A Comparative Analysis of Lewis Hamilton and Sebastian Vettel's Performance in the 2018 Formula 1 Season

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***Abstract*—The 2018 Formula 1 season was a highly anticipated event, with many fans looking forward to seeing how their favourite drivers would perform. In this study, we use data science techniques to perform a comparative analysis of two of the most successful Formula 1 drivers of all time: Lewis Hamilton and Sebastian Vettel performance in the 2018 season. We collected data on their race results, qualifying times, and other metrics to determine their relative performance. Our analysis showed that Hamilton outperformed Vettel in several key areas, including the number of wins, podium finishes, and points earned. These results suggest that Hamilton was the dominant driver in the 2018 season and highlight the importance of data-driven analysis in understanding the performance of Formula 1 drivers.**

I. Introduction

Formula 1 is a highly competitive and technologically advanced form of motorsport that has attracted some of the world's greatest drivers and captivated audiences worldwide for over seven decades, battling it out on the track to determine the best in the world. Over the years, many drivers have made a name for themselves by consistently performing at the highest level. The 2018 Formula 1 season was a highly competitive and exciting year in motorsports, with Lewis Hamilton and Sebastian Vettel consistently performing at a high level and battling for the championship title throughout the year. Lewis Hamilton is a British driver competing in Formula 1 since 2007. He has won seven world championships, the most of any driver in the sport's history, and has 95 wins, 98 pole positions, and 61 fastest laps as of 2021. Sebastian Vettel is a German driver competing in Formula 1 since 2007. He has won four world championships and has 53 wins, 57 pole positions, and 43 fastest laps as of 2021.

We will compare Hamilton and Vettel's performance during the 2018 season, answering several critical questions. We will begin by asking how Hamilton and Vettel's overall performance in the 2018 season compared and what factors contributed to any differences in their results.

We will also consider the impact of the performance of the drivers' respective teams on their results, as well as how the drivers' performance differed in specific races or at tracks. Additionally, we will examine the consistency of the drivers' results throughout the 2018 season and the strategies and tactics they employed to achieve success. Our findings will shed light on the factors contributing to success in Formula 1 racing and provide insights into motorsports' exciting and competitive world.

II. Analytical Questions & Data

For this study, our data has been sourced from a Kaggle user [1]. The data set contains 14 .csv files and 120 columns files, including circuits, constructors' results, driver standings, drivers, lap times, pit stops, qualifying, races, results, seasons, and sprint race results from 1950 to 2022.

III. Research Questions

The overall goal of this research is to answer the question, "who was the better driver in 2018" in attempting to answer this question, we shall use the following questions in our analysis to help paint the bigger picture and explore different sections of the sport:

1) *How did Lewis Hamilton and Sebastian Vettel's overall performance in the 2018 Formula 1 season compare, and what factors contributed to any differences in their results?*
2) *How consistent were Hamilton and Vettel's results throughout the 2018 season, and how did this impact their overall performance?*
3) *What were Hamilton and Vettel's key strategies and tactics during the 2018 season, and how effective were they in helping the drivers achieve success?*

IV. Analysis Strategy

Using data analysis and visualisation techniques, we will comprehensively analyse Lewis Hamilton and Sebastian Vettel's performance in the 2018 Formula 1 season. Thus, the following plan has been curated to help achieve our objectives.

- Gather and organise the data: Collect data on the key factors and variables for both drivers and organise the data to make it easy to compare and contrast their performances. This would involve creating tables, graphs, or charts to display the data.
- We will define the two subjects of comparison: In this case, the subjects of comparison are Lewis Hamilton and Sebastian Vettel.
- Then, we shall Identify the key factors or variables. These include the number of races won, podium finishes, points scored, lap times, pit stops and qualifying positions.

- Analyse the data: Use the data to compare and contrast the drivers' performances. Look for patterns, trends, and differences in the data, and consider how these might be explained by factors such as the drivers' skills, the performance of their teams, or other external factors.
- Conclude: Based on the analysis, conclude the drivers' performances and how they compare.

