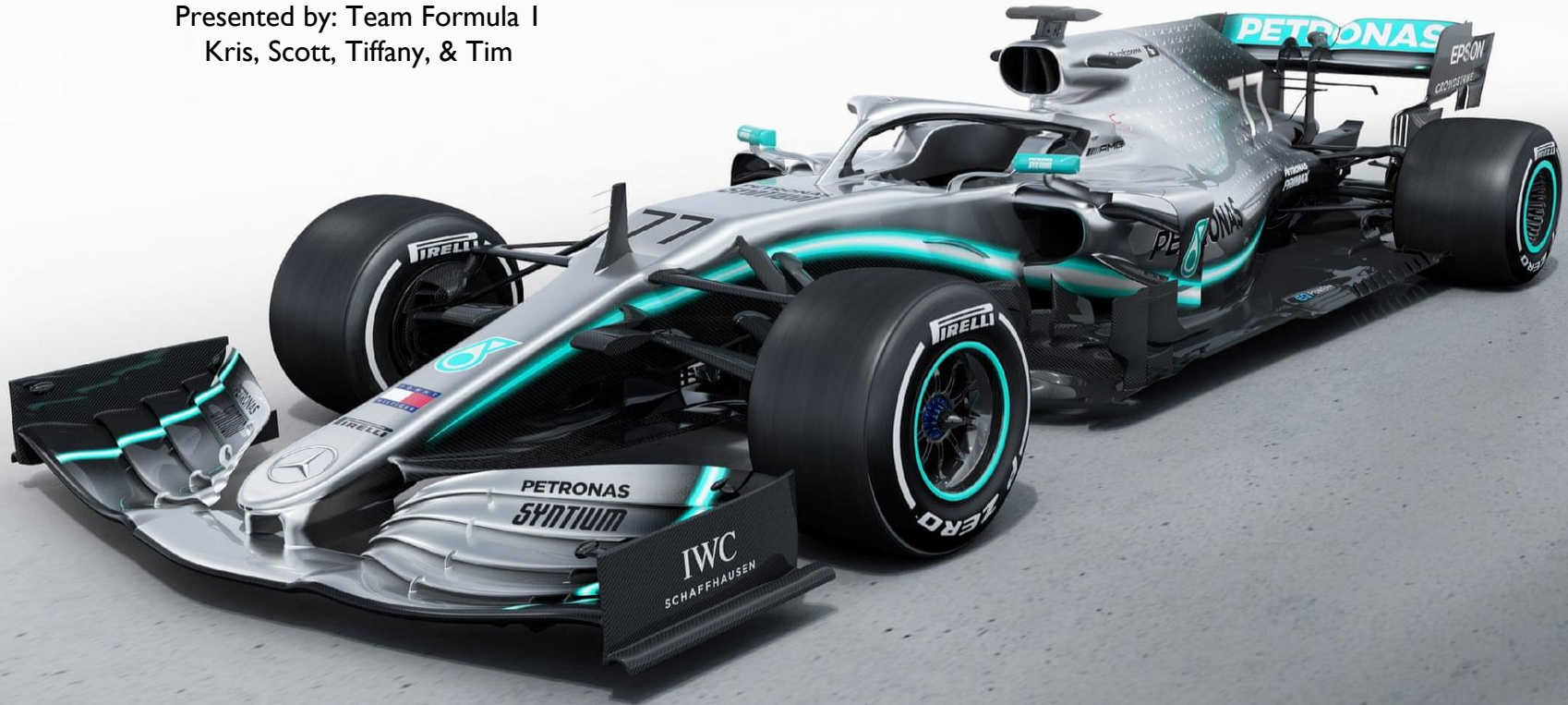# Lewis Hamilton: The Greatest Formula 1 Driver

Presented by: Team Formula 1
Kris, Scott, Tiffany, & Tim

What is Formula One (F1)?

Formula One (F1) is a single-seat, open-wheel, open-cockpit, international motor racing contest. The objective of the race is to determine a winner based on a driver completing a predetermined number of laps.

A "season" of races are conducted over a period of time, typically a year, called a Grand Prix (GP), where races are held on purpose built circuits around the world. The results of each race are combined to determine the F1 World Championship Winner for both drivers and constructors (car manufacturers).

Why are we talking about Formula 1 Racing?

F1 Racing is a sport of made of data points. Year after year, Constructors acquire metrics like speed, aerodynamics, pit time, tire exhaustion, and use these data points to make real technical changes that enhance the engineering of the cars time and again. Because of this intriguing and potentially complex analysis, we selected this data set from Kaggle that observes F1 Racing from 1950 to 2020.

We began by asking how could we look at this data? How could we use these data points to observe the way the engineering has changed or how the driver's have changed? Are there any driver's that are more successful than others? Constructors that are more successful than others? What metrics define the best driver?

While attempting to answer these questions, it became clear that there was one F1 driver that shifts the data. One driver that is more successful than others. One driver that made one Constructor more successful than others. That one driver proves that the car and the engineering behind it are only half the power. He holds the outright records for the most wins (93), pole positions (97), podium finishes (162), points finishes (226), career points (3713), points in a season (413), and the second most World F1 Championships (6).

That driver is Lewis Hamilton, the greatest F1 Driver.

Ok, so who's Lewis Hamilton?

Lewis Hamilton is a British Formula 1 Driver. He began his driving career in 2007, driving for the British car Constructor, McLaren. He drove for McLaren from 2007-2013 during which he only won a single F1 World Championship.

In 2013, Hamilton was signed to the German car Constructor, Mercedes, whom he still drives for today. During his 7 year stint with Mercedes, Hamilton has gone on to win 5 F1 World Championships.

