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Formula 1 DataBase

Introduction

- Formula 1, also known as F1, is the most prestigious motorsport competition in the world. Since its inception in 1950, it has grown exponentially in both popularity and technical complexity. With teams from around the globe competing on various international tracks, efficient data management becomes crucial. This relational database project using MySQL aims to organize, store, and analyze data from Formula 1 seasons, making it easier to access and understand the rich and diverse information.

Project Description

Managing Formula 1 with MySQL

- This relational database is designed to manage and store detailed information related to Formula 1, one of the most prestigious and followed motor racing competitions in the world. Using MySQL, a relational database management system, this project allows for efficient and structured organization and analysis of historical and current competition data.

Objective

- The main objective of this database is to provide a solid and flexible structure to record and query information about Formula 1 seasons, including race details, teams, drivers, engineers, sponsors, and results. The database is designed to facilitate data analysis, statistics generation, and retrieval of relevant information for fans, journalists, and sports analysts.

Key Components

1. Seasons and Races:

- The database stores information about different Formula 1 seasons and the races held in each season, including specific race data such as date and location.

2. Teams and Drivers:

- Teams competing in Formula 1 are registered along with the drivers who are part of each team. The database allows tracking the career paths of drivers and their associations with different teams over time.

3. Engineering Teams and Sponsors:

- The database also includes information about the engineering teams behind the teams' cars and the sponsors supporting them. This information is crucial for understanding the dynamics and financing behind each team.

4. Results and Statistics:
- Race results are recorded, including final positions of drivers, points earned, fastest laps, and any penalties received. This enables detailed tracking of driver and team performance throughout the season.

Problem Statement

- The world of Formula 1 involves a vast amount of data, including race results, team compositions, driver statistics, engineering details, and sponsor information. This data is often scattered across different sources, making it challenging to compile and analyze comprehensively. A centralized and well-structured database is necessary to manage this information effectively, enabling fans, journalists, and analysts to retrieve and analyze data efficiently.

Business Model

The database is designed to serve various stakeholders in the Formula 1 community:

- **Fans:** Provide easy access to historical and current race data, driver and team statistics, and other relevant information.
- **Journalists:** Offer a reliable source for detailed race results, driver performances, and team compositions to support their reporting.
- **Analysts:** Enable in-depth analysis of performance trends, team dynamics, and race outcomes through structured data queries and visualizations.
- **Teams and Sponsors:** Provide a comprehensive overview of team performances, sponsor relationships, and engineering collaborations for strategic decision-making.

Technology Used

- **SQL** (Structured Query Language): Language used to manage and manipulate the database, allowing for creation, updating, querying, and deletion of data.
- **MySQL**: Relational database management system (RDBMS) chosen to implement this project due to its scalability and widespread adoption in the industry.
- **Tableau:** Used for data visualization, allowing for the creation of comprehensive and interactive dashboards to present insights derived from the database.

- In summary, this relational database for Formula 1, implemented using MySQL, offers a solution for comprehensive management of information for one of the most complex and exciting sports competitions in the world. 🏁

