Formula 1 Regression

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Agenda

- Introduction
- Methodology
- Results / Conclusions
- Future Work
- Appendix

Introduction

- Motivation: What does it take to be a winner?
- Objective: Model Formula 1 race results against practice data and race day choices
- Goals: Determine key factors for race day performance

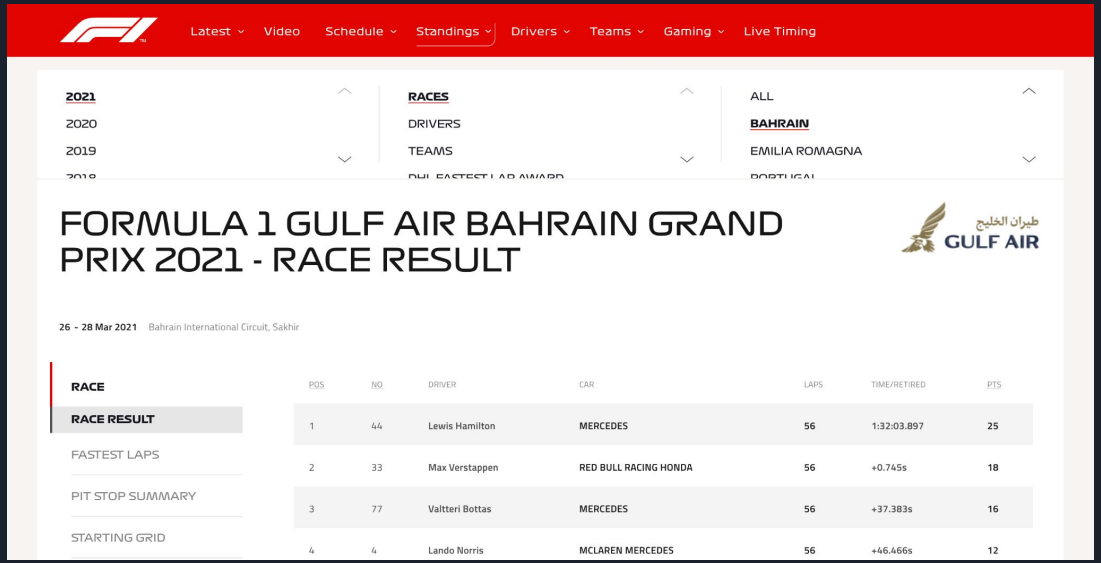
Methodology

Methodology - Model

- Outcome
  - Predict driver finish position based on pre-race trials and in-race decisions
- Features
  - Fastest_laps_Pos
  - Fastest_laps_Lap
  - SG_Pos_Q_Laps
  - FL_avg_p_laps
  - Fastest_laps_Avg_Speed
  - Pit_stop_summary_Stops
  - Pit_stop_summary_Total
  - Starting_grid_Pos
  - Qualifying_Laps
  - Practice_3_Pos and Laps
  - Practice_2_Pos and Laps
  - Practice_1_Pos and Laps
  - P3_P2_delta
  - P2_P1_delta
  - Q2_Q1_delta

Methodology - Data

- Web-scraped from Formula1.com
- 2006-2021
- ~4200 unique driver finishes
- Initially 26 features



Results


BRASTEMP
BRIDGESTONE
RedBull
MALAYSYA
PETRONAS
fkg.com
BRIDGESTONE
POTENZA
BRIDGESTONE
POTENZA
PETRONAS

Results

R2: 0.684

MAE: 2.187

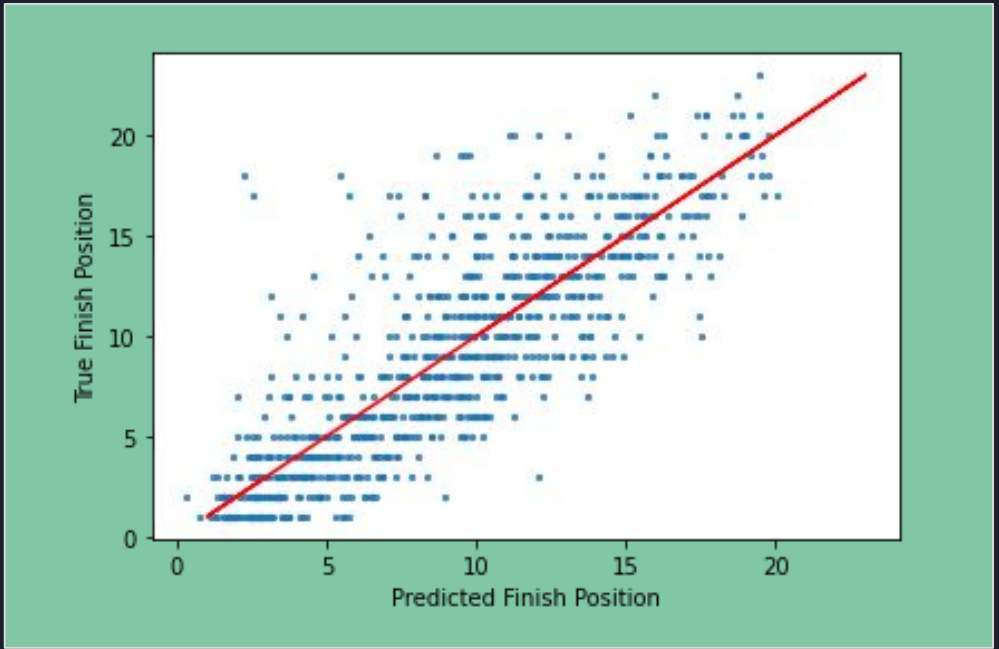
Note: Output is due to discrete nature of target var

