

```
In [1]: import libraryF1dataNotebook as libraryDataF1
import pandas as pd
```

# FORMULA 1 MSC CRUISES JAPANESE GRAND PRIX 2024

The Japanese Grand Prix (Japanese: 日本グランプリ) is a motor racing event in the calendar of the Formula One World Championship. Historically, Japan has been one of the last races of the season, and as such the Japanese Grand Prix has been the venue for many title-deciding races, with 13 World Drivers' Champions being crowned over the 36 World Championship Japanese Grands Prix that have been hosted. Japan was the only Asian nation to host a Formula One race (including the Pacific Grand Prix) until Malaysia joined the calendar in 1999. Source: Wikipedia Source: Wikipedia

## Obtain session information

```
In [2]: libraryDataF1.obtain_information('sessions',year=2024,country_acronym='JPN')
```

```
Out[2]:
```

	session_key	session_name	date_start	date_end	gmt_offset
0	9489	Practice 1	2024-04-05T02:30:00+00:00	2024-04-05T03:30:00+00:00	09:00:00
1	9490	Practice 2	2024-04-05T06:00:00+00:00	2024-04-05T07:00:00+00:00	09:00:00
2	9491	Practice 3	2024-04-06T02:30:00+00:00	2024-04-06T03:30:00+00:00	09:00:00
3	9492	Qualifying	2024-04-06T06:00:00+00:00	2024-04-06T07:00:00+00:00	09:00:00
4	9496	Race	2024-04-07T05:00:00+00:00	2024-04-07T07:00:00+00:00	09:00:00

## Free Practice 1

### Obtain setup

```
In [3]: practice = libraryDataF1.obtain_information('laps',session_key=9489)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9489)
drivers = libraryDataF1.obtain_information('drivers',session_key=9489)
```

```
In [4]: stintsDataFrame =libraryDataF1.stint_configuration(drivers,stintInformation)
jointables2 = pd.merge(practice,stintsDataFrame,on=['lap_number','driver_number'])
jointables2
```

```
Out[4]:
```

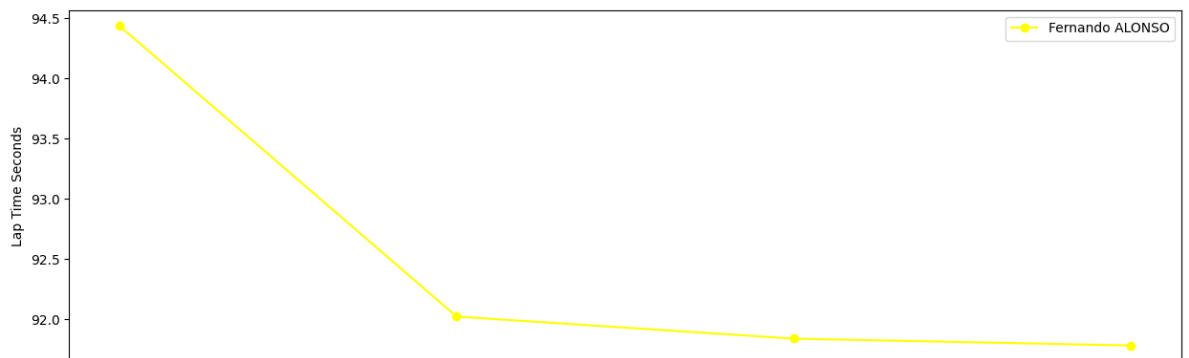
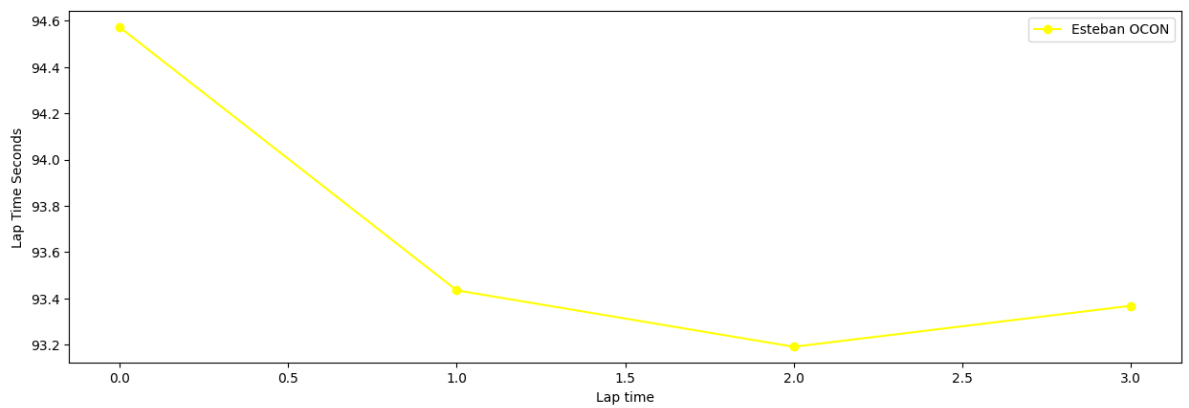
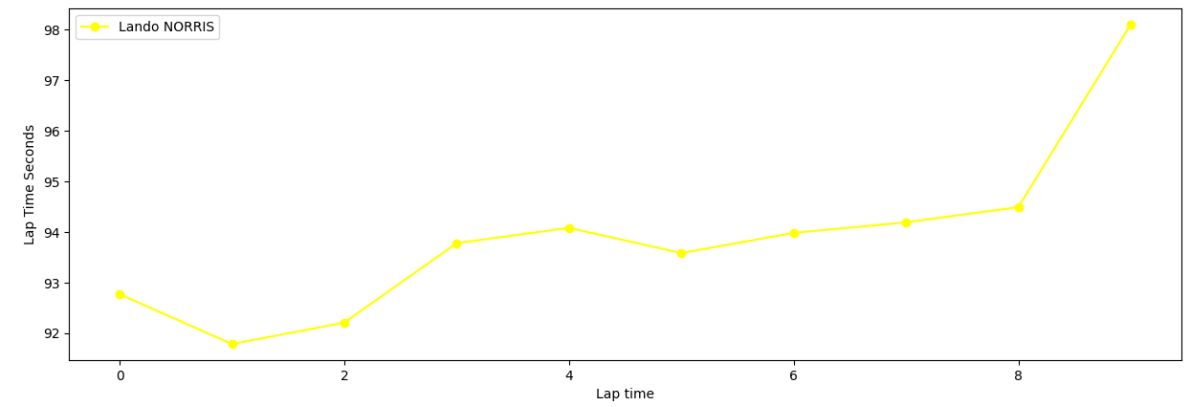
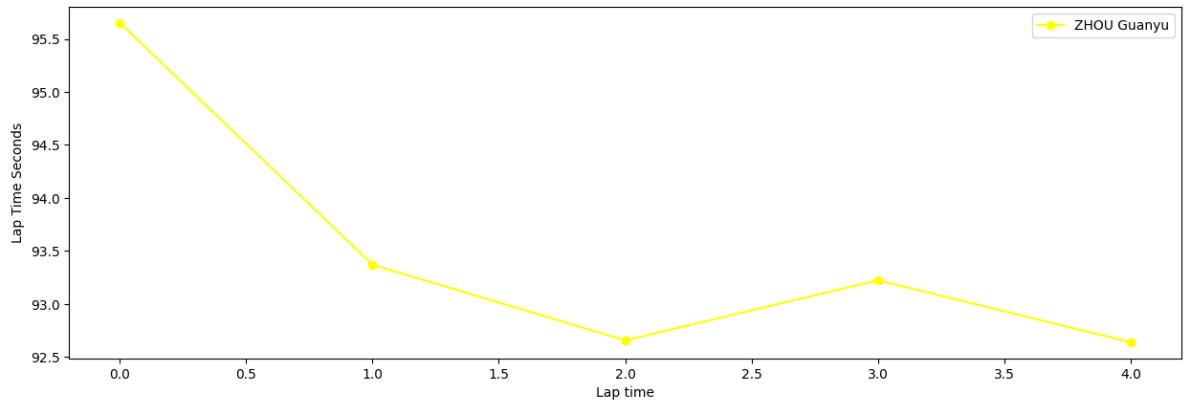
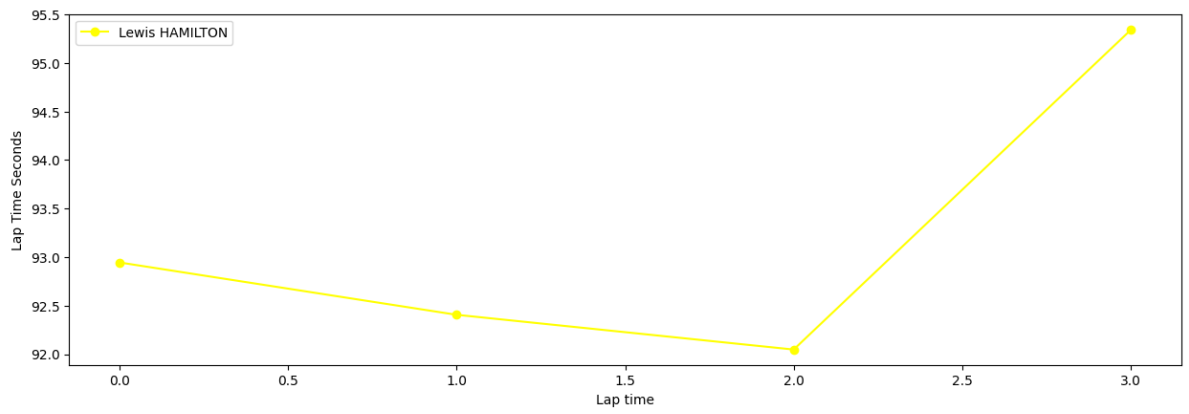
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1232	9489	18	268.0	199.0	227.0	2024-04-05T02:30:00+00:00
1	1232	9489	40	252.0	284.0	262.0	2024-04-05T02:30:00+00:00

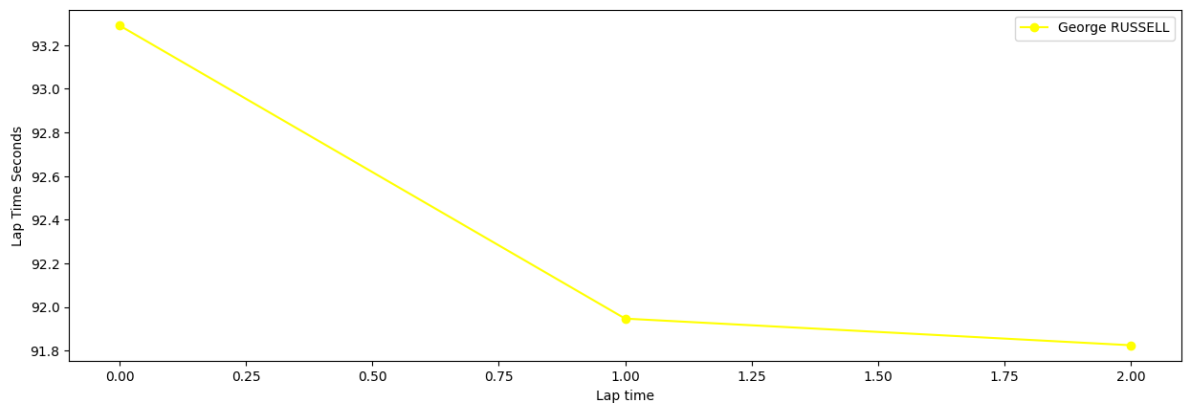
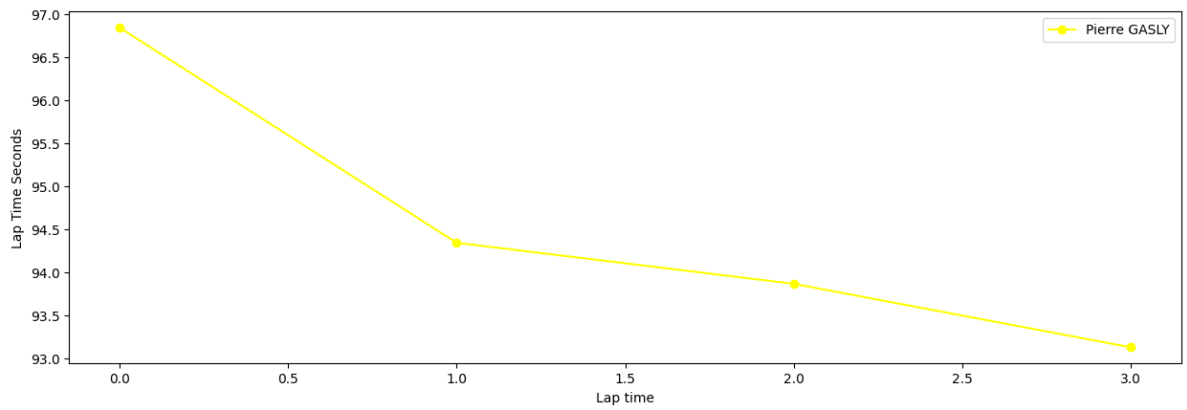
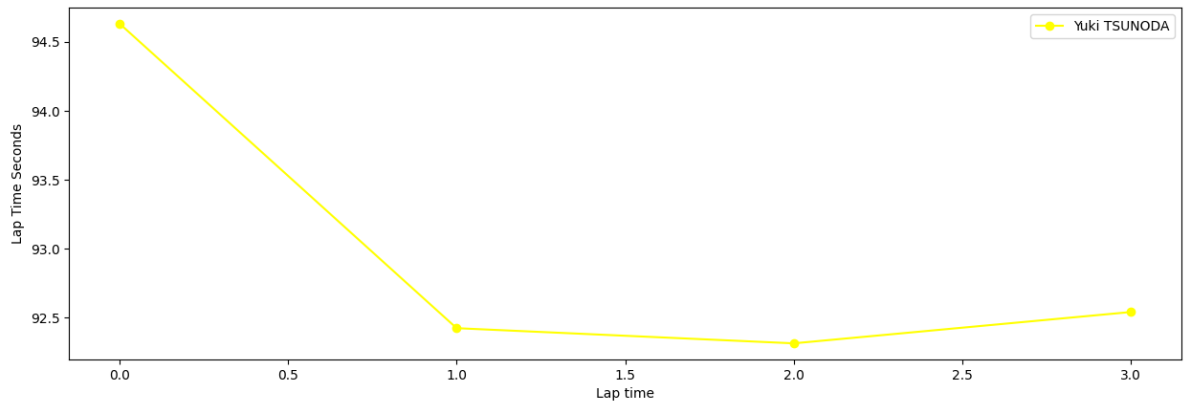
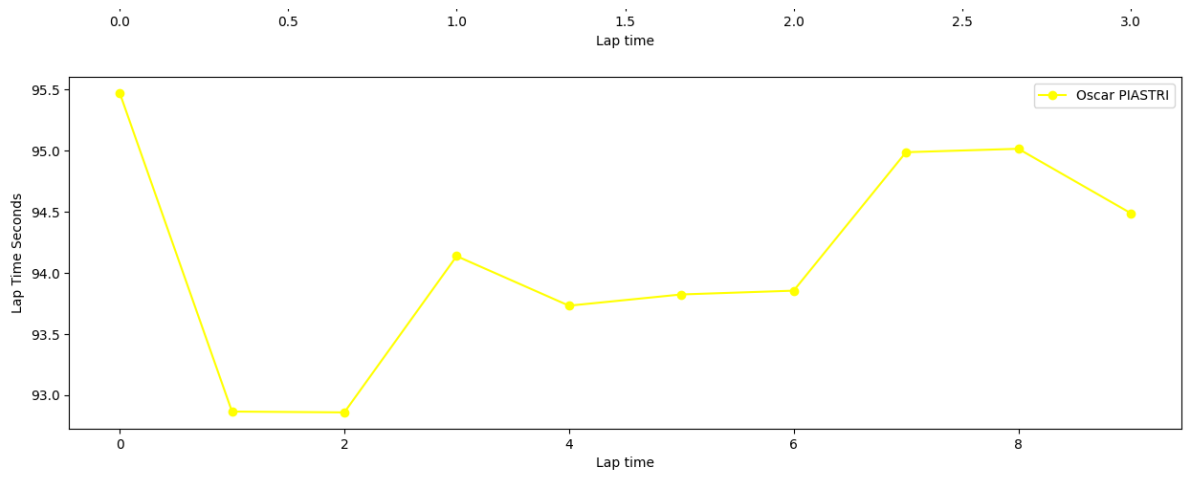
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
<b>2</b>	1232	9489	77	249.0	248.0	248.0	2024-04-05T02:30:
<b>3</b>	1232	9489	44	255.0	257.0	234.0	2024-04-05T02:30:
<b>4</b>	1232	9489	31	237.0	262.0	155.0	2024-04-05T02:30:
...	...	...	...	...	...	...	
<b>378</b>	1232	9489	14	274.0	177.0	250.0	2024-04-05T03:33:
<b>379</b>	1232	9489	20	274.0	271.0	273.0	2024-04-05T03:33:
<b>380</b>	1232	9489	18	276.0	277.0	263.0	2024-04-05T03:33:
<b>381</b>	1232	9489	24	270.0	210.0	139.0	2024-04-05T03:33:
<b>382</b>	1232	9489	10	269.0	292.0	282.0	2024-04-05T03:33:

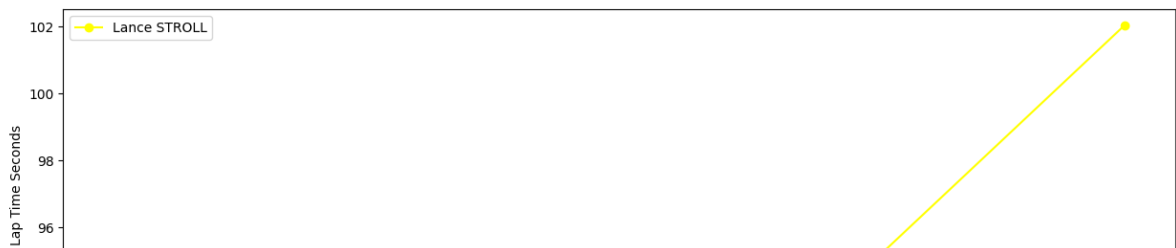
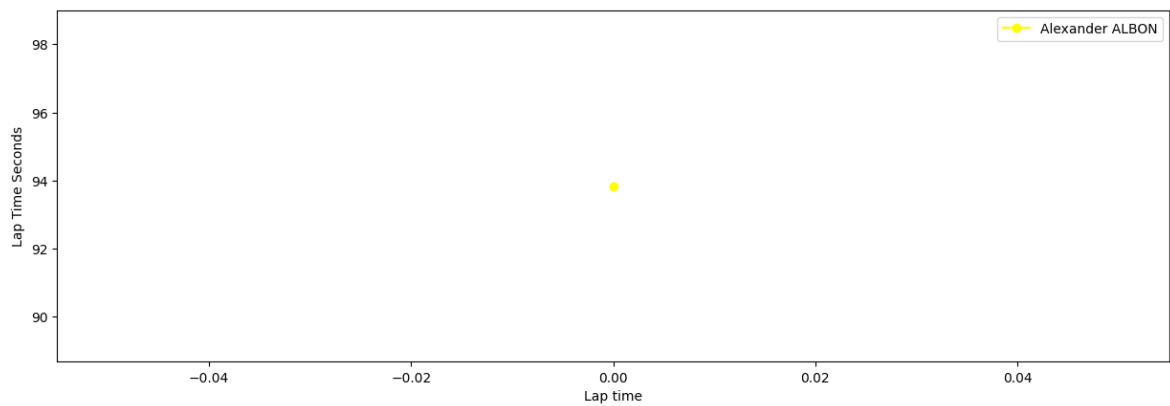
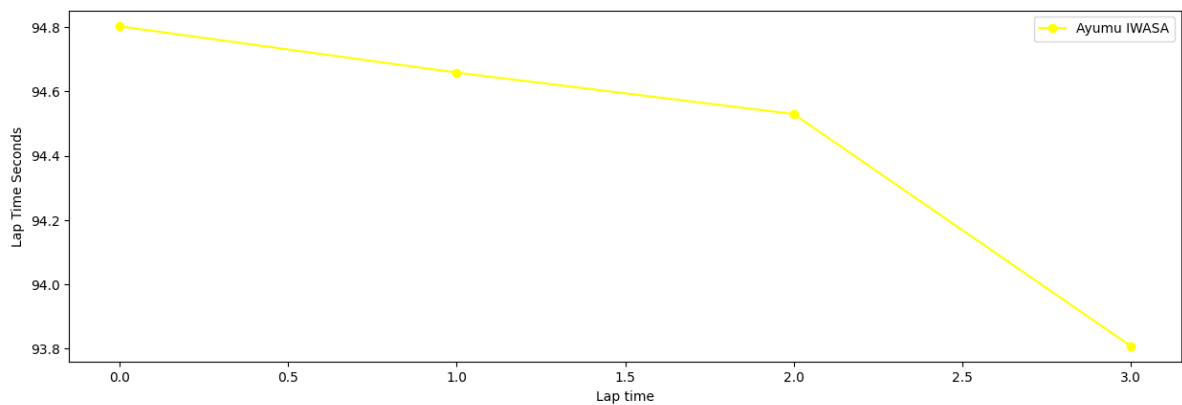
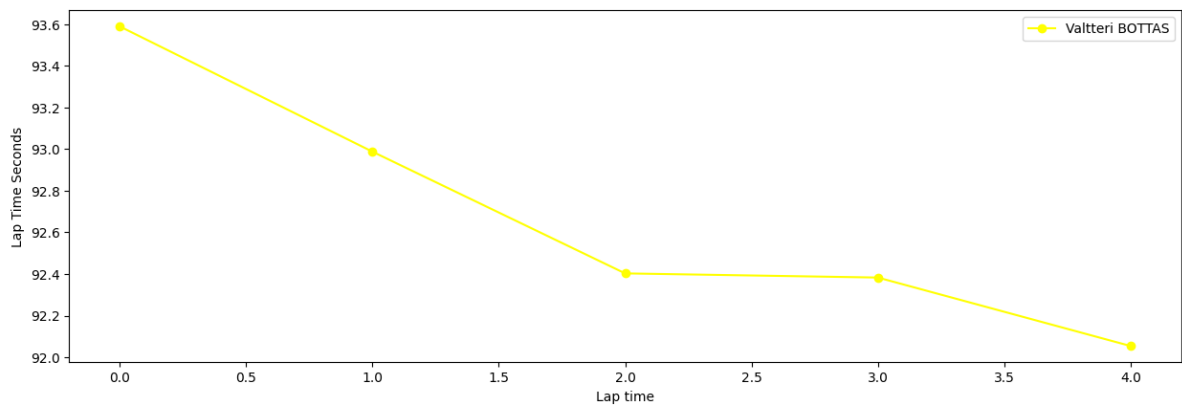
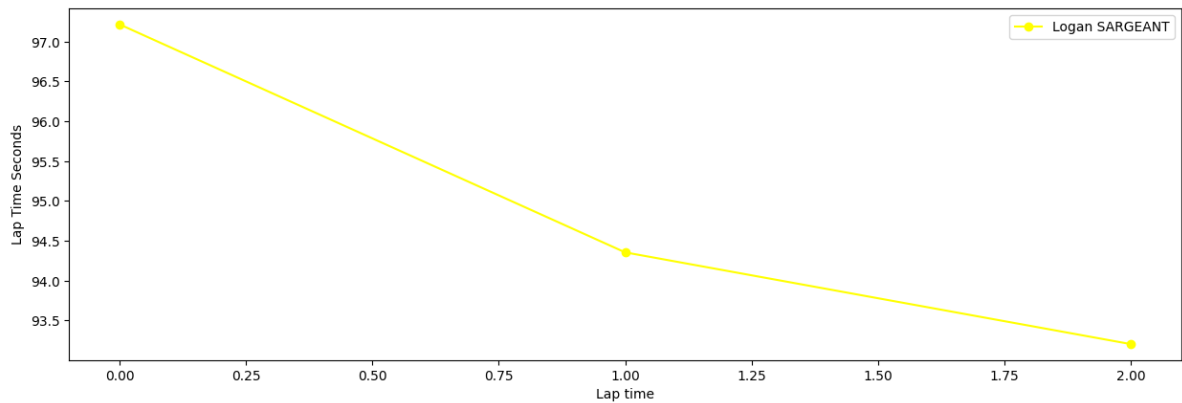
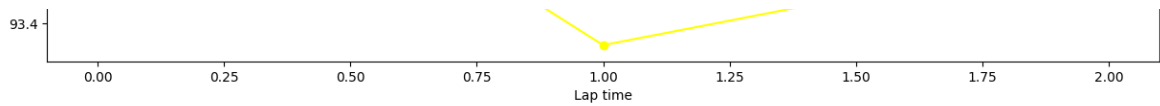
See race pace by means of the charts

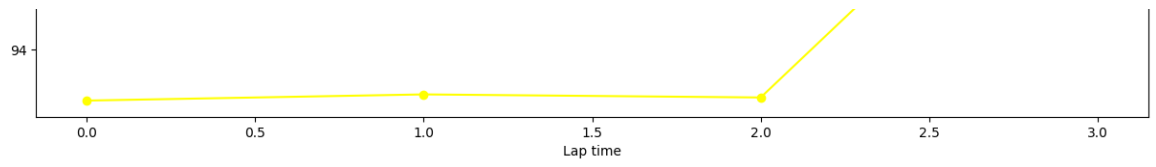
Medium tyres

```
In [5]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",105)
```