Prior to Hamilton's switch, Mercedes had not won a F1 World Championship since 1998.

Following this timeline, we will observe Hamilton's success and demonstrate why he is the greatest F1 Driver.

The Data

To make our observations about Lewis Hamilton, we utilized the overall Formula 1 dataset from Kaggle that consists of information pertaining to Formula 1 Racing from 1950 to the end of the 2020 season. The data included csv.'s of race information, driver demographics, Constructor demographics, qualifying times, circuits, lap times, pit times, points, wins, and championships.

Races, drivers, and Constructors, were all assigned a unique ID which allowed us to join the csv.'s by that ID and make further analysis regarding how drivers work with Constructors, pit times for races, driver and Constructor nationality, and more.

https://github.com/tiffburns/SMU_Project1_Group2/blob/feature-tim-work/TS_Branch/Pitstop_Time_Analysis.ipynb

Data Cleaning & Exploration

After joining the datasets together, we decided to limit our scope of time. Because Lewis Hamilton began his driving career in 2007, we first filtered our dataset from 2007 to 2020 to eliminate any outliers.

From here, we each began individual analysis, all hoping to come to the same conclusion, that each of our observations would cement our theory that Lewis Hamilton is the greatest Formula 1 Driver. Comparing his success as he transferred from McLaren to Mercedes, did the car or his experience (or both) contribute to his success, comparing his qualifying times to his competitors, and comparing his pit stop times to his competitors.

We explored all these points, collaborating together on how to groupby points or wins, z scoring qualifying times, and even discussing whether our findings demonstrated any point of view at all.

In the end, not all of our data points demonstrated Lewis Hamilton's success. While his wins and points clearly demonstrate his mastery of the sport; his pit stop times lend themselves to his mastery; and we found little correlation in qualifying round time. Nevertheless, our data does prove that Lewis Hamilton is the greatest Formula 1 Driver and there is something to be said about pit stop time as he switched from McLaren to Mercedes.

Visual Inspiration
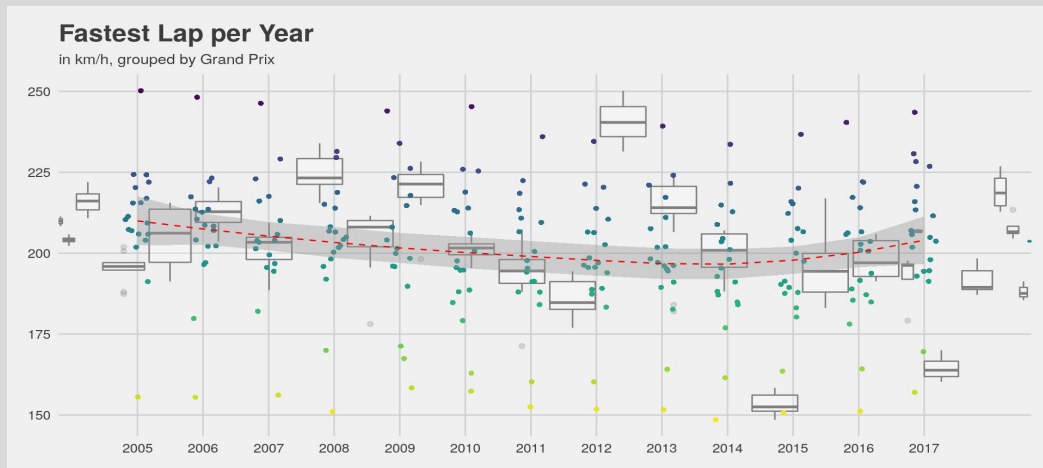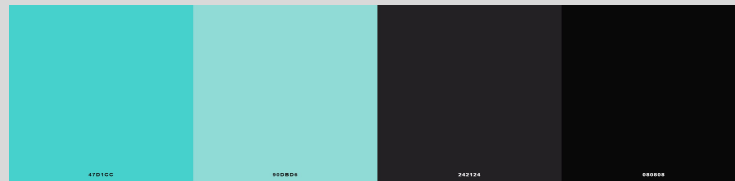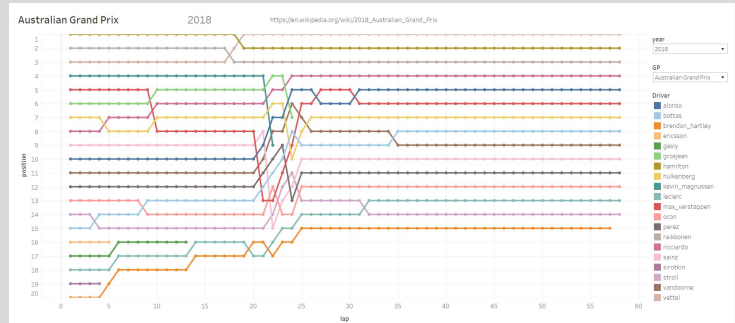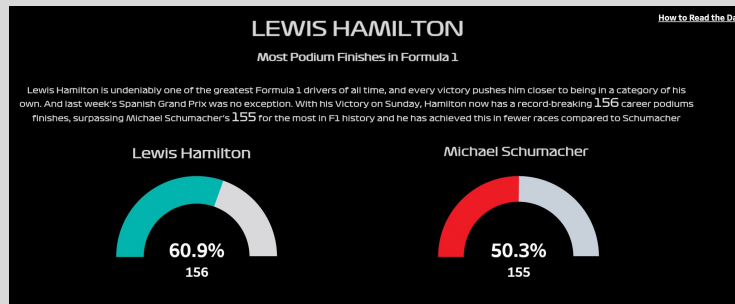
So how do you win F1 Racing again?