Key Features:

- # Pit Stops
- Fastest Lap Pos
- Starting Grid Pos

Honorable Mention :

- # Practice /Qualifying laps



Results

Intercept: -9.764 Coefficients:

- ('Fastest_laps_Pos', 0.308),
- ('Fastest_laps_Lap', 0.003),
- ('SG_Pos_Q_Laps', 0.005),
- ('FL_avg_p_laps', -0.0),
- ('Fastest_laps_Avg_Speed', 0.039),
- ('Pit_stop_summary_Stops', 0.74),
- ('Pit_stop_summary_Total', -0.001),
- ('Starting_grid_Pos', 0.272),
- ('Qualifying_Laps', 0.058),
- ('Practice_3_Pos', 0.077),
- ('Practice_3_Laps', 0.075),
- ('Practice_2_Pos', 0.063),
- ('Practice_2_Laps', 0.083),
- ('Practice_1_Pos', 0.08),
- ('Practice_1_Laps', 0.069),
- ('P3_P2_delta', 0.006),
- ('P2_P1_delta', 0.016),
- ('Q2_Q1_delta', 0.01)

Prediction Examples

- Y_hat = 0.773 -> y_true = 1st
- Y_hat = 19.49 -> y_true = 21st

Future Work

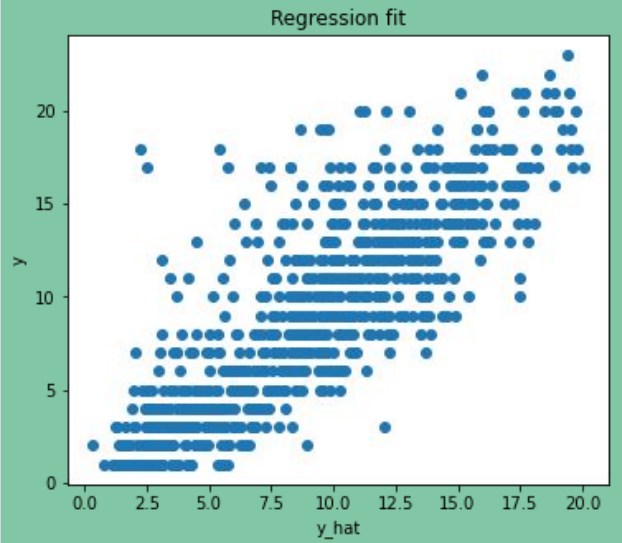
1. Incorporate more data dating before 2006 when race weekend format was changed
2. Incorporate more features such as money spent, previous success of driver, presence of advanced technology on car, etc
3. Use non-discrete continuous measure of driver success (perhaps fastest average speed)
4. Try more regression methods to deal with discrete data better

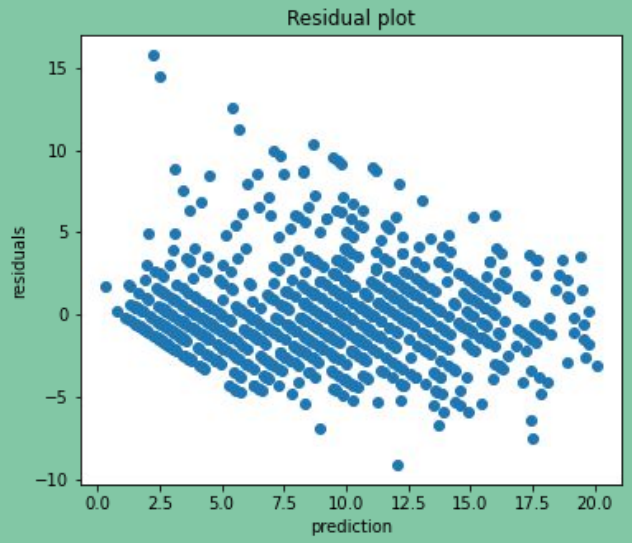
Thank You!

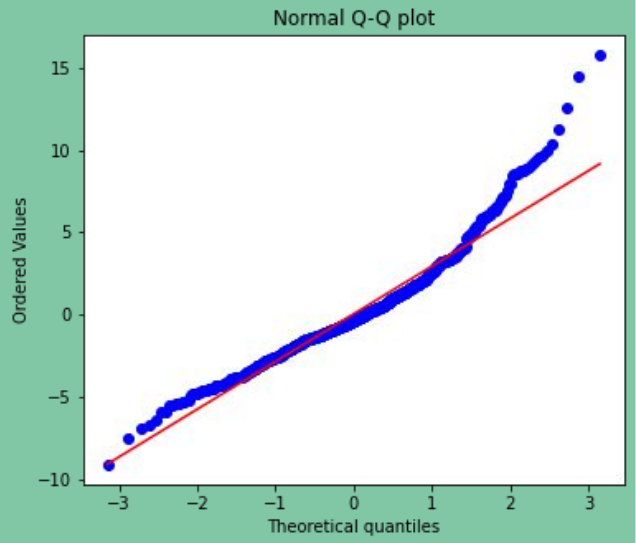
Appendix


BRASTEMP
BRIDGESTONE
RedBull
MALAYSYA
PETRONAS
fkg.com
BRIDGESTONE
POTENZA
BRIDGESTONE
POTENZA
PETRONAS

Appendix


Regression fit
y
y_hat
0
5
10
15
20
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


Residual plot
residuals
prediction
15
10
5
0
−5
−10
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


Normal Q-Q plot
Ordered Values
Theoretical quantiles
15
10
5
0
−5
−10
−3
−2
−1
0
1
2
3