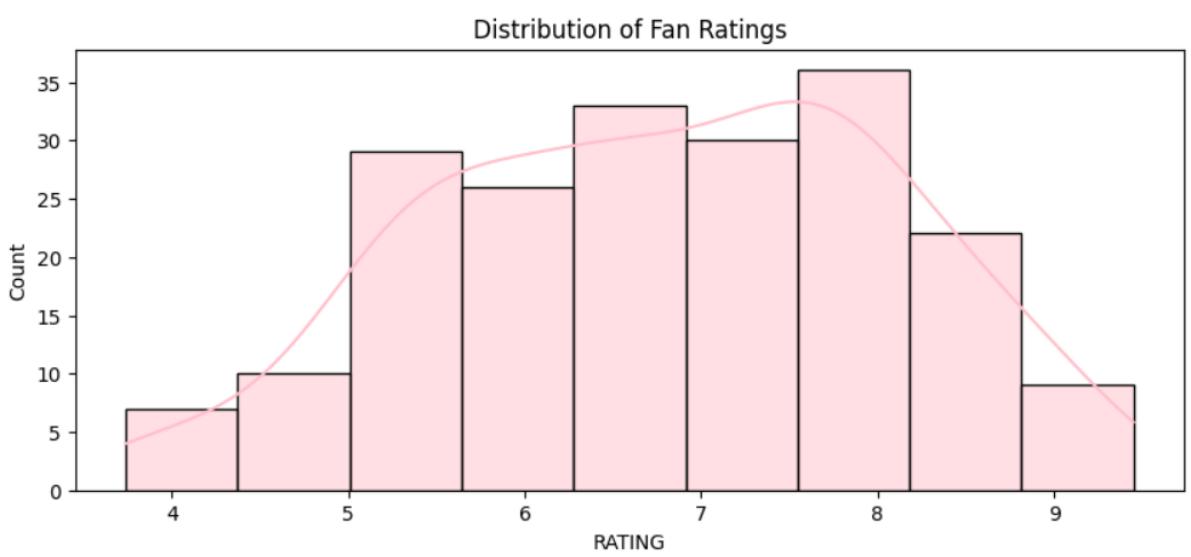


Note: the following content is also present at the end of the README file

Analysis of Findings

Key Observations from visualized Mean and Median



- **Distribution Shape:**
 - Ratings follow a near-normal distribution, peaking around 6.5–7.
 - Mild left skew (fewer low ratings) but no significant outliers.
- **Central Tendency:**
 - **Mean: 6.79 | Median: 6.81**
 - Close alignment confirms symmetric distribution.
- **Range & Spread:**
 - Majority of ratings fall between 6–8 (positive bias).
 - Minimal extreme values (low polarization).

Implications for Analysis

1. Supports use of parametric tests (e.g., ANOVA) due to ~normal distribution.
2. Consistent mean/median reduces risk of skewed interpretations.

Analysis of Most Frequent Winners

Key Findings

- **Most Frequent Winning Driver:** Hamilton
- **Most Frequent Winning Constructor:** Mercedes

Interpretation

- Dominance of **Hamilton** and **Mercedes** aligns with known F1 trends (2014-2021 era).
- Useful baseline for comparing fan ratings across top performers.

Comparative Analysis of Mean Fan Ratings

By Constructor

Constructor	Mean Rating
Red Bull	7.01
McLaren	6.97
Ferrari	6.91
Mercedes	6.67
Brawn	6.32
BMW Sauber	5.36

Insight: Red Bull leads with highest average ratings (7.01), while BMW Sauber trails (5.36).

By Race Location (Top 5)

Grand Prix	Mean Rating
Azerbaijan	8.69
United States	7.40
British	7.36
Canadian	7.33
Chinese	7.26

Key Observation: Street circuits (Azerbaijan) and North American races score highest.