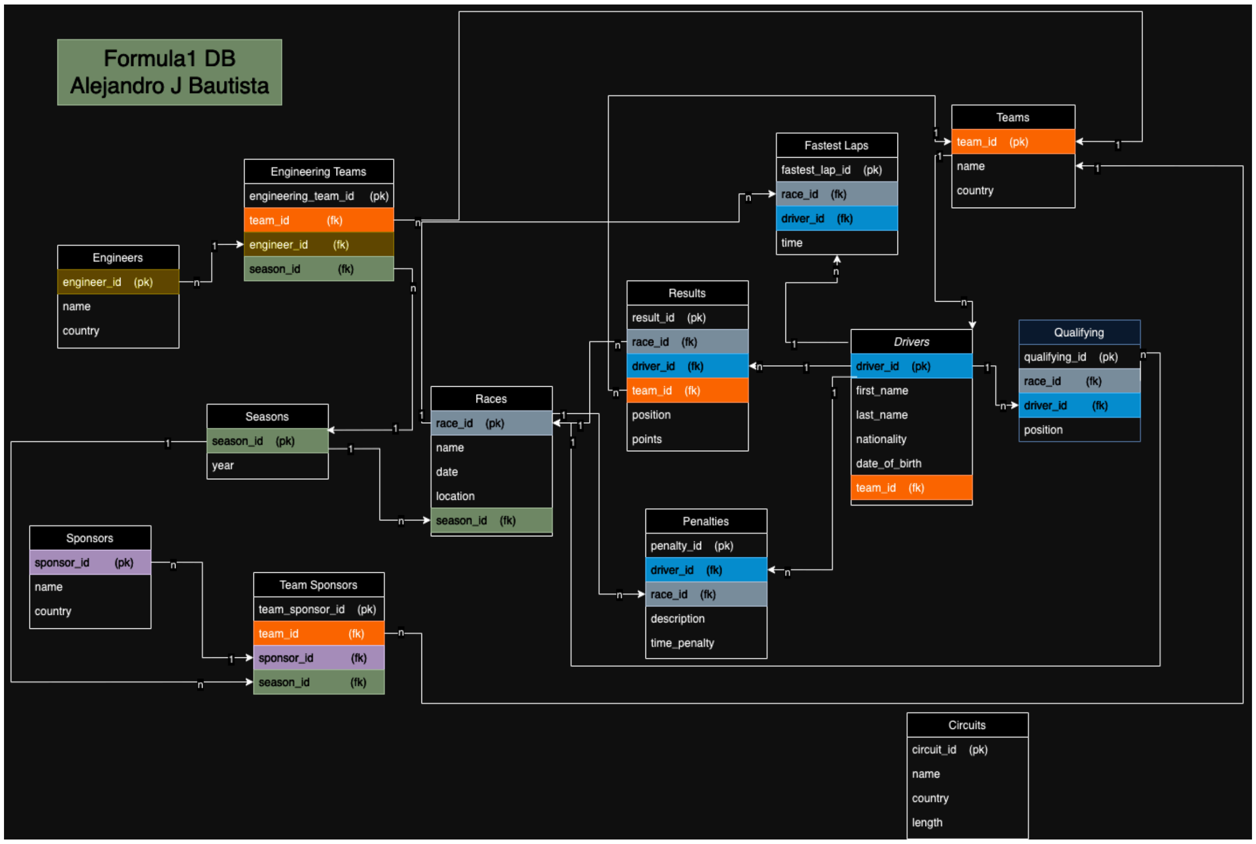
E-R Diagram Description

The E-R (Entity-Relationship) Diagram is a visual representation of the database structure, showcasing the relationships between different entities. In this database:

- **Drivers** are linked to **Teams** and **Races** through **Results**.
- **Teams** have associations with **Drivers**, **Engineers**, and **Sponsors** through intermediate tables.
- **Seasons** are connected to **Races**, **Team Constructors**, and **Team Sponsors**.
- **Circuits** (optional) store information about race locations but are not directly linked in this simplified design.
- **Results**, **Fastest Laps**, **Qualifying**, and **Penalties** provide detailed race performance data.

This diagram helps in understanding how various components of the Formula 1 data are interconnected, facilitating efficient data management and retrieval.

E-R Diagram



Tables and Relationships

1️⃣ Teams:

- team_id (PK)
- name
- country

Relationships:

- (1-n) with Drivers
- (1-n) with Results
- (m-n) with Engineers through Engineering Teams
- (m-n) with Sponsors through Team_Sponsors

2️⃣ Drivers:

- driver_id (PK)
- first_name
- last_name
- nationality
- date_of_birth
- team_id (FK)

Relationships:

- (1-n) with Teams
- (1-n) with Results
- (1-n) with Fastest_Laps
- (1-n) with Qualifying
- (1-n) with Penalties

3️⃣ Seasons:

- season_id (PK)
- year

Relationships:

- (1-n) with Races
- (1-n) with Team_Constructors
- (1-n) with Team_Sponsors

4️⃣Circuits (Additional, not directly related in the simplified design):

- circuit_id (PK)
- name
- country
- length

5️⃣ Races:

- race_id (PK)
- name
- date
- location
- season_id (FK)

Relationships:

- (1-n) with Results
- (1-n) with Fastest_Laps
- (1-n) with Qualifying
- (1-n) with Penalties

6 Results:

- result_id (PK)
- race_id (FK)
- driver_id (FK)
- team_id (FK)
- position
- points

Relationships:

- (n-1) with Races
- (n-1) with Drivers
- (n-1) with Teams

7 Fastest_Laps:

- fastest_lap_id (PK)
- race_id (FK)
- driver_id (FK)
- time

Relationships:

- (n-1) with Races
- (n-1) with Drivers

8️⃣ Qualifying:

- qualifying_id (PK)
- race_id (FK)
- driver_id (FK)
- position

Relationships:

- (n-1) with Races
- (n-1) with Drivers

9️⃣ Penalties:

- penalty_id (PK)
- driver_id (FK)
- race_id (FK)
- description
- time_penalty

Relationships:

- (n-1) with Drivers
- (n-1) with Races

🔟 Engineers

- engineer_id (PK)
- name
- country

Relationships:

- (1-n) with Engineering Team

11 Egineering_Team:

- engineering_team_id (PK)
- team_id (FK)
- engineer_id (FK)
- season_id (FK)

Relationships:

- (n-1) with Engineers
- (n-1) with Teams
- (n-1) with Seasons

12 Sponsors:

- sponsor_id (PK)
- name
- country

Relationships:

- (1-n) with Team_Sponsors

13 Team_Sponsors:

- team_sponsor_id (PK)
- team_id (FK)
- sponsor_id (FK)
- season_id (FK)

Relationships:

- (n-1) with Sponsors
- (n-1) with Teams
- (n-1) with Seasons

Github Link: https://github.com/Alexjav129/Formula1DB-Bautista

Views (4)

VIEW 1: Team and Driver Info

- Objective: Provides detailed information about teams and their associated drivers.
- Tables: Teams (teams) and Drivers (drivers).
- Description: This view combines data from the teams table and the drivers table to show the names, nationalities, and birthdates of each driver along with their respective team's name and country.

VIEW 2: Race Results with Driver and Team Information

- Objective: Offers comprehensive race result details including driver and team information.
- Tables: Races (races), Results (results), Drivers (drivers), Teams (teams), Seasons (seasons).
- Description: This view integrates data from multiple tables to display race names, dates, locations, along with driver names, team names, and specific race results such as positions and points scored.

VIEW 3: Teams and Their Engineers

- Objective: Presents teams alongside their engineering staff for a given season.
- Tables: Teams (teams), Engineering Team (engineering_team), Engineers (engineers), Seasons (seasons).
- Description: This view combines information from the teams, engineering_team, engineers, and seasons tables to show each team's name and country alongside the names and countries of their engineers for a specified season.

VIEW 4: Teams and Their Sponsors

- Objective: Displays teams and their sponsor relationships for a particular season.
- Tables: Teams (teams), Team Sponsors (team_sponsors), Sponsors (sponsors), Seasons (seasons).
- Description: This view utilizes data from the teams, team_sponsors, sponsors, and seasons tables to showcase each team's name and country alongside the names and countries of their sponsors for a given season.

These views provide consolidated information based on the relationships between teams, drivers, engineers, sponsors, races, and results within the database structure.

Functions (2)

Function 1: Calculate Points Per Race

- **Objective:** This function calculates the points awarded based on the finishing position in a race, adhering to Formula 1 championship points rules.
- **Manipulated Data/Tables:** No specific tables are manipulated; it takes an integer parameter (position) and computes points based on conditional logic.
- **Description:** The function calculate_points_per_race determines the points awarded to drivers based on their finishing position in a race. It uses a series of conditional statements (IF and ELSE IF) to assign points according to Formula 1 scoring rules. Positions from 1st to 10th are assigned specific points (25, 18, 15, 12, 10, 8, 6, 4, 2, and 1 respectively), while positions below 10th receive no points.

Function 2: Determine Champion Status

- **Objective:** This function determines whether a given championship count qualifies an individual as a champion or not.
- **Manipulated Data/Tables:** No specific tables are manipulated; it takes an integer parameter (championship) and returns a status based on its value.
- **Description:** The function determine_champion_status evaluates whether the input championship count qualifies an individual as a champion. It returns a string indicating "Champion" if the input is greater than zero, otherwise "Not a Champion". This function operates in a NO SQL context, meaning it doesn't interact with database tables but rather performs a simple conditional check and returns a result based on the input parameter.

These functions are designed to encapsulate specific logic for calculating race points and determining championship status based on provided inputs, enhancing the database's capability to handle Formula 1-related calculations and status determinations.