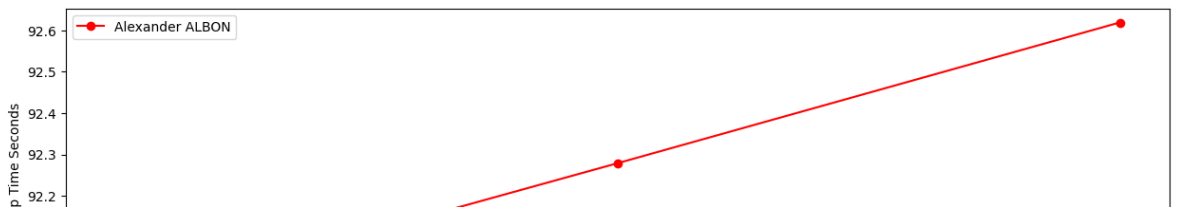
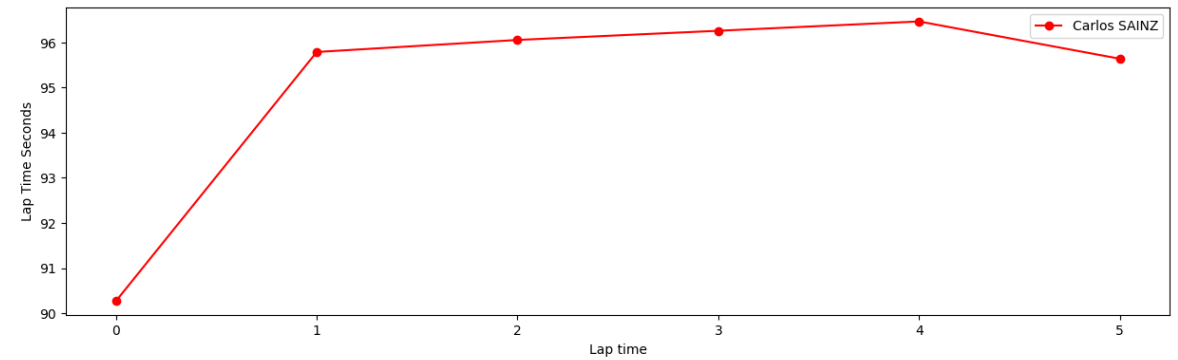
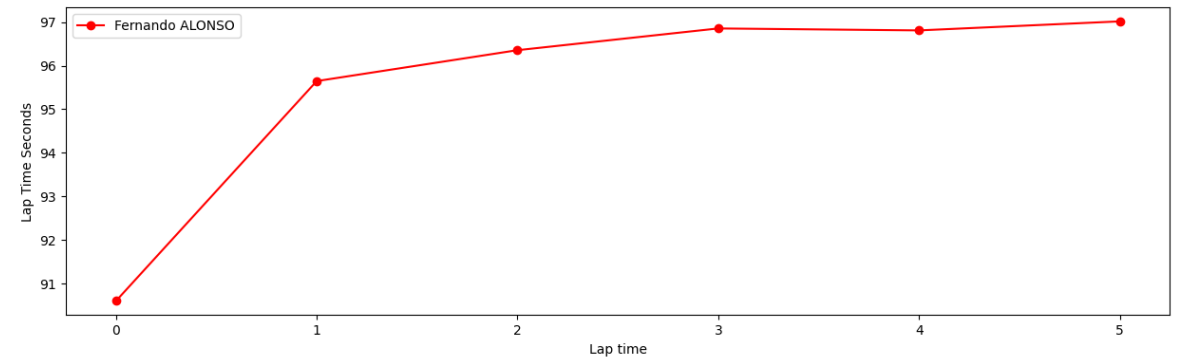
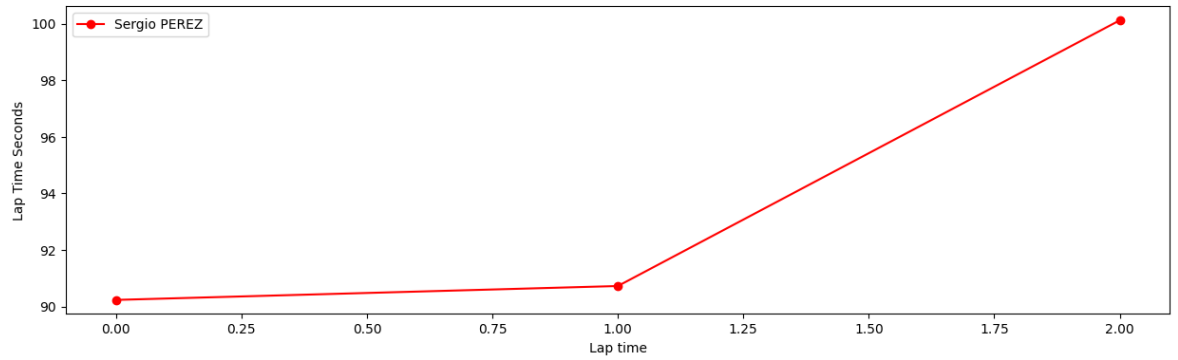
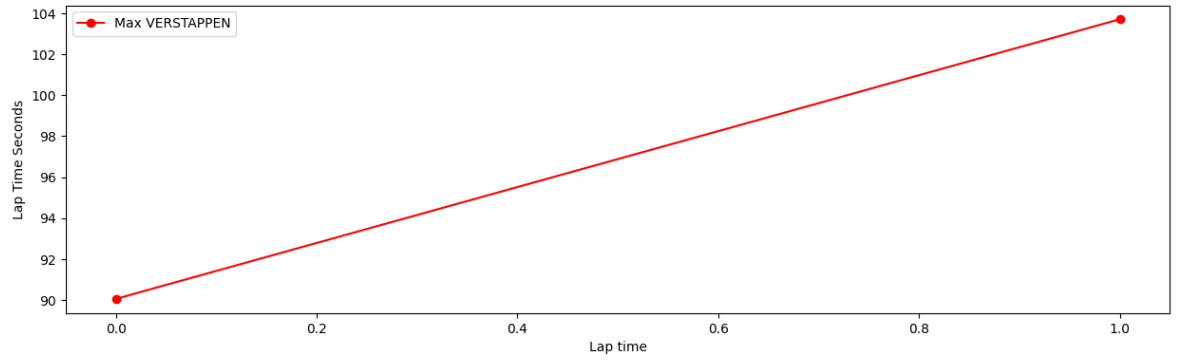
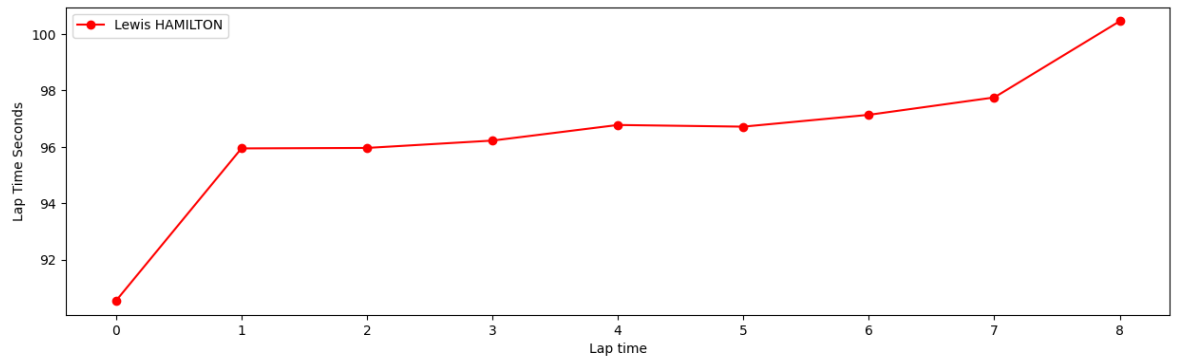


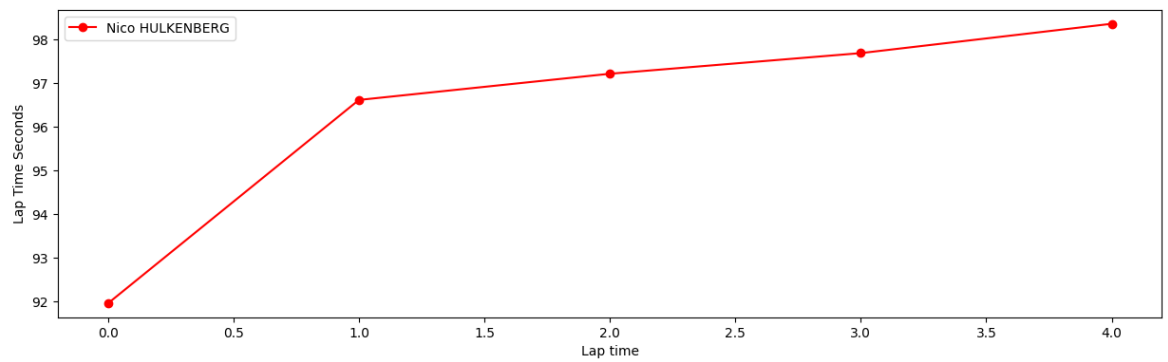
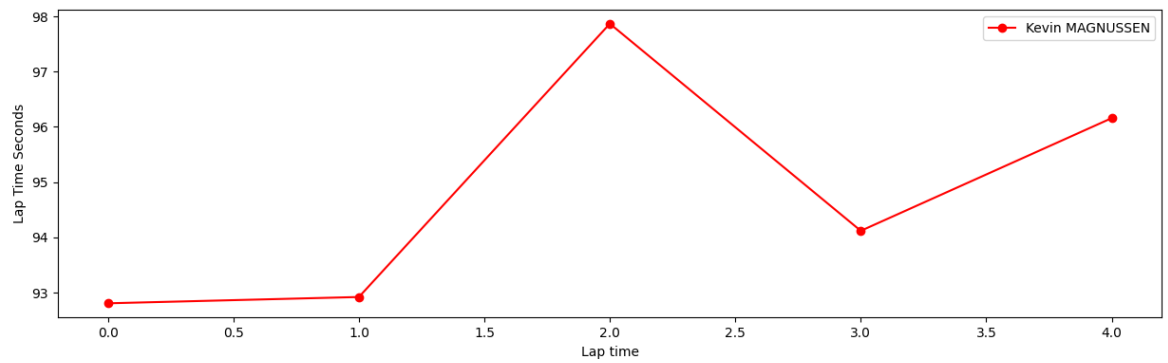
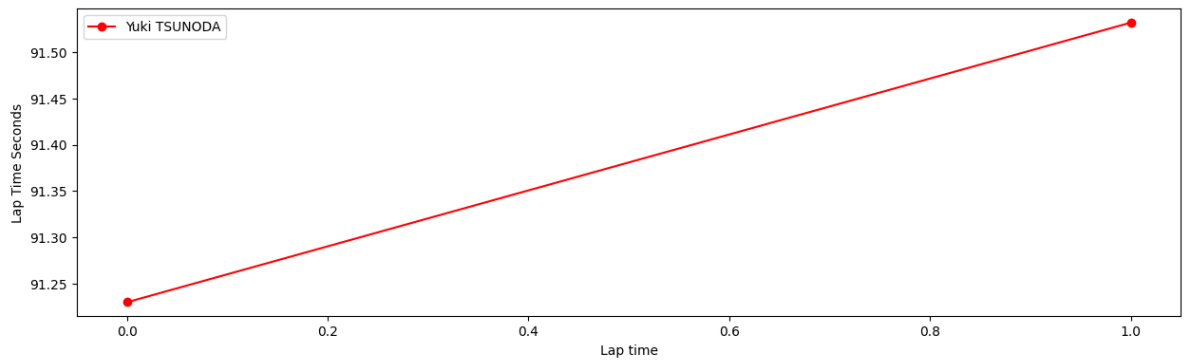
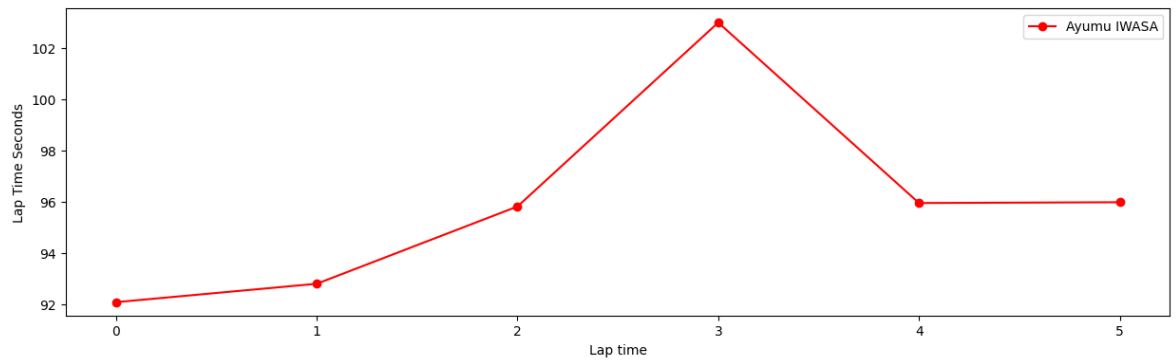
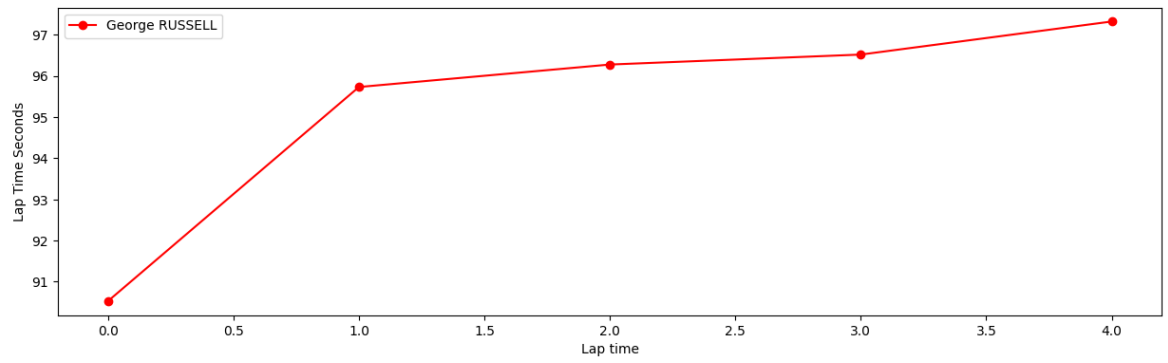
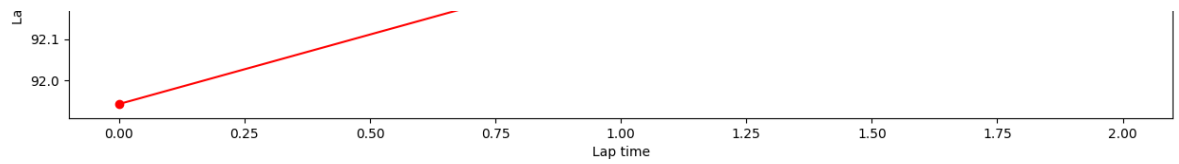




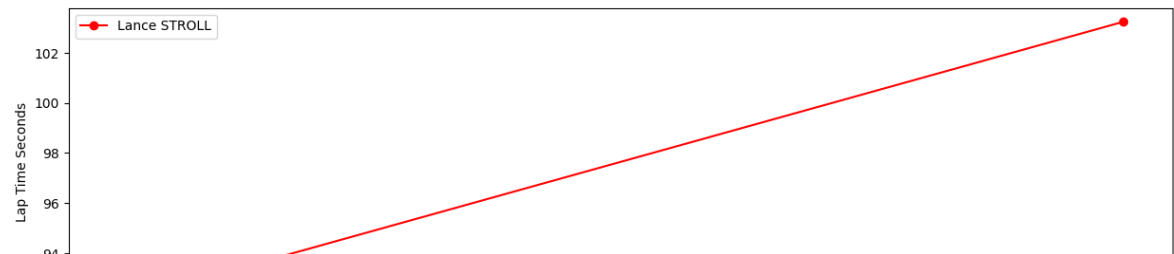
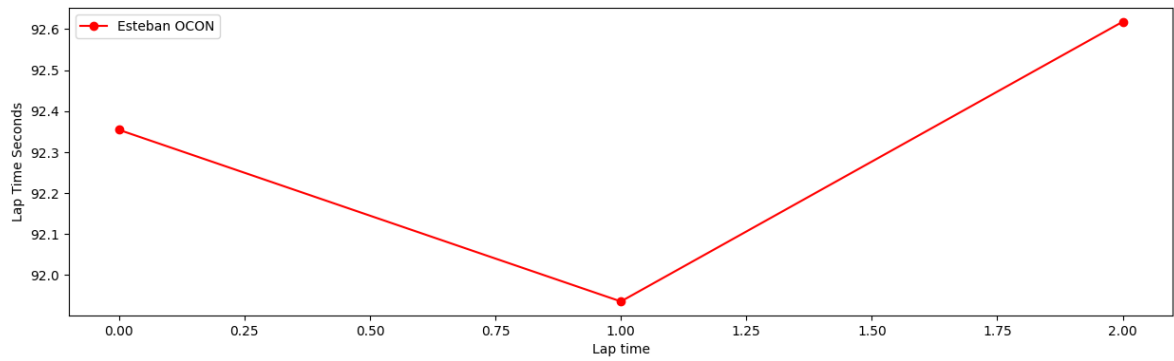
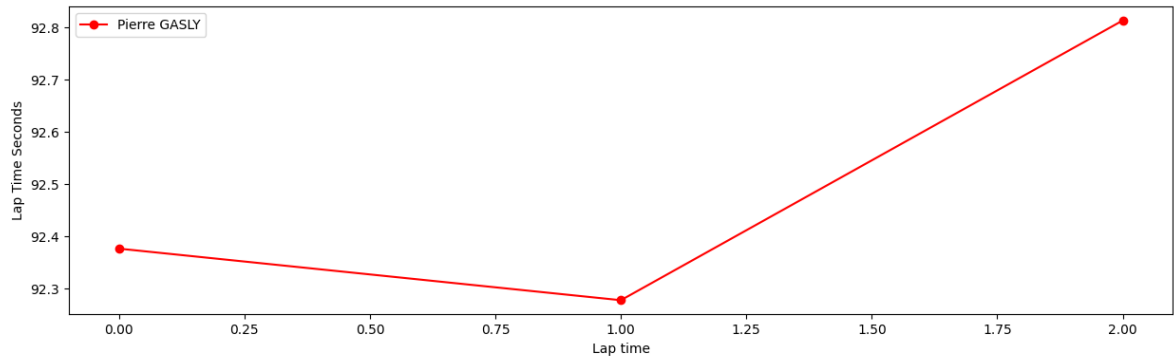
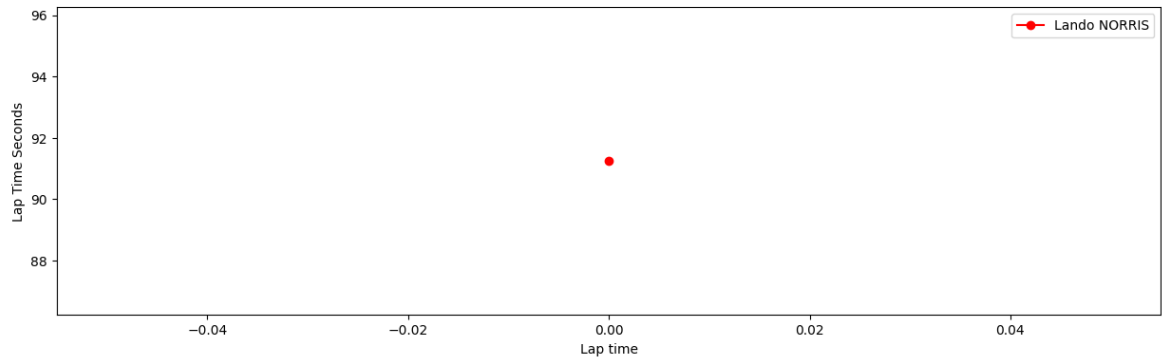
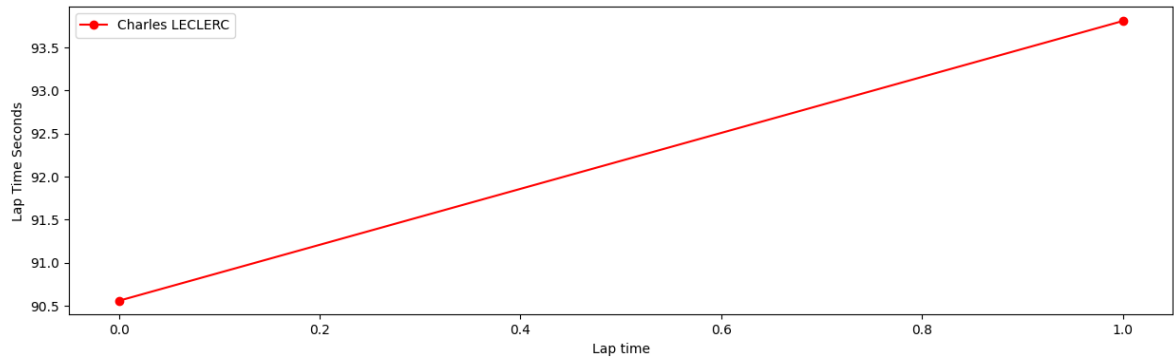
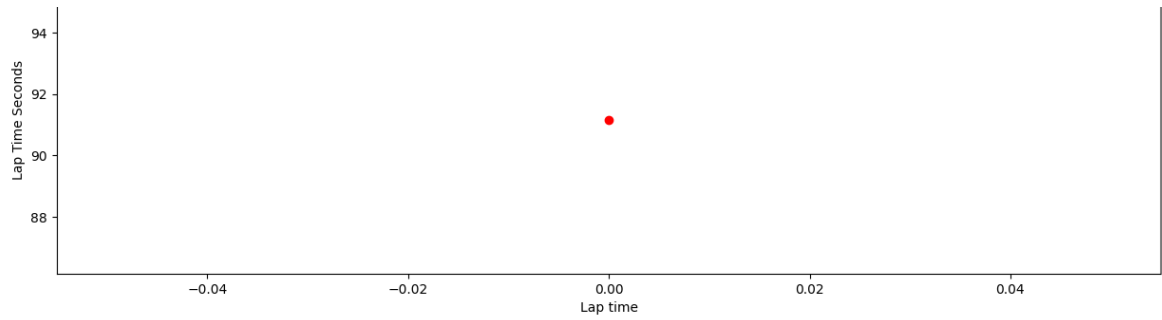
## Soft tyres

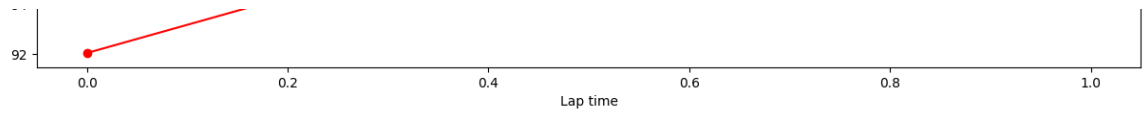
```
In [6]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",105)
```