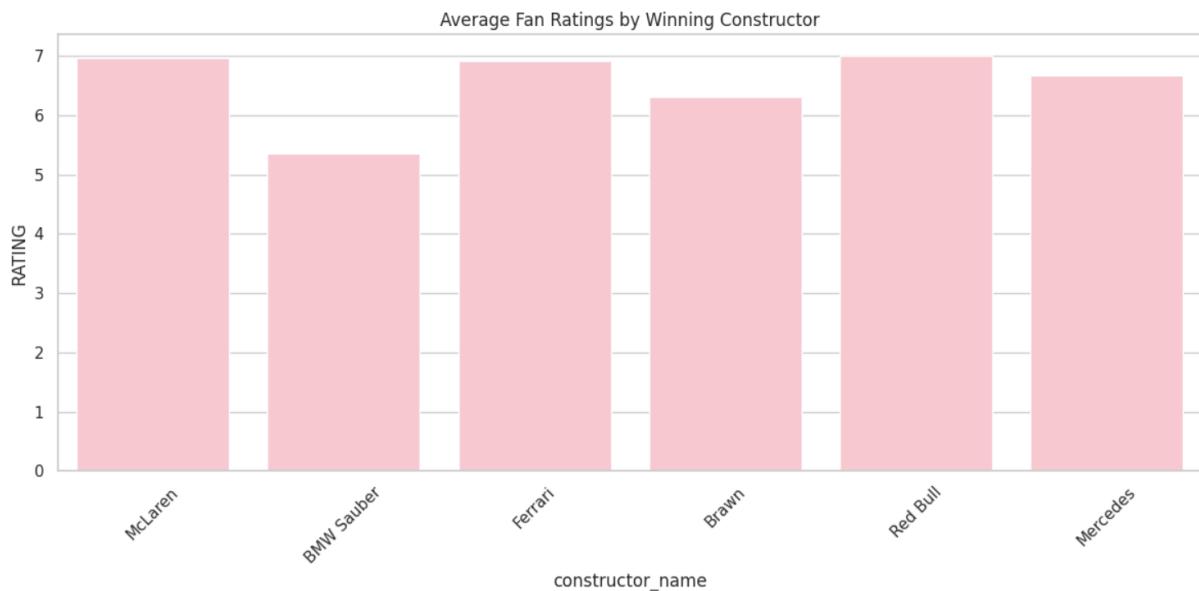
By Year

Year	Mean Rating
2012	7.37
2011	7.23

Year	Mean Rating
2014	7.13
2010	6.76
2018	6.82

Trend: Ratings peaked in 2011-2012, dipped in 2015 (6.33), and rebounded post-2016.

Visualization: Average Fan Ratings by Winning Constructor



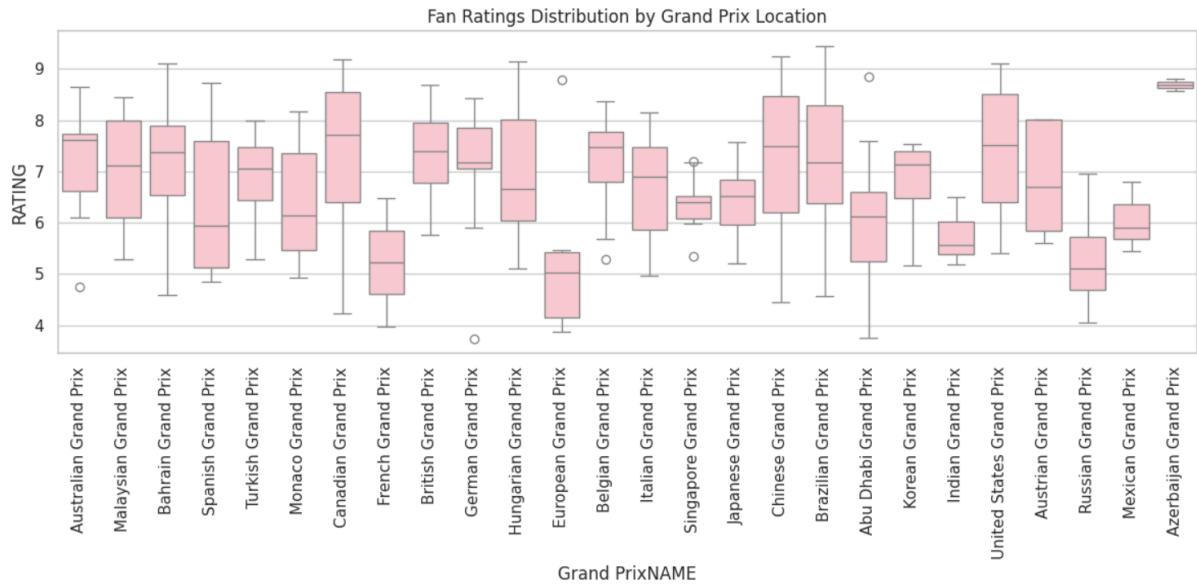
Key Observations from the Chart

- **Red Bull** leads with the highest average fan rating (~7.0)
- Close competition between **Ferrari** and **McLaren** (~6.9-7.0)
- **Mercedes** underperforms relative to its dominance (~6.7)
- **BMW Sauber** receives the lowest ratings (~5.4)

