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## Abstract

In this paper, we will analyze Formula 1 performance data to explore the relationship between pole positions, race wins, and points for both drivers and their teams. Using software such as Power BI and Python, we visualize patterns in driver and team performance across the 2023 and 2024 seasons. The results of this analysis indicate that while pole positions often correlate with greater race outcomes, the sum of points scored is not solely dependent on the number of race wins.

## Introduction

Formula 1 racing is a sport in which twenty of the best drivers in the world work with a team of engineers to score the most points throughout the season. Points are awarded for each race, where the top ten drivers earn points based on position. First place earns 25 points, second place earns 18 points, with the number of points decreasing incrementally until tenth place, which earns 1 point. Also, if a driver completes the fastest lap of the race and finishes in the top 10, they receive one additional point. At the end of the season, there are two championships: the World Driver's Championship, which awards the driver with the most overall points, and the World Constructor's Championship, which awards the team with the most overall points. While race wins are an important factor in the scoring of points for the championships, other factors can play a crucial role in race performance, such as pole position (starting from first on the track). By analyzing the 2023 and 2024 seasons, we seek to understand how pole positions correlate with race wins and how it affects the overall points earned by the teams and the drivers.

## Methodology

The dataset used for this analysis includes statistical data from the 2023 and 2024 Formula 1 seasons. This includes 23 drivers and 10 teams across both seasons, as well as data such as their race results, pole positions, and points earned throughout the season for both the drivers and the teams. Assuming that the dataset consists of complete and accurate data based on

the results of the Formula 1 races provided, this analysis uses tools such as Power BI and Python to visualize trends in the data. In addition, the number of points, pole positions, and race wins are analyzed without accounting for external factors that otherwise play a role in performance. To visualize the data, bar graphs comparing the points earned by drivers and the points earned by teams were created using pandas and the matplotlib libraries in Python. In addition, scatterplots comparing the sum of points and the sum of pole positions by driver and team names were created using Power BI. These comparisons were also displayed in tabular form using the same program.

## Data Analysis and Results

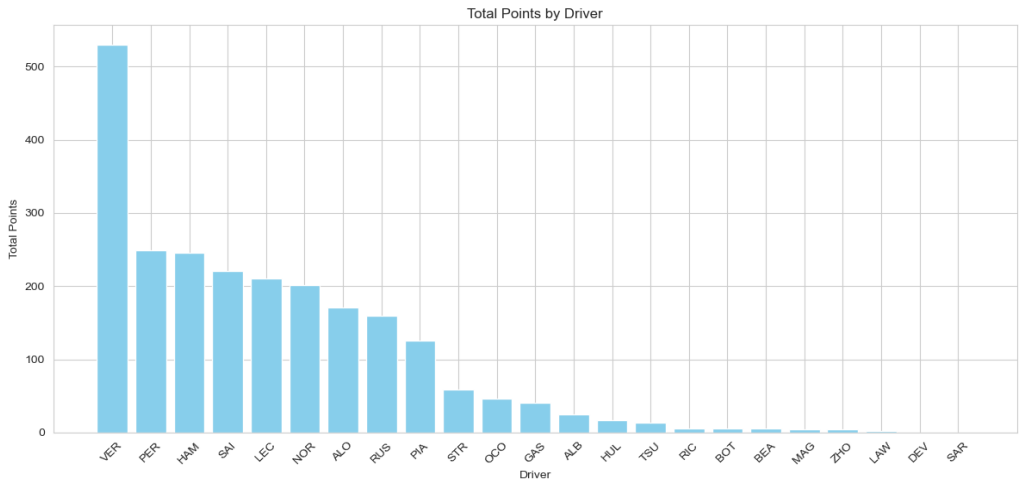


Figure 1: Total Points by Driver

Figure 1 shows the total points earned across the seasons by driver. According to the graph, the driver who earned the most points, and who subsequently won the World Driver's Championship in 2023, was Max Verstappen. In addition, the driver who earned the least number of points was Logan Sargeant.