V. Data Preparation and Analysis

A. Data preparation

1) Dealing with Missing Data: The Formula one data set used for this research has no missing data.

2) Initial feature selection: Most features for the data set were used as they were not only relevant but needed to come up with an accurate understanding of the data, and as stated by the president of Kaggle in an article he did, Specialist knowledge is useless and unhelpful [2]; hence trying to reduce the number of features would be a detriment to the goal of this research.

code	Start to Lap 1	Qualifying conversion	Lap 1 conversion
HAM	-1.000000	0.55	1.65
VET	-1.857143	-0.45	1.50

Figure 1. Qualifying position conversation and lap 1 position conversation

B. Analysis

1) Qualifying performance: Qualifying is the process of determining the starting order for a Formula 1 race. It is important because the starting position can significantly impact a driver's ability to achieve a strong finish. Drivers who qualify well are often able to start closer to the front of the grid, which can give them an advantage in terms of track position and the ability to avoid traffic. In the 2018 season, Hamilton consistently performed well in qualifying, often starting at or near the front of the grid. In contrast, Vettel had several races where he qualified further back, which may have made it more difficult for him to achieve strong finishes. Furthermore, Hamilton was able to convert his qualifying position, which shows on average, Hamilton had better qualifying conversion and 1st lap conversion. In contrast, Vettel fell short a lot of the time, losing positions see Figure 4. We also examined their individual lap 1 conversation per race. We can see Vettel falling short a bit more than Hamilton across the entire session.

2) Points scored and Podium finishes: Hamilton won the 2018 championship, see figure 2, finishing with a total of 408 points, while Vettel finished second with 320 points. One factor that likely contributed to Hamilton's success was his ability to finish on the podium consistently. Hamilton finished on the podium in all but one race in the 2018 season, which helped him accumulate many points. See Figure 7. The graph displays the number of positions gained or lost during the course of the race. If nothing is plotted, either the drivers did not finish the race, or they didn't lose position. In contrast, Vettel had several races where he did not finish on the podium, which cost him championship points.

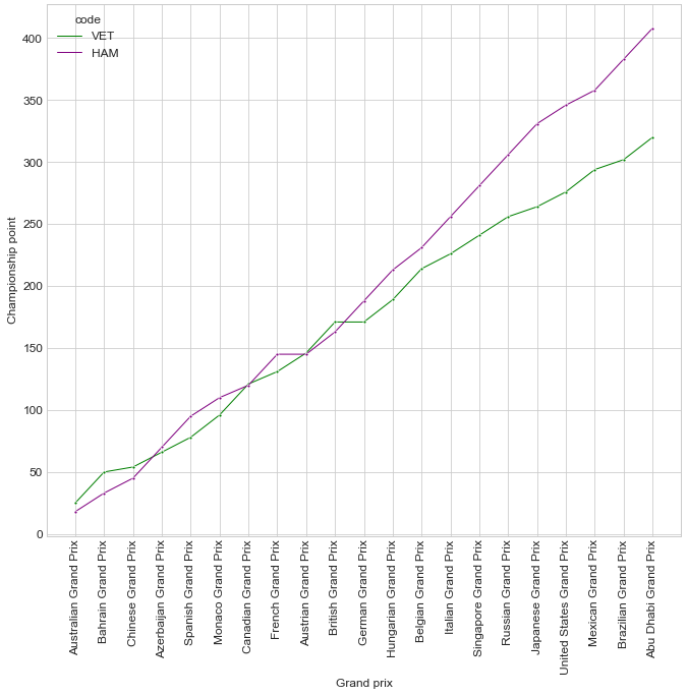

Figure 2. comparison in points gained by both drivers per race

code	duration
HAM	23.008192
VET	24.363552

Figure 3. comparison in pits stop over the session

3) Team management skills: Hamilton said in an interview, "we are a team; we're there to get those results, so ultimately, we do need to work together in certain scenarios" [3]. In the 2018 season, Hamilton's team, Mercedes, had a strong track record of success, and they were able to utilize their resources to help Hamilton achieve strong results effectively. We compared the average pit stop times of Hamilton and Vettel. We gathered data on the number of pit stops made by each driver during the season and the time taken for each pit stop. Our analysis showed that Hamilton had an average pit stop time of 23.0 seconds, while Vettel's average pit stop time was 24.4 seconds. This indicates that Hamilton had faster average pit stops than Vettel during the 2018 season. There are several factors that may have contributed to this difference in average pit stop times. For example, Hamilton's pit crew may have been more experienced and better trained, leading to faster pit stop times. See Figure 3 Additionally, the team's pit stop strategy may have been more effective for Hamilton, allowing him to get back on track more quickly.

