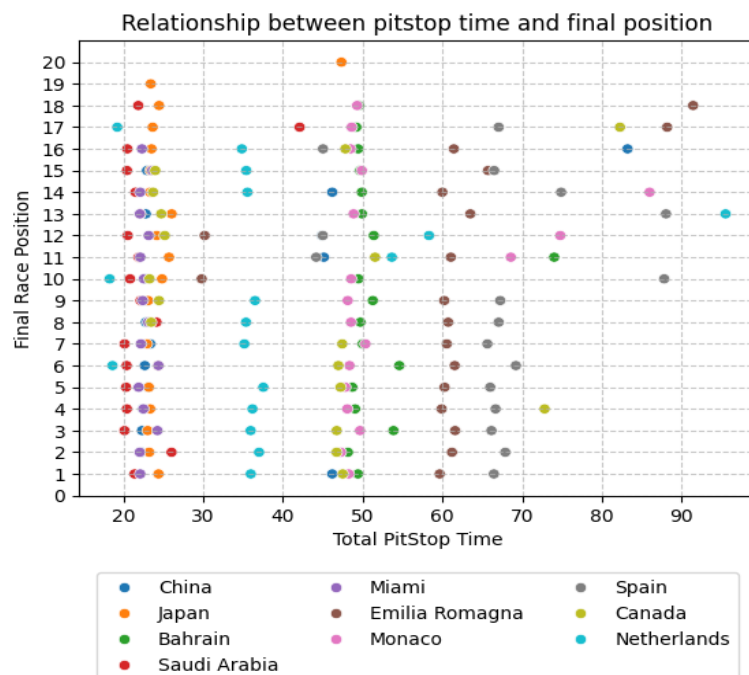**Introduction:**

Pit stops, while essential for tire changes and adjustments, take drivers off the track and intuitively seem likely to hurt race results. We generally expect longer pit stop times to correspond to worse finishing positions. This analysis examines whether pit stop time meaningfully predicts final race outcomes. So, does the Pit stop time primarily affect the outcome of the race in F1?

Data Methods:

To investigate this relationship, I collected data from 10 Grand Prix races during the 2025 F1 season using the official Formula 1 website. For each race, I gathered two key pieces of information:

1. **Pit Stop Summary data**: This included the number of stops each driver made, their team, lap numbers, and most importantly, their total pit stop time.- From this, I have only used 'Total Pit Stop Time'
2. **Race Result data**: This provided each driver's final finishing position in the race.- From this, I have only used the final position of the Driver.

I combined these datasets to create a clean panel of 176 observations, with each row representing one driver in one race. Additionally, to determine the relationship between the two variables before running the Linear Regression, I used a Scatterplot to showcase the same:

Note: We can roughly see a few data points towards the right of the graph (higher total pitstop time) result in later finishing positions.

Statistical Methods and Results:

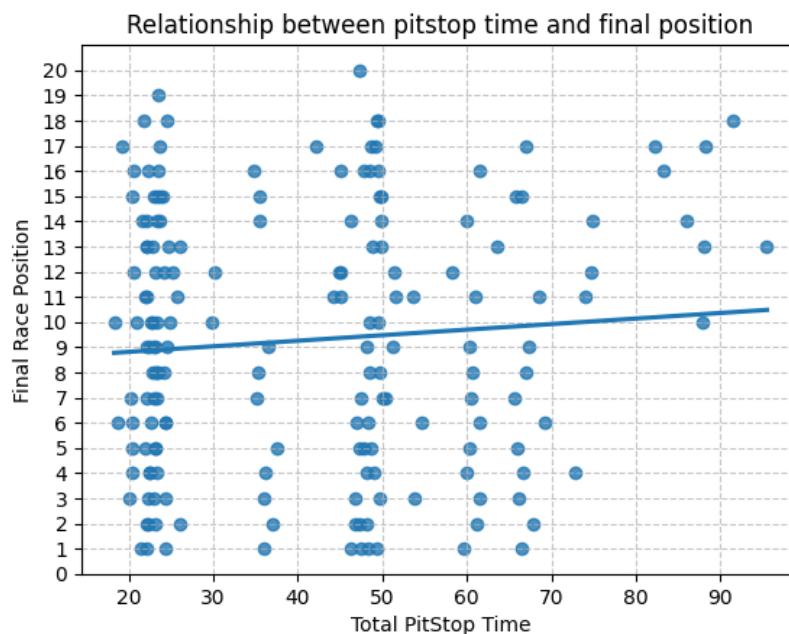To answer the main research question, Here is the GLM equation:

$Final\ Position = B_0 + B_1 . Total\ Pit\ Stop\ Time + \mathcal{E}$

Next, I got numerical data for this equation using this coefficient table:

```
==============================================================================
                    coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept         8.3711      0.921      9.090      0.000       6.553      10.189
Total_Pit_Time    0.0221      0.020      1.094      0.275      -0.018       0.062
==============================================================================
```

Here, the **slope = 0.0221 or 1/50** and P-value = 0.275

The following figure showcases the slope and the relationship between both the variables:

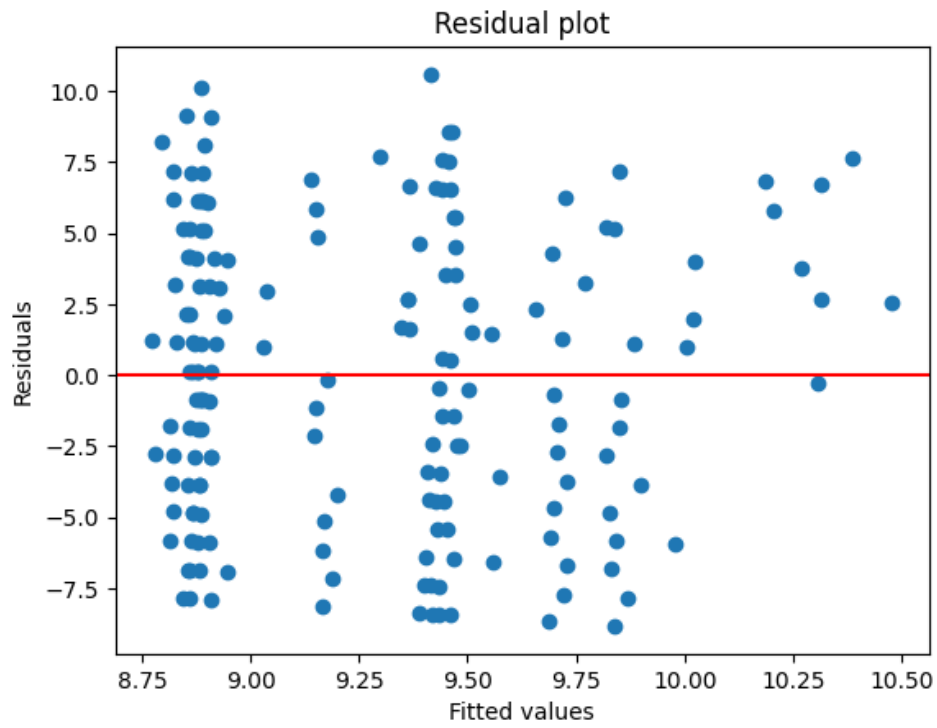Relationship between pitstop time and final position

Conclusion:

Each additional second in the pit lane worsens finishing position by about 0.02 or 1/50th places, but the effect is not statistically significant (p = 0.275 > 0.05).
Because we fail to reject the null hypothesis, such an observed effect could occur 27.5% of the time even if pit stop time had no real impact.
Therefore, pit stop time does not significantly influence final position. There are larger factors like driver performance, car reliability, and race strategy matter far more.

Residuals:

Here, looking roughly at the vertical spread of the data points, this may showcase Homoskesdacity for the data.

Residual plot

Sources:

- Links for Pit Stop Summary of all 10 races:

https://www.formula1.com/en/results/2025/races/1255/china/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1256/japan/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1257/bahrain/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1258/saudi-arabia/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1259/miami/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1260/emilia-romagna/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1261/monaco/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1262/spain/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1263/canada/pit-stop-summary
https://www.formula1.com/en/results/2025/races/1267/netherlands/pit-stop-summary

- Links to Race Result of all 10 Races:

https://www.formula1.com/en/results/2025/races/1255/china/race-result
https://www.formula1.com/en/results/2025/races/1256/japan/race-result
https://www.formula1.com/en/results/2025/races/1257/bahrain/race-result
https://www.formula1.com/en/results/2025/races/1258/saudi-arabia/race-result
https://www.formula1.com/en/results/2025/races/1259/miami/race-result
https://www.formula1.com/en/results/2025/races/1260/emilia-romagna/race-result
https://www.formula1.com/en/results/2025/races/1261/monaco/race-result
https://www.formula1.com/en/results/2025/races/1262/spain/race-result
https://www.formula1.com/en/results/2025/races/1263/canada/race-result
https://www.formula1.com/en/results/2025/races/1267/netherlands/race-result

https://claude.ai/

https://www.perplexity.ai/