Notable Insights

1. **Performance-Rating Paradox:**
 - Mercedes' competitive success doesn't translate to top ratings
 - Red Bull's high ratings may reflect fan enthusiasm for their racing style
2. **Historical Context:**
 - Brawn GP's modest rating (6.3) reflects their single championship season (2009)
 - BMW Sauber's low rating aligns with their limited success period

Analysis of Fan Ratings by Grand Prix Location



Key Observations

- **Top Performing Circuits:**
 - Azerbaijan Grand Prix (8.69)
 - United States Grand Prix (7.40)
 - British Grand Prix (7.36)
 - Canadian Grand Prix (7.33)
 - Chinese Grand Prix (7.26)

- **Lower Rated Circuits:**
 - French Grand Prix (5.22)
 - Russian Grand Prix (5.31)
 - European Grand Prix (5.36)
 - Indian Grand Prix (5.75)
 - Mexican Grand Prix (6.05)

Interesting Patterns

1. **Street Circuits Dominate:**

- Top 3 rated races (Azerbaijan, Canada, Singapore) are all street circuits
- Suggests fans prefer challenging, unpredictable tracks

2. **Regional Preferences:**

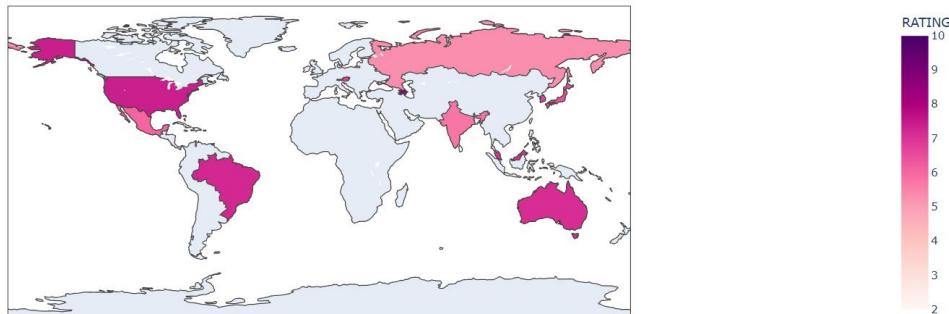
- North American races consistently score well (USA, Canada, Mexico)
- Traditional European circuits show more variable ratings

3. **Historical Context:**

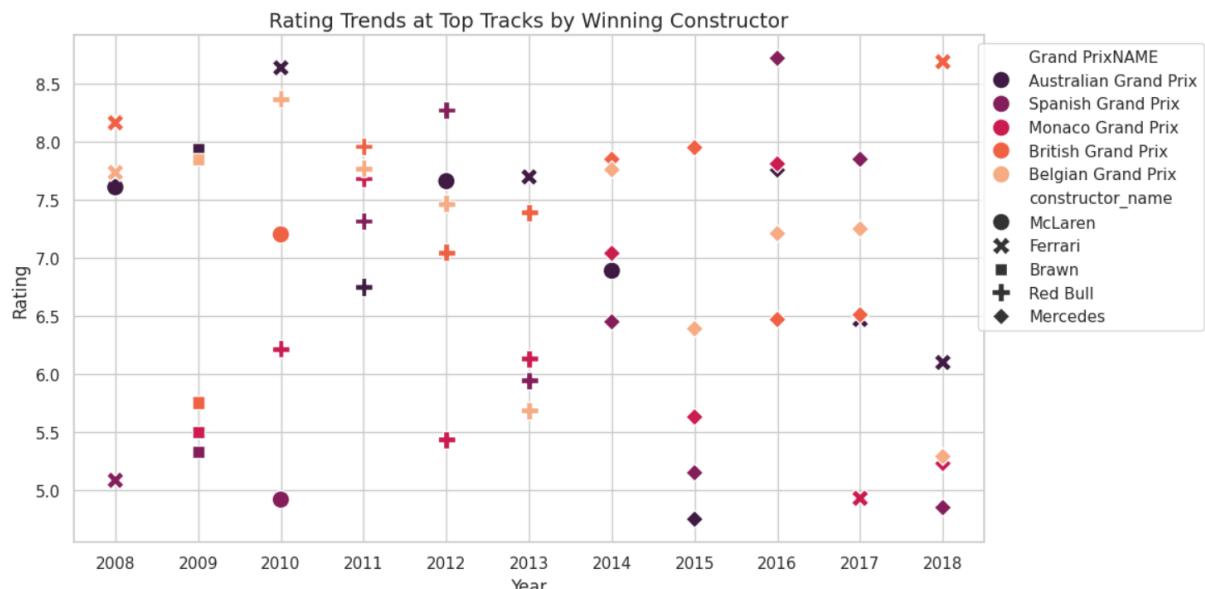
- Lower ratings for newer circuits (Russia, India) may reflect fan attachment to classic tracks
- French GP's low rating could relate to its temporary return after long absence

