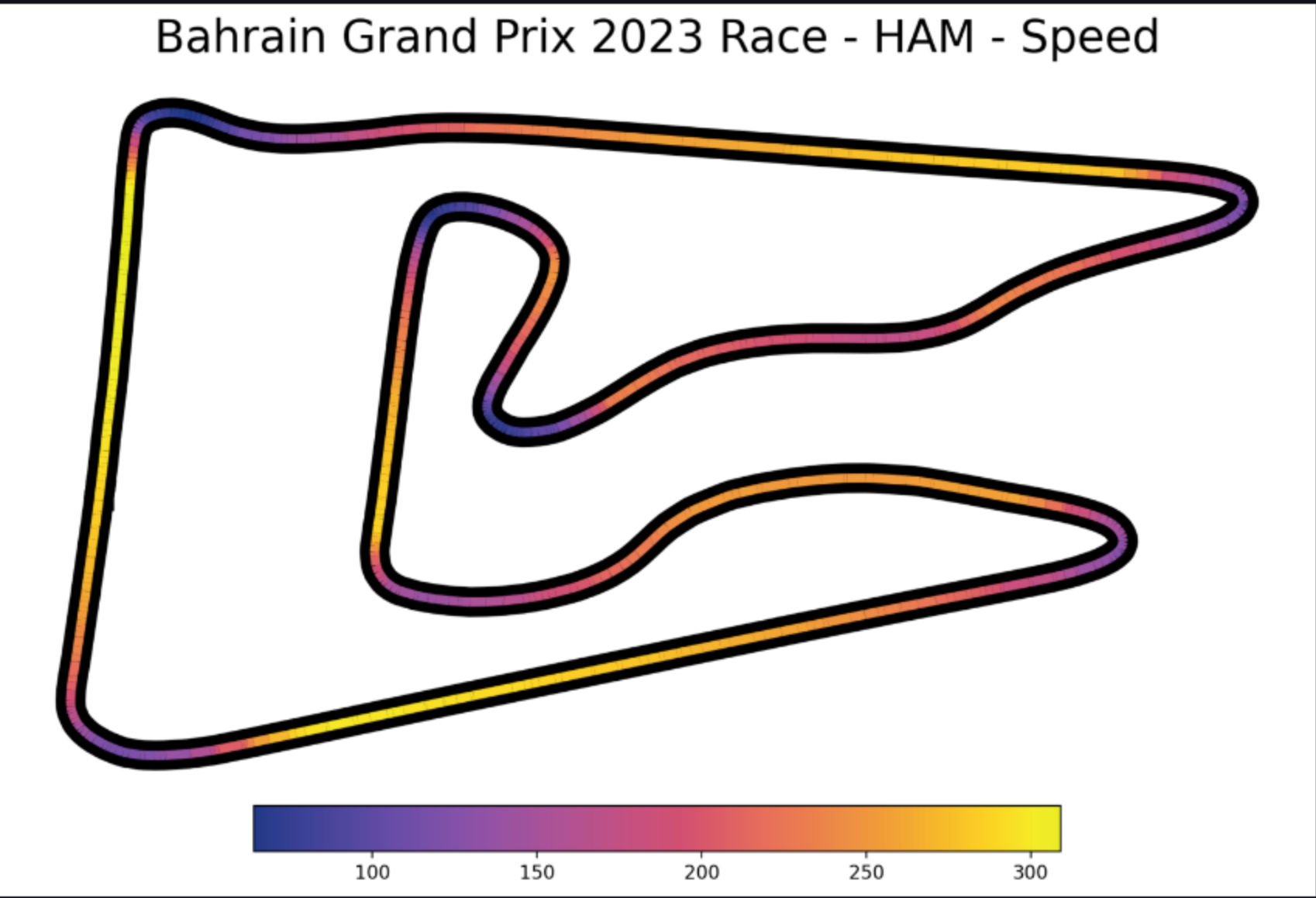
Lewis Hamilton (HAM) - Mercedes

Driver laptimes / Tyre strategies

Lewis Hamilton laptimes - Bahrain Grand Prix 2023 Race



Speed visualization on track map (fastest lap)