Stored Procedures (2)

Stored Procedure 1: Get Number of Races per Season

- **Objective/Benefit:** This stored procedure is designed to provide a summary of the number of races held each season. It aggregates the count of races per year, offering a quick overview of the racing activity across different seasons.
- **Interacting Tables:**
  - seasons
  - races
- **Description:** The stored procedure sp_get_races_per_season retrieves the total number of races for each season. It performs a LEFT JOIN between the seasons and races tables on the season_id column. The procedure then groups the results by the year column from the seasons table and counts the number of races (race_id) for each year. This information is useful for understanding the distribution of races over different seasons and can help in analyzing the growth or changes in the racing calendar.

```SQL
CALL sp_get_races_per_season();
```

Stored Procedure 2: Get Race Results for a Driver

- **Objective/Benefit:** This stored procedure provides detailed race results for a specific driver, allowing for the analysis of a driver's performance over time. It fetches and organizes the race results in a clear and concise manner.
- **Interacting Tables:**
  - results
  - races
  - drivers
- **Description:** The stored procedure sp_get_driver_results retrieves all race results for a specified driver. It accepts a driver ID as an input parameter and joins the results, races, and drivers tables to collect relevant data. The procedure selects the race name, race date, the driver's finishing position, and the points earned in each race. The results are ordered by the race date in descending order, providing a chronological overview of the driver's performance. This procedure is beneficial for analyzing a driver's historical performance and can be used for reporting and statistical analysis.

```SQL
CALL sp_get_driver_results(1);
CALL sp_get_driver_results(10);
CALL sp_get_driver_results(20);
```

These stored procedures enhance the functionality of the Formula 1 database by providing essential summary and detailed data retrieval capabilities, which are crucial for performance analysis and reporting.

Triggers (2)

Trigger 1: Audit Races Trigger

- **Objective/Benefit:** This trigger ensures that any insertion into the `races` table is logged in the `racesTriggerAudit` table. This is crucial for maintaining an audit trail of changes, providing a historical record of all additions to the `races` table.
- **Interacting Tables:**
    - `races`
    - `racesTriggerAudit`
- **Description:** The `afterInsertRacesTrigger` is an `AFTER INSERT` trigger that activates whenever a new record is inserted into the `races` table. When this occurs, the trigger copies the details of the new race (including `race_id`, `name`, `date`, `location`, and `season_id`) into the `racesTriggerAudit` table. Additionally, it logs the type of DML operation ('INSERT'), the current date and time (`ChangeDate`), and the user who made the change (`UserChange`). This ensures that all new race entries are recorded for audit purposes.

```SQL
-- Insert data into Races to trigger the audit
INSERT INTO races (name, date, location, season_id) VALUES
('British Grand Prix2023', '2023-10-16', 'Silverstone', 4),
('Monaco Grand Prix2023', '2023-11-28', 'Monaco', 4),
('Italian Grand Prix2023', '2023-12-03', 'Monza', 4);
```

Trigger 2: Audit Results Trigger

- **Objective/Benefit:** This trigger ensures that any insertion into the `results` table is logged in the `resultsTriggerAudit` table. This is essential for tracking all changes made to the race results, thereby maintaining a comprehensive audit trail.

- **Interacting Tables:**
    - `results`
    - `resultsTriggerAudit`
- **Description:** The `afterInsertResultsTrigger` is an `AFTER INSERT` trigger that activates whenever a new record is inserted into the `results` table. When triggered, it copies the details of the new result (including `result_id`, `race_id`, `driver_id`, `team_id`, `position`, and `points`) into the `resultsTriggerAudit` table. Additionally, it logs the type of DML operation ('INSERT'), the current date and time (`ChangeDate`), and the user who made the change (`UserChange`). This trigger ensures that all new results entries are recorded for audit purposes, providing a detailed log of all race results additions.