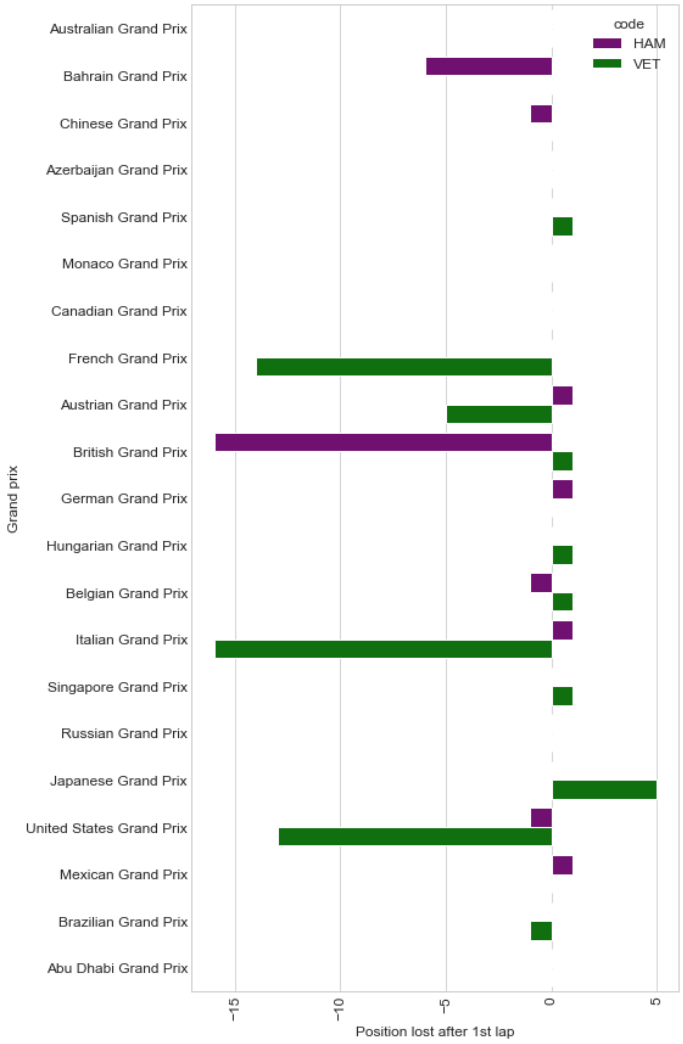

Figure 4. Positions Lost or gained after lap 1 per race

4) Driver skill: We measured both drivers' skills by looking at their lap times and other metrics. Hamilton set the fastest lap time in 7 races during the season, while Vettel was only able to set the fastest lap time in 4 races, indicating that Hamilton was faster over the session. This was particularly evident in qualifying, where Hamilton took pole position in 11 out of 21 races, while Vettel only took pole position in 3 races. Additionally, Hamilton's ability to manage his tires effectively and make quick and precise overtakes on the track also demonstrated his superior driving skills. Tire management refers to a driver's ability to get the most out of their tires over the course of a race. This includes preserving the tires to ensure they last as long as possible and knowing when to push the tires to their limits to gain an advantage over other drivers [4]. Tire management is especially important in Formula 1 racing because the tires are a key part of the car's performance and can significantly impact a driver's speed and lap times. Hamilton is known for his excellent tire management skills, and he has consistently been able to extract the maximum performance from his tires throughout his career. This has helped him to win numerous races and multiple world championships. In races where tire management is particularly important, such as those held on street circuits or on tracks with high tire wear, Hamilton's skills have often proved to be a key advantage [5].