To win a Grand Prix Race, a driver must complete a predetermined number of laps on the circuit the fastest.

However, the winner of the F1 World Championship is determined by points which driver's receive based on the positions they finished in.
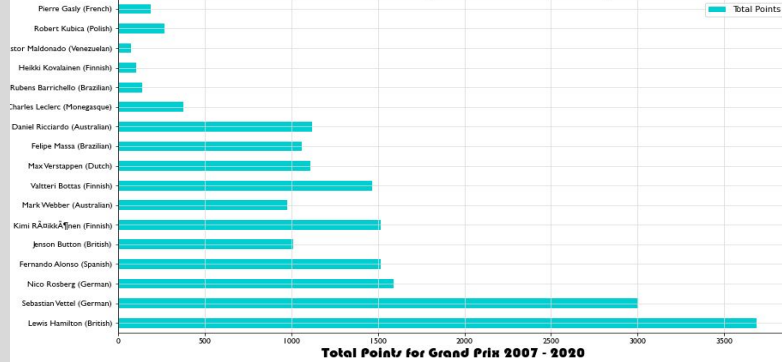
The winner receives 25 points (25 Drivers' Championship points as well as 25 Constructors' Championship points) and other drivers receive points according to the following table -

1st place	25 points
2nd place	18 points
3rd place	15 points
4th place	12 points
5th place	10 points
6th place	8 points
7th place	6 points
8th place	4 points
9th place	2 points
10th place	1 point

Points and Wins by Nationality
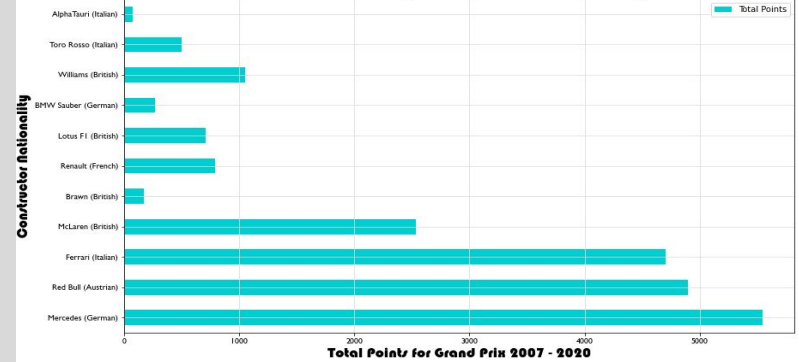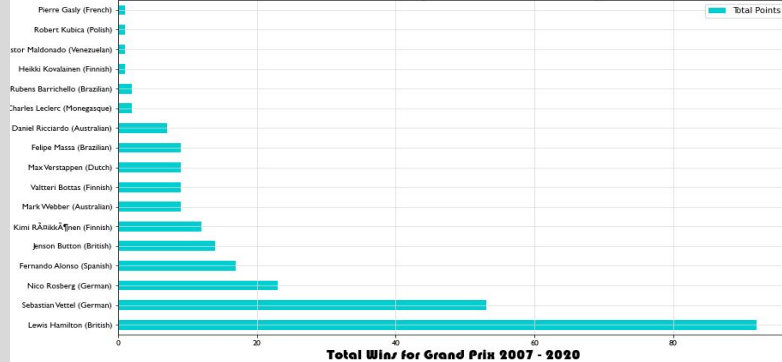
Lewis Hamilton v. The Car