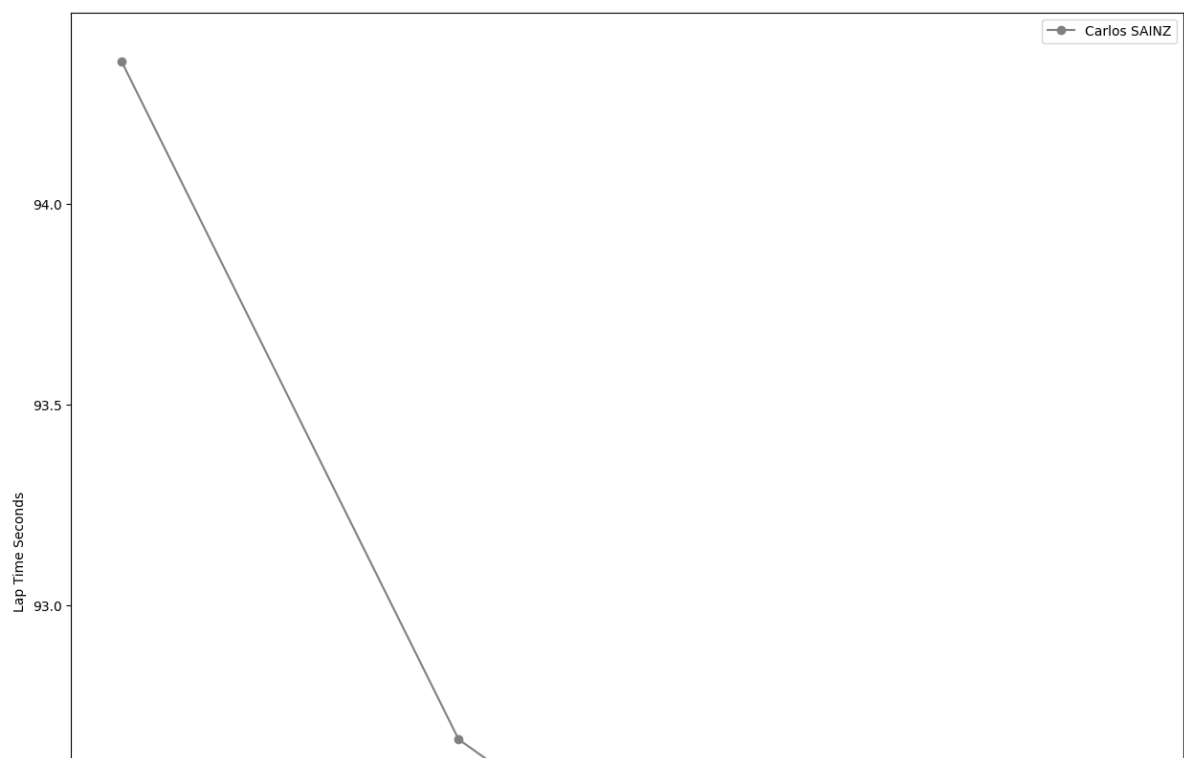
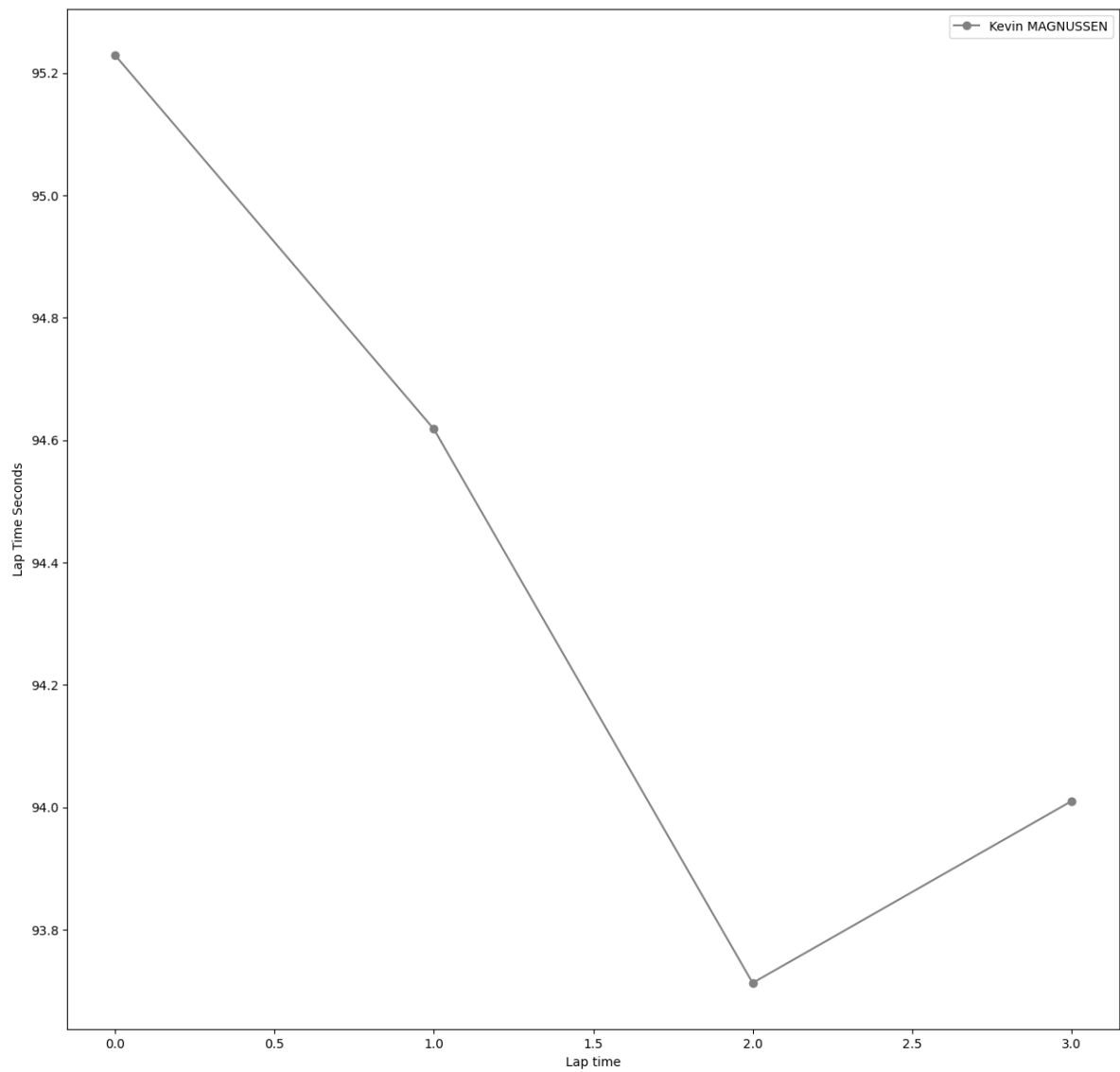


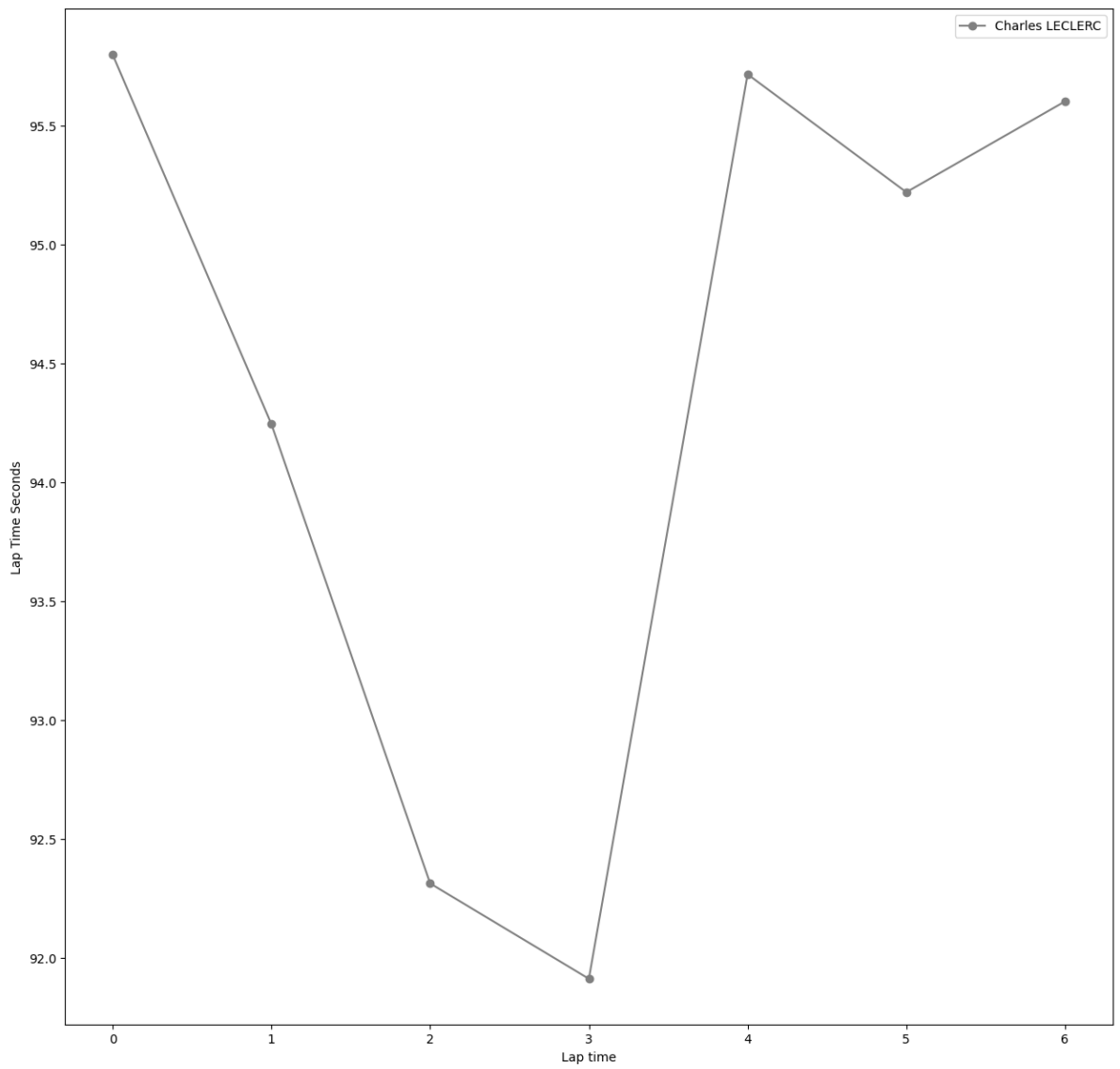
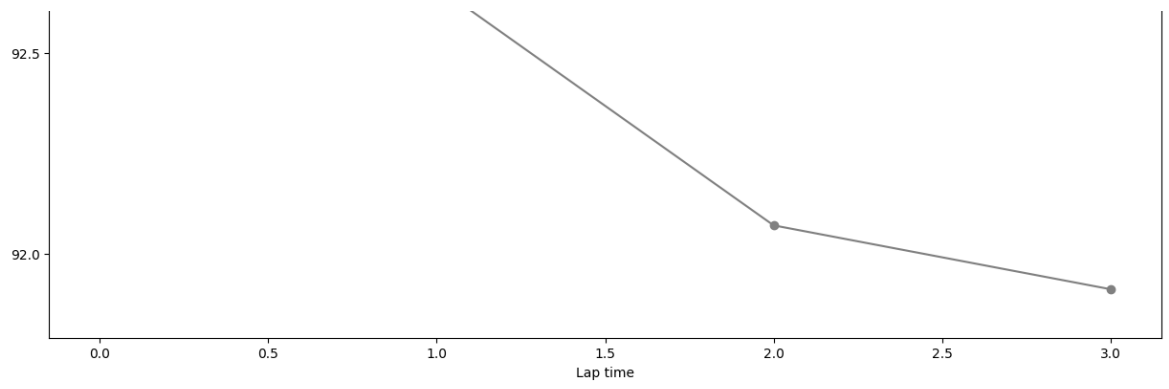


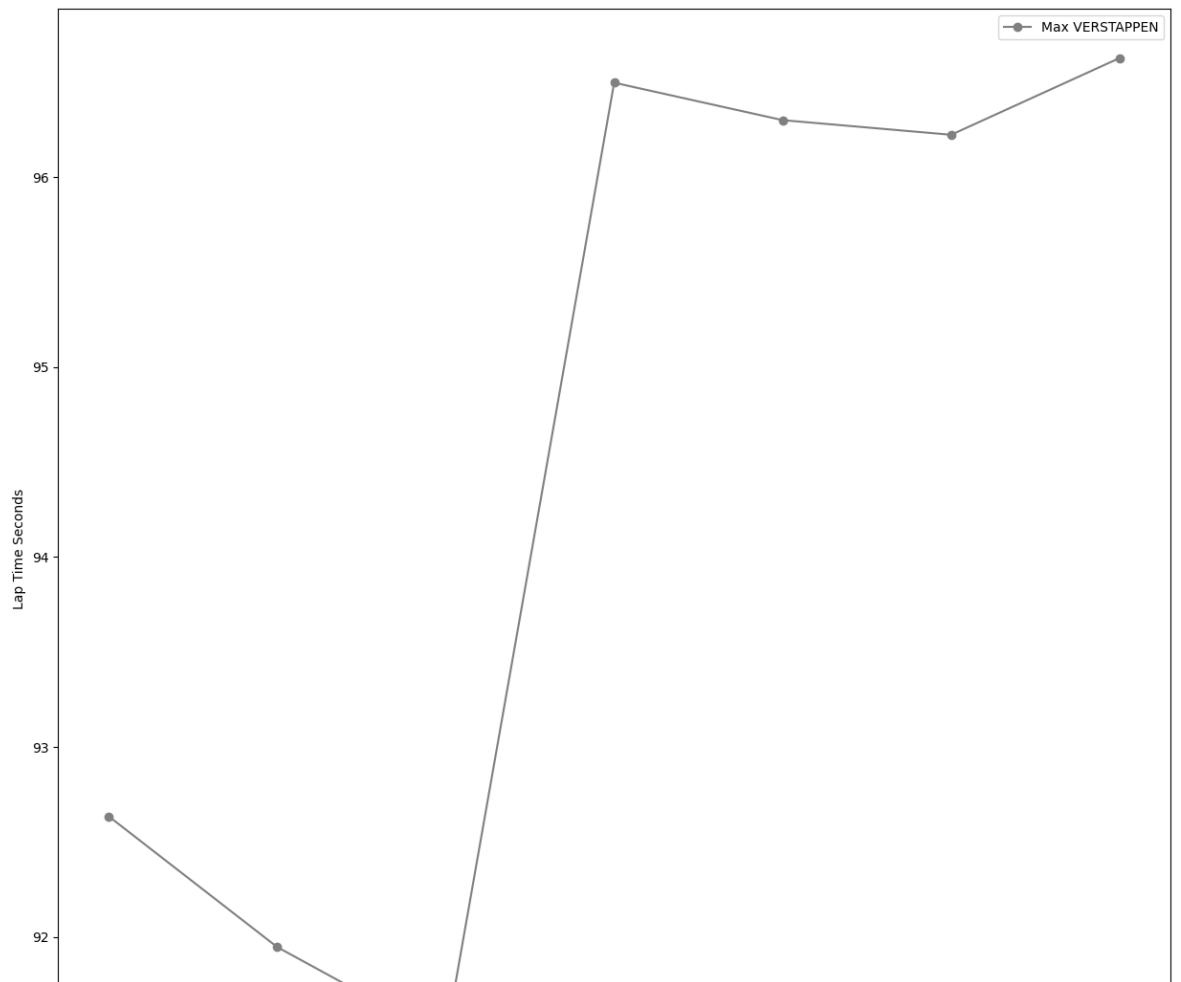
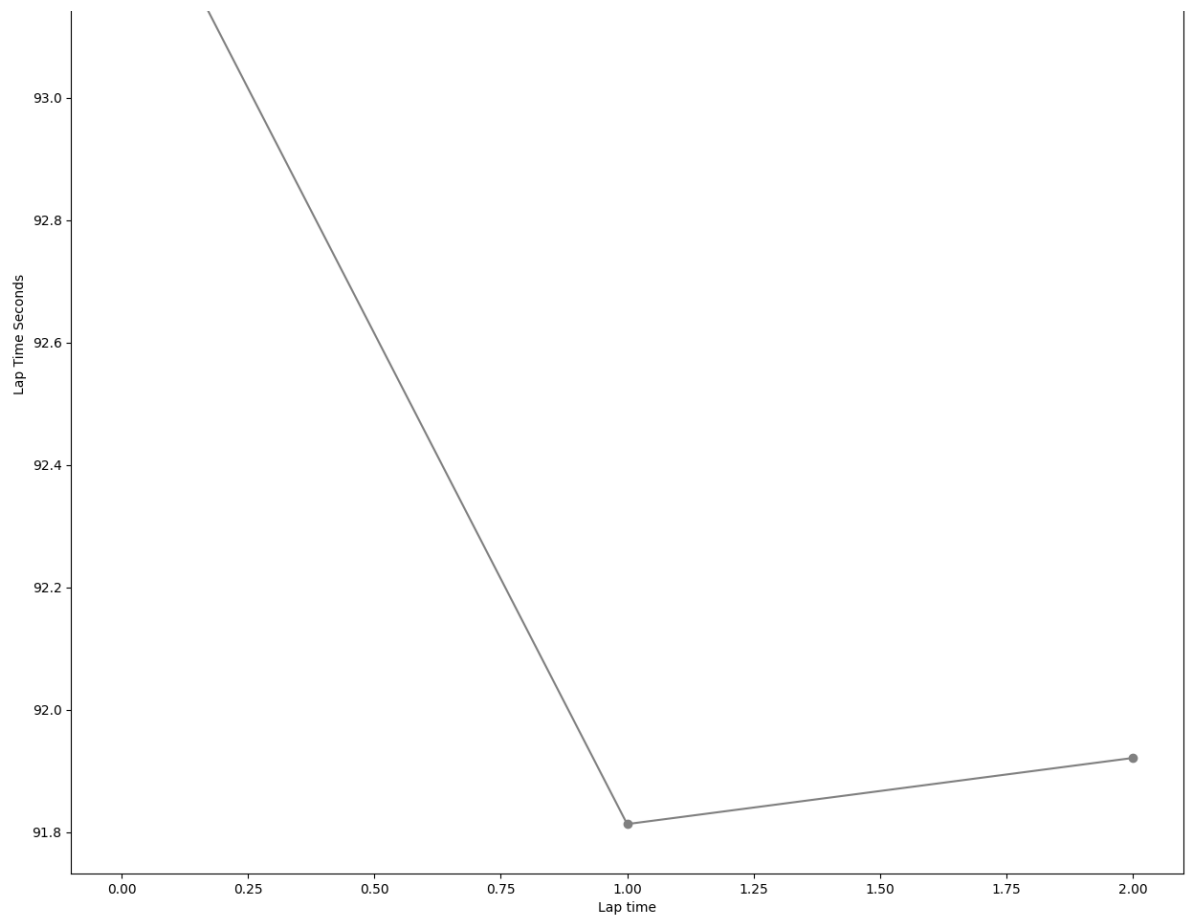


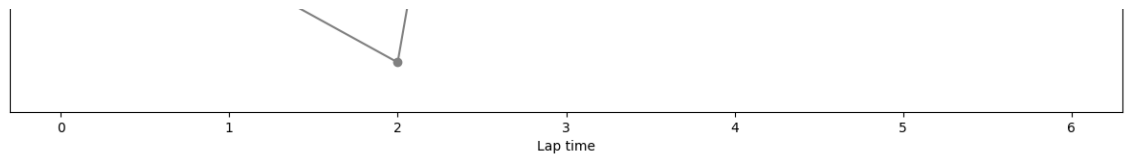
## Hard tyres

```
In [7]: libraryDataF1.obtain_data_tyres(jointables2,"HARD",105)
```



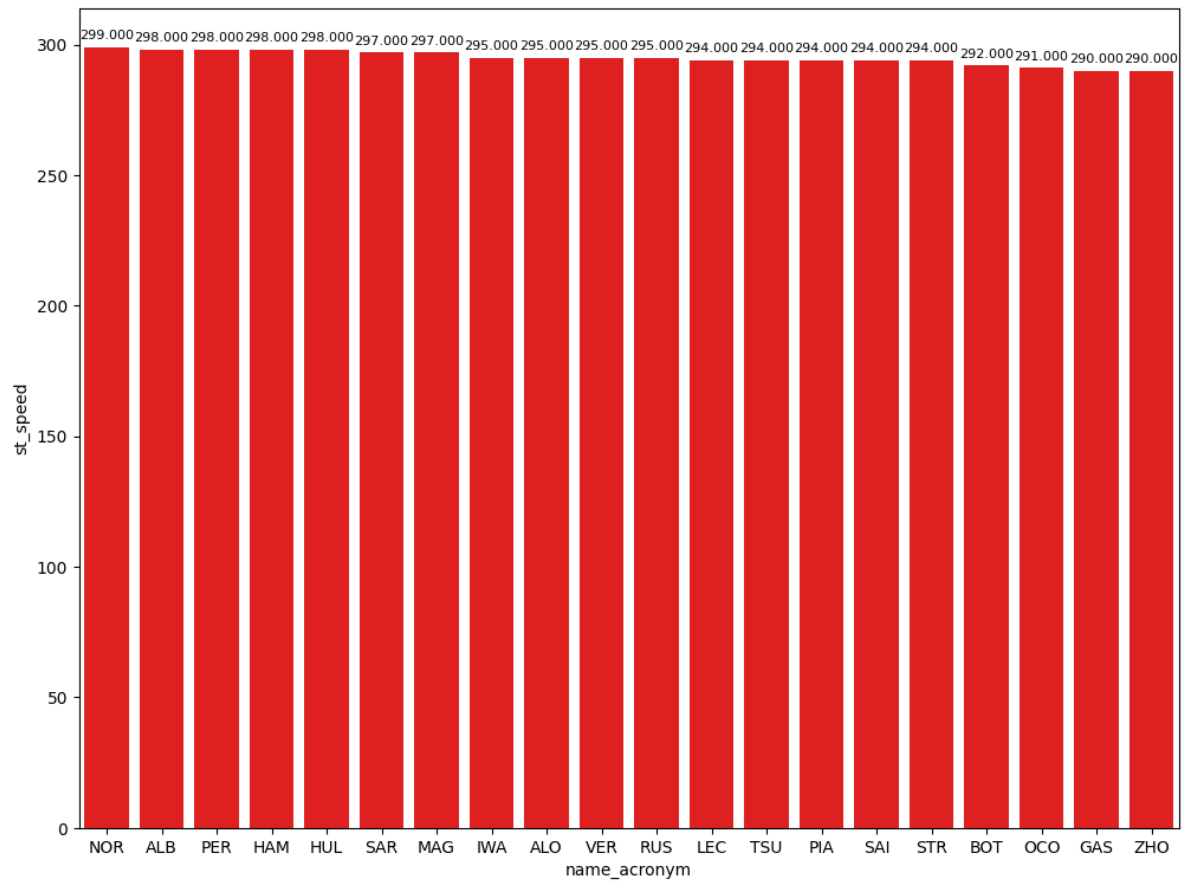




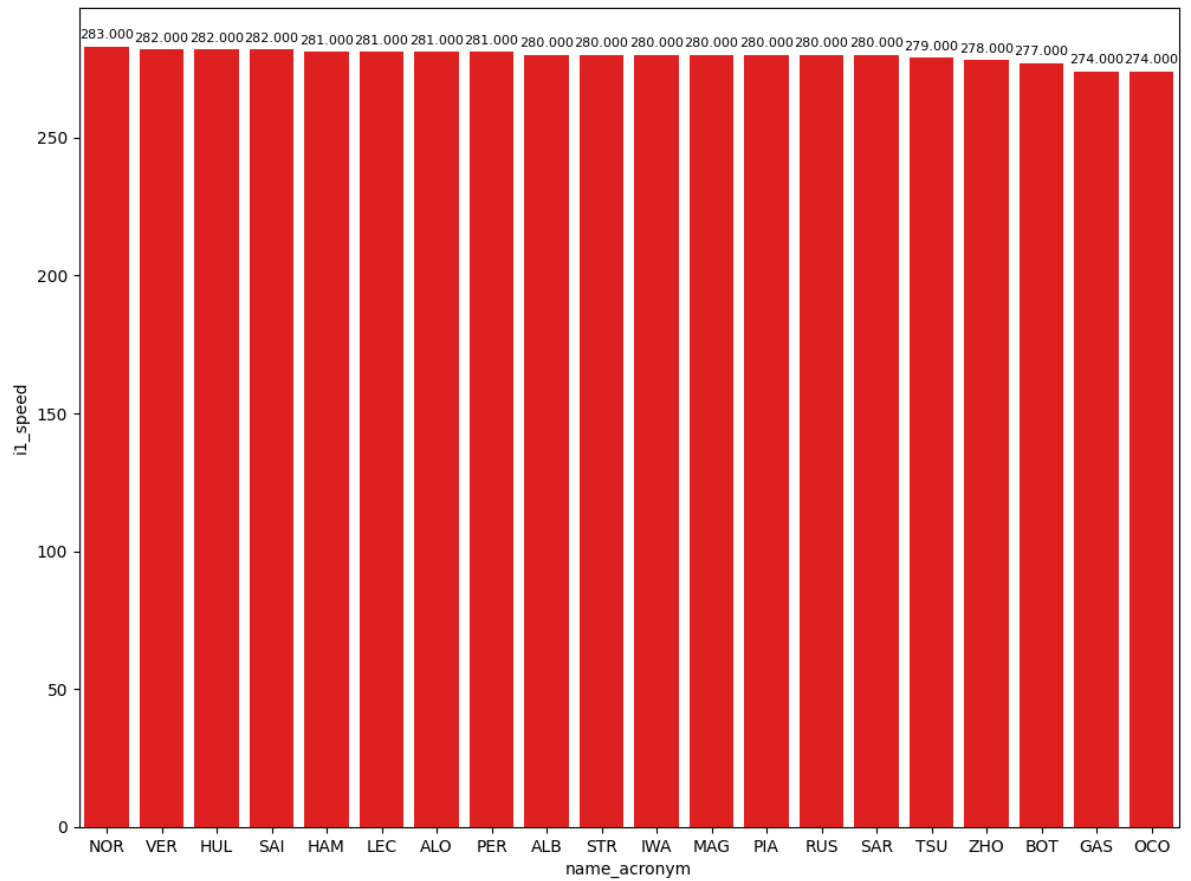


## Speed trap

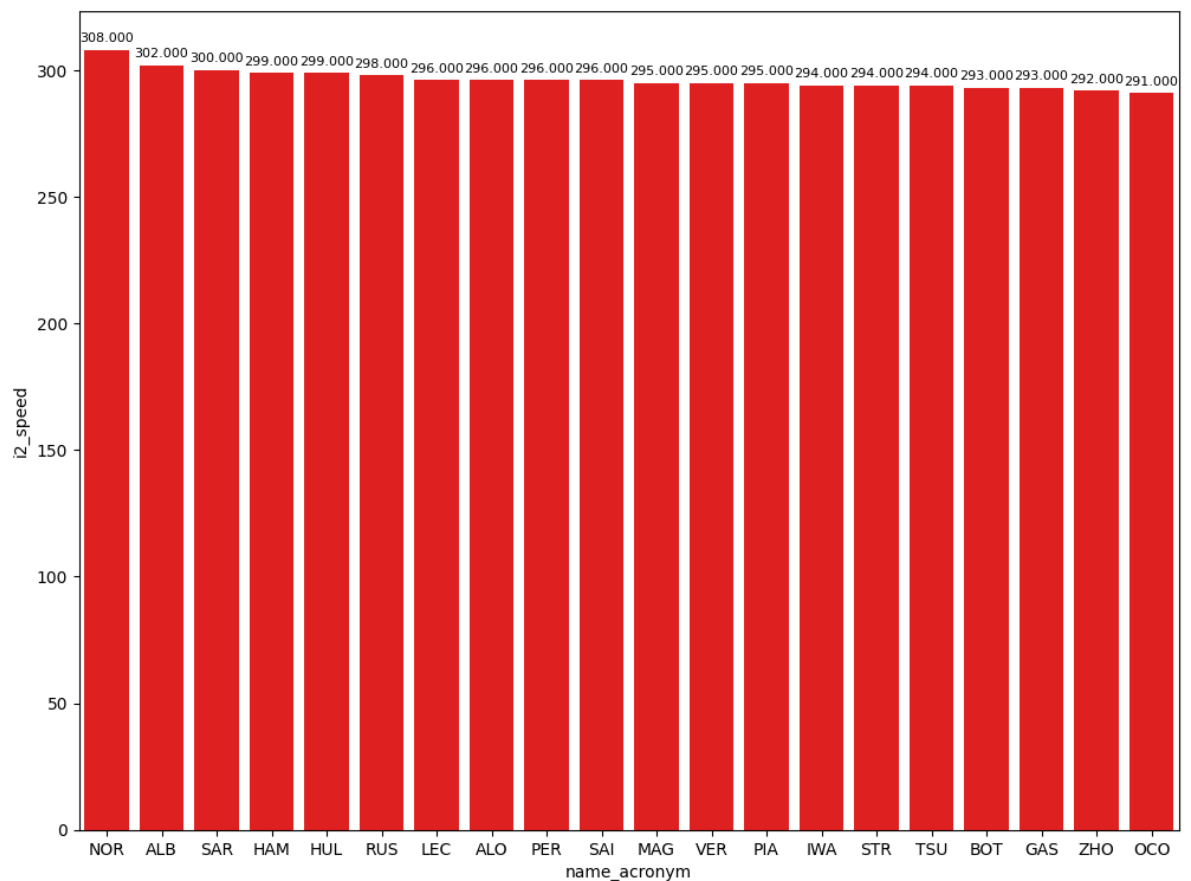
```
In [8]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed']]
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



```
In [9]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed']]
libraryDataF1.obtainchart("name_acronym","i1_speed",top_speed)
```



In [10]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i2_speed'].max()  
libraryDataF1.obtainchart("name_acronym","i2_speed",top_speed)`



Fastest lap per compound

In this section, I will show the best lap with the different compounds of the session.