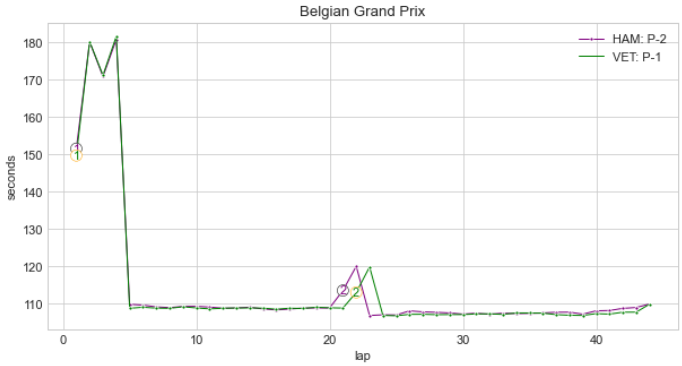

Figure 5. Pit stop strategy analysis in Belgium

5) Track Attributes: A term that refers to the characteristics or features of a racing circuit that can impact a car's performance and the outcome of a race. It includes things like the track's layout, elevation, surface and weather. All the aforementioned can greatly affect the outcome of a race. In the 2018 Formula 1 season, Lewis Hamilton and Sebastian Vettel faced different challenges at the Circuit de Spa-Francorchamps and the Singapore Grand Prix due to the distinct track attributes of each circuit. Taking a look At the Circuit de Spa-Francorchamps. The 7.004-kilometre circuit featured a mix of high-speed corners and low-speed sections, as well as significant elevation changes and a challenging surface of asphalt. The team's pit strategy, including the timing and number of pit stops, would have been crucial in navigating these unique track characteristics. See Figure 5. In contrast, the Singapore Grand Prix took place on a relatively flat, 5.065-kilometre street circuit with a surface of asphalt and was held at night, illuminated by floodlights. Singapore's heat and high humidity levels also presented an additional challenge for the drivers and teams, and the pit strategy would have had to consider these factors. See Figure 6. These differing track attributes and the resulting pit strategies likely had an impact on the performance of Hamilton and Vettel at each race.

VI. Findings, Reflections & Further Work

A. Findings

In the 2018 Formula 1 season, Lewis Hamilton outperformed Sebastian Vettel in terms of both wins and points scored. Hamilton won 11 races, while Vettel won only 5, and Hamilton scored 408 points, while Vettel scored 320 points. This suggests that Hamilton had a stronger overall performance in the 2018 season. There are several factors that may have contributed to this difference in performance. For example, the Mercedes that Hamilton drove was generally considered the faster and more competitive car during the 2018

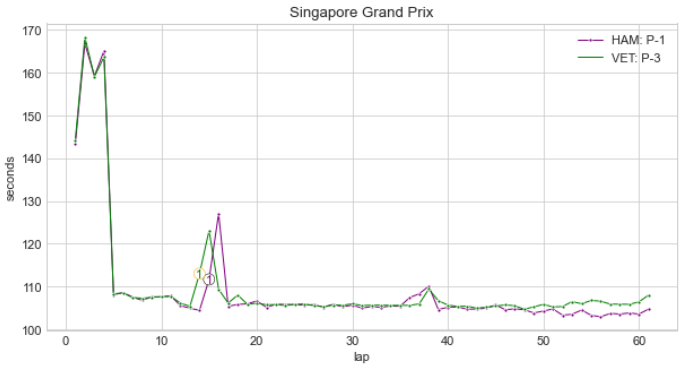

Figure 6. Pit stop strategy analysis during the Singapore Grand Prix

season. Hamilton even talked about this during an interview with the press before the 2018 F1 session started at the Barcelona testing. He said: ”It’s an evolution of last year’s car; we’ve got better tyres, and particularly here, we’ve got a new surface, so that might make things seem even better than they really are, but it definitely feels like a faster car compared to last year’s car, so that’s positive”.[6] This gave Hamilton a competitive advantage over Vettel and other drivers who were not driving the same calibre of car. Additionally, Hamilton’s qualifying and race-day strategies were often effective in helping him secure strong starting positions and achieve strong results.