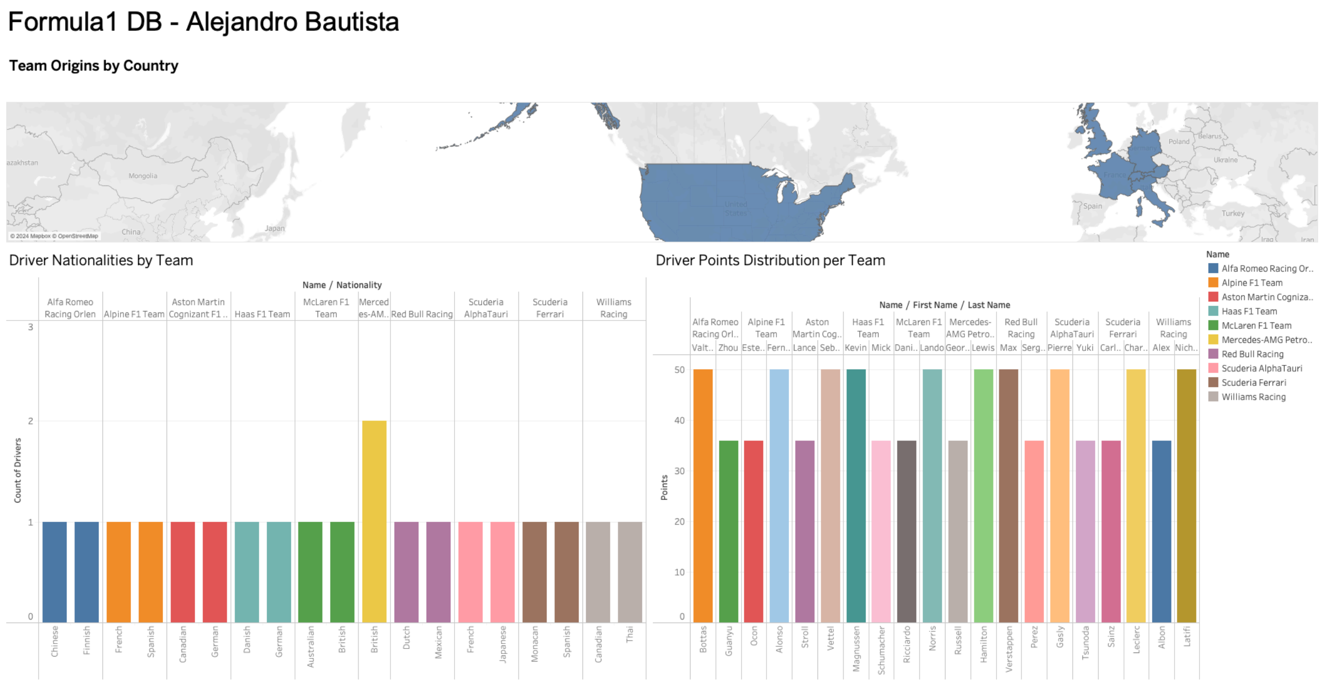
```SQL
Insert data into Results to trigger the audit
INSERT INTO results (race_id, driver_id, team_id, position,
points) VALUES
(1, 1, 1, 1, 25),
(1, 2, 1, 2, 18),
(2, 3, 2, 1, 25),
(2, 4, 2, 2, 18),
(3, 5, 3, 1, 25);
```

These triggers help maintain the integrity and accountability of the data within the Formula 1 database by providing automatic logging of significant table changes.