Hamilton's Wins with McLaren v. Mercedes Per Year 2007 - 2020

Legend:
— Mercedes Wins Per Year
— McLaren Wins Per Year

Y-axis: Total Wins Per Year
X-axis: Years (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019)
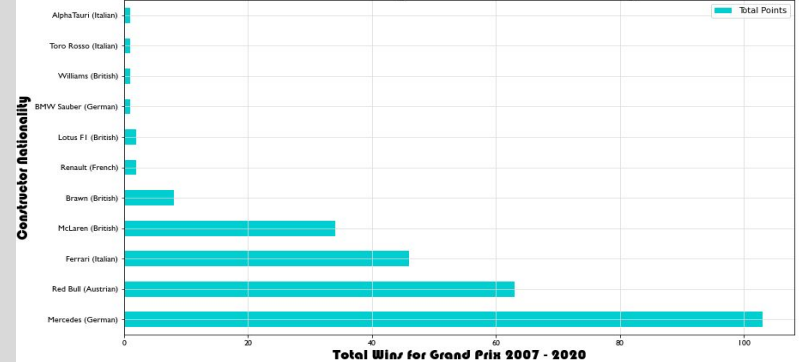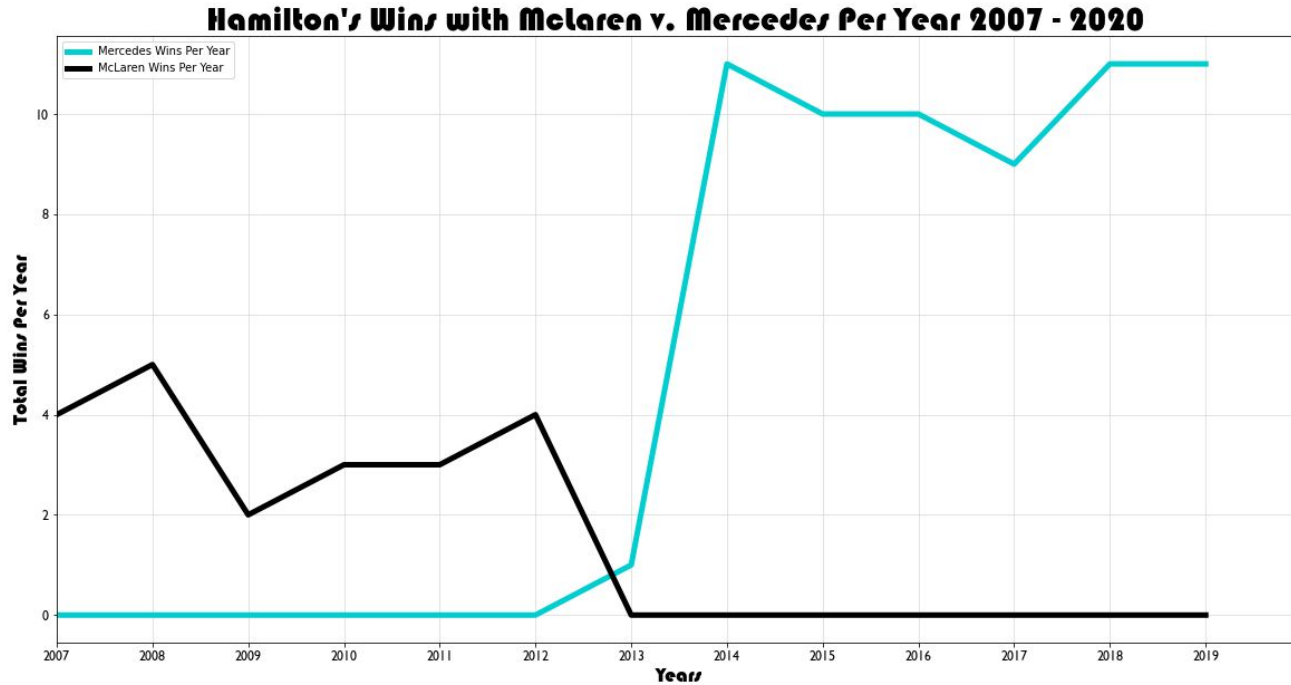
Did Hamilton's experience/age make him a better driver?
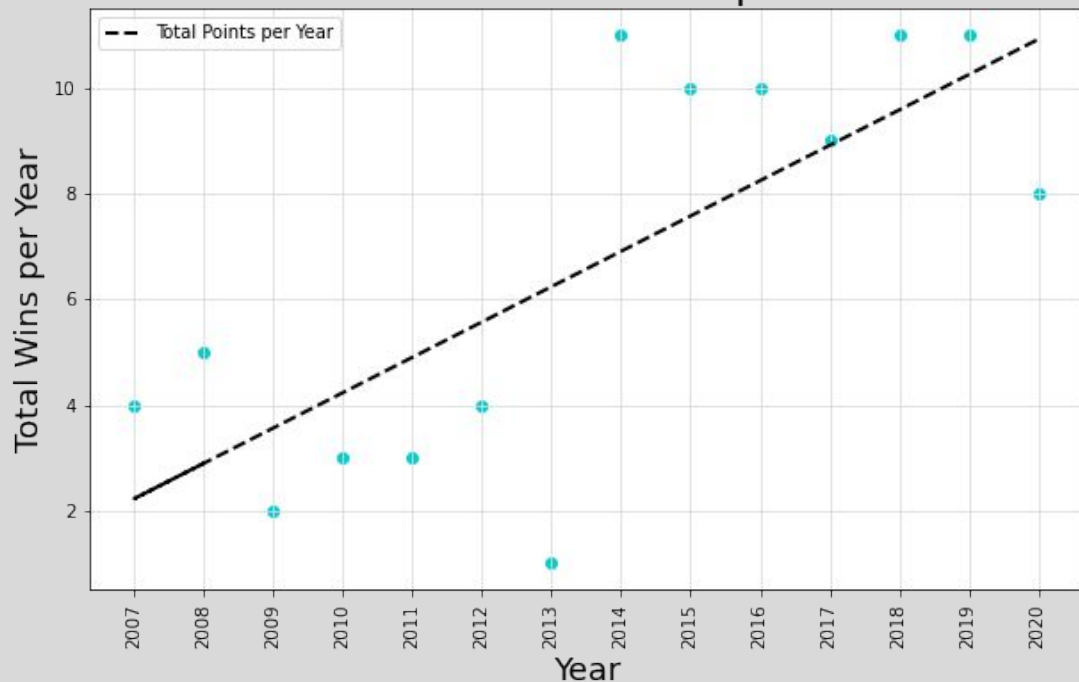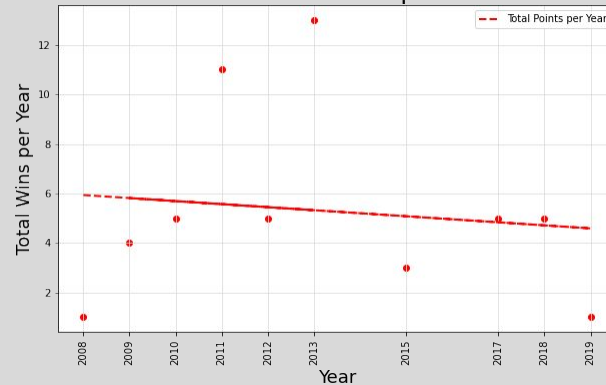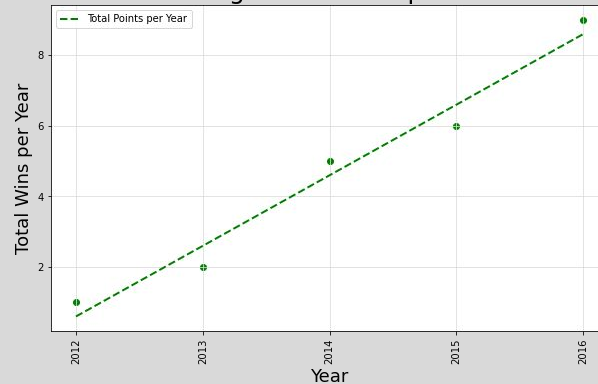
How does wins v. experience trend with other drivers?