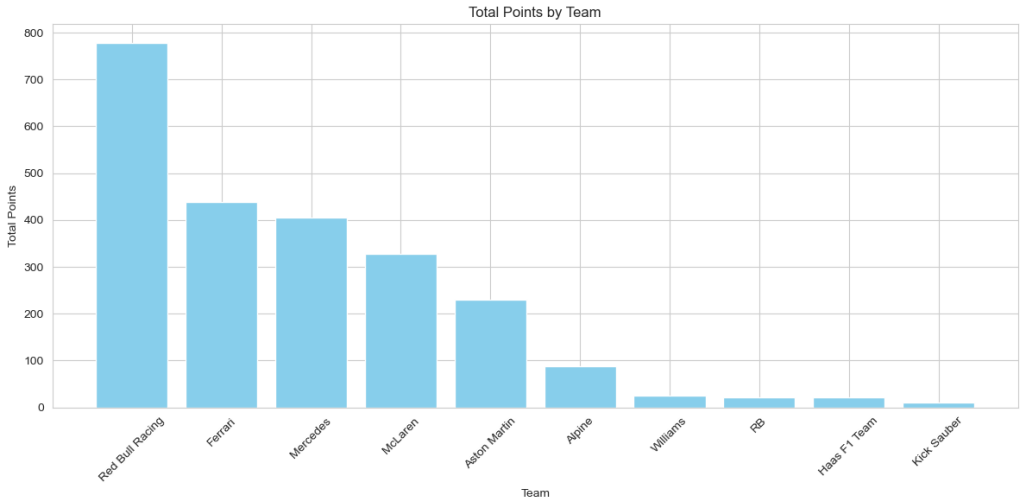


Figure 2: Total Points by Team

Figure 2 shows the total points earned across the seasons by team. According to the graph, the team which earned the most points, and who subsequently won the World Constructor's Championship in 2023, was Red Bull Racing. In addition, the team which earned the least number of points was Kick Sauber.

Sum of RaceWins

BY POLEPOSITION, DRIVER

| PolePosition | ALB | ALO | BEA | BOT | DEV | GAS | HAM | HUL | LAW | LEC | MAG | NOR | OCO | PER | PIA | RIC | RUS | SAI | SAR | STR | TSU | VER | ZHO | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 0 | **8** |
| 1 | | | | | | | 0 | | | 0 | | 0 | | 1 | | | 0 | 1 | | | | 13 | | **15** |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **2** | **0** | **0** | **0** | **19** | **0** | **23** |

Table 1: Sum of Race Wins and Pole Positions by Driver

Table 1 shows the sum of race wins and pole positions by driver. According to the table, Max Verstappen started from pole most races, and he also won the most races out of all the drivers. The table also shows that the majority of race wins were won from pole position.

Sum of RaceWins

BY POLEPOSITION, TEAMNAME

| PolePosition | Alpine | Aston Martin | Ferrari | Haas F1 Team | Kick Sauber | McLaren | Mercedes | RB | Red Bull Racing | Williams | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | **8** |
| 1 | | | 1 | | | 0 | 0 | | 14 | | **15** |
| **Total** | **0** | **0** | **2** | **0** | **0** | **0** | **1** | **0** | **20** | **0** | **23** |

Table 2: Sums of Race Wins and Pole Positions by Team

Table 2 shows the sum of race wins and pole positions by team. According to the table, a driver from Red Bull Racing started from pole most races, and they also won the most races out of all the drivers. The table also shows that the majority of race wins were won from pole position.

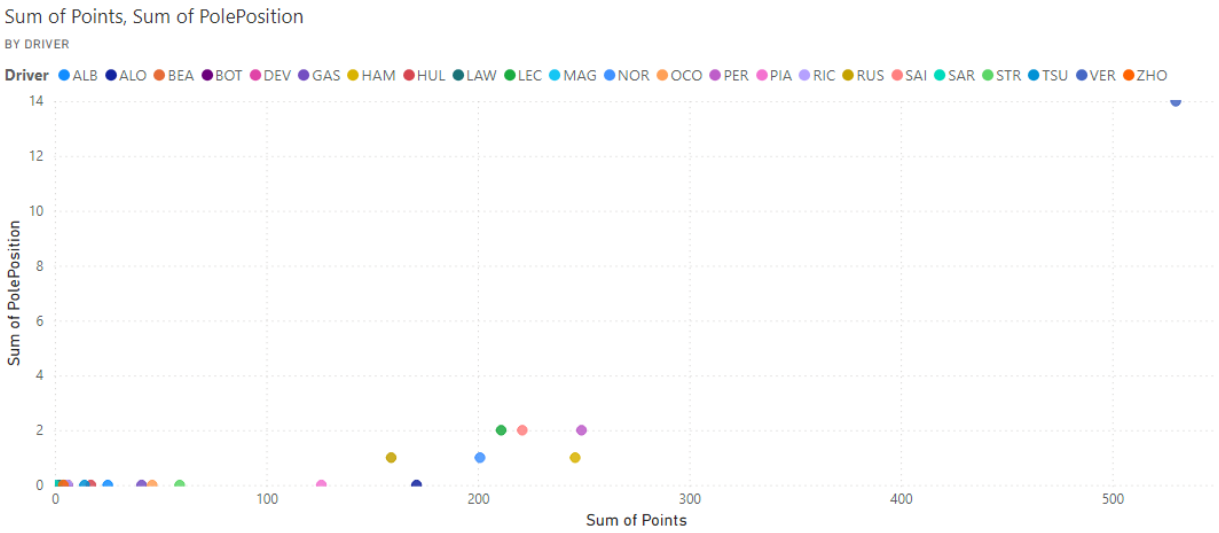


Figure 3: Sum of Points and Sum of Pole Positions by Driver

Figure 3 shows the sum of pole positions and the sum of points earned throughout the season by driver. According to the scatterplot, the driver with the most pole positions, as well as the greatest number of points earned, was Max Verstappen. In addition, there were many drivers who did not make pole position and earned significantly less points, if any at all. The scatterplot shows that the driver who never made pole position and earned the least number of points was Logan Sargeant.