Data Visualization with Tableau

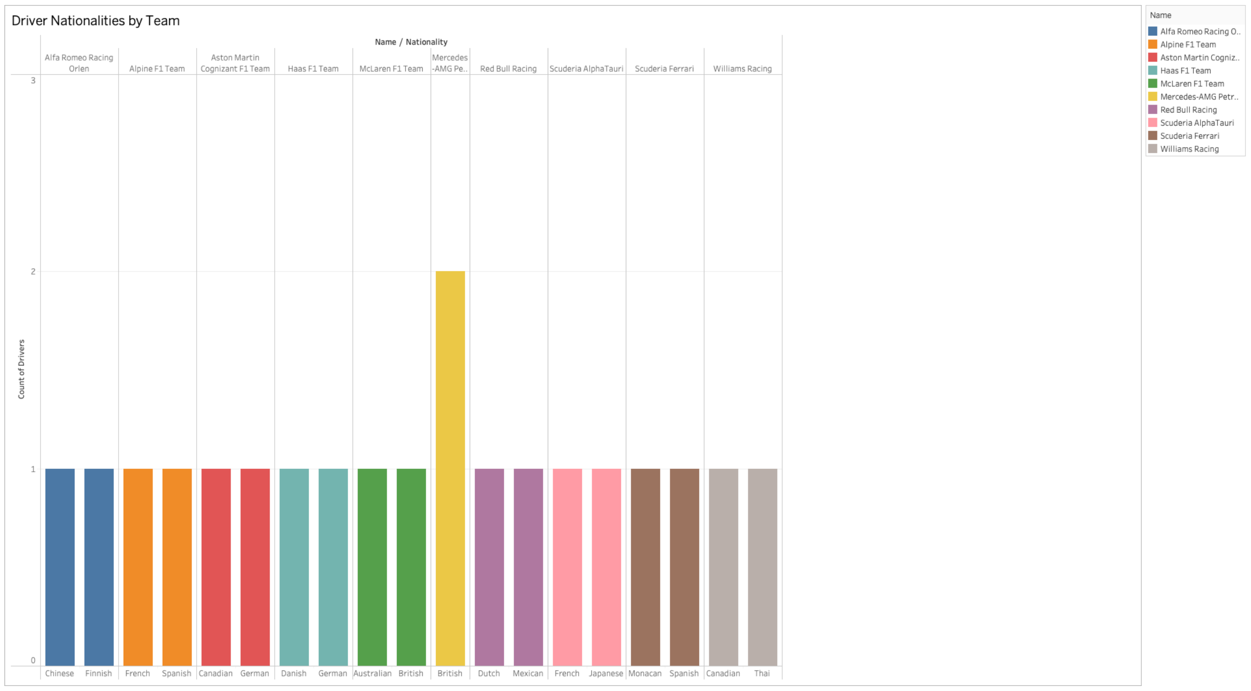
Dashboard Overview

The Formula 1 Insights Dashboard provides a comprehensive analysis of various aspects of Formula 1 teams and drivers. It leverages data from the MySQL database to offer a visual representation of driver nationalities, points distribution, and team origins. This dashboard is designed to give users a deeper understanding of the geographical diversity and performance metrics within the world of Formula 1 racing.



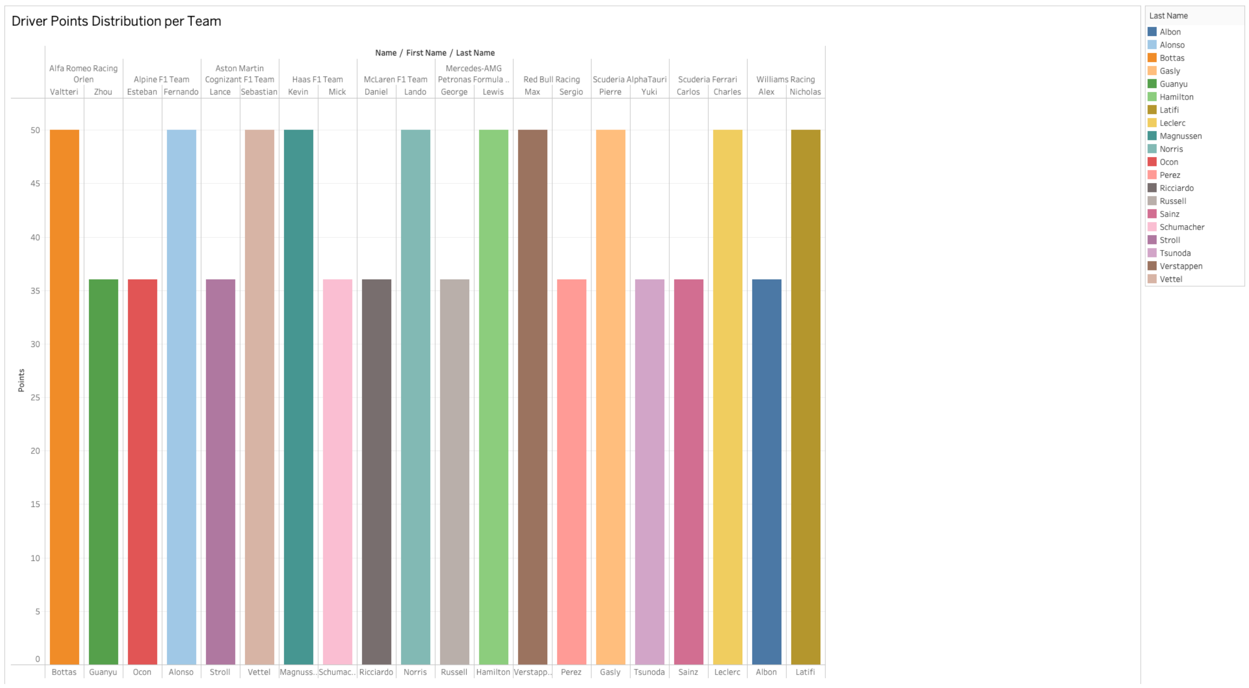
Sheet 1: Driver Nationalities by Team

This sheet visualizes the nationalities of drivers for each Formula 1 team. By displaying a breakdown of driver nationalities, users can easily see the diversity within each team. This chart helps to understand how international the teams are and provides insights into the global reach of Formula 1 in terms of talent acquisition.