Total Points by Driver Age
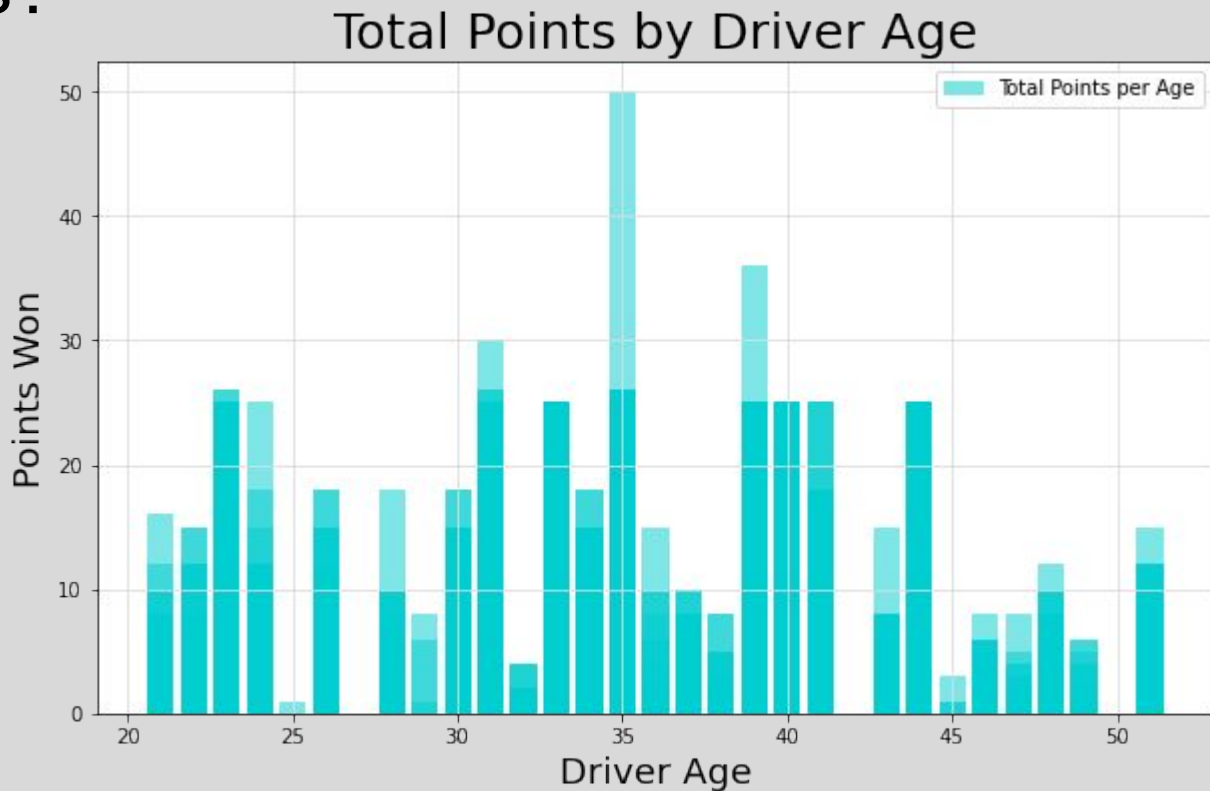
What are Qualifying Times/Sessions?

Qualifying Sessions

The second day, Saturday, begins with the 3rd practice session in the morning, for a duration of one hour. The qualifying session follows in the afternoon and this session is used to determine the starting order for the race day (Sunday).

The qualifying session lasts one hour and is divided into 3 knock-out stages − Q1, Q2, Q3, with small intervals in between.

Q1 lasts 18 minutes and all 20 cars race on the circuit. Of these the five slowest cars are eliminated and they occupy the places − 16, 17, 18, 19, 20, on the grid.

Q2 begins after a brief interval with 16 cars and lasts 15 minutes. Again, the five slowest cars are eliminated and they occupy the places − 11, 12, 13, 14, 15, on the grid.

Finally, Q3 begins with the 10 remaining cars and is 12 minutes long and fill the remaining 10 positions on the grid. The fastest driver occupies 'pole position', a position on the grid that is considered best to begin a game.