```
In [11]: compoundsPace = jointables2.loc[jointables2.groupby(['compound'])['lap_duration'].min().reset_index()
compoundsPace[['full_name', 'compound', 'duration_sector_1', 'duration_sector_2', 'duration_sector_3', 'lap_duration']]
```

```
Out[11]:
```

	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
146	Max VERSTAPPEN	HARD	32.166	41.363	17.934	9
53	Lando NORRIS	MEDIUM	32.117	41.298	18.366	9
197	Max VERSTAPPEN	SOFT	31.603	40.617	17.836	9

## Deltas

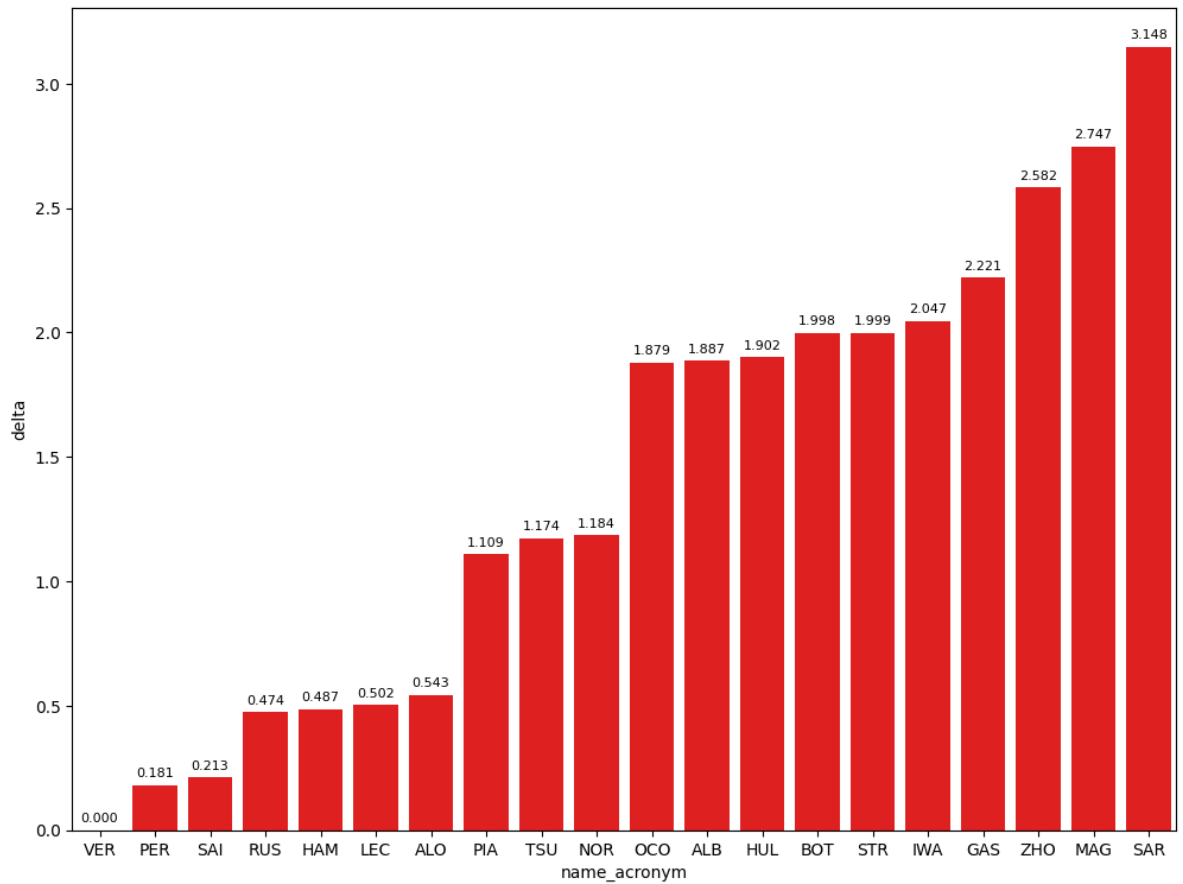
In this section we can see the deltas of the fastest lap of each driver compared with the fastest lap of the session

```
In [12]: practiceCleaned = jointables2.query("lap_duration > 1")
drivers_list = list(practiceCleaned['driver_number'].unique())
newdataset = pd.DataFrame()
for driver in drivers_list:
    newdataset = libraryDataF1.obtain_fastest_lap(driver, practiceCleaned, newdataset)

arr = libraryDataF1.obtain_deltas(newdataset)
newdataset.insert(3, 'delta', arr)
```

```
In [13]: dt = newdataset.sort_values(ascending=True, by='delta')
libraryDataF1.obtainchart("name_acronym", "delta", dt)
```





## Track dominance

In this section, best sector are taken of each sector to see the car's performance in each sector.

In [14]:

```
sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_1'].min()
sectorPace[['duration_sector_1', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

Out[14]:

	duration_sector_1	full_name	compound	lap_duration	lap_number
197	31.603	Max VERSTAPPEN	SOFT	90.056	10
201	31.629	Carlos SAINZ	SOFT	90.269	11
200	31.695	Fernando ALONSO	SOFT	90.599	11
198	31.742	Sergio PEREZ	SOFT	90.237	11
173	31.799	Lando NORRIS	SOFT	NaN	9
170	31.819	Lewis HAMILTON	SOFT	90.543	9
213	31.863	Charles LECLERC	SOFT	90.558	10
203	31.906	George RUSSELL	SOFT	90.530	10
211	31.910	Oscar PIASTRI	SOFT	91.165	12
311	32.084	Lance STROLL	SOFT	118.475	13
261	32.116	Yuki TSUNODA	SOFT	91.532	16
278	32.344	Esteban OCON	SOFT	91.935	14
267	32.430	Pierre GASLY	SOFT	92.277	17
205	32.495	Ayumu IWASA	SOFT	92.103	13

	duration_sector_1	full_name	compound	lap_duration	lap_number
214	32.517	Valtteri BOTTAS	MEDIUM	92.383	10
202	32.588	Alexander ALBON	SOFT	91.943	9
210	32.588	Nico HULKENBERG	SOFT	91.958	11
256	32.658	ZHOU Guanyu	MEDIUM	92.638	14
244	32.938	Kevin MAGNUSSEN	SOFT	92.917	13

```
In [15]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_2', 'full_name', 'compound', 'lap_duration', 'lap_number']
```

	duration_sector_2	full_name	compound	lap_duration	lap_number
198	40.602	Sergio PEREZ	SOFT	90.237	11
197	40.617	Max VERSTAPPEN	SOFT	90.056	10
201	40.618	Carlos SAINZ	SOFT	90.269	11
203	40.666	George RUSSELL	SOFT	90.530	10
213	40.694	Charles LECLERC	SOFT	90.558	10
170	40.800	Lewis HAMILTON	SOFT	90.543	9
200	40.847	Fernando ALONSO	SOFT	90.599	11
206	41.055	Yuki TSUNODA	SOFT	91.230	13
216	41.111	Lando NORRIS	SOFT	91.240	11
211	41.129	Oscar PIASTRI	SOFT	91.165	12
202	41.251	Alexander ALBON	SOFT	91.943	9
278	41.272	Esteban OCON	SOFT	91.935	14
210	41.326	Nico HULKENBERG	SOFT	91.958	11
327	41.356	Lance STROLL	SOFT	92.055	14
246	41.420	Valtteri BOTTAS	MEDIUM	92.054	12
205	41.482	Ayumu IWASA	SOFT	92.103	13
222	41.525	Pierre GASLY	SOFT	92.376	14
208	41.640	Kevin MAGNUSSEN	SOFT	92.803	11
83	41.642	ZHOU Guanyu	MEDIUM	92.656	6
111	41.692	Logan SARGEANT	MEDIUM	93.204	6

```
In [16]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_3', 'full_name', 'compound', 'lap_duration', 'lap_number']
```

	duration_sector_3	full_name	compound	lap_duration	lap_number
197	17.836	Max VERSTAPPEN	SOFT	90.056	10
198	17.893	Sergio PEREZ	SOFT	90.237	11
170	17.924	Lewis HAMILTON	SOFT	90.543	9
203	17.958	George RUSSELL	SOFT	90.530	10
213	18.001	Charles LECLERC	SOFT	90.558	10

	duration_sector_3	full_name	compound	lap_duration	lap_number
201	18.022	Carlos SAINZ	SOFT	90.269	11
210	18.044	Nico HULKENBERG	SOFT	91.958	11
206	18.051	Yuki TSUNODA	SOFT	91.230	13
200	18.057	Fernando ALONSO	SOFT	90.599	11
291	18.098	Alexander ALBON	SOFT	92.619	14
246	18.115	Valtteri BOTTAS	MEDIUM	92.054	12
205	18.126	Ayumu IWASA	SOFT	92.103	13
211	18.126	Oscar PIASTRI	SOFT	91.165	12
208	18.205	Kevin MAGNUSSEN	SOFT	92.803	11
216	18.206	Lando NORRIS	SOFT	91.240	11
159	18.237	Lance STROLL	MEDIUM	92.492	4
267	18.310	Pierre GASLY	SOFT	92.277	17
278	18.319	Esteban OCON	SOFT	91.935	14
256	18.337	ZHOU Guanyu	MEDIUM	92.638	14
...	...	...	...	...	...

## Mean pace with the different compound used on the session

```
In [17]: race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and l
race_pace
```

```
Out[17]:
```

	lap_duration
compound	
MEDIUM	93.606955
HARD	93.929120
SOFT	94.226729

## Long runs

```
In [18]: MINIMUM_SECONDS = 93
MAXIMUM_SECONDS = 105
```

## Red Bull Racing

```
In [19]: stintInformation.query('driver_number == 1 or driver_number == 11')
```

```
Out[19]:
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1232	9489	1	1	1	2	HARD	
6	1232	9489	1	11	1	6	HARD	
21	1232	9489	2	1	3	9	HARD	
28	1232	9489	2	11	7	10	HARD	
39	1232	9489	3	1	10	12	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
45	1232	9489	3	11	11	13	SOFT	
58	1232	9489	4	1	13	19	HARD	
61	1232	9489	4	11	14	16	SOFT	

In [20]: `libraryDataF1.getinfo(longruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS,`

Out[20]:

	full_name	compound	date_start	lap_number	duration_sector_1	
215	Max VERSTAPPEN	SOFT	2024-04-05T03:14:30.874000+00:00	11	37.651	
292	Max VERSTAPPEN	HARD	2024-04-05T03:24:11.597000+00:00	13	34.702	
303	Max VERSTAPPEN	HARD	2024-04-05T03:25:48.167000+00:00	14	34.629	
318	Max VERSTAPPEN	HARD	2024-04-05T03:27:24.486000+00:00	15	34.681	
336	Max VERSTAPPEN	HARD	2024-04-05T03:29:00.641000+00:00	16	34.707	

In [21]: `libraryDataF1.getinfo(longruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,`

Out[21]:

	full_name	compound	date_start	lap_number	duration_sector_1	
30	Sergio PEREZ	HARD	2024-04-05T02:33:49.433000+00:00	2	33.059	
264	Sergio PEREZ	SOFT	2024-04-05T03:21:08.093000+00:00	15	37.527	

## Ferrari

In [22]: `libraryDataF1.getinfo(longruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAX_SECONDS,`

Out[22]:

	full_name	compound	date_start	lap_number	duration_sector_1	
25	Charles LECLERC	HARD	2024-04-05T02:33:25.291000+00:00	2	33.902	
40	Charles LECLERC	HARD	2024-04-05T02:35:00.927000+00:00	3	33.541	
248	Charles LECLERC	SOFT	2024-04-05T03:18:20.275000+00:00	12	32.031	
305	Charles LECLERC	HARD	2024-04-05T03:25:55.827000+00:00	14	34.462	
319	Charles LECLERC	HARD	2024-04-05T03:27:31.568000+00:00	15	34.146	
337	Charles LECLERC	HARD	2024-04-05T03:29:06.902000+00:00	16	34.365	

In [23]: `libraryDataF1.getinfo(longruns(jointables2,55,'Ferrari',MINIMUM_SECONDS,MAX_SECONDS,`

Out[23]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
24	Carlos SAINZ	HARD	2024-04-05T02:33:16.919000+00:00	2	33.588	
275	Carlos SAINZ	SOFT	2024-04-05T03:22:05.117000+00:00	14	34.364	
286	Carlos SAINZ	SOFT	2024-04-05T03:23:40.839000+00:00	15	34.550	
300	Carlos SAINZ	SOFT	2024-04-05T03:25:16.905000+00:00	16	34.654	
314	Carlos SAINZ	SOFT	2024-04-05T03:26:53.415000+00:00	17	34.792	
329	Carlos SAINZ	SOFT	2024-04-05T03:28:29.584000+00:00	18	34.570	

Mercedes

In [24]:

```
stintInformation.query('driver_number == 63 or driver_number == 44')
```

Out[24]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
11	1232	9489	1	44	1	8	MEDIUM	
16	1232	9489	1	63	1	9	MEDIUM	
34	1232	9489	2	44	9	11	SOFT	
41	1232	9489	2	63	10	12	SOFT	
54	1232	9489	3	44	12	20	SOFT	
59	1232	9489	3	63	13	19	SOFT	
78	1232	9489	4	44	21	24	MEDIUM	

In [25]:

```
libraryDataF1.getinfo(longruns(jointables2,44,'Mercedes',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[25]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
207	Lewis HAMILTON	SOFT	2024-04-05T03:13:56.194000+00:00	12	34.398	
226	Lewis HAMILTON	SOFT	2024-04-05T03:15:31.467000+00:00	13	34.319	
237	Lewis HAMILTON	SOFT	2024-04-05T03:17:07.381000+00:00	14	34.442	
250	Lewis HAMILTON	SOFT	2024-04-05T03:18:43.675000+00:00	15	34.810	
263	Lewis HAMILTON	SOFT	2024-04-05T03:20:20.437000+00:00	16	34.682	
274	Lewis HAMILTON	SOFT	2024-04-05T03:21:57.199000+00:00	17	34.844	
284	Lewis HAMILTON	SOFT	2024-04-05T03:23:34.284000+00:00	18	35.023	
298	Lewis HAMILTON	SOFT	2024-04-05T03:25:12.038000+00:00	19	35.227	

```
full_name compound date_start lap_number duration_sector_1 d
In [26]: libraryDataF1.getinfo(longruns(jointables2,63,'Mercedes',MINIMUM_SECONDS,MAXI
```

```
Out[26]: full_name compound date_start lap_number duration_sector_1 d
46 George RUSSELL MEDIUM 2024-04-05T02:35:49.985000+00:00 3 32.798
294 George RUSSELL SOFT 2024-04-05T03:24:23.738000+00:00 13 34.339
306 George RUSSELL SOFT 2024-04-05T03:25:59.494000+00:00 14 34.576
320 George RUSSELL SOFT 2024-04-05T03:27:35.712000+00:00 15 34.648
338 George RUSSELL SOFT 2024-04-05T03:29:12.385000+00:00 16 34.740
```

## McLaren

```
In [27]: stintInformation.query('driver_number == 81 or driver_number == 4')
```

```
Out[27]: meeting_key session_key stint_number driver_number lap_start lap_end compound tyre
7 1232 9489 1 81 1 6 MEDIUM
8 1232 9489 1 4 1 8 MEDIUM
27 1232 9489 2 81 7 9 MEDIUM
31 1232 9489 2 4 9 10 SOFT
38 1232 9489 3 81 10 11 SOFT
44 1232 9489 3 4 11 13 SOFT
53 1232 9489 4 81 12 14 SOFT
68 1232 9489 4 4 14 23 MEDIUM
70 1232 9489 5 81 15 24 MEDIUM
```

```
In [28]: libraryDataF1.getinfo(longruns(jointables2,4,'McLaren',MINIMUM_SECONDS,MAXI
```

```
Out[28]: full_name compound date_start lap_number duration_sector_1 d
258 Lando NORRIS MEDIUM 2024-04-05T03:19:49.548000+00:00 14 33.537
268 Lando NORRIS MEDIUM 2024-04-05T03:21:23.600000+00:00 15 33.534
281 Lando NORRIS MEDIUM 2024-04-05T03:22:57.439000+00:00 16 33.268
295 Lando NORRIS MEDIUM 2024-04-05T03:24:30.918000+00:00 17 33.462
307 Lando NORRIS MEDIUM 2024-04-05T03:26:04.898000+00:00 18 33.494
321 Lando NORRIS MEDIUM 2024-04-05T03:27:39.099000+00:00 19 33.551
```

full\_name compound date\_start lap\_number duration\_sector\_1 du

In [29]: libraryDataF1.getinfo(longruns(jointables2,81,'McLaren',MINIMUM\_SECONDS,MAX\_SECONDS))

	full_name	compound	date_start	lap_number	duration_sector_1	duration
27	Oscar PIASTRI	MEDIUM	2024-04-05T02:33:39.451000+00:00	2	34.114	
259	Oscar PIASTRI	MEDIUM	2024-04-05T03:19:56.208000+00:00	15	33.386	
269	Oscar PIASTRI	MEDIUM	2024-04-05T03:21:30.394000+00:00	16	33.386	
282	Oscar PIASTRI	MEDIUM	2024-04-05T03:23:04.143000+00:00	17	33.432	
296	Oscar PIASTRI	MEDIUM	2024-04-05T03:24:38.013000+00:00	18	33.364	
309	Oscar PIASTRI	MEDIUM	2024-04-05T03:26:11.757000+00:00	19	33.407	
322	Oscar PIASTRI	MEDIUM	2024-04-05T03:27:46.842000+00:00	20	33.793	
340	Oscar PIASTRI	MEDIUM	2024-04-05T03:29:21.845000+00:00	21	33.684	

## Aston Martin

In [30]: stintInformation.query('driver\_number == 18 or driver\_number == 14')

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
3	1232	9489	1	18	1	3	MEDIUM	
17	1232	9489	1	14	1	10	MEDIUM	
24	1232	9489	2	18	4	7	MEDIUM	
30	1232	9489	3	18	8	12	MEDIUM	
46	1232	9489	2	14	11	13	SOFT	
56	1232	9489	4	18	13	18	SOFT	
66	1232	9489	3	14	14	21	SOFT	

In [31]: libraryDataF1.getinfo(longruns(jointables2,14,'Aston Martin',MINIMUM\_SECONDS,MAX\_SECONDS))

	full_name	compound	date_start	lap_number	duration_sector_1	duration
26	Fernando ALONSO	MEDIUM	2024-04-05T02:33:33.801000+00:00	2	32.579	
283	Fernando ALONSO	SOFT	2024-04-05T03:23:19.224000+00:00	14	34.241	
297	Fernando ALONSO	SOFT	2024-04-05T03:24:54.907000+00:00	15	34.374	
313	Fernando ALONSO	SOFT	2024-04-05T03:26:31.311000+00:00	16	34.534	

	full_name	compound	date_start	lap_number	duration_sector_1	du
326	Fernando ALONSO	SOFT	2024-04-05T03:28:08.139000+00:00	17	34.682	
-	.					

