



Overtakes and Collisions on F1 Circuits

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Research Topic

Crashes and overtakes on F1 Circuits

Experimental Question

Where are the areas of improvement throughout F1 Circuits

Hypothesis/Engineering goal:

If trends of crashes and overtakes on F1 race circuits can be identified, then necessary areas of improvement can be found.

Methodology/Experimental Design

Obtain footage of a 2023 Season F1 race from database. Analyze the first lap of the race, record starting placements, final placements, and net positions lost/gained per driver. Using a data collection program, such as Excel, document crashes and overtakes at each turn. Corner numbers as outlined by official track maps used as reference points to document the crash or overtake. Overtakes and collisions are related using driver names and placements. Repeat for 2023 season races. Derive averages for overtakes and crashes by sectors.

Methodology/Experimental Design

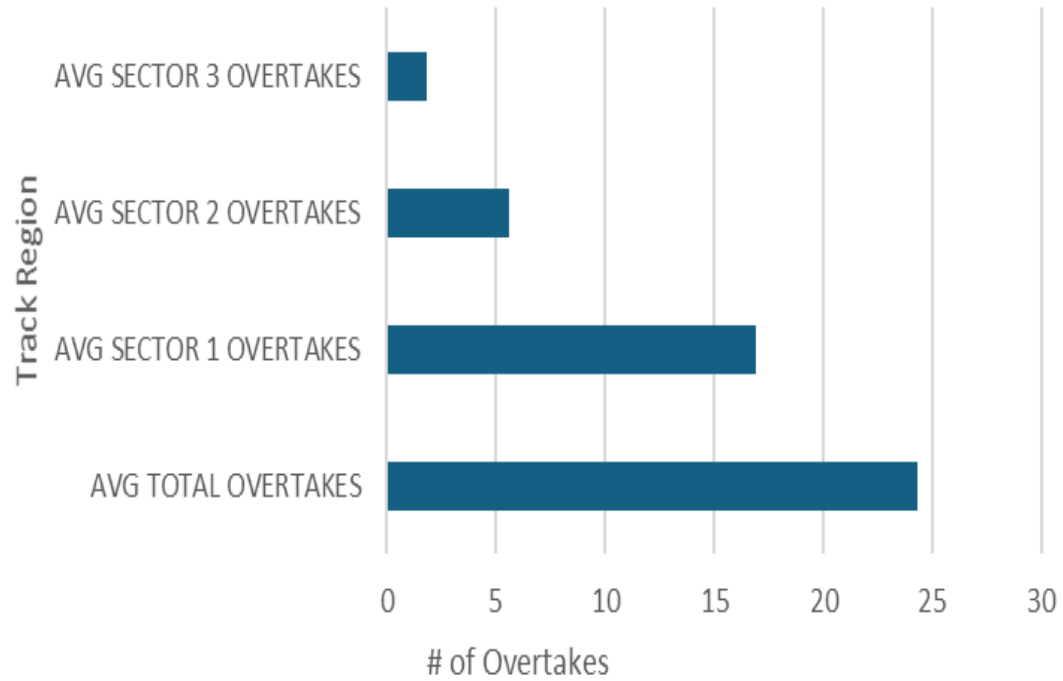
1. Race data is collected in table format on the top left
2. Overtakes and crashes are compiled with other races by sector and full lap.
3. Averages are taken.

CANADA	Column1	Column2	Column3	Co
DriverOvertaking	NewPosDriverOvertaking	DriverOvertook	NewPosDriverOvertook	PO
HAM	2	ALO	3	2
OCO	5	HUL	6	2
PIA	7	NOR	8	2
LEC	9	ALB	10	2
PER	11	SAI	12	2
MAG	12	SAI	13	2
STR	15	GAS	16	3
STR	14	BOT	15	3
GAS	15	BOT	16	3
SAI	12	MAG	13	3
GAS	14	STR	15	5
SAI	11	PER	12	9
TSU	18	SAR	19	9
PER	11	SAI	12	10
DEV	17	SAR	18	13
SAI	11	PER	12	13
MAG	12	PER	13	13
PER	12	MAG	13	14