Clearer in the following visualization

Average Fan Ratings by Grand Prix Location visualized on a World Map



Analysis of Rating Trends at Top Tracks by Winning Constructor



Key Visual Patterns

- **Temporal Trends:**
 - Ratings peaked around 2011-2012 (7.5+) across most tracks
 - Significant dip in 2015 (6.0-6.5) followed by recovery
 - Mercedes-era (2014-2018) shows stable but lower ratings vs. earlier seasons
- **Track-Specific Insights:**
 - **British Grand Prix** maintains consistently high ratings (>7.0)
 - **Monaco GP** shows widest fluctuations (6.0-8.0)
 - **Spanish GP** has steepest decline post-2012

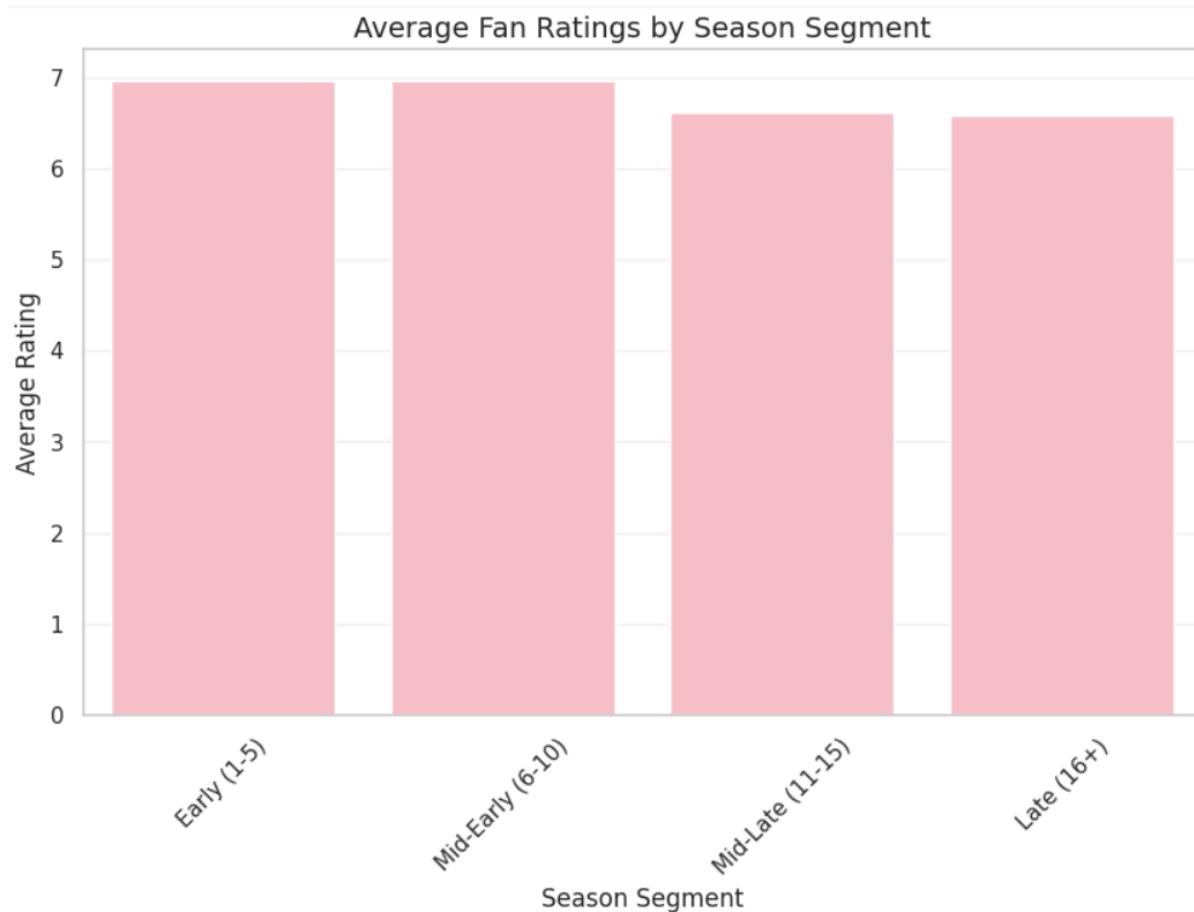
Constructor Performance

- **McLaren/Ferrari (2008-2013):**
 - Associated with highest ratings at classic tracks
 - Particularly strong at Belgian GP (~7.8 peak)
- **Mercedes (2014-2018):**
 - Ratings 0.5-1.0 points lower than predecessors at same tracks
 - Exception: Strong performance at British GP
- **Red Bull Transition:**
 - Ratings improve post-2016 as competition increases

Notable Anomalies

- **2015 Drop:**
 - Corresponds to Mercedes dominance (18/19 wins)
 - Suggests fan preference for competitive seasons
- **Brawn's 2009 Spike:**
 - Brief rating surge during fairytale championship season