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Clustering

Scaler

Minimum-Maximum Scaler

Clustering Model

KMeans

Number of clusters

5

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Dimensionality Reduction

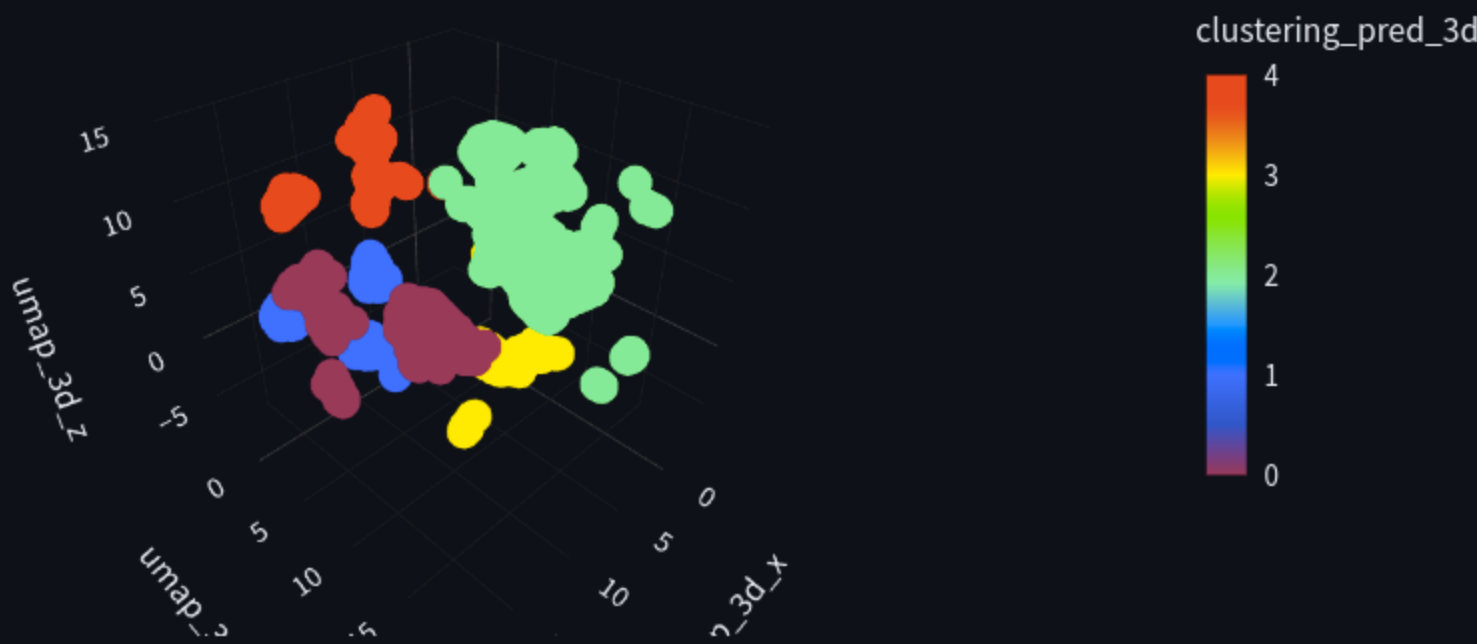
KMeans

Uniform Manifold Approximation and Projection (UMAP)

Dimensionality Reduction (2D)



Dimensionality Reduction (3D)



Silhouette Score (2D)

44.45%

Calinski-Harabasz Index (2D)

26385.87

Davies-Bouldin Index (2D)

72.67%

Silhouette Score (3D)

46.18%

Calinski-Harabasz Index (3D)

17255.88

Davies-Bouldin Index (3D)

80.25%

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Let's work together!



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