In [32]: `libraryDataF1.getinfo(longruns(jointables2,18,'Aston Martin',MINIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1	du
249	Lance STROLL	MEDIUM	2024-04-05T03:18:34.499000+00:00	11	35.198	
344	Lance STROLL	SOFT	2024-04-05T03:29:58.372000+00:00	15	36.930	

## RB

In [33]: `stintInformation.query('driver_number == 3 or driver_number == 22')`

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
15	1232	9489	1	22	1	9	MEDIUM	
40	1232	9489	2	22	10	12	MEDIUM	
57	1232	9489	3	22	13	18	SOFT	
76	1232	9489	4	22	19	21	MEDIUM	

In [34]: `libraryDataF1.getinfo(longruns(jointables2,3,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_
--	-----------	----------	------------	------------	-------------------	-------------------	-----------

In [35]: `libraryDataF1.getinfo(longruns(jointables2,22,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1	du
28	Yuki TSUNODA	MEDIUM	2024-04-05T02:33:43.273000+00:00	2	33.939	

## Haas

In [36]: `libraryDataF1.getinfo(longruns(jointables2,20,'Haas F1 Team',MINIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1	du
22	Kevin MAGNUSSEN	HARD	2024-04-05T02:33:01.406000+00:00	2	34.184	
37	Kevin MAGNUSSEN	HARD	2024-04-05T02:34:36.579000+00:00	3	33.714	
67	Kevin MAGNUSSEN	HARD	2024-04-05T02:38:25.929000+00:00	5	33.268	
100	Kevin MAGNUSSEN	HARD	2024-04-05T02:42:21.613000+00:00	7	33.438	



	full_name	compound	date_start	lap_number	duration_sector_1
270	Kevin MAGNUSSEN	SOFT	2024-04-05T03:21:35.268000+00:00	15	33.213
310	Kevin MAGNUSSEN	SOFT	2024-04-05T03:26:20.508000+00:00	17	32.982

In [37]: `libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS,`

Out[37]:

	full_name	compound	date_start	lap_number	duration_sector_1
47	Nico HULKENBERG	MEDIUM	2024-04-05T02:35:59.439000+00:00	2	34.036
78	Nico HULKENBERG	MEDIUM	2024-04-05T02:39:47.891000+00:00	4	33.078
112	Nico HULKENBERG	MEDIUM	2024-04-05T02:43:52.248000+00:00	6	33.358
288	Nico HULKENBERG	SOFT	2024-04-05T03:23:52.410000+00:00	14	34.847
301	Nico HULKENBERG	SOFT	2024-04-05T03:25:29.091000+00:00	15	35.006
316	Nico HULKENBERG	SOFT	2024-04-05T03:27:06.319000+00:00	16	35.347
333	Nico HULKENBERG	SOFT	2024-04-05T03:28:43.949000+00:00	17	35.868

## Alpine

In [38]: `libraryDataF1.getinfo(longruns(jointables2,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

Out[38]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
23	Esteban OCON	MEDIUM	2024-04-05T02:33:10.580000+00:00	2	33.389	33.389
54	Esteban OCON	MEDIUM	2024-04-05T02:37:04.922000+00:00	4	32.835	32.835
87	Esteban OCON	MEDIUM	2024-04-05T02:41:12.971000+00:00	6	32.739	32.739
123	Esteban OCON	MEDIUM	2024-04-05T02:45:09.997000+00:00	8	32.737	32.737

In [39]: `libraryDataF1.getinfo(longruns(jointables2,10,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

Out[39]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
31	Pierre GASLY	MEDIUM	2024-04-05T02:33:54.883000+00:00	2	34.570	34.570
64	Pierre GASLY	MEDIUM	2024-04-05T02:37:48.097000+00:00	4	33.476	33.476
117	Pierre GASLY	MEDIUM	2024-04-05T02:44:22.660000+00:00	7	32.901	32.901
140	Pierre GASLY	MEDIUM	2024-04-05T02:48:08.396000+00:00	9	32.748	32.748

## Williams

```
In [40]: libraryDataF1.getinfo(longruns(jointables2,23,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[40]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
158	Alexander ALBON	MEDIUM	2024-04-05T02:55:17.261000+00:00	5	33.298	

```
In [41]: libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[41]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
48	Logan SARGEANT	MEDIUM	2024-04-05T02:36:08.817000+00:00	2	35.260	
79	Logan SARGEANT	MEDIUM	2024-04-05T02:39:56.518000+00:00	4	33.760	
111	Logan SARGEANT	MEDIUM	2024-04-05T02:43:45.887000+00:00	6	33.056	

## Kick Sauber

```
In [42]: libraryDataF1.getinfo(longruns(jointables2,24,'Kick Sauber',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[42]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
20	ZHOU Guanyu	MEDIUM	2024-04-05T02:32:37.783000+00:00	2	34.163	
50	ZHOU Guanyu	MEDIUM	2024-04-05T02:36:27.576000+00:00	4	32.939	
231	ZHOU Guanyu	MEDIUM	2024-04-05T03:15:54.943000+00:00	12	32.741	

```
In [43]: libraryDataF1.getinfo(longruns(jointables2,77,'Kick Sauber',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[43]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
119	Valtteri BOTTAS	MEDIUM	2024-04-05T02:44:46.270000+00:00	3	33.046	

## Free Practice 2

### Obtain setup

```
In [44]: practice = libraryDataF1.obtain_information('laps',session_key=9490)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9490)
drivers = libraryDataF1.obtain_information('drivers',session_key=9490)
```

```
In [45]: stintsDataFrame =libraryDataF1.stint_configuration(drivers,stintInformation)
jointables2 = pd.merge(practice,stintsDataFrame,on=['lap_number','driver_number'])
jointables2
```

```
Out[45]:
```

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1232	9490	3	169.0	212	128	2024-04-05T06:15:4
1	1232	9490	4	206.0	295	293	2024-04-05T06:58:2
2	1232	9490	16	249.0	270	264	2024-04-05T06:57:5
3	1232	9490	20	161.0	271	223	2024-04-05T06:52:2
4	1232	9490	22	261.0	264	245	2024-04-05T06:28:5
...	...	...	...	...	...	...	
66	1232	9490	77	262.0	159	158	2024-04-05T07:03:0
67	1232	9490	81	263.0	280	236	2024-04-05T07:02:1
68	1232	9490	3	241.0	270	271	2024-04-05T07:01:1
69	1232	9490	22	205.0	254	175	2024-04-05T07:02:5
70	1232	9490	3	208.0	263	265	2024-04-05T07:03:1

71 rows × 20 columns

See race pace by means of the charts

Medium tyres

```
In [46]: #libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",93)
```

Soft tyres

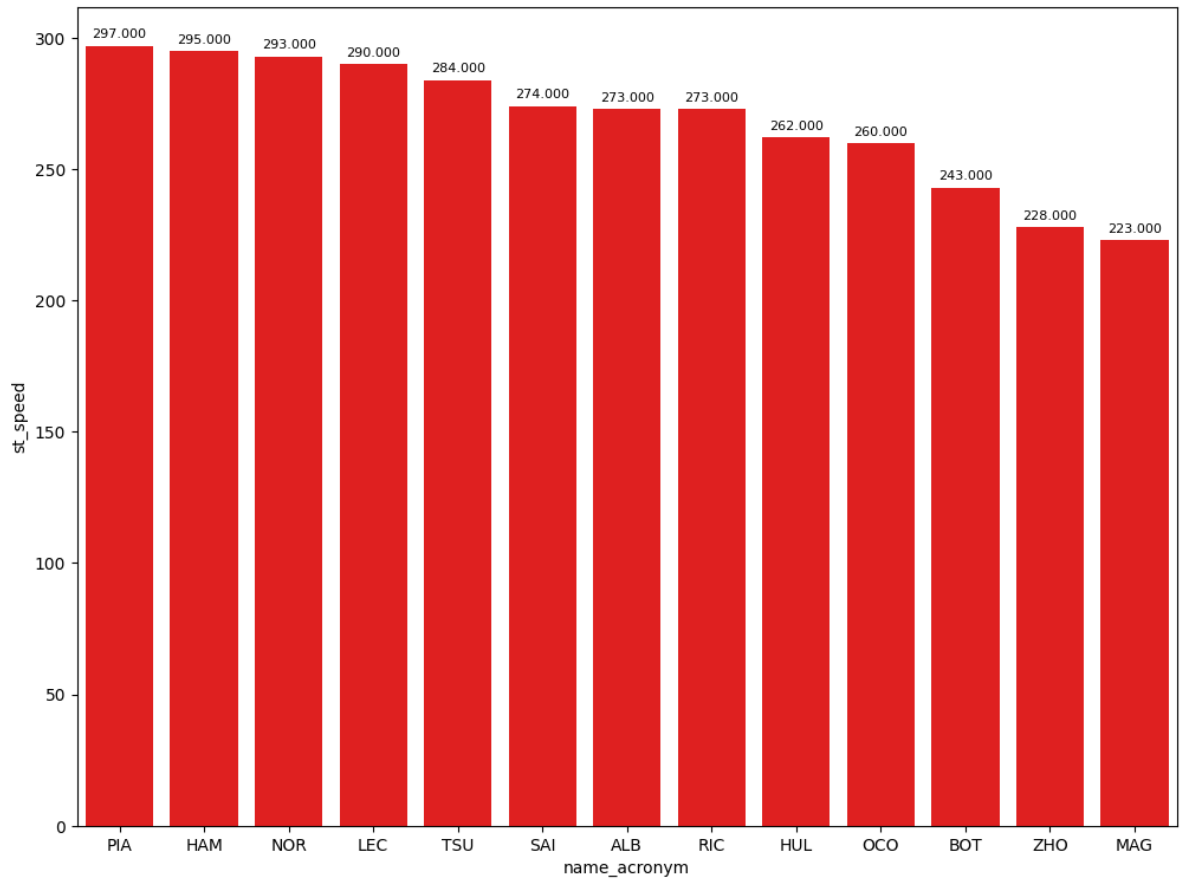
```
In [47]: #libraryDataF1.obtain_data_tyres(jointables2,"SOFT",93)
```

Hard tyres

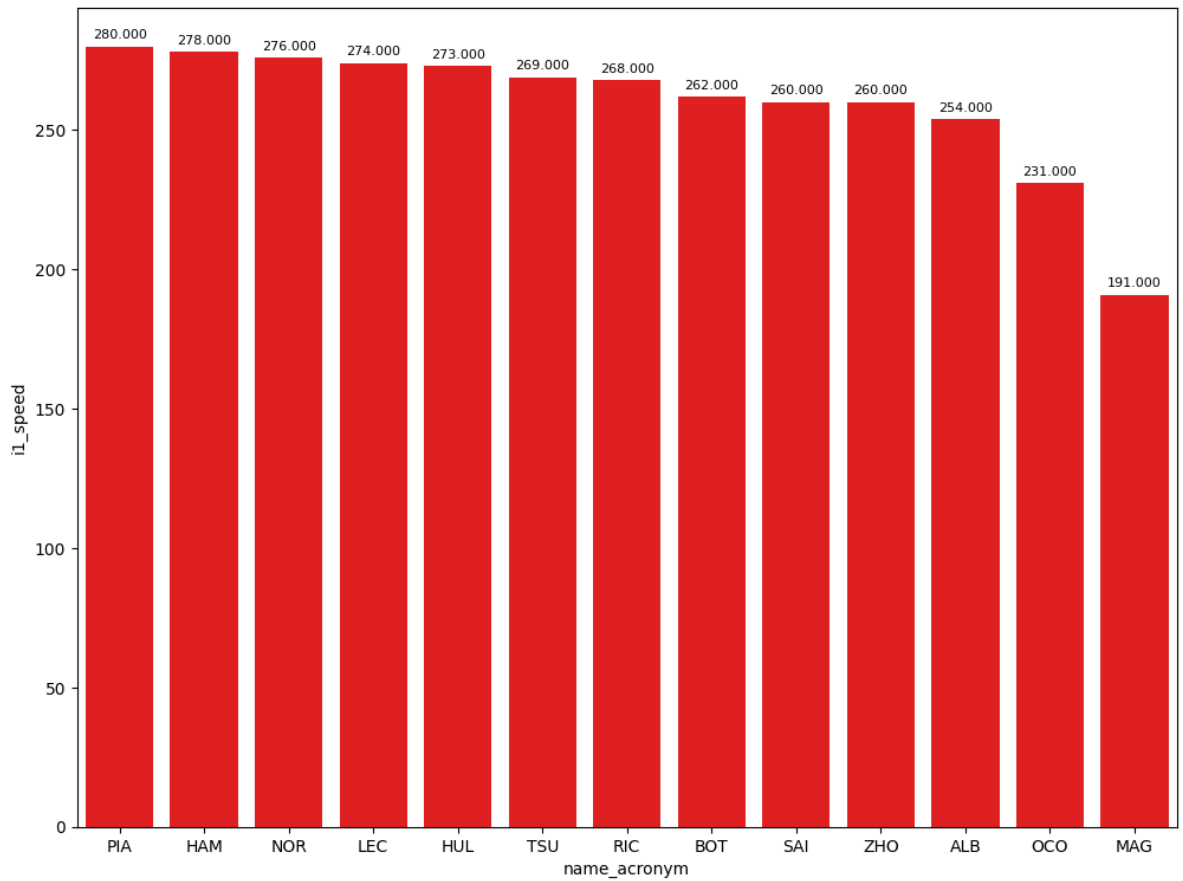
```
In [48]: #libraryDataF1.obtain_data_tyres(jointables2,"HARD",93)
```

## Speed trap

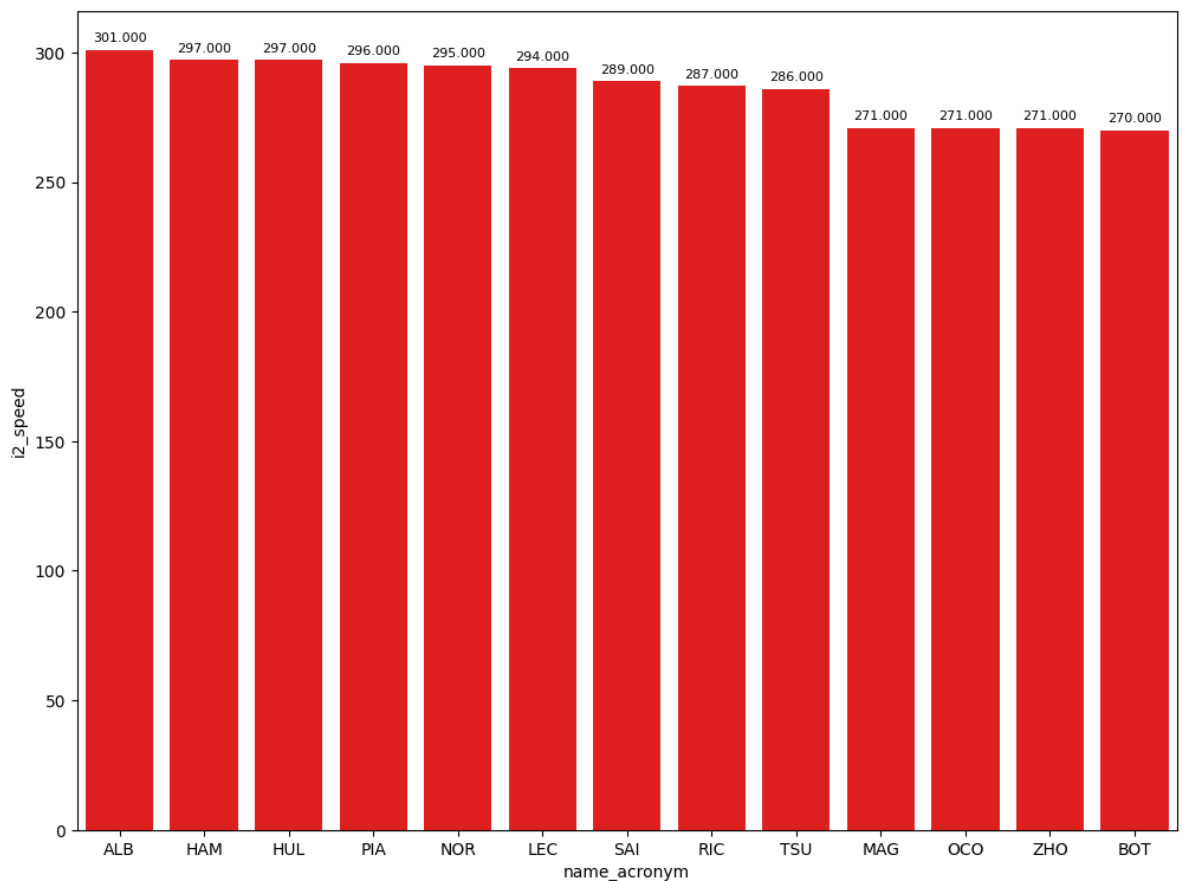
```
In [49]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed']]
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



```
In [50]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed']]
libraryDataF1.obtainchart("name_acronym","i1_speed",top_speed)
```



In [51]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i2_speed'].rank(ascending=False)]`  
`libraryDataF1.obtainchart("name_acronym","i2_speed",top_speed)`



Fastest lap per compound

In this section, I will show the best lap with the different compounds of the session.

```
In [52]: compoundsPace = jointables2.loc[jointables2.groupby(['compound'])['lap_duration'].min()  
compoundsPace[['full_name', 'compound', 'duration_sector_1', 'duration_sector_2', 'duration_sector_3', 'lap_duration']]
```

```
Out[52]:
```

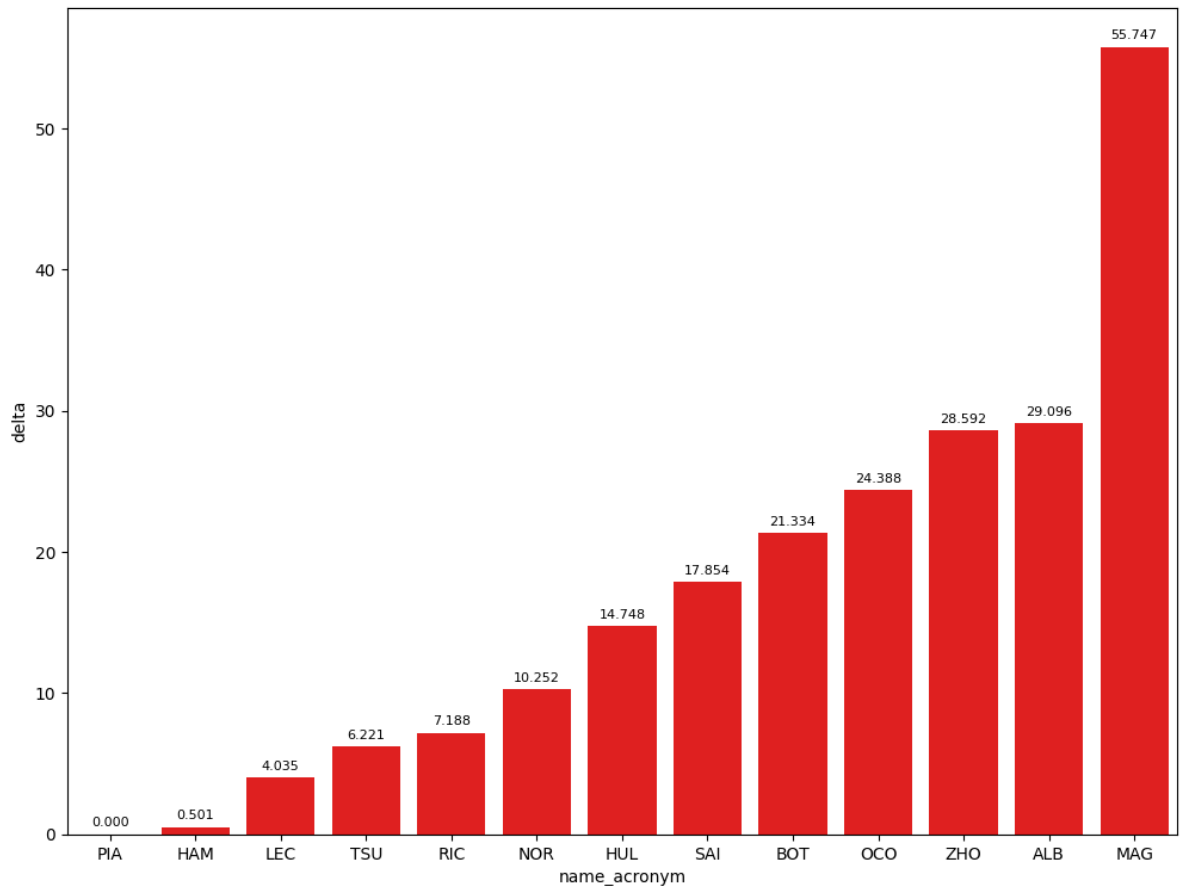
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
42	Yuki TSUNODA	INTERMEDIATE	35.839	45.384	19.723	10
22	Lewis HAMILTON	MEDIUM	36.494	51.965	26.484	11
56	Oscar PIASTRI	SOFT	34.616	41.883	18.226	9

## Deltas

In this section we can see the deltas of the fastest lap of each driver compared with the fastest lap of the session

```
In [53]: practiceCleaned = jointables2.query("lap_duration > 1")  
drivers_list = list(practiceCleaned['driver_number'].unique())  
newdataset = pd.DataFrame()  
for driver in drivers_list:  
    newdataset = libraryDataF1.obtain_fastest_lap(driver, practiceCleaned, newdataset)  
  
arr = libraryDataF1.obtain_deltas(newdataset)  
newdataset.insert(3, 'delta', arr)
```

```
In [54]: dt = newdataset.sort_values(ascending=True, by='delta')  
libraryDataF1.obtainchart("name_acronym", "delta", dt)
```



## Track dominance

In this section, best sector are taken of each sector to see the car's performance in each sector.

```
In [55]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_1'].min()
sectorPace[['duration_sector_1', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

```
Out[55]:
```

	duration_sector_1	full_name	compound	lap_duration	lap_number
56	34.616	Oscar PIASTR	SOFT	94.725	5
46	35.724	Lewis HAMILTON	SOFT	95.226	4
42	35.839	Yuki TSUNODA	INTERMEDIATE	100.946	4
14	36.389	Lando NORRIS	SOFT	104.977	2
49	36.740	Daniel RICCIARDO	INTERMEDIATE	101.913	5
15	37.038	Charles LECLERC	SOFT	98.760	2
23	38.596	Carlos SAINZ	SOFT	112.579	2
61	39.726	Valtteri BOTTAS	SOFT	116.059	6
45	39.796	Nico HULKENBERG	SOFT	115.179	4
43	41.075	Alexander ALBON	INTERMEDIATE	123.821	4
21	43.766	Esteban OCON	SOFT	119.113	2
59	44.308	ZHOU Guanyu	SOFT	123.317	6
29	56.304	Kevin MAGNUSSEN	INTERMEDIATE	150.472	3

```
In [56]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_2', 'full_name', 'compound', 'lap_duration', 'lap_number']
```

Out[56]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
46	41.449	Lewis HAMILTON	SOFT	95.226	4
56	41.883	Oscar PIASTRI	SOFT	94.725	5
27	42.165	Lando NORRIS	SOFT	137.847	3
15	43.266	Charles LECLERC	SOFT	98.760	2
45	45.075	Nico HULKENBERG	SOFT	115.179	4
42	45.384	Yuki TSUNODA	INTERMEDIATE	100.946	4
49	45.453	Daniel RICCIARDO	INTERMEDIATE	101.913	5
36	45.952	Carlos SAINZ	SOFT	147.469	3
43	46.973	Alexander ALBON	INTERMEDIATE	123.821	4
21	48.852	Esteban OCON	SOFT	119.113	2
59	49.096	ZHOU Guanyu	SOFT	123.317	6
61	49.828	Valtteri BOTTAS	SOFT	116.059	6
3	57.065	Kevin MAGNUSSEN	SOFT	NaN	1

```
In [57]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_3', 'full_name', 'compound', 'lap_duration', 'lap_number']
```

Out[57]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
46	18.053	Lewis HAMILTON	SOFT	95.226	4
56	18.226	Oscar PIASTRI	SOFT	94.725	5
15	18.456	Charles LECLERC	SOFT	98.760	2
1	18.750	Lando NORRIS	SOFT	NaN	1
49	19.720	Daniel RICCIARDO	INTERMEDIATE	101.913	5
42	19.723	Yuki TSUNODA	INTERMEDIATE	100.946	4
33	19.986	Nico HULKENBERG	SOFT	308.768	3
31	20.228	Alexander ALBON	INTERMEDIATE	397.769	3
55	21.817	Valtteri BOTTAS	INTERMEDIATE	143.811	5
10	21.832	Carlos SAINZ	SOFT	NaN	1
8	22.158	Esteban OCON	SOFT	NaN	1
52	23.592	ZHOU Guanyu	INTERMEDIATE	149.346	5
3	28.146	Kevin MAGNUSSEN	SOFT	NaN	1

## Mean pace with the different compound used on the session

```
In [58]: race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and lap_number < 100"))
```



Out[58]:

lap_duration	
compound	
SOFT	99.875429
INTERMEDIATE	102.906000

## Long runs

In [59]:

```
MINIMUM_SECONDS = 76
MAXIMUM_SECONDS = 93
```

## Red Bull Racing

In [60]:

```
stintInformation.query('driver_number == 1 or driver_number == 11')
```

Out[60]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1232	9490	1	1	1	1	None	
3	1232	9490	1	11	1	1	None	

In [61]:

```
libraryDataF1.getinfo(longruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[61]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_total
--	-----------	----------	------------	------------	-------------------	-------------------	----------------

In [62]:

```
libraryDataF1.getinfo(longruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[62]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_total
--	-----------	----------	------------	------------	-------------------	-------------------	----------------

## Ferrari

In [63]:

```
libraryDataF1.getinfo(longruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[63]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_total
--	-----------	----------	------------	------------	-------------------	-------------------	----------------

In [64]:

```
libraryDataF1.getinfo(longruns(jointables2,55,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[64]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_total
--	-----------	----------	------------	------------	-------------------	-------------------	----------------

## Mercedes

In [65]:

```
stintInformation.query('driver_number == 63 or driver_number == 44')
```

Out[65]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
6	1232	9490	1	63	1	1	None	
14	1232	9490	1	44	1	3	MEDIUM	

meeting\_key session\_key stint\_number driver\_number lap\_start lap\_end compound tyre

In [66]: libraryDataF1.getinfo(longruns(jointables2,44,'Mercedes',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[66]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

In [67]: libraryDataF1.getinfo(longruns(jointables2,63,'Mercedes',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[67]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

## McLaren

In [68]: stintInformation.query('driver\_number == 81 or driver\_number == 4')

Out[68]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound
12	1232	9490	1	81	1	2	INTERMEDIATE
15	1232	9490	1	4	1	4	SOFT
25	1232	9490	2	81	3	8	SOFT

In [69]: libraryDataF1.getinfo(longruns(jointables2,4,'McLaren',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[69]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

In [70]: libraryDataF1.getinfo(longruns(jointables2,81,'McLaren',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[70]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

## Aston Martin

In [71]: stintInformation.query('driver\_number == 18 or driver\_number == 14')

Out[71]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
4	1232	9490	1	14	1	1	None	
5	1232	9490	1	18	1	1	None	

In [72]: libraryDataF1.getinfo(longruns(jointables2,14,'Aston Martin',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[72]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

In [73]: libraryDataF1.getinfo(longruns(jointables2,18,'Aston Martin',MINIMUM\_SECONDS,MAXIMUM\_SECONDS))

Out[73]: full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

## RB

```
In [74]: stintInformation.query('driver_number == 3 or driver_number == 22')
```

```
Out[74]:
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	
	7	1232	9490	1	3	1	2	MEDIUM
	19	1232	9490	1	22	1	6	INTERMEDIATE
	24	1232	9490	2	3	3	7	INTERMEDIATE
	35	1232	9490	2	22	7	9	INTERMEDIATE
	36	1232	9490	3	3	8	10	INTERMEDIATE

```
In [75]: libraryDataF1.getinfo(longruns(jointables2,3,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[75]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

```
In [76]: libraryDataF1.getinfo(longruns(jointables2,22,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[76]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

## Haas

```
In [77]: libraryDataF1.getinfo(longruns(jointables2,20,'Haas F1 Team',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[77]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

```
In [78]: libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[78]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

## Alpine

```
In [79]: libraryDataF1.getinfo(longruns(jointables2,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[79]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

```
In [80]: libraryDataF1.getinfo(longruns(jointables2,10,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[80]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

## Williams

```
In [81]: libraryDataF1.getinfo(longruns(jointables2,23,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

```
Out[81]:
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
-----------	----------	------------	------------	-------------------	-------------------	-------------------