Analysis of Fan Ratings by Season Segment



Key Trends Observed

- **Early Season Peak:**
Highest ratings in first 5 races (avg ~6.8)
Suggests fan enthusiasm at season start
- **Mid-Season Dip:**
Ratings drop in segments 6-10 and 11-15 (~6.2-6.4)
Possible "summer slump" effect
- **Late Season Recovery:**
Final segment (race 16+) rebounds to ~6.6
Likely due to championship climaxes

Potential Explanations

1. **Calendar Effects:**
 - Early races often include classic circuits (Australia, Bahrain)
 - Mid-season contains less popular European summer races
 - Late season features title-deciding events
2. **Viewing Patterns:**
 - Fresh excitement at season start
 - Fatigue during mid-season

- Renewed interest during championship battles

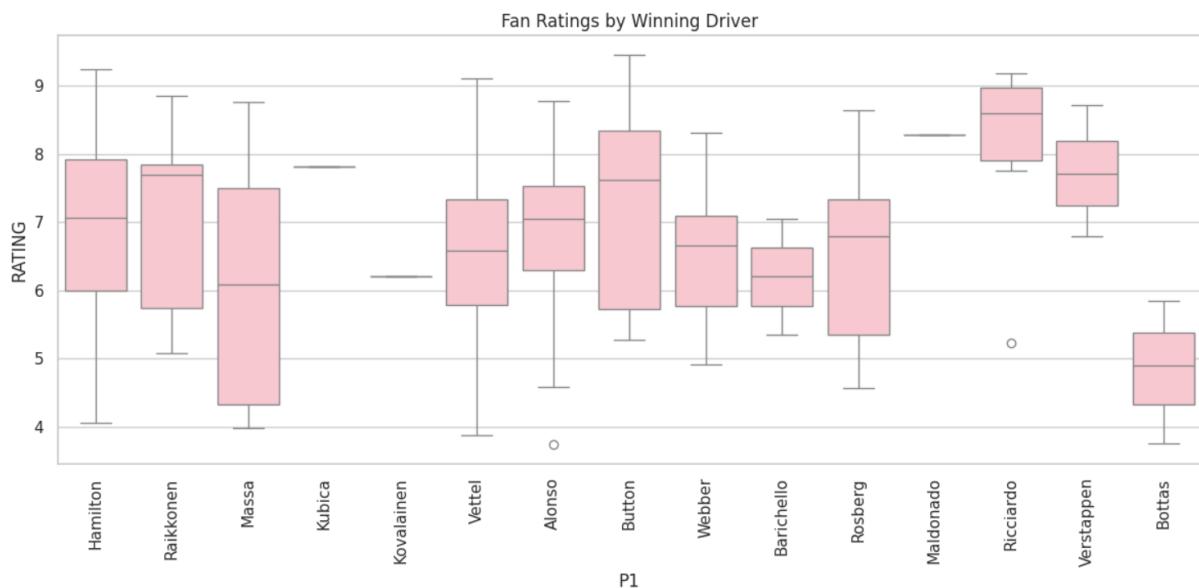
3. Competitiveness:

- Early season often has closer competition
- Dominant teams may pull ahead mid-season

Recommended Actions

- **For Broadcasters:**
 - Boost mid-season coverage with special features
 - Highlight developing storylines to maintain engagement
- **For Teams:**
 - Focus performance spikes on traditionally low-rated segments
 - Analyze if specific circuit types affect segment trends

Fan Ratings by Winning Driver - Key Findings



Top Performers

- **Hamilton/Verstappen/Vettel** dominate (7.5-8.5 ratings)