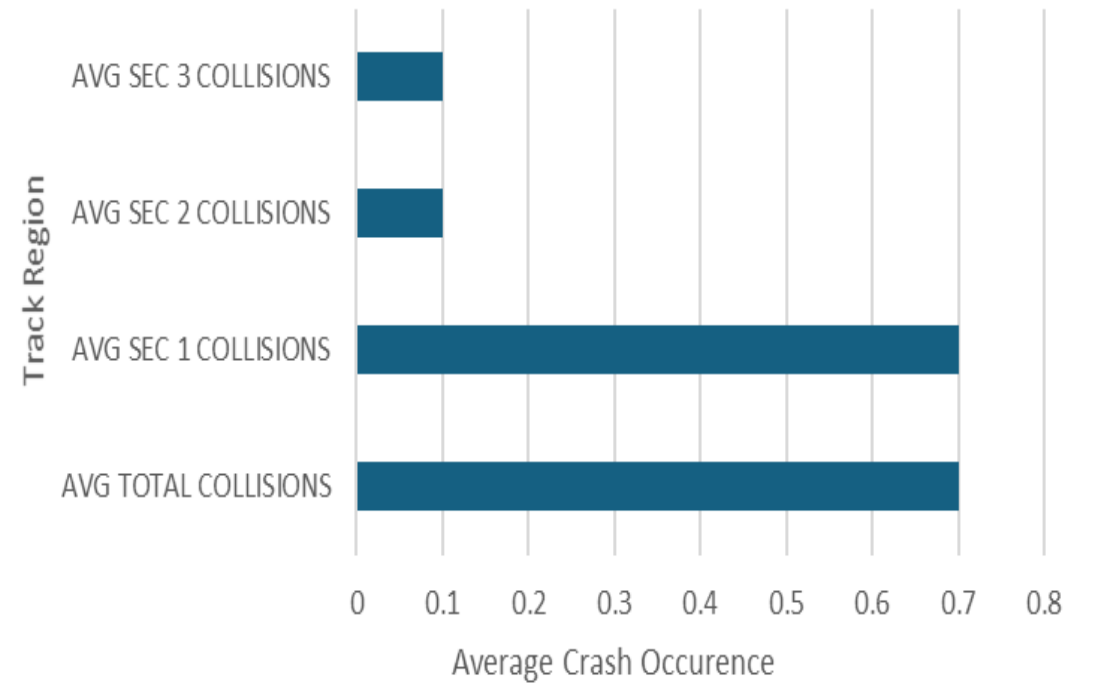
Race	TOTAL OTS	S1 OTS	S2 OTS	S3 OTS	TOTAL COL	S1 COL	S2 COL	S3 COL
Bahrain	22	19	3	0	2	2	0	0
Saudi Arabia	21	9	8	4	0	0	0	0
Australia	16	12	0	4	1	1	0	0
Spain	34	22	11	1	2	2	0	0
Monaco	20	8	12	0	0	0	1	1
Canada	18	10	3	5	0	0	0	0
Great Britain	20	14	4	2	0	0	0	0
Azerbaijan	21	20	1	0	0	0	0	0
Dutch	34	22	10	2	0	0	0	0
Japan	37	33	4	0	2	2	0	0
AVERAGES	24.3	16.9	5.6	1.8	0.7	0.7	0.1	0.1

Data/Results

Lap 1 Overtakes



Lap 1 Collisions



Data/Results

- Data supported the hypothesis of areas of improvement being found through analyzing overtake and collisions.
- Sector 1 consistently showed a trend of more collisions and overtakes per race. 7:1 ratio in collisions between Sector One and Sector Two and Three combined.
- Sector One averaged significantly more overtakes throughout all races, 16.9 as opposed to 5.6 and 1.8.
- Only one outlier where Sector 2 had more overtakes than Sector 1.

Result Validity

- ▶ Races were meticulously examined second by second in slow motion using official F1 trackers to document every change in position across drivers.
- ▶ Each F1 circuit is unique, however, Sector One averages more overtakes and collisions throughout.
- ▶ Starting vs Final positions chart was used to verify that overtake data resulted in official Final Lap 1 Positions.
- ▶ Both visual analysis and race commentary were analyzed to detect any collision and/or overtake.

Conclusion/Areas of Improvement

- Sector One can be identified as the primary area of improvement across F1 Circuits as the most overtakes and collisions occur in it.
- The characteristics of each POI can be noted to relate the type of POI to collisions and overtakes.
- Data for more races can be collected to increase accuracy and expand the data pool.
- The speed of the drivers in each POI can be accounted for
- The track conditions and weather during races can be accounted for as they affect grip and visibility.

Future Plans/ Societal Impact

- ▶ The project aims to find areas of improvement related to collisions and overtakes in F1 circuits. Identifying these areas, such as Sector One's track surface, will allow for faster and more extreme F1 performance, rather than limiting technological improvement due to safety concerns.
- ▶ A beneficial continuation of the experiment involves accounting for track conditions, car speed, and POI characteristics.
- ▶ The relation between tire grip, track conditions, and G-forces experienced throughout the POIs can be collected to determine ways to improve grip on either track, tires or the vehicle itself. Finding areas of improvements would again be the focus, however more detailed data and calculations would be collected; and therefore more specific improvements could be made.
- ▶ Technological advancements should not be hindered due to safety concerns. Instead, technology should help improve safety to allow for greater performance

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