```
In [82]: libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAX_SECONDS))
```

```
Out[82]: full_name compound date_start lap_number duration_sector_1 duration_sector_2 duration
```

Kick Sauber

```
In [83]: libraryDataF1.getinfo(longruns(jointables2,24,'Kick Sauber',MINIMUM_SECONDS,MAX_SECONDS))
```

```
Out[83]: full_name compound date_start lap_number duration_sector_1 duration_sector_2 duration
```

```
In [84]: libraryDataF1.getinfo(longruns(jointables2,77,'Kick Sauber',MINIMUM_SECONDS,MAX_SECONDS))
```

```
Out[84]: full_name compound date_start lap_number duration_sector_1 duration_sector_2 duration
```

## Free Practice 3

### Obtain setup

```
In [85]: practice = libraryDataF1.obtain_information('laps',session_key=9491)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9491)
drivers = libraryDataF1.obtain_information('drivers',session_key=9491)
```

```
In [86]: stintsDataFrame = libraryDataF1.stint_configuration(drivers,stintInformation)
jointables2 = pd.merge(practice,stintsDataFrame,on=['lap_number','driver_number'])
jointables2
```

```
Out[86]: meeting_key session_key driver_number i1_speed i2_speed st_speed
```

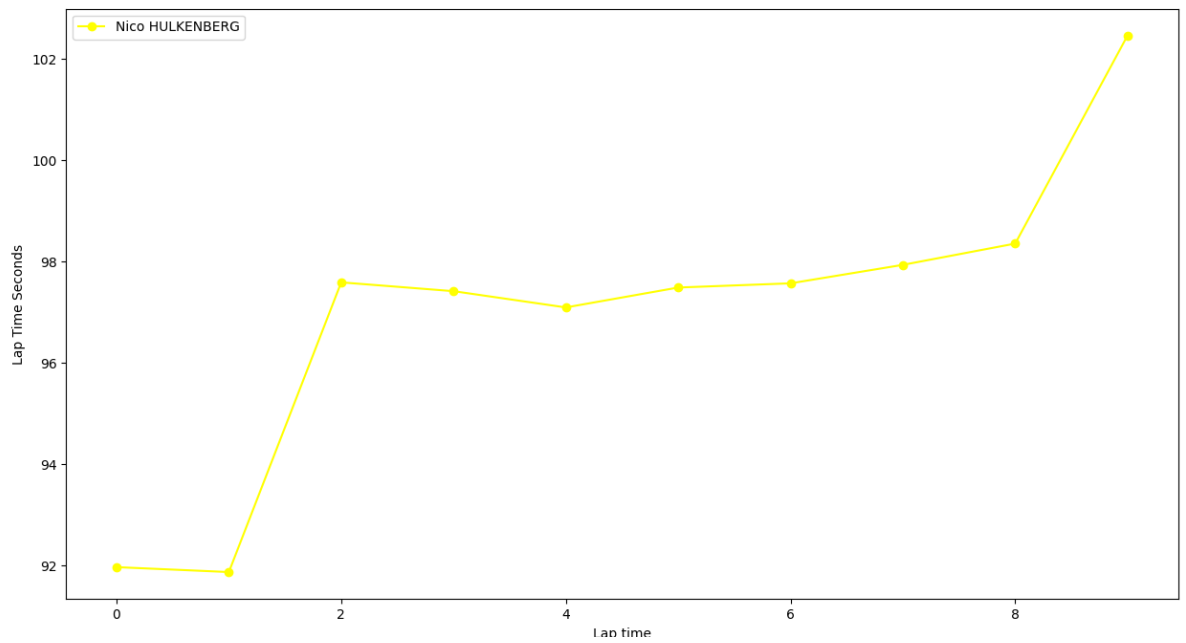
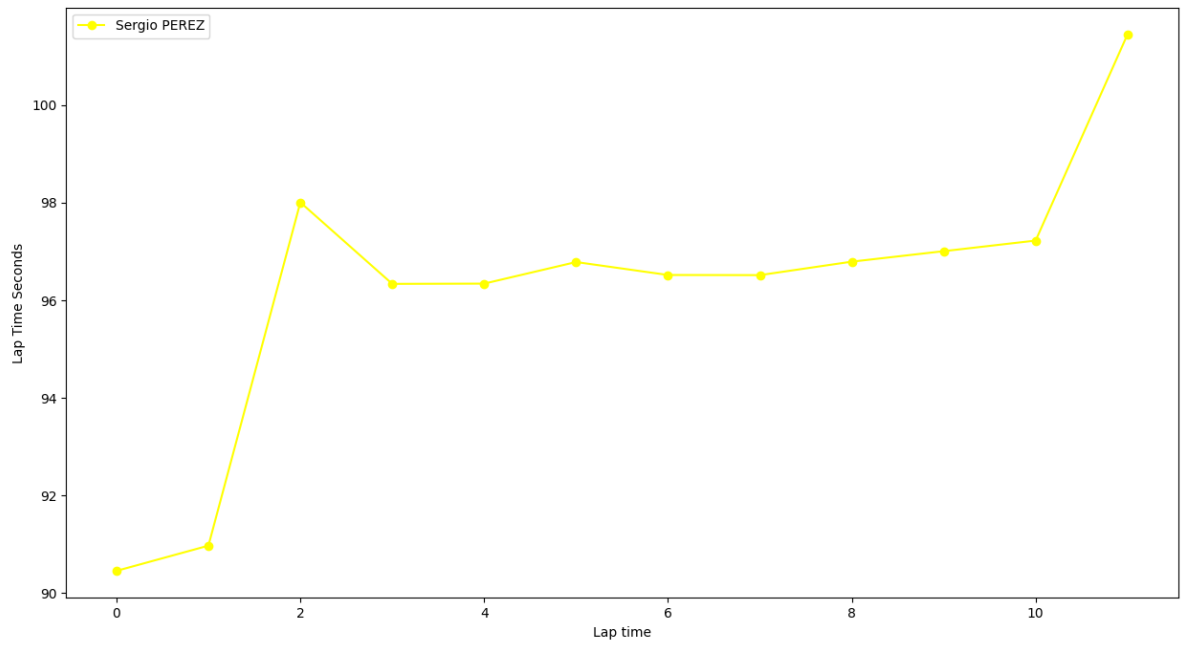
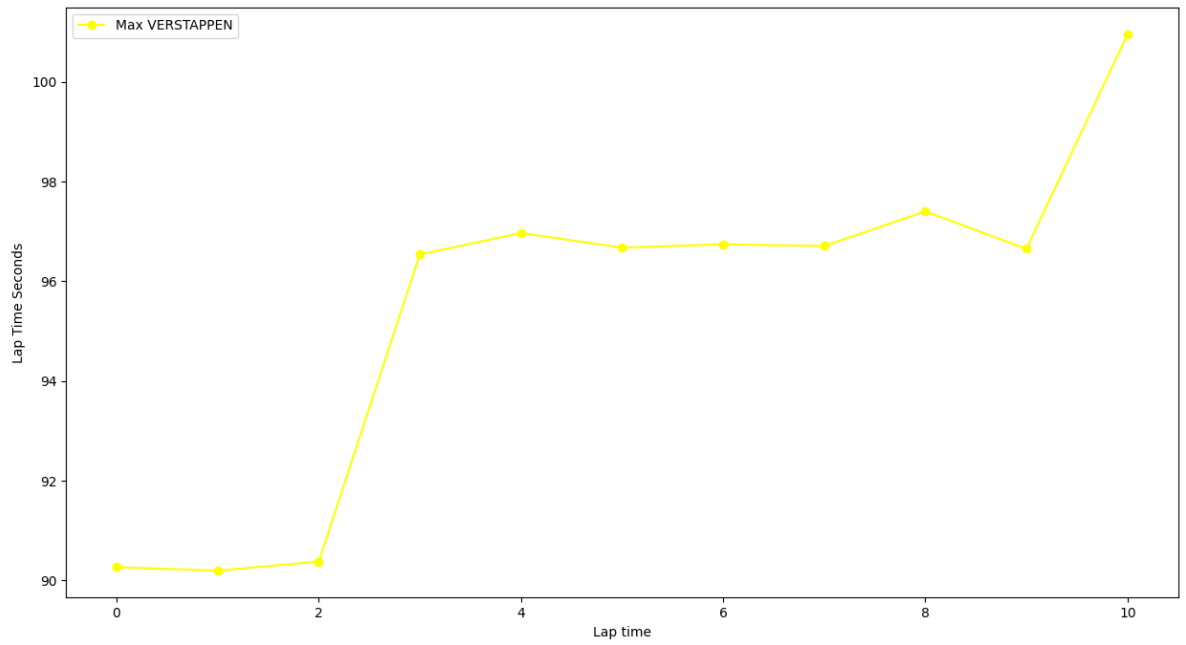
0	1232	9491	1	270.0	183	198	2024-04-06T02:30:00.000
1	1232	9491	77	251.0	270	227	2024-04-06T02:30:00.000
2	1232	9491	24	252.0	263	114	2024-04-06T02:30:00.000
3	1232	9491	11	263.0	269	265	2024-04-06T02:30:00.000
4	1232	9491	20	257.0	160	152	2024-04-06T02:30:00.000
...	...	...	...	...	...	...	...
430	1232	9491	4	263.0	239	239	2024-04-06T03:33:00.000
431	1232	9491	55	283.0	290	275	2024-04-06T03:33:00.000

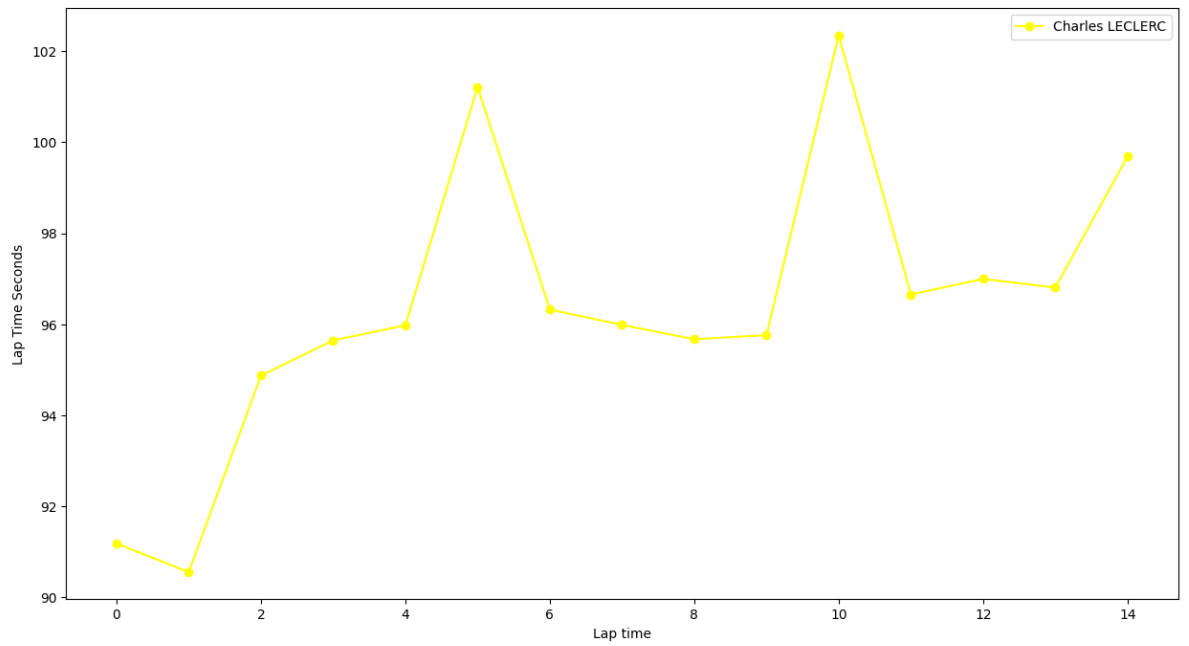
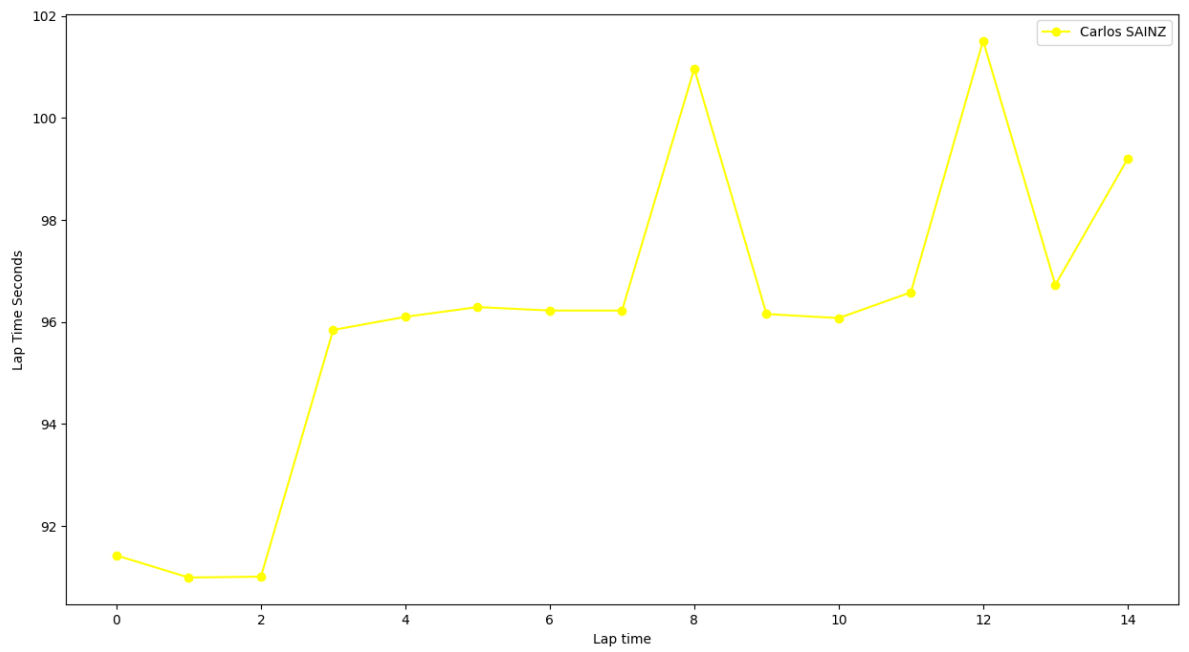
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
432	1232	9491	23	282.0	244	229	2024-04-06T03:33:
433	1232	9491	2	166.0	254	260	2024-04-06T03:33:
434	1232	9491	63	268.0	270	274	2024-04-06T03:34:

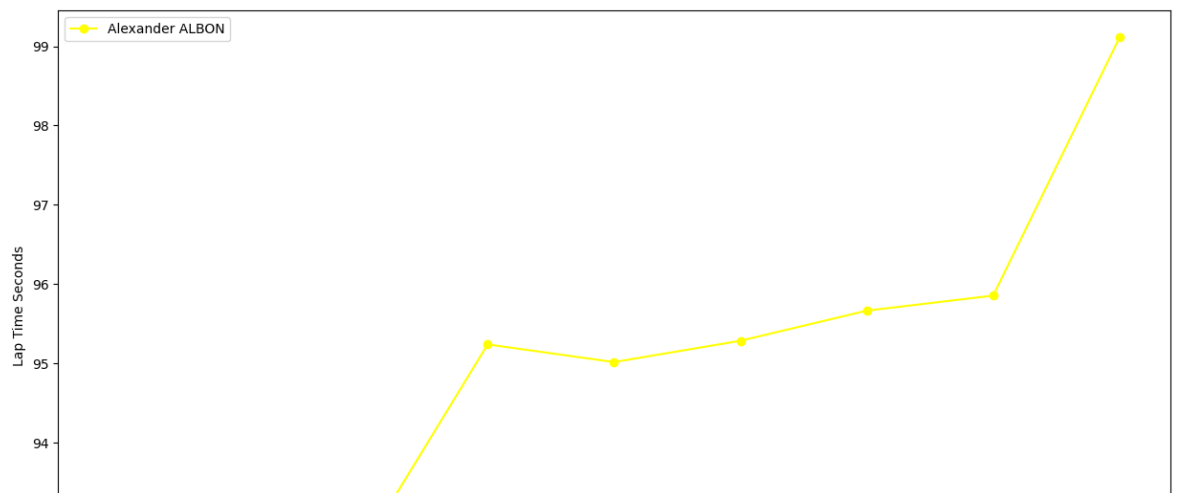
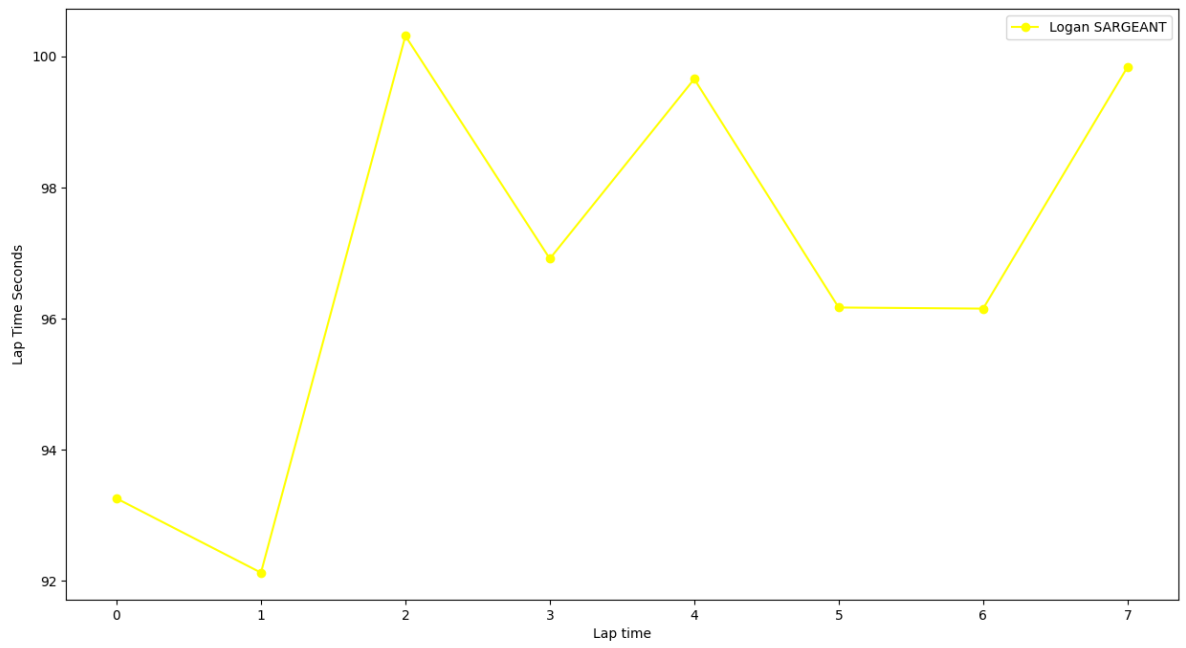
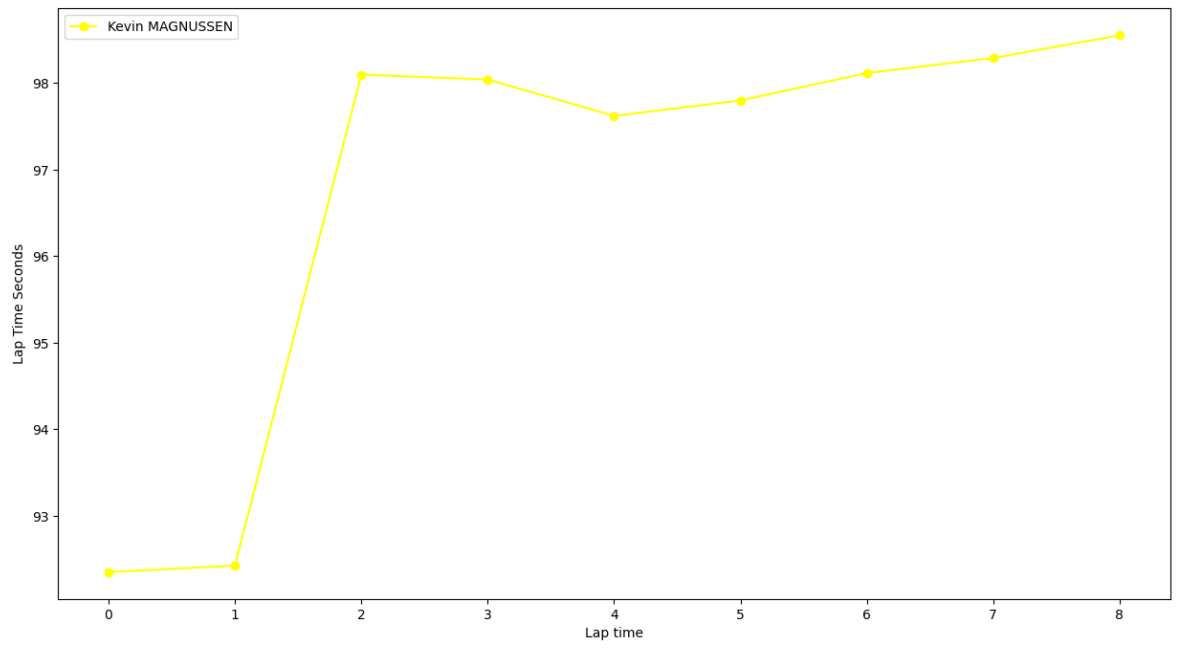
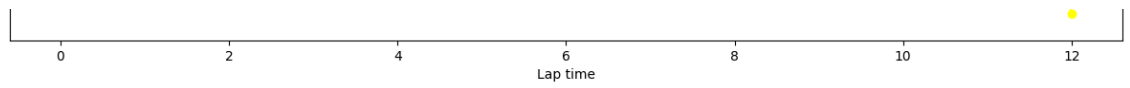
See race pace by means of the charts

Medium tyres

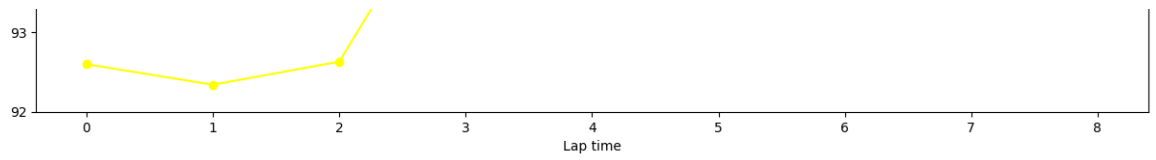
```
In [87]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",103)
```





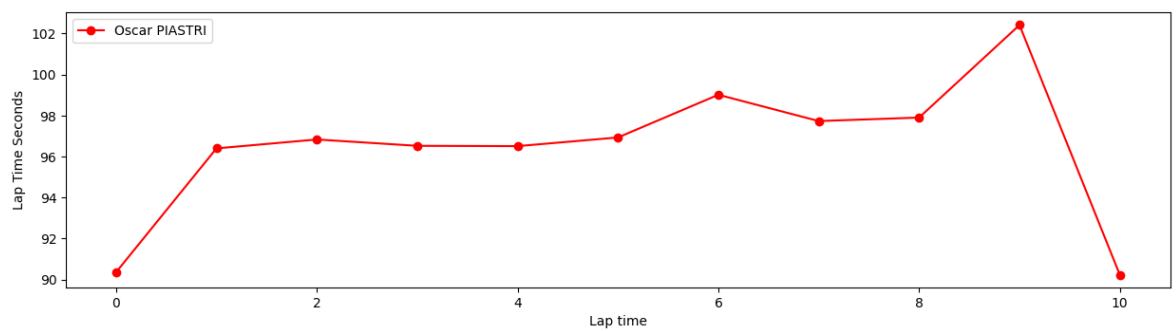
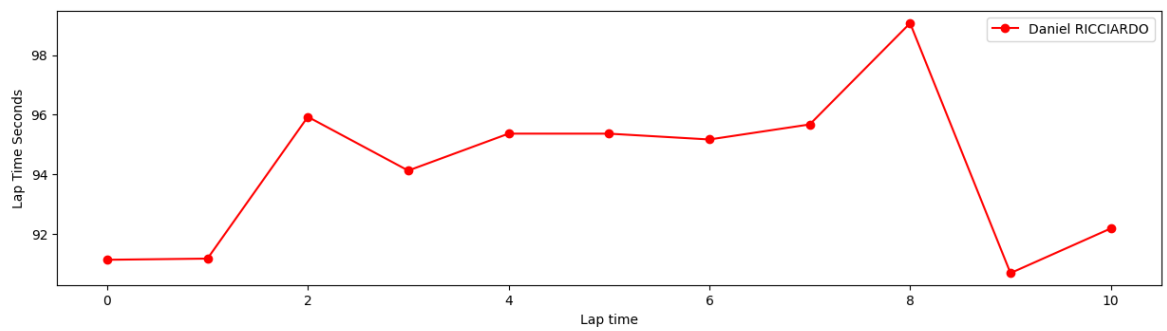
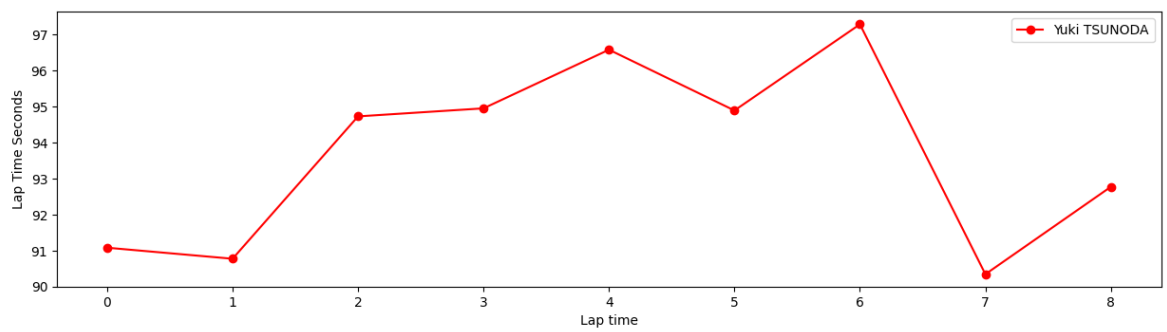
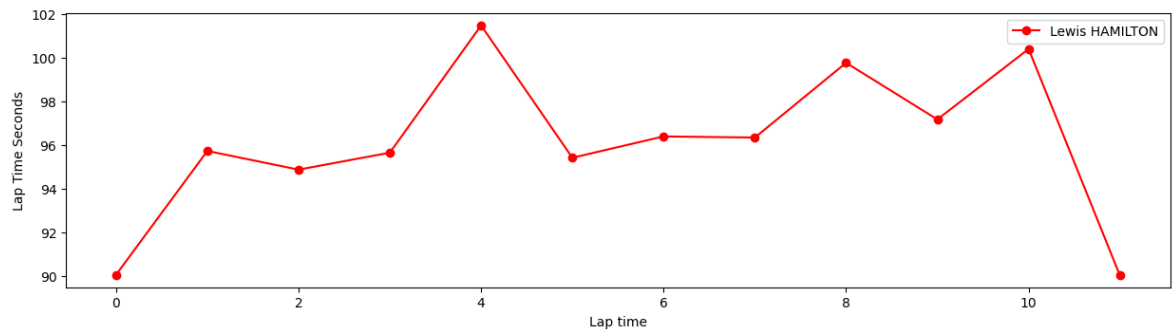
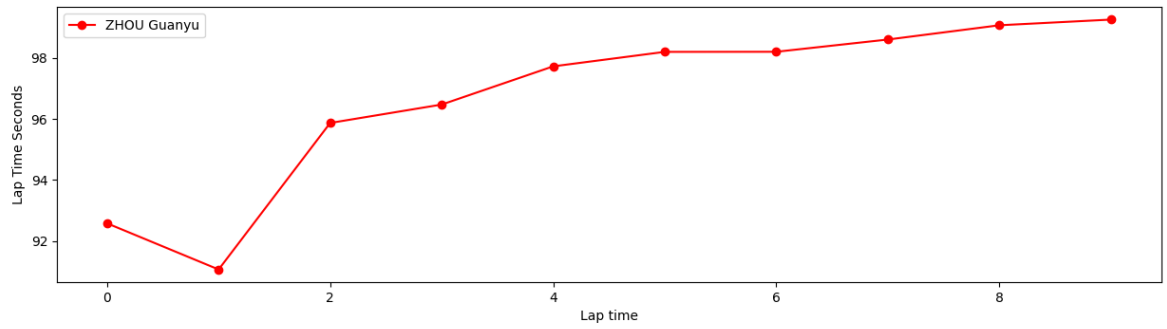
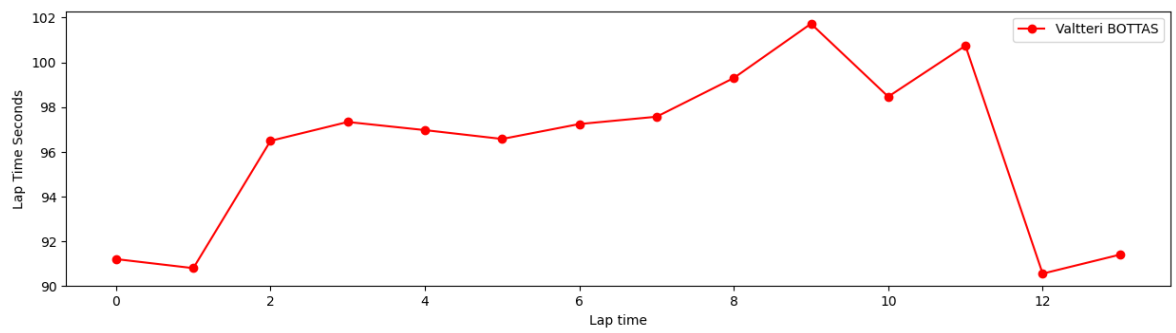


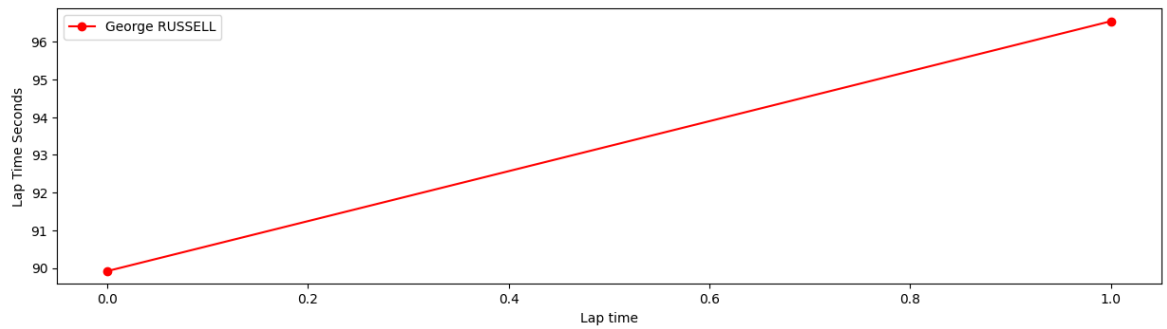
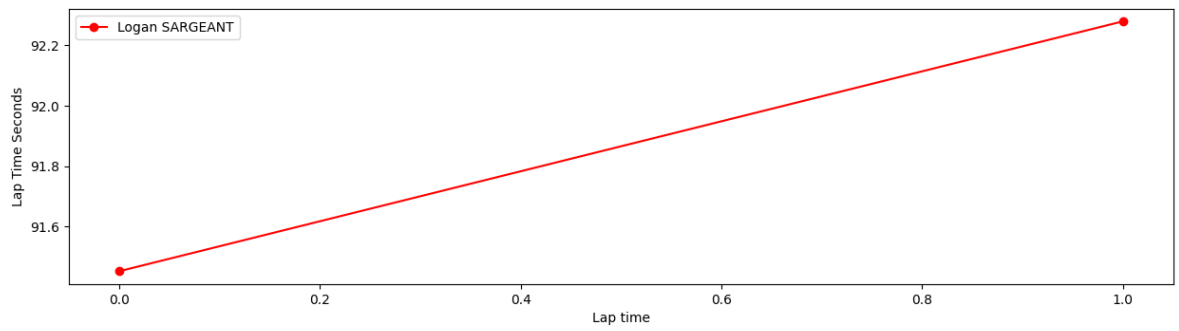
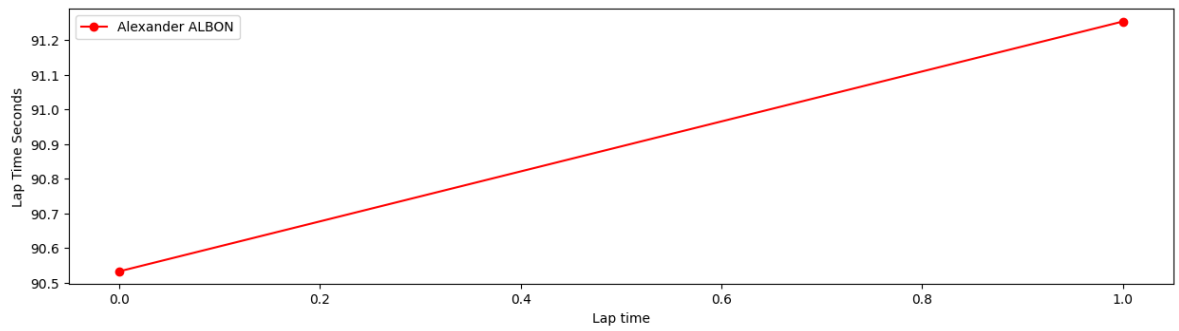
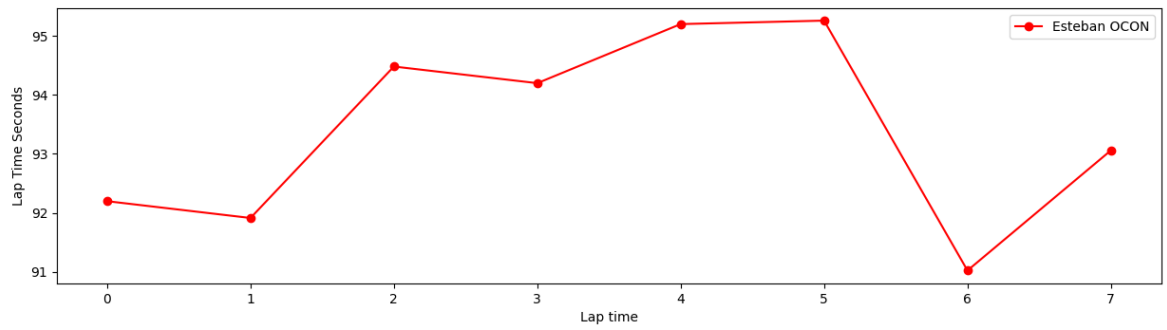
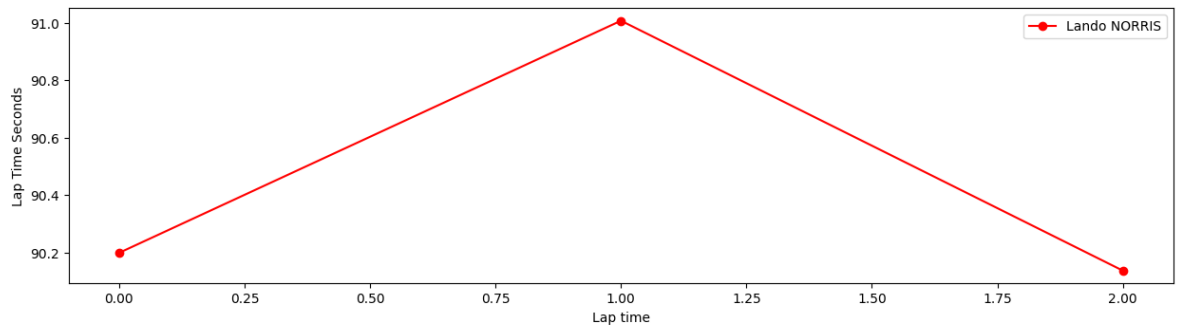
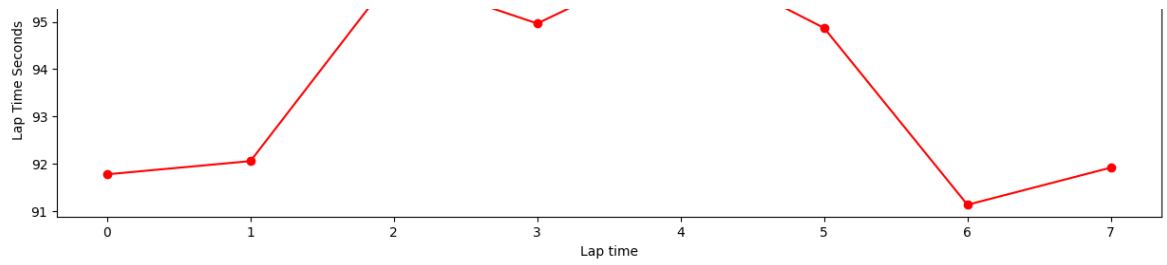


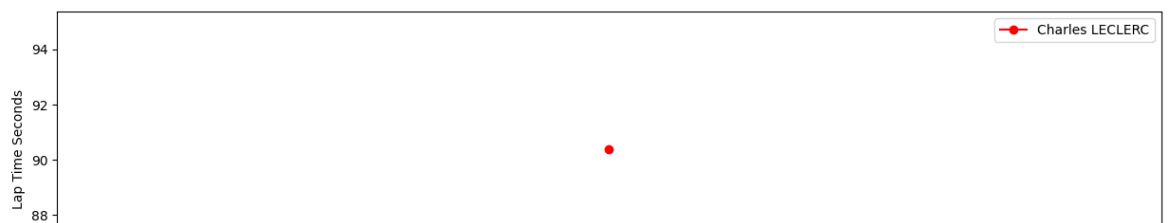
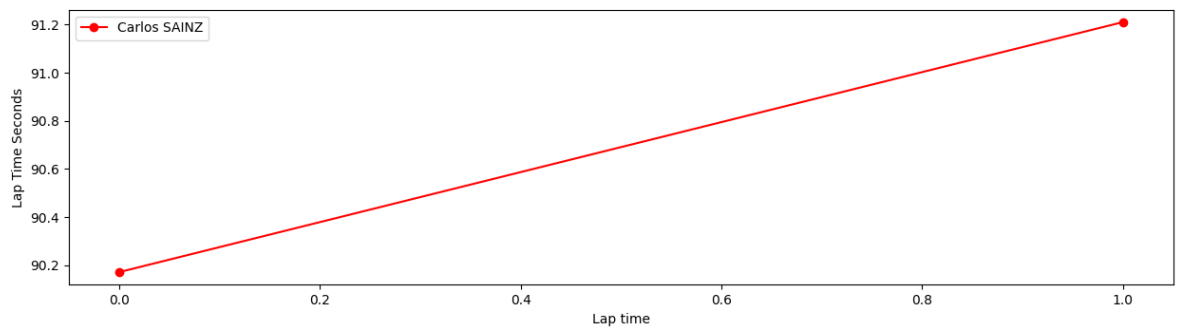
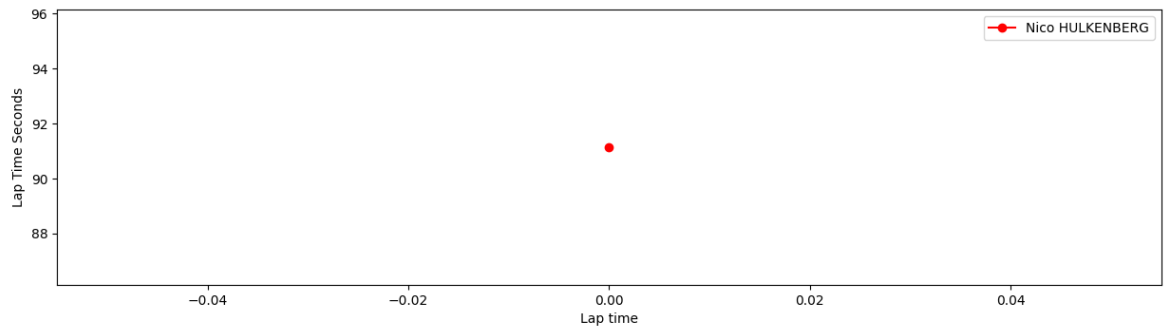
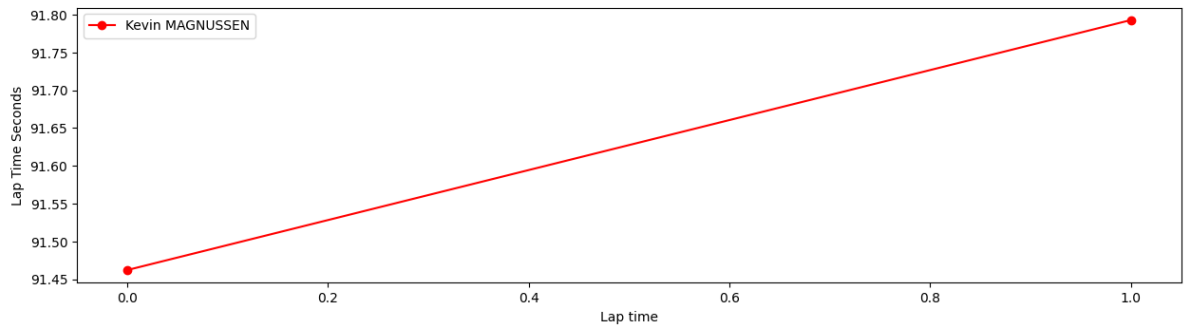
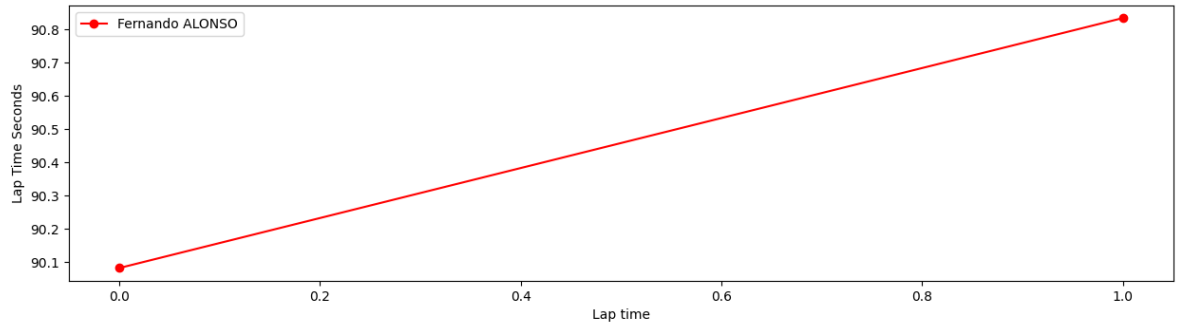
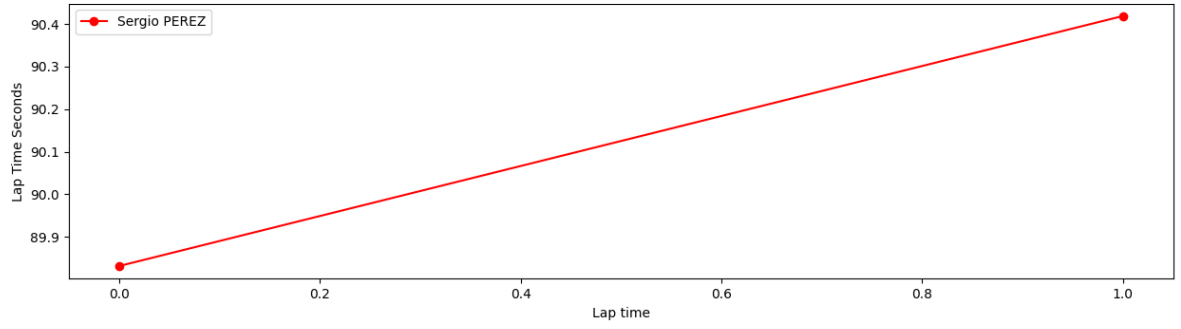
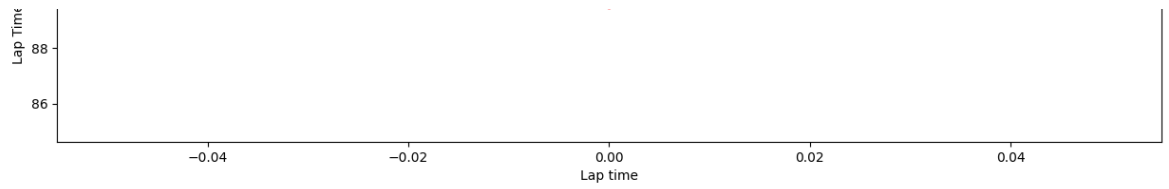


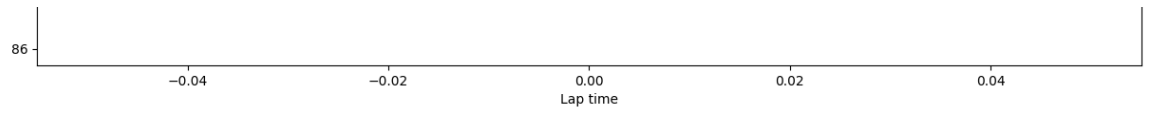
## Soft tyres