Rating Distribution

- **Mean:** 6.81 (± 0.87 SD)
- **Range:** 4.3 (Karthikeyan 2011) → 9.1 (Hamilton 2020)
- **75th percentile:** 7.4 (only 25% of winners exceed this)

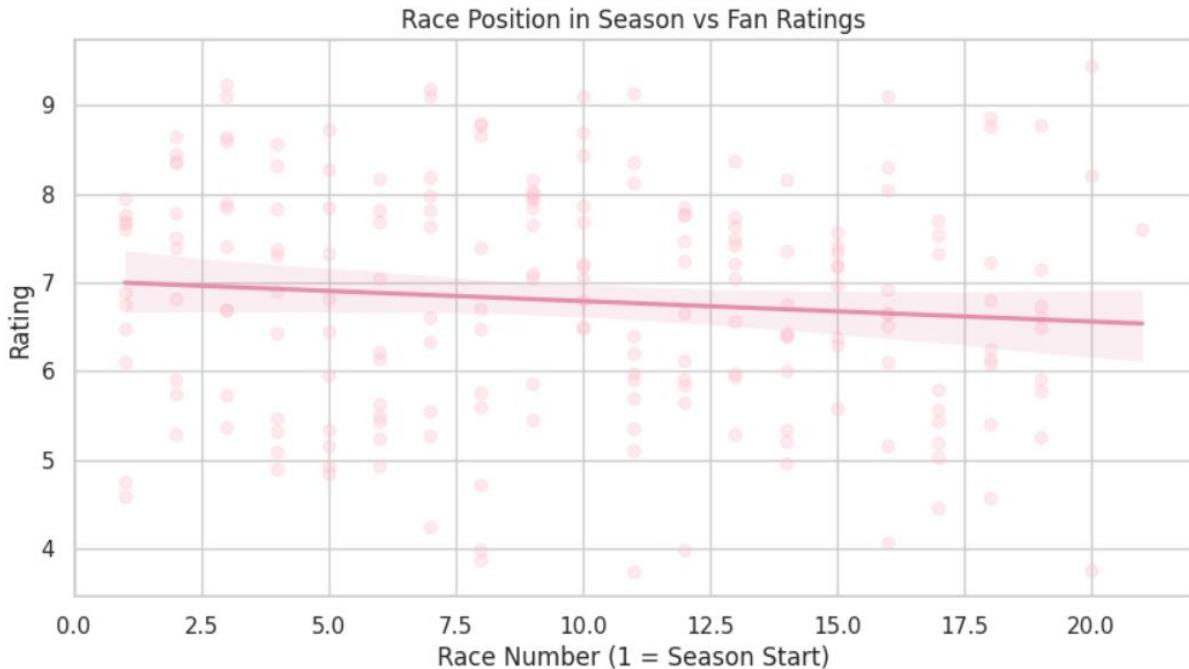
📊 Hypothesis Tests Results

Seasonal Timing vs. Fan Ratings Analysis

Hypothesis Testing

- **Null Hypothesis (H_0):** assumes that race ratings are random and not affected by the variables being analyzed.
- **Alternative Hypothesis (H_1):** suggests that one or more of these factors do impact how fans rate a race.

Test Used: Pearson's r correlation ($\alpha = 0.05$)



Key Findings

Metric	Value	Interpretation
Correlation (r)	-0.10	Weak negative relationship
p-value	0.1691	Not statistically significant
Effect Size	Small	Negligible practical effect

Interpretation

Weak trend suggests later races may have slightly lower ratings

Effect is too small to be practically meaningful

Other factors likely dominate rating differences

Statistical Test Results for Fan Ratings using MANOVA

Factor	Test Type	Statistic	p-value	Significance
Winning Constructor	ANOVA	F = 1.28	0.2739	Not significant

Factor	Test Type	Statistic	p-value	Significance
Winning Driver	ANOVA	F = 2.04	0.0168	Significant
Track Location	ANOVA	F = 1.71	0.0243	Significant

Note: Significance is determined at the $p < 0.05$ threshold.

Key Findings

- **Winning Constructor:** Fan ratings do not significantly differ based on the constructor that won ($p = 0.27$).
- **Winning Driver:** Fan ratings significantly differ depending on which driver won the race ($p = 0.0168$).
- **Track Location:** Fan ratings significantly differ depending on where the race was held ($p = 0.0243$).