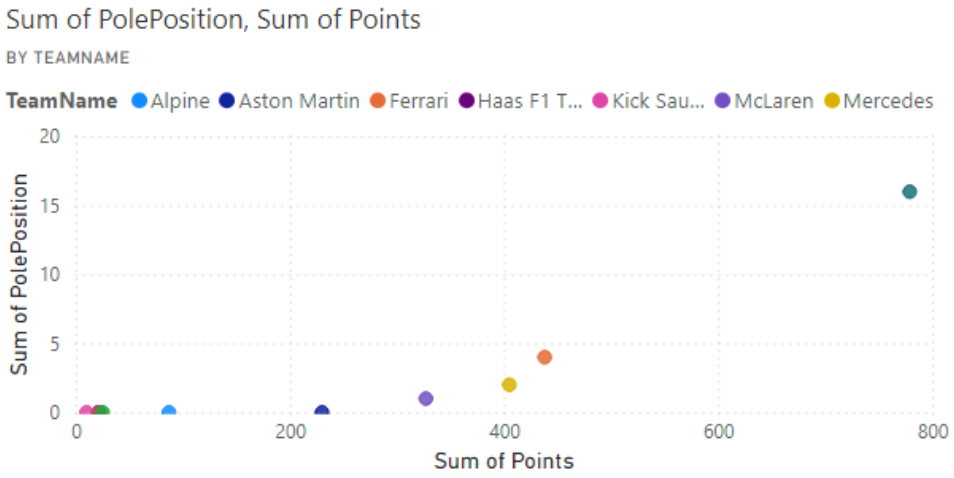


Figure 4: Sum of Points and Sum of Pole Positions by Team

Figure 4 shows the sum of pole positions and the sum of points earned throughout the season by team. According to the scatterplot, the team whose drivers made the most pole positions, as well as the greatest number of points earned, was Red Bull Racing. In addition, there were many teams whose drivers did not make pole position and earned significantly less points, if any at all. The scatterplot shows that the team whose drivers never made pole position and earned the least number of points was Kick Sauber.

## Conclusions

Through this analysis of the dataset covering the 2023 and 2024 Formula 1 seasons, we can conclude that pole position and race wins play a significant role in driver and team performance based on point scoring. As seen from the results, Max Verstappen won the most races and made the most pole positions throughout the seasons, which earned him the greatest number of points scored. Similarly, Red Bull Racing was the team who made these accomplishments. This supports the analysis, since Max Verstappen raced for Red Bull Racing during the time that the data was collected. While pole positions and race wins significantly assisted in higher point scoring, they are not the only factors that contribute to the earning of points. Other factors include strategies when it comes to tire management, pitstops, weather, and much more are important to consider when analyzing where drivers and teams score the greatest number of points. In addition, teams like Kick Sauber, whose drivers did not make pole position

or win any races, earned fewer points throughout the seasons, which shows the importance of these factors in this analysis. Further studies may include the consideration of other factors in the analysis of points scored by the teams and their drivers.

# Appendix

## Dataset

GentritKaggler. (2024). *F1 Race 2023–2024 Dataset* [Data set]. Kaggle. https://www.kaggle.com/datasets/gentritkaggler/f1-race-2023-2024-dataset

## Python Code for Bar Graphs

(Used to create Figures 1 and 2)

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style("whitegrid")

file_path =
'/Users/elliemiranda/Downloads/f1_race_2023_2024_dataset.csv'
F1Dataset = pd.read_csv(file_path)

plt.scatter(F1Dataset["PitStopTime_avg"],
F1Dataset["GainedPosition"])
plt.xlabel("Average Pit Stop Time (s)")
plt.ylabel("Gained Position")
plt.title("Pit Stop Time vs. Positions Gained")
plt.grid(True)
plt.show()

team_avg = F1Dataset.groupby("TeamName")[["PitStopTime_avg",
"GainedPosition"]].mean()
team_avg = team_avg.dropna().sort_values("PitStopTime_avg")

plt.figure(figsize=(12, 6))
plt.bar(team_avg.index, team_avg["PitStopTime_avg"],
color='skyblue')
plt.title("Average Pit Stop Time by Team")
plt.xlabel("Team")
plt.ylabel("Average Pit Stop Time (s)")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

**Interactive Power BI Report**

(Used to create Figures 3 and 4 as well as Tables 1 and 2)

Interactive Power BI Report