```
In [88]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",103)
```



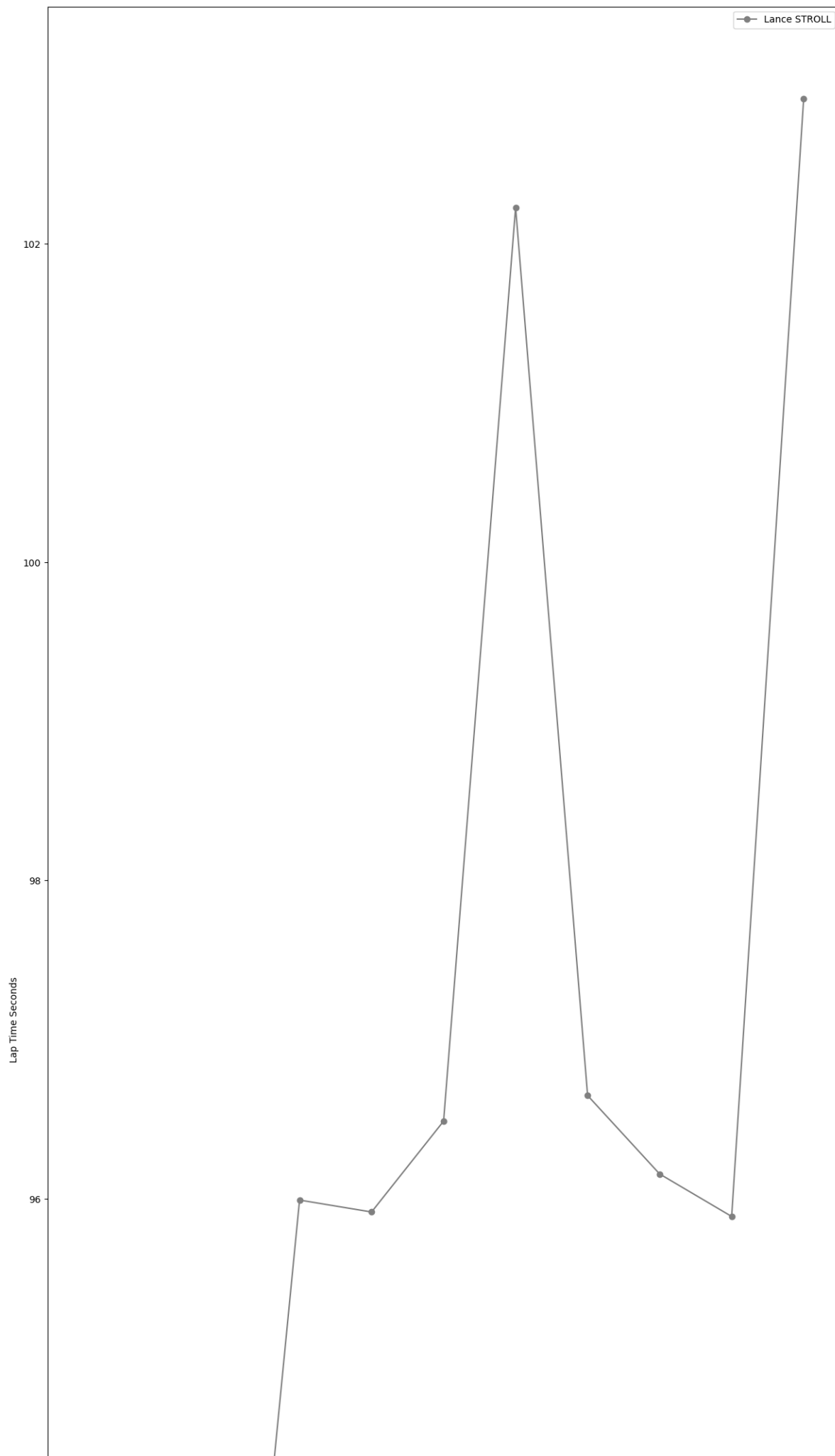


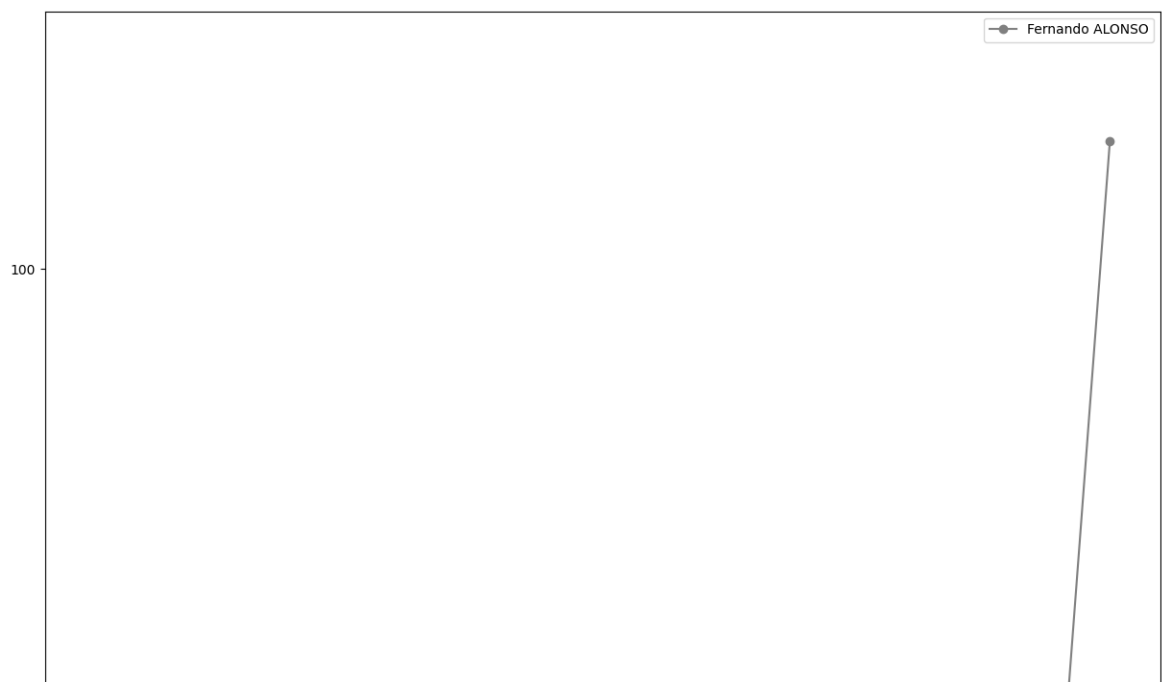
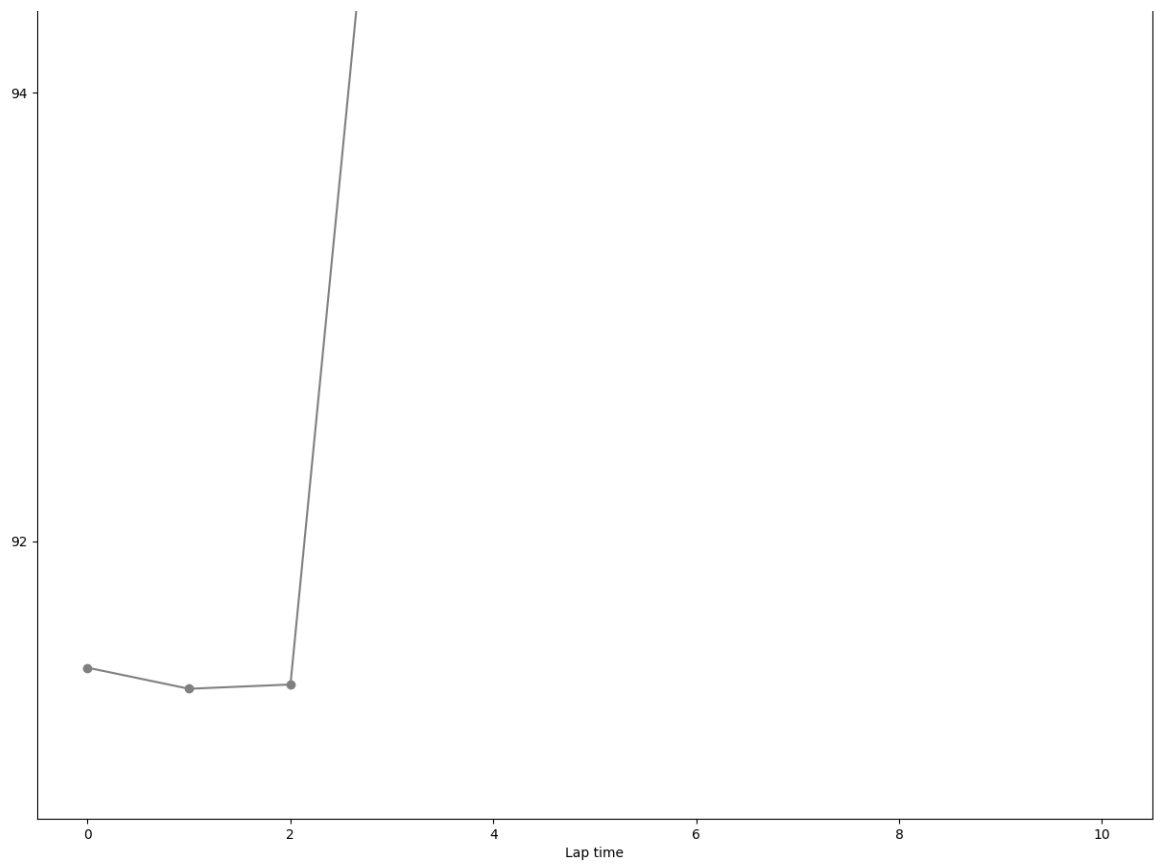


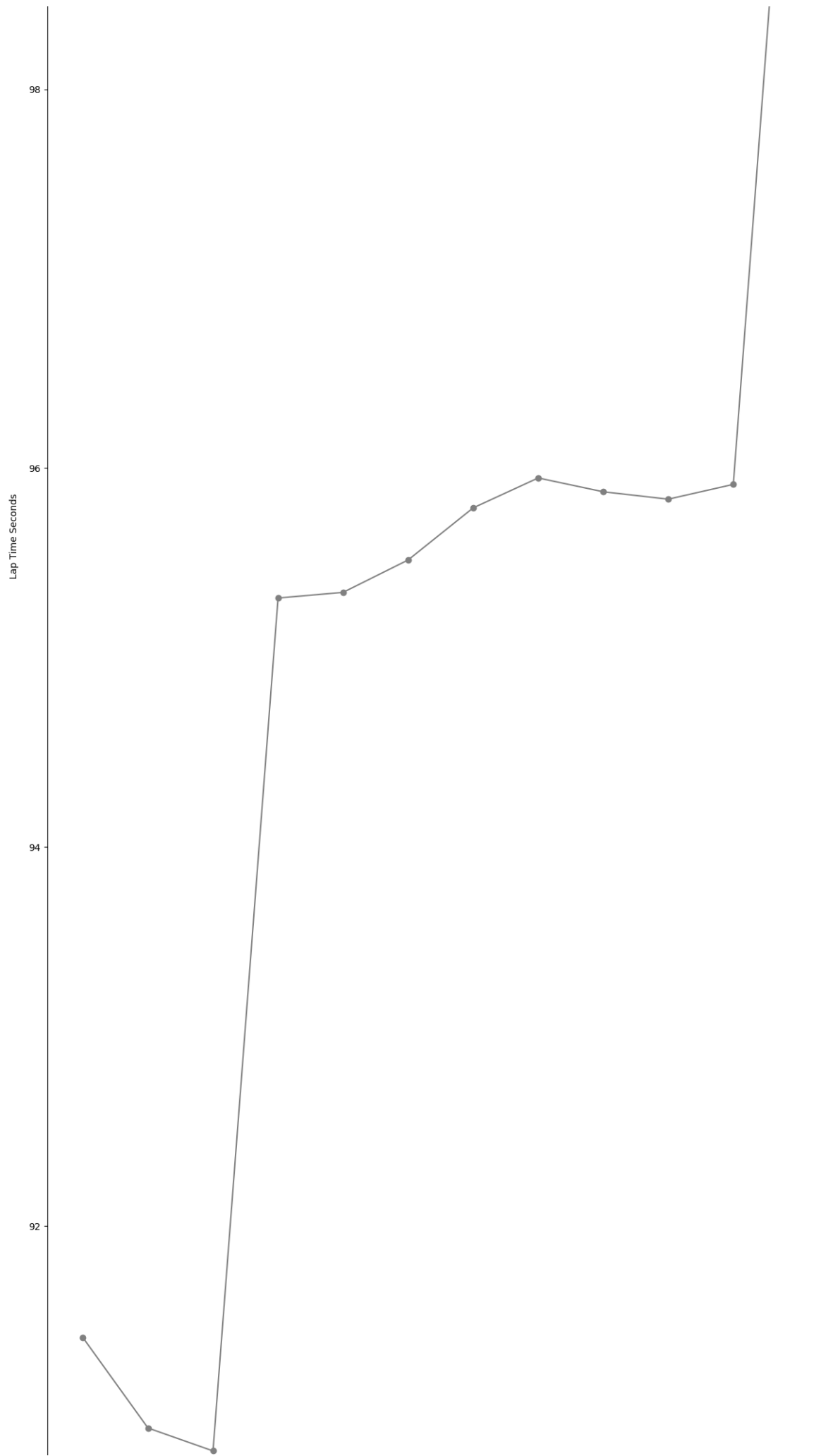


## Hard tyres

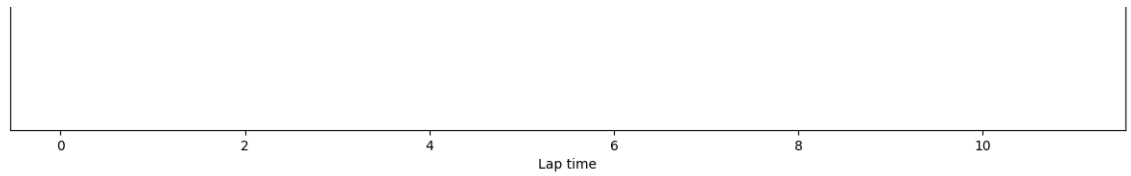
```
In [89]: libraryDataF1.obtain_data_tyres(jointables2,"HARD",103)
```





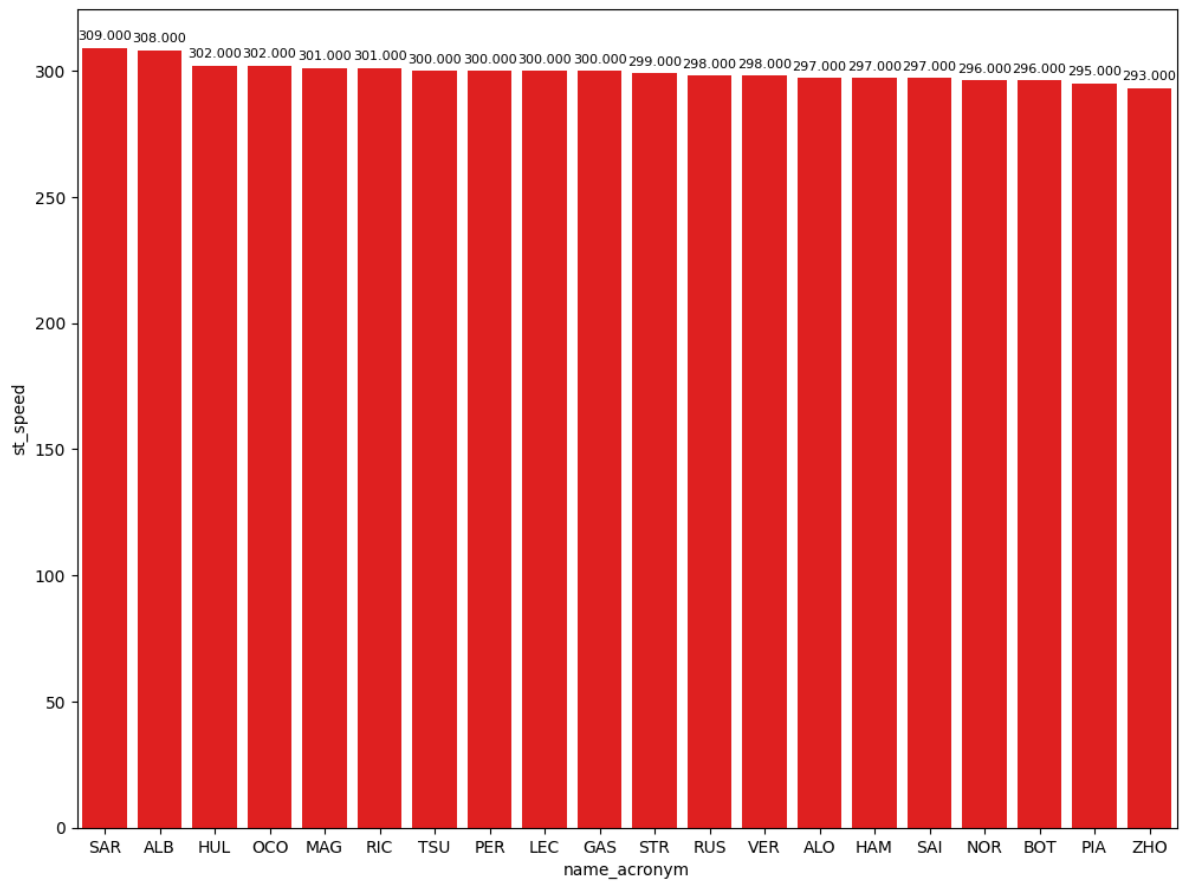




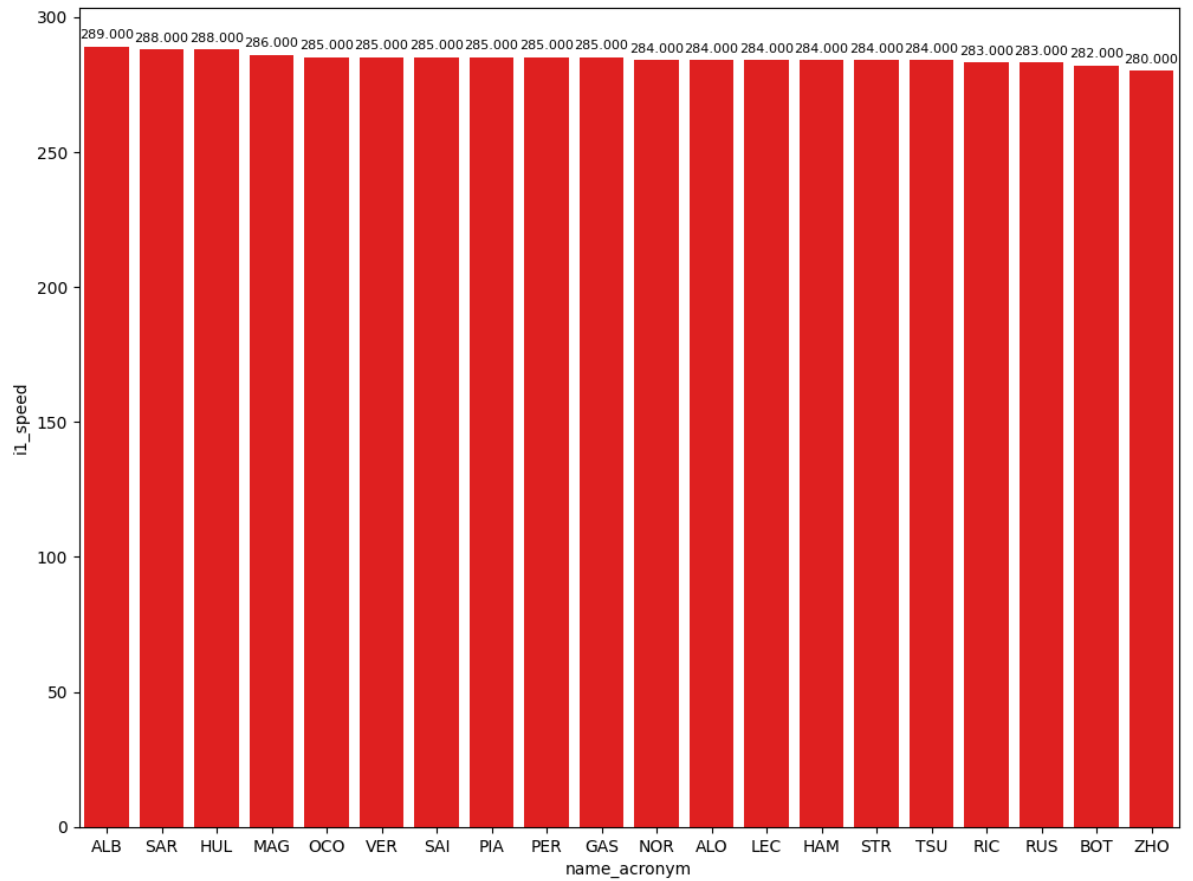


## Speed trap

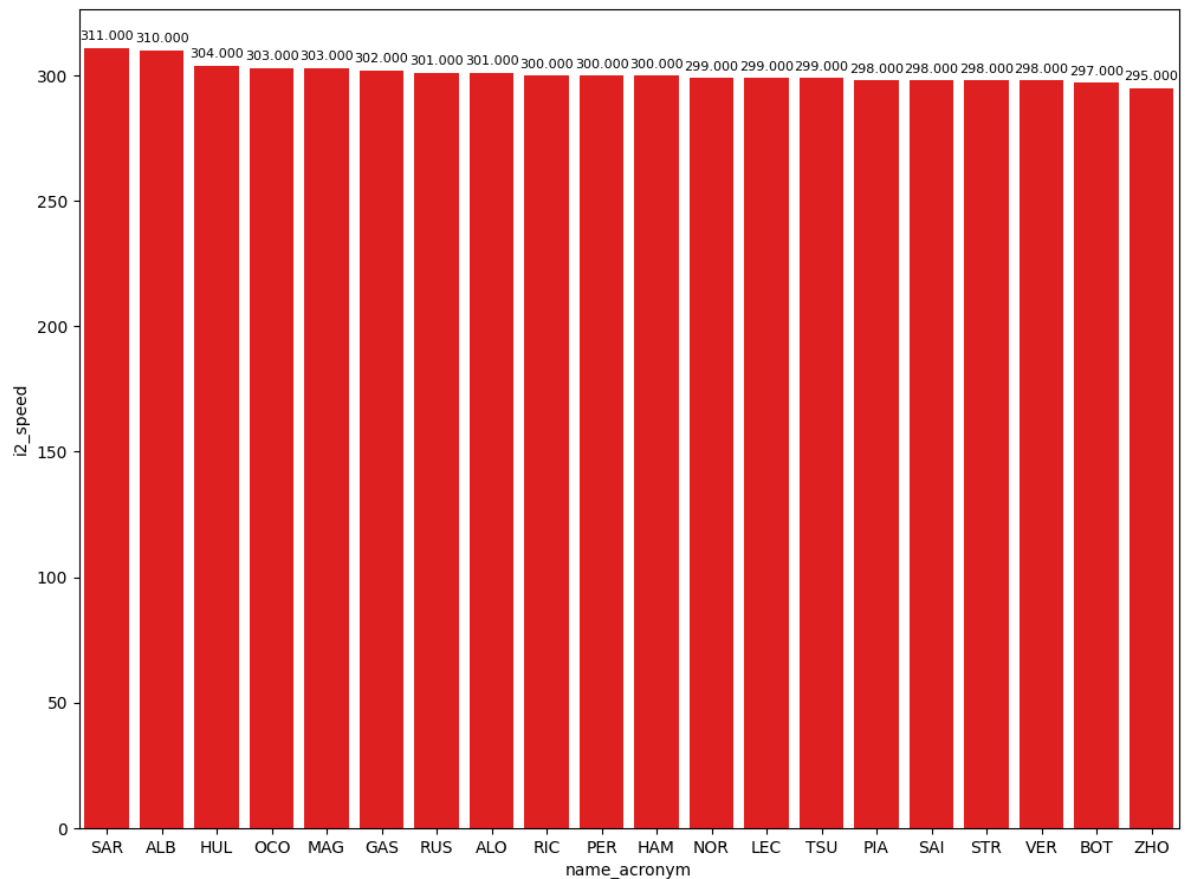
```
In [90]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed']]
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



```
In [91]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['il_speed']]
libraryDataF1.obtainchart("name_acronym","il_speed",top_speed)
```