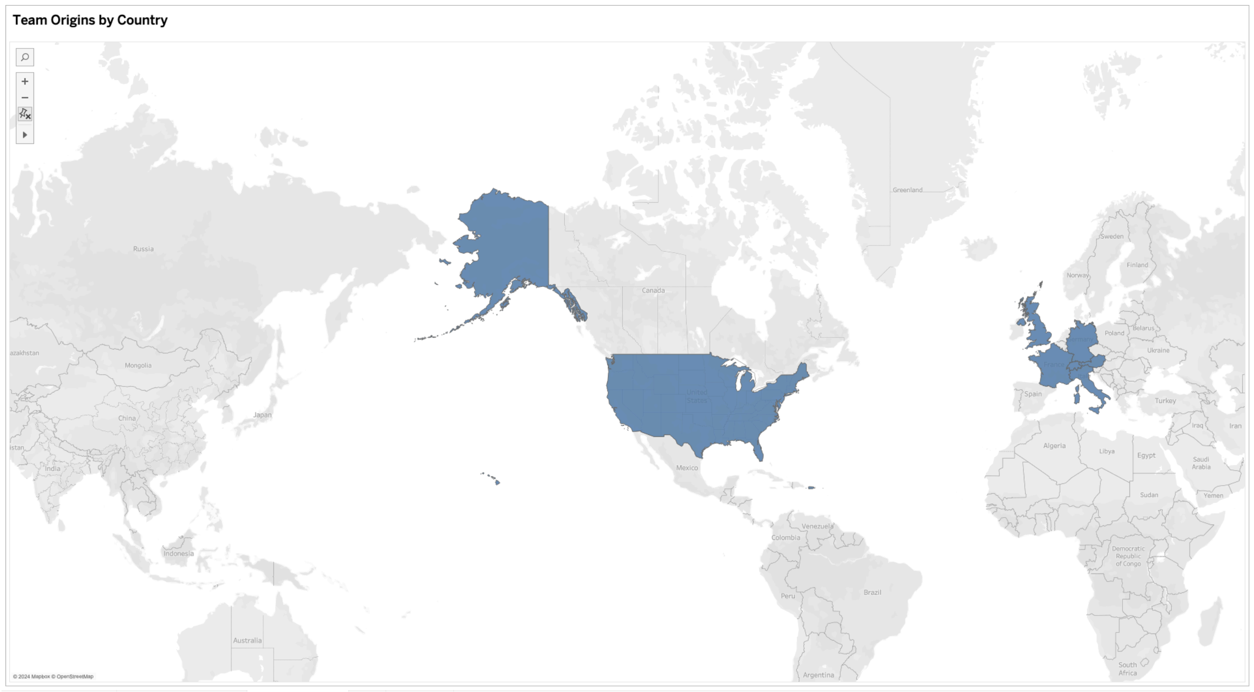
Sheet 2: Driver Points Distribution per Team

This sheet shows the distribution of points scored by drivers for each team. It highlights the performance of individual drivers within their respective teams. Users can analyze how points are distributed among team members, identifying key drivers and understanding team dynamics in terms of scoring and contributions to the team's overall performance.



Sheet 3: Team Origins by Country

This sheet maps the countries of origin for the different Formula 1 teams. By showcasing the geographical locations of the teams, users can see the global spread of Formula 1 teams and identify which countries are home to the most teams. This visualization provides insights into the concentration of teams and the prominence of Formula 1 in various regions around the world.


Team Origins by Country
Russia
Canada
Greenland
Mexico
Brazil
Australia
China
Japan
India
Indonesia
Mongolia
Kazakhstan
Spain
Sweden
Norway
Finland
Poland
Ukraine
Belarus
Turkey
Iraq
Iran
Algeria
Libya
Egypt
Saudi Arabia
Yemen
Sudan
Democratic Republic of Congo
South Africa
Venezuela
Colombia
Peru
Argentina
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