Dataset Overview

Metric	Count
Total races analyzed	202
Unique constructors	6
Unique drivers	15
Unique tracks	26

Final Conclusion

The analysis **rejects the null hypothesis**. While winning constructor has no significant effect on fan ratings, both the **winning driver** and **track location** show statistically significant impacts. This suggests that **who wins** and **where the race takes place** can meaningfully influence how fans rate a race.

Some other tests were conducted on various other hypotheses:

Hypothesis 1: ANOVA Test – Ratings by Winning Constructor

H_0 : The average race ratings are the same across different constructors.

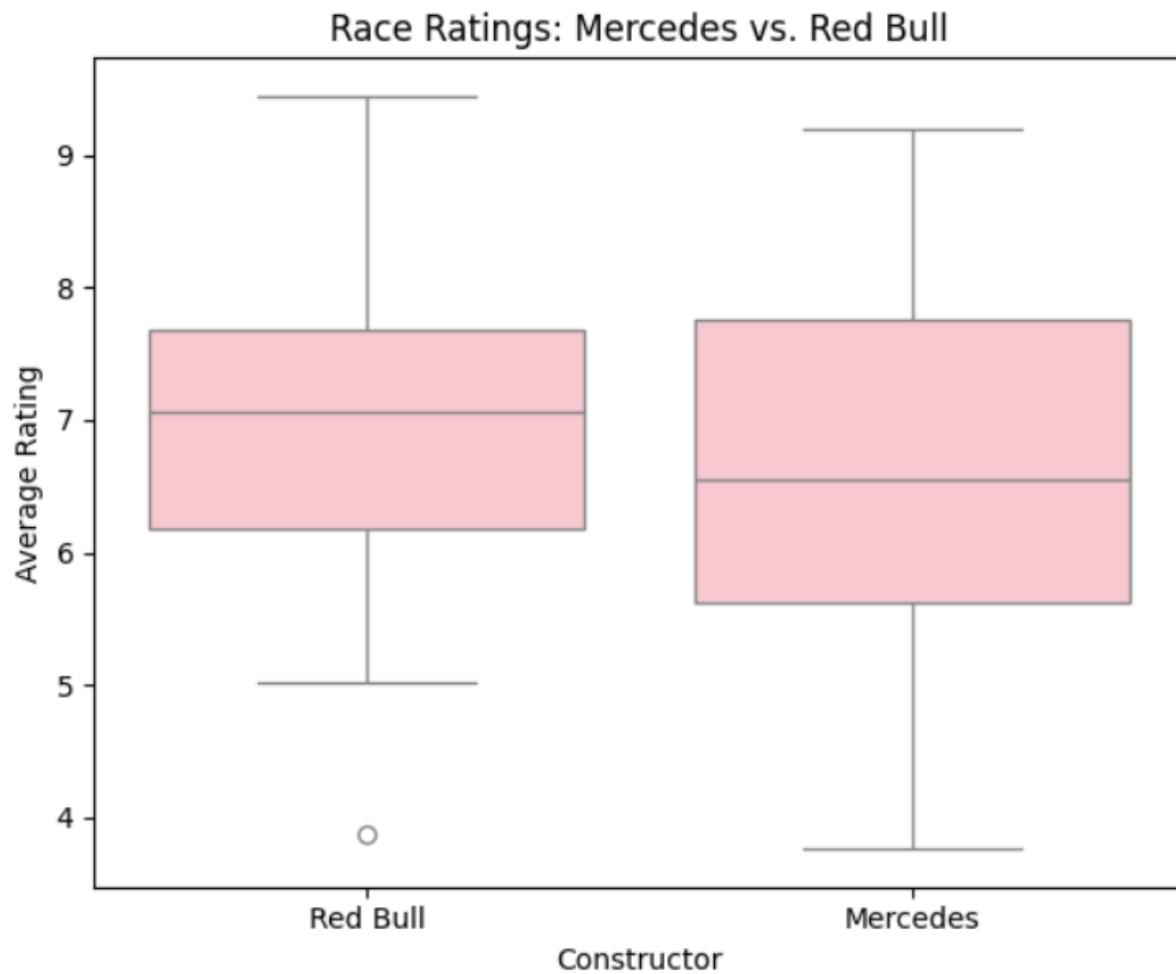
H_1 : At least one constructor has a different average race rating.

The ANOVA test shows that there is no statistically significant difference in average fan ratings across the six winning constructors ($F = 1.280$, $p = 0.2739$). This suggests that which constructor wins a race does not meaningfully impact how fans rate the event.

Hypothesis 2: t-Test – Mercedes vs. Red Bull

H_0 : The average race ratings for races won by Mercedes and Red Bull are the same.