Lewis Hamilton's Qualifying Times vs Wins

Correlation Between Z-Score and Final Position-LH
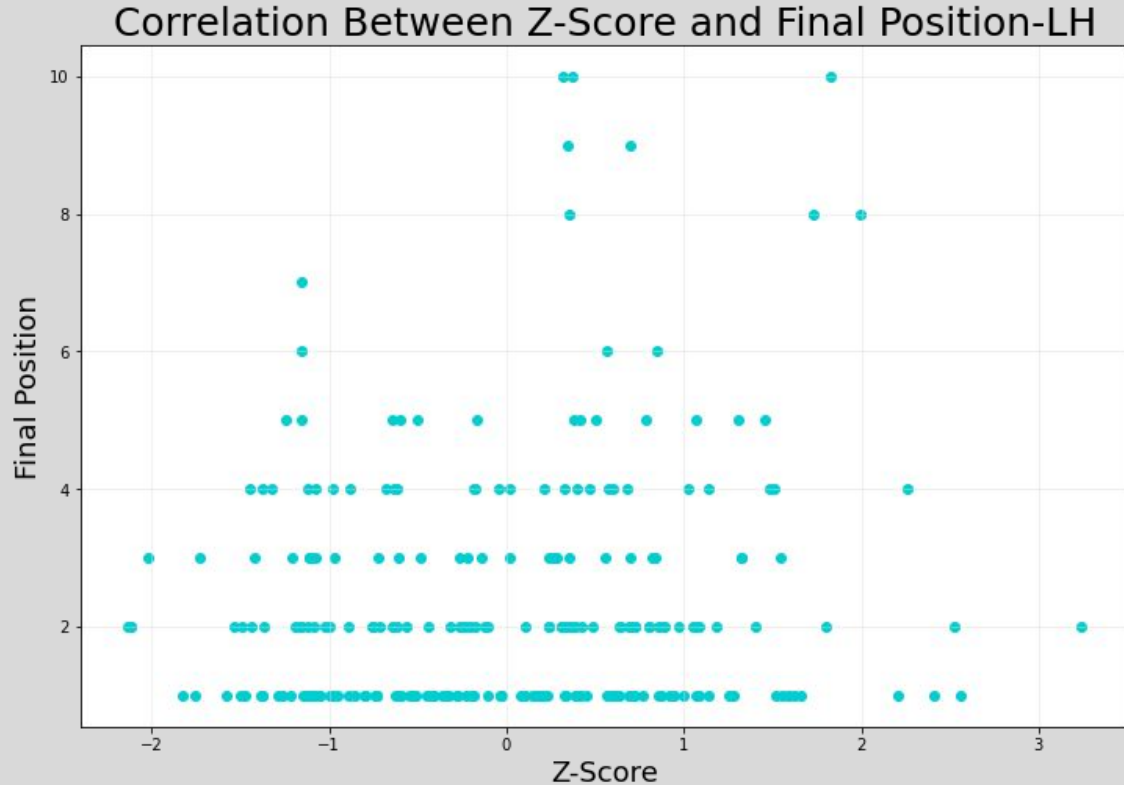
LH's Qualifying Times & Wins vs Other F1 Drivers
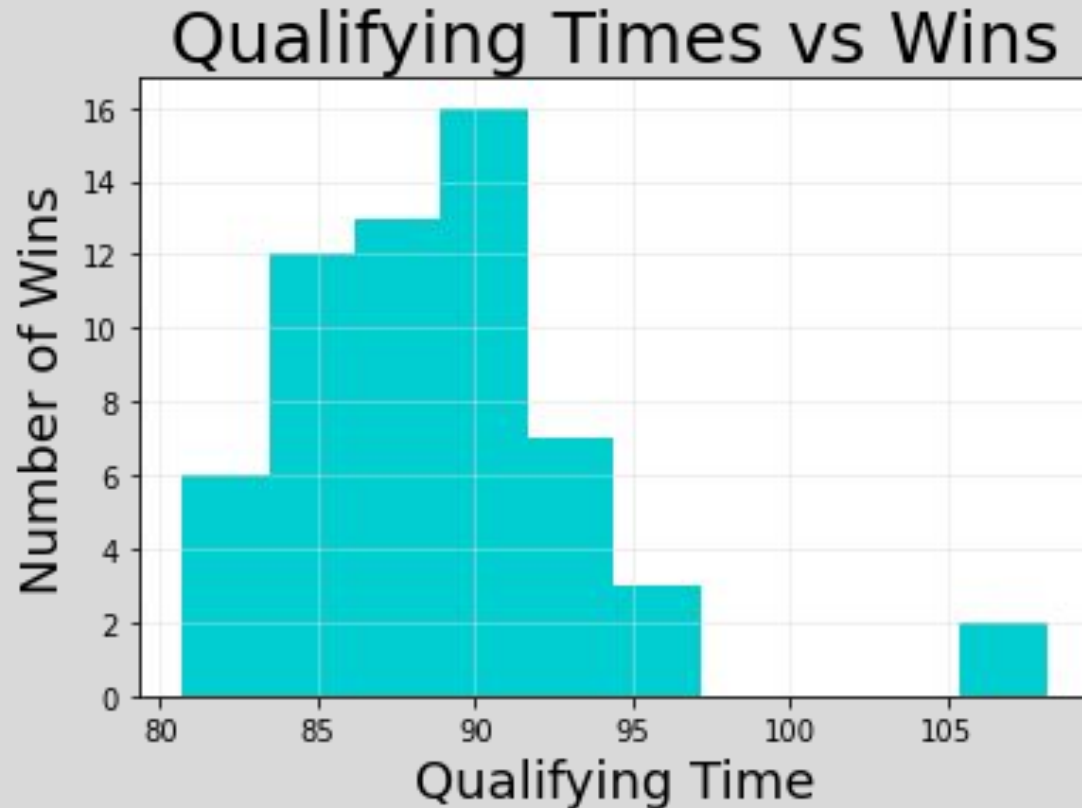
Pit stops - Why do they matter?

"One hundred thousand. That's roughly how many practice pit stops Formula 1's 10 teams did between them before the 2019 campaign. The aim isn't just to get under two seconds, less than the blink of an eye, but to do so consistently – because race results depend on it…" Lawrence Barretto, Formula 1

In Formula 1, each team has a pit stop crew of around 23 people. During a race, drivers will stop at a pit (several are located together at a designated portion of a race track). The crew will perform quick maintenance on the car, with a focus on replacing the race car's wheels. Then, once the team is complete, the driver is off again.

