

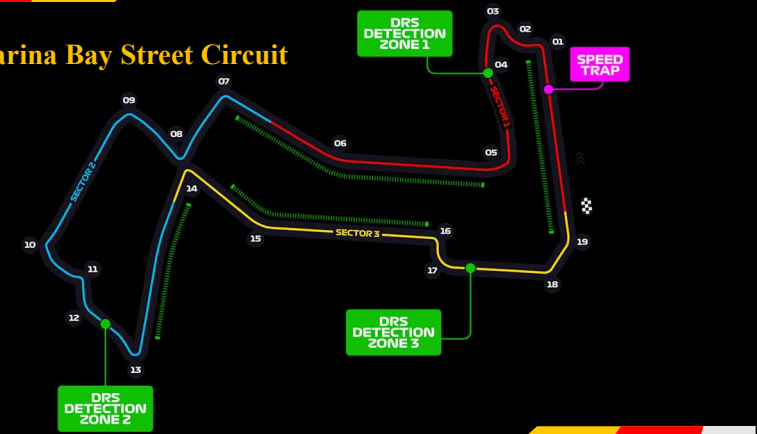
Data Analysis Mini Project

F1 Singapore Grand Prix 2024

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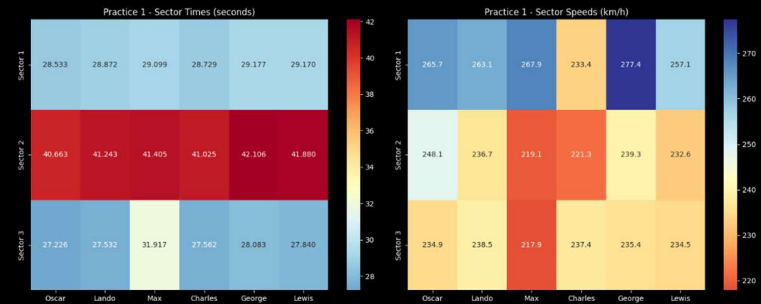
Marina Bay Street Circuit



Overview

This project focuses on analyzing Formula 1 race data sourced from the official FIA webpage. The dataset includes comprehensive information such as Lap times (race session), sector timings (practice sessions), mean speeds (practice sessions), pit stop summaries (race session) for all. Key insights were derived by cleaning and processing the data. The analysis involved creating visual representations for investigating performance metrics to uncover trends, strategies, and driver/team performance dynamics. We have chosen Top 6 performing drivers and conducted analysis at both the individual and team levels. The Data was extracted by the team and then cleaned ourselves.

FP1 Sector Heatmap

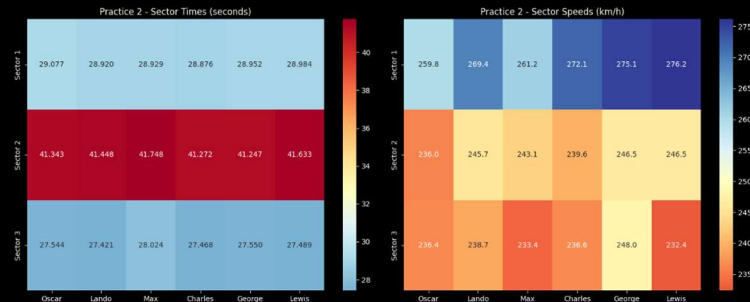


FP1 Sector Analysis

Overall Observations:

- **Oscar** seems consistent across sectors, with fast times and good speed management, particularly excelling in Sectors 1 and 2.
- **Lando** exhibits exceptional straight-line speed, especially in Sector 1, coupled with a solid performance in Sector 3.
- **Max**, despite having moments of strong pace, underperforms in both speed and times in Sectors 2 and 3, hinting at possible setup issues or mistakes.
- **Russell** appears to struggle slightly with time in Sector 1 and Sector 2 but makes up for it in Sector 3 with consistent speed and quick times.
- **Charles** and **Lewis** maintain steady performances but lack standout speeds or times to challenge for the best sector results.