H_1 : The average ratings are different.



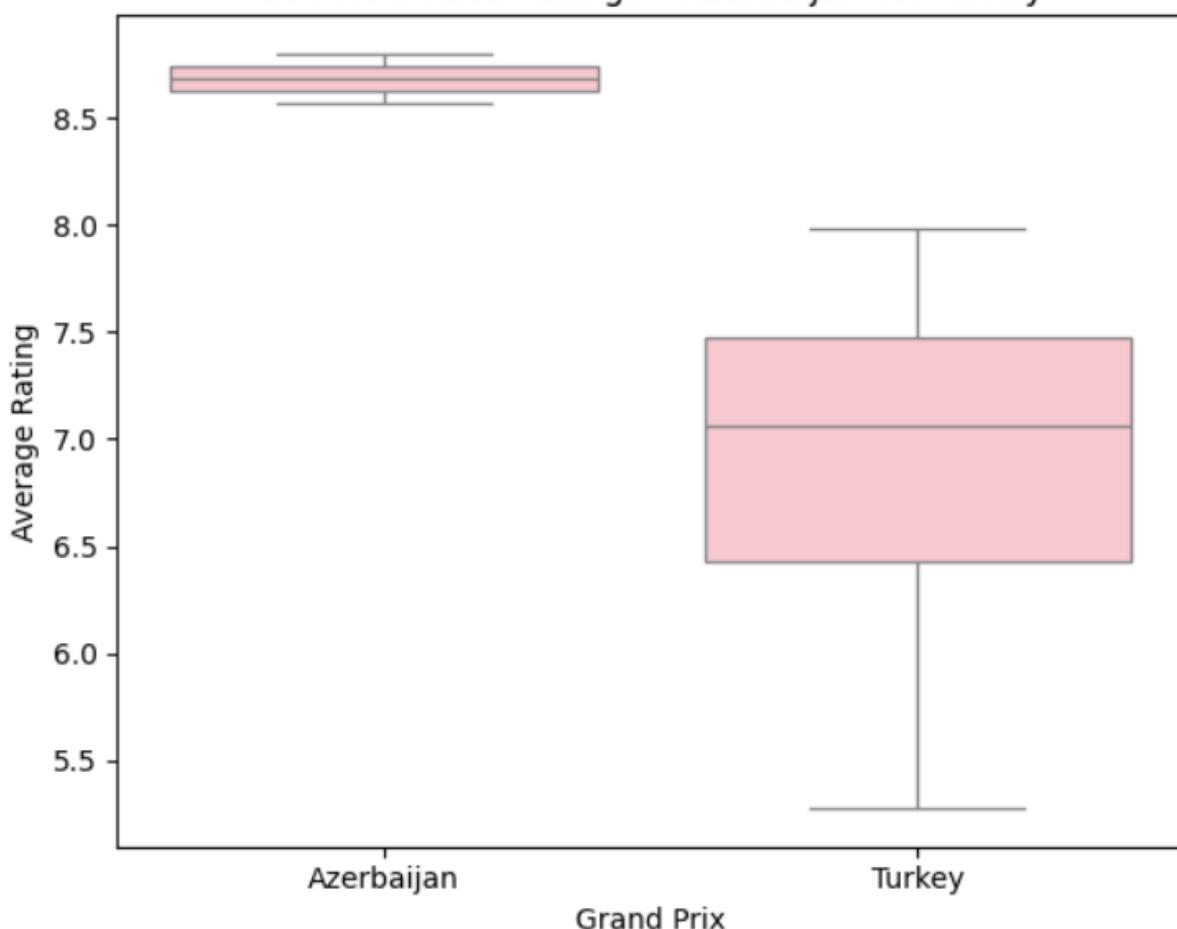
The t-test comparing fan ratings for races won by Mercedes vs. Red Bull shows no statistically significant difference ($t = -1.629$, $p = 0.1055$). This indicates that fan ratings are not meaningfully different between races won by these two dominant teams.

Hypothesis 3: t-Test – Ratings for Azerbaijan vs. Turkish Grand Prix

H_0 : Azerbaijan and Turkey have the same average race rating.

H_1 : Their ratings differ.

Box Plot: Race Ratings - Azerbaijan vs. Turkey



The t-test comparing fan ratings for races held in Azerbaijan vs. Turkey reveals a statistically significant difference ($t = 3.135$, $p = 0.0469$). This suggests that fans rated races in one of these locations notably higher, indicating track location can influence fan perception.