Every car requires pit stops, around 1 or 2 per race. Every team practices them and puts that practice into play every single race.
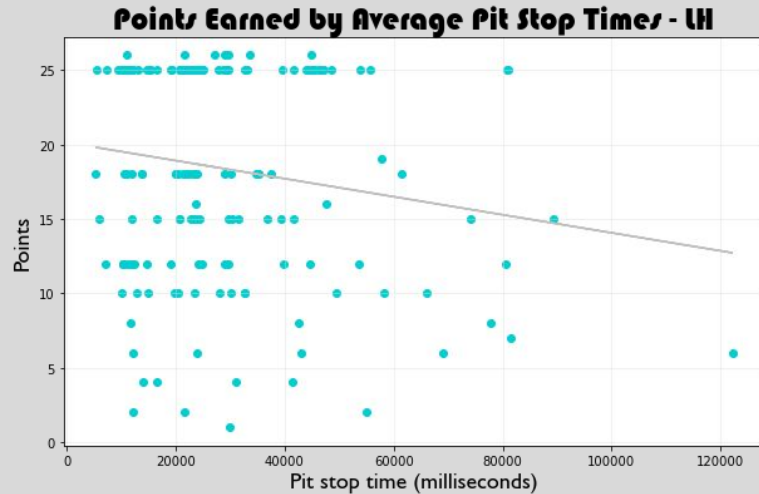
Therefore, the hypothesis is that if a team has low pit stop times during a race, that will more likely result in a better position for that team's driver in that race.

Winning Pit Stop Times

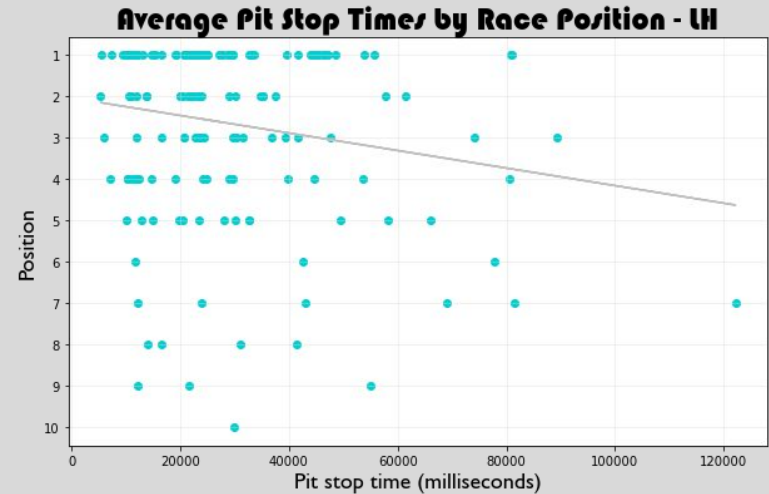## Average Pit Stop Times for Winners
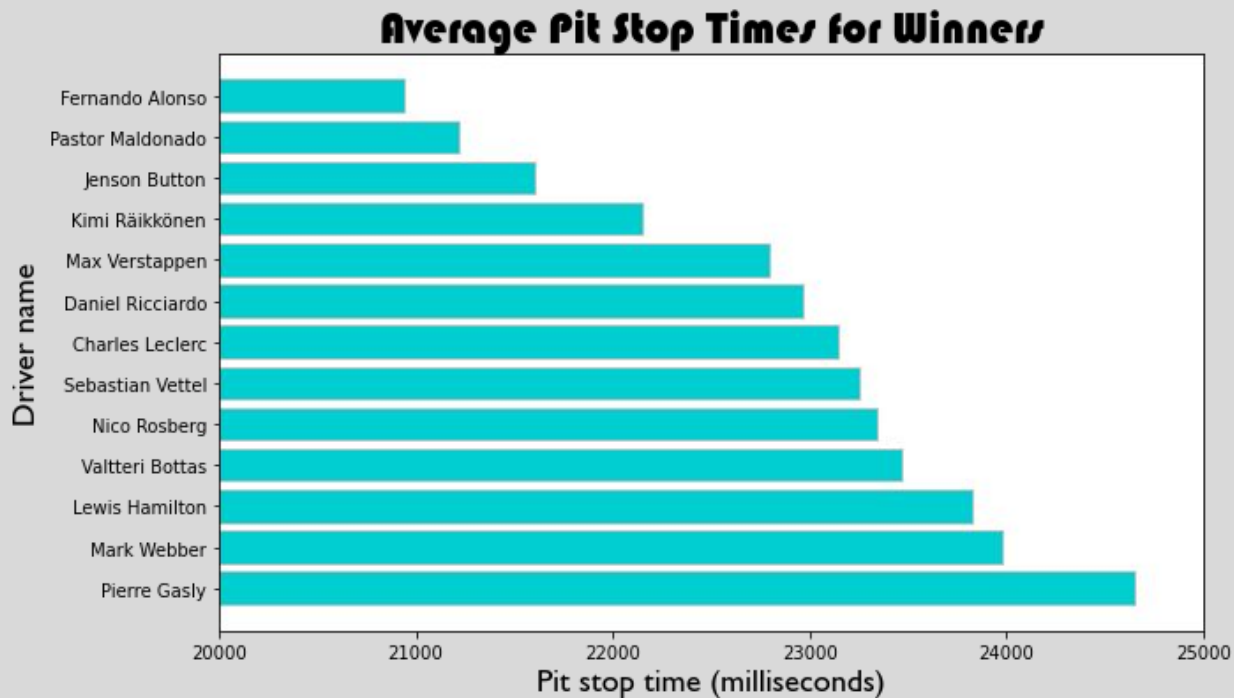
Do Lewis Hamilton's pit stop times correlate to his wins?