FP2 Sector Heatmap

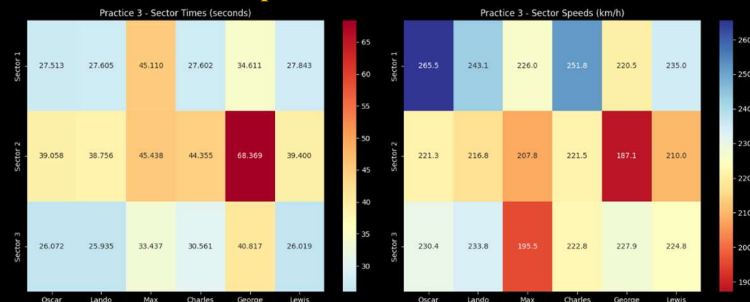


FP2 Sector Analysis

Overall Observations:

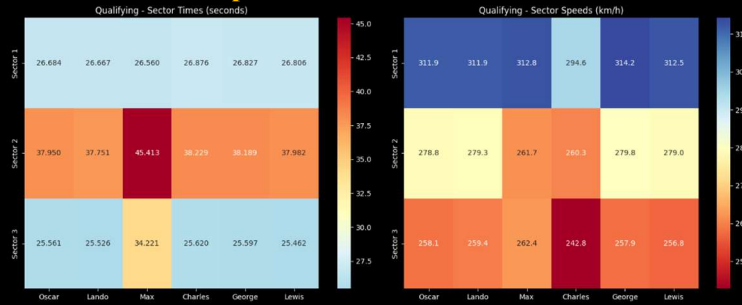
- **Consistency Across Sectors:** Charles and Russell displayed consistency in both times and speeds, indicating balanced car setups optimized for all sectors.
- **Strengths and Weaknesses:** Oscar struggled in terms of outright speed in Sector 2 and Sector 1, suggesting potential areas to address for qualifying.
- **Setup and Strategy:** Variations in sector speeds hint at differing approaches—some drivers prioritized straight-line speed, while others focused on cornering efficiency.
- **Drivers to Watch:** Based on the data, Charles and Max seem well-prepared for a competitive performance, while Oscar might need adjustments to match the pace of others.

FP3 Sector Heatmap*



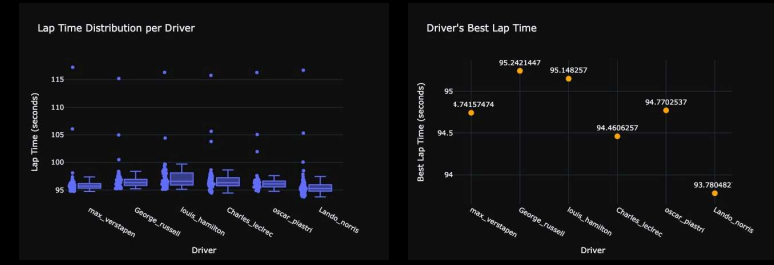
*The analysis may vary from an accurate analysis due to lack of sufficient data.

Q Sector Heatmap*



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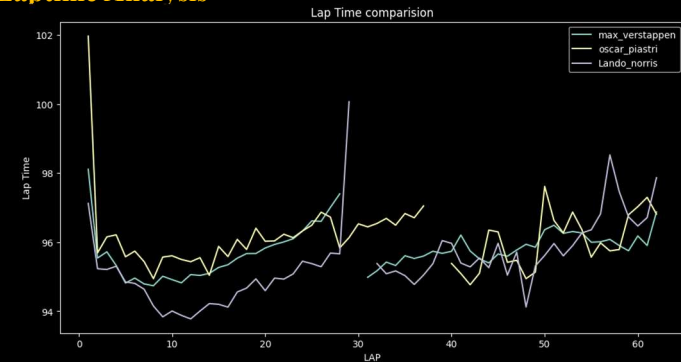
Laptime Box Plot



Laptime Box Plot

- The box plot displays, considering the fuel corrected lap-times. The outliers found above the whiskers are mostly for lap-times during pitstop. These are helpful to detect outlier data and clean it.
- The Best lap time scatter plot shows that Lando_Norris has cracked the best latime in the race followed by Charles Leclerc.
- As seen, Max is having reduced IQR, which denotes Lower variability and better consistency unlike Lewis and Charles (Having broader IQR)
- Oscar Piastrri and Lando Norris have similar clustering of lap times, though Norris has a few significantly higher outliers