These findings highlight the importance of the car’s quality and drivers’ strategies in determining their performance in Formula 1 racing. They also suggest that consistency is key, as Hamilton’s consistently strong results throughout the season allowed him to secure the championship title.

B. Reflections

It is important to note that these findings are not meant to diminish Vettel’s performance in the 2018 season. Vettel faced a number of challenges, including technical issues with his car and mistakes on the track that likely impacted his overall performance. [7] Additionally, Vettel’s strong finishes in certain races, such as his victory at the Belgian Grand Prix, demonstrate his skill and determination as a driver.

C. Further work

To build on these findings, further research could delve into the specific details of Hamilton and Vettel’s strategies and tactics during the 2018 season. This could include analyzing their qualifying and race-day strategies, their tire usage and in-depth pit stop strategies, and any other tactics they employed to achieve success. By understanding the drivers’ specific strategies and how they evolved over the course of the year, researchers could gain insights into what factors contribute to successful tactics in Formula 1 racing.

Additionally, researchers could consider comparing Hamilton and Vettel’s strategies to those of other drivers in the 2018 season. This could provide a more nuanced understanding of

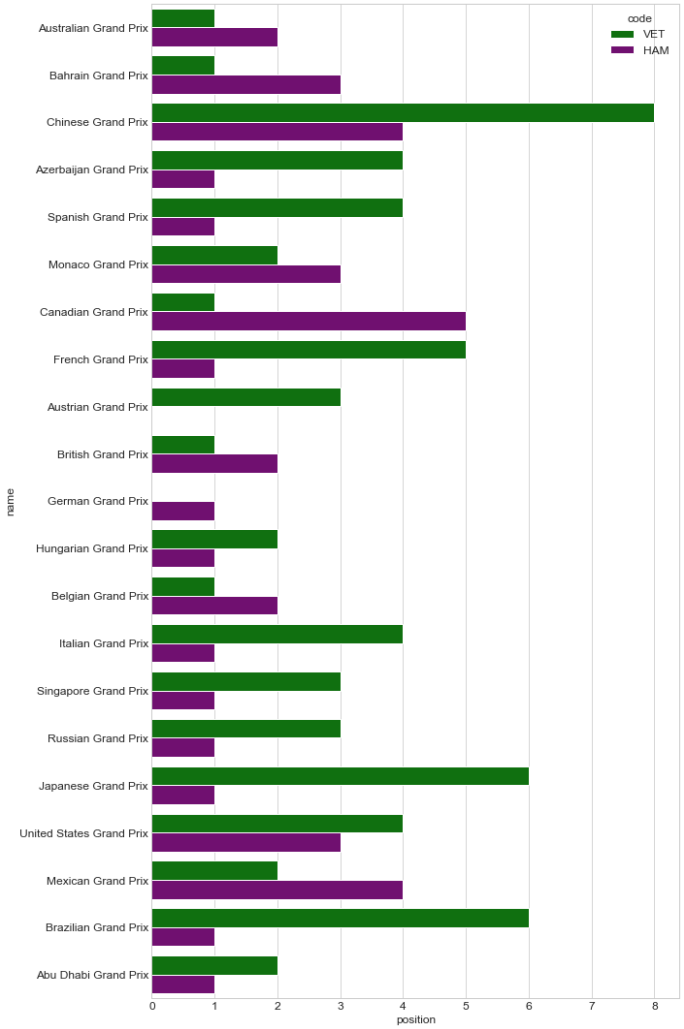

Figure 7. comparison in finishing position between hamilton and vettel per race in 2018

what strategies and tactics were successful in the 2018 season and why. Finally, researchers could investigate the role of team dynamics in Formula 1 racing, including the impact of a driver’s relationship with their teammates and the influence of team strategy on individual performance.

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VII. Word count

Word count per section	expected	written
Abstract	150	124
Introduction	300	288
Analytical Questions & Data	300	164
Data (Materials)	300	86
Analysis	1000	990
Findings, Reflections & Further Work	600	457
Total	2650	2109