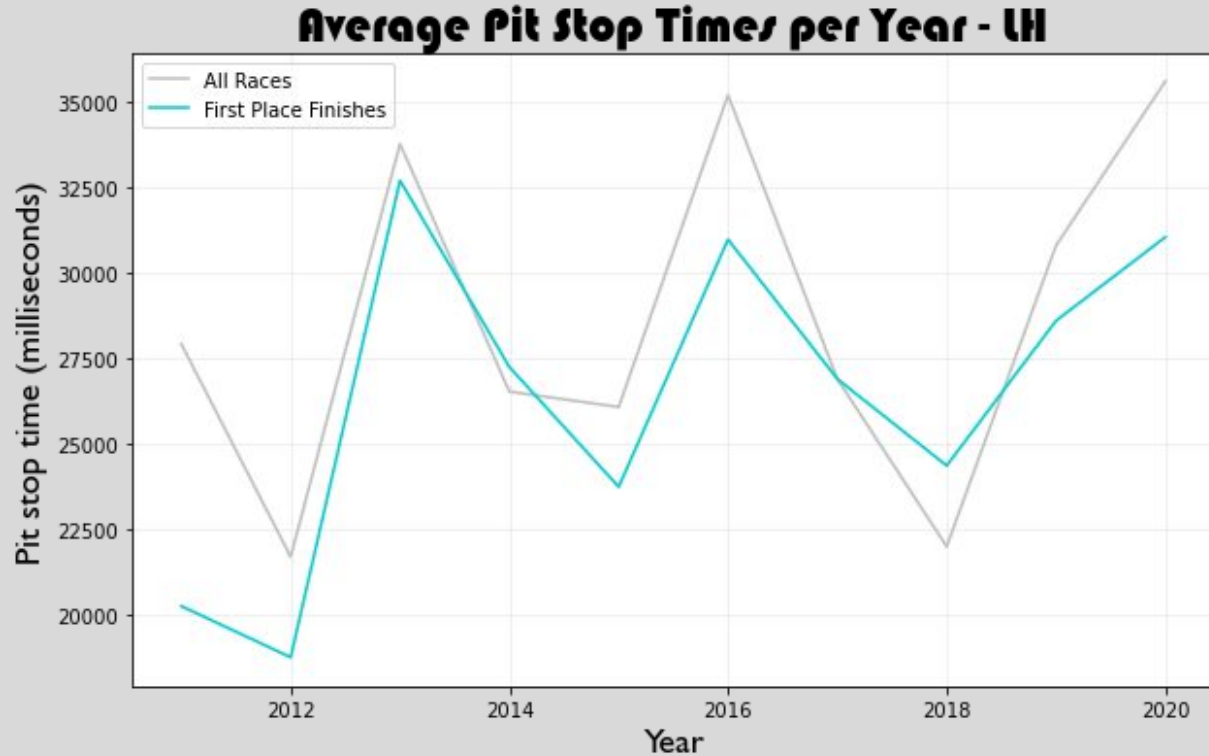Correlation between LH avg ps time and points is: -0.16

P-value is: 1.81e-47

Correlation between LH avg ps time and points is: .18

P-value is: 1.7e-47

Lewis Hamilton's Pit Stop Times over his Career

Average Pit Stop Times per Year - LH

Conclusion

The data supports that Lewis Hamilton is the best driver!

In the end, most of our data supports that Lewis Hamilton is the best driver. His wins and points clearly demonstrate his mastery. His quick pit stop times correlate meaningfully to his wins. Finally, there was no meaningful correlation between his best qualifying times and his success - however, this was true for all drivers as well.

Limitations:
-Limited the data set to primarily Lewis Hamilton's career, starting in 2007, while Formula One has been around for nearly 70 years.
-Fully understanding complex data. If we had more time, we could perform more complex analysis.
-Having so many null values impacted our data very heavily. We dropped a large amount of data due to this as it would have skewed our data.

Resources

Data
https://www.kaggle.com/rohanrao/formula-1-world-championship-1950-2020

Copy & Editorial information:
https://www.tutorialspoint.com/formula_one/formula_one_quick_guide.htm
https://www.lewishamilton.com/
https://www.mercedesamgf1.com/en/team/drivers/lewis-hamilton/
https://www.formula1.com/en/latest/article.gone-in-1-88s-putting-together-the-perfect-f1-pit-stop.3lLKnEoPKdJgACsUn9IltC.html

Charts & Graphs for Inspiration:
https://public.tableau.com/profile/pratheek.pj#!/vizhome/LewisHamilton-MostPodiumsinFormula1/LH-MostPodiums
https://public.tableau.com/profile/rene.tijssen#!/vizhome/LapChartGPFormule1/LapChart
https://public.tableau.com/profile/rene.tijssen#!/vizhome/LapChartGPFormule1/LapChart
https://www.kaggle.com/jonathanbouchet/f1-data-analysis
https://www.tutorialspoint.com/formula_one/formula_one_quick_guide.htm

Images:
https://www.theweek.co.uk/formula-1/100791/f1-lewis-hamilton-title-race-up-in-the-air-mercedes-ferrari-red-bull
https://www.theweek.co.uk/formula-1/100791/f1-lewis-hamilton-title-race-up-in-the-air-mercedes-ferrari-red-bull
https://www.theguardian.com/sport/2019/feb/13/lewis-hamilton-f1-formula-one-mercedes
https://www.schemecolor.com/medium-turquoise-and-black.php#download
https://www.formula1.com/content/dam/fom-website/manual/XPB_Images/Misc/WilliamsPitStop3XPB.jpg.transform/9col/image.jpg
https://beyondtheflag.com/2020/07/19/formula-1-lewis-hamilton-dominates-8th-hungary-win/