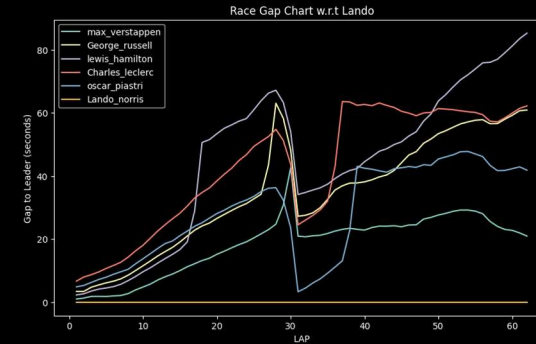
Laptime Analysis



Laptime Analysis

- **Fuel Corrected Lap time:** As the Vehicle starts with same fuel, 110kg. This is burnt through the race, thus decreasing the weight. This reduction in weight helps in better lap time performance.
Assumption considered: 110kg of fuel initially, After 62 laps 0 kg fuel left and due to each 1kg there is a 0.03sec lap time loss
- Here above three drivers are considered. Lando and Oscar being from the same team (McLaren), still are differing in strategy in first stint. Oscar is focusing hard to maintain his tires (Medium) for longer first stint well, Lando is degrading his tires faster than Oscar for him to maintain 1st position against max.
- In the first stint Max and Lando exhibit remarkable similarity in the slope of their graphs after lap 10. Lando shows his skills and Car performance before 10 laps showcasing fastest lap time

Race Gap Chart



Race Gap Chart

INDIVIDUAL ANALYSIS:

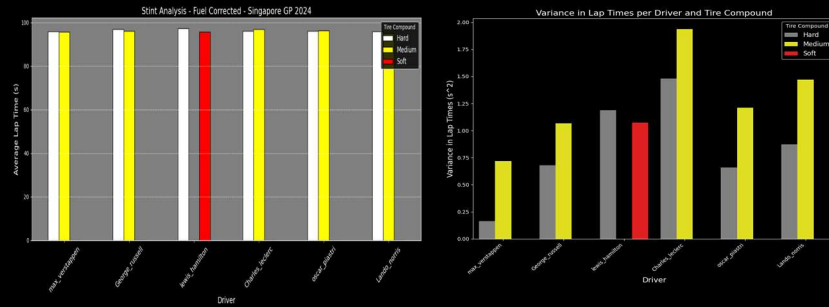
- **Max Verstappen:** Consistently closed the gap to Lando after Lap ~30, indicating a strong race strategy with well-timed pit stops or tire management, maintaining competitive pace throughout the race.
- **George Russell:** Showed a steady increase in the gap but maintained a relatively consistent pace, suggesting a balanced strategy but lacked the speed to challenge for the lead.
- **Lewis Hamilton:** Had a sharp increase in gap early on, but recovered strongly after Lap ~30, potentially indicating a late push after an earlier strategy setback, possibly due to pit stop or tire management issues.
- **Charles Leclerc:** Experienced a steady increase in gap from early in the race, with a sharp rise post Lap ~30, indicating poor tire strategy or a suboptimal pit stop, which caused him to lose significant ground compared to others.
- **Oscar Piastri:** Showed a similar trend to Lando, maintaining a competitive pace initially, but gradually falling off post Lap ~30, possibly due to a different tire or pit strategy compared to Lando.

Race Gap Chart

STRATEGY INSIGHTS:

- **McLaren (Oscar Piastri, Lando Norris):** Lando had a strong and consistent race as the leader, maintaining a near-zero gap.
- **Oscar Piastri's** performance dipped after Lap ~30, suggesting team prioritization of Lando or a strategy misstep on Oscar's side.
- **Ferrari and Mercedes:** Ferrari, particularly with **Charles**, faced issues in the middle stages of the race, likely from pit stop timing or tire choice. Mercedes had a mixed performance, with **Hamilton** recovering but still unable to close the gap.
- **Red Bull (Max Verstappen):** Max consistently maintained a close gap to Lando early in the race. A steep reduction in the gap after Lap ~30 suggests a well-timed pit stop or use of fresher tires, allowing him to recover time effectively.

Stint Analysis & Variance Analysis



Stint Analysis & Variance Analysis

- The Stint Analysis showcases mean lap time in particular stint with the particular tire.
- It can be seen that only Lewis Hamilton put on a strategy of soft tire and early pitstop. He actually had a better average lap time with soft tires.
- Through this graph there is no significance difference between each drivers average stint Lap time, who are using Hard and medium
- In the Variance graph each drivers variance in each stint is shown. More the Variation less consistency and performance stability. Every driver (except Lewis) shown less stability and fluctuation in performance on medium tires than on hard.
- Max is giving the most stable and consistent performance and Charles and Lewis worst.