In [92]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i2_speed'].max()  
libraryDataF1.obtainchart("name_acronym","i2_speed",top_speed)`



Fastest lap per compound

In this section, I will show the best lap with the different compounds of the session.

```
In [93]: compoundsPace = jointables2.loc[jointables2.groupby(['compound'])['lap_duration'].min().reset_index()
compoundsPace[['full_name', 'compound', 'duration_sector_1', 'duration_sector_2', 'duration_sector_3', 'lap_duration']]
```

```
Out[93]:
```

	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
94	Fernando ALONSO	HARD	31.925	40.965	17.921	9
34	Max VERSTAPPEN	MEDIUM	31.727	40.639	17.827	9
316	Max VERSTAPPEN	SOFT	31.458	40.438	17.667	8

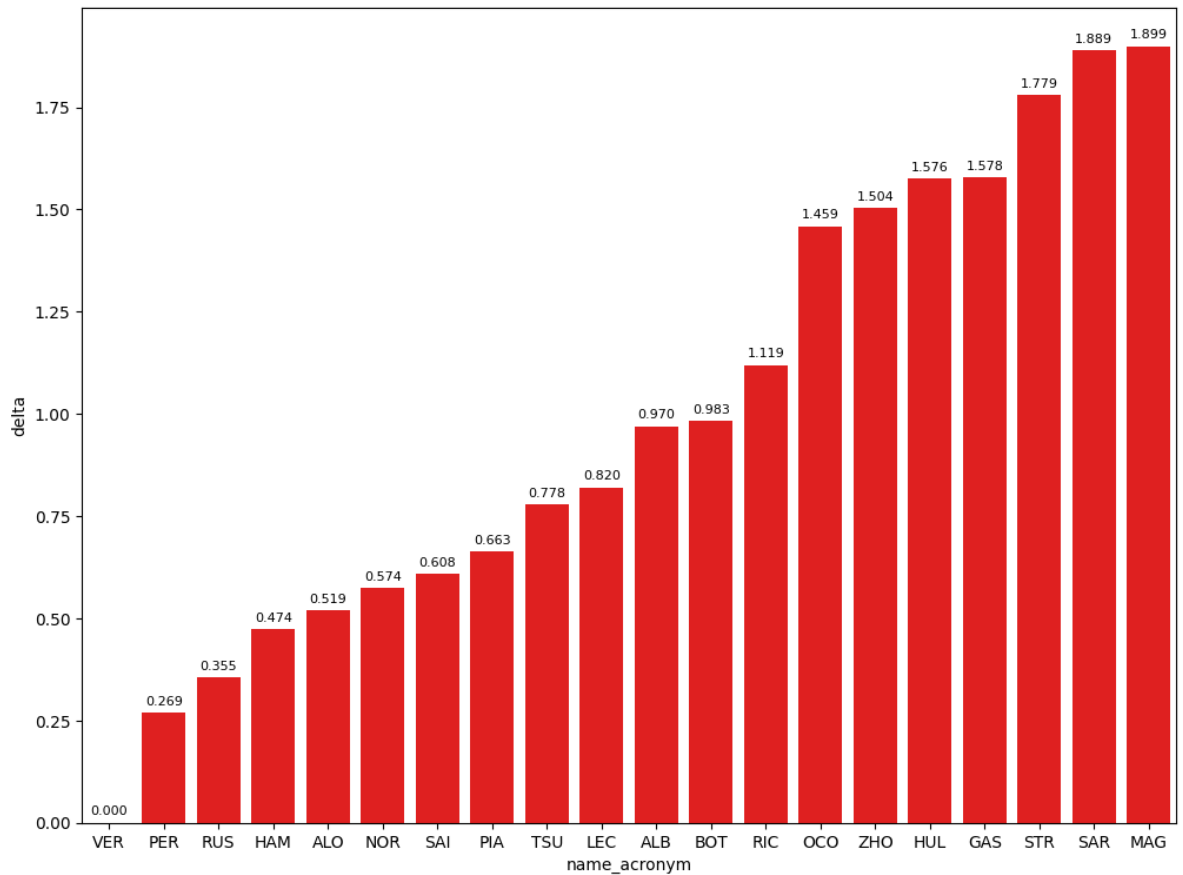
## Deltas

In this section we can see the deltas of the fastest lap of each driver compared with the fastest lap of the session

```
In [94]: practiceCleaned = jointables2.query("lap_duration > 1")
drivers_list = list(practiceCleaned['driver_number'].unique())
newdataset = pd.DataFrame()
for driver in drivers_list:
    newdataset = libraryDataF1.obtain_fastest_lap(driver, practiceCleaned, newdataset)

arr = libraryDataF1.obtain_deltas(newdataset)
newdataset.insert(3, 'delta', arr)
```

```
In [95]: dt = newdataset.sort_values(ascending=True, by='delta')
libraryDataF1.obtainchart("name_acronym", "delta", dt)
```



## Track dominance

In this section, best sector are taken of each sector to see the car's performance in each sector.

In [96]:

```
sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_1', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

Out[96]:

	duration_sector_1	full_name	compound	lap_duration	lap_number
<b>318</b>	31.323	Lando NORRIS	SOFT	125.669	8
<b>25</b>	31.405	Lewis HAMILTON	SOFT	90.065	2
<b>316</b>	31.458	Max VERSTAPPEN	SOFT	89.563	19
<b>322</b>	31.467	Sergio PEREZ	SOFT	89.832	19
<b>91</b>	31.531	Oscar PIASTRI	SOFT	90.360	2
<b>327</b>	31.663	Fernando ALONSO	SOFT	90.082	20
<b>324</b>	31.686	Yuki TSUNODA	SOFT	90.341	15
<b>346</b>	31.727	Lance STROLL	SOFT	146.445	18
<b>311</b>	31.771	George RUSSELL	SOFT	89.918	19
<b>353</b>	31.818	Carlos SAINZ	SOFT	90.171	22
<b>355</b>	31.873	Charles LECLERC	SOFT	90.383	21
<b>317</b>	31.888	Valtteri BOTTAS	SOFT	90.546	19
<b>321</b>	31.940	Pierre GASLY	SOFT	91.141	13
<b>345</b>	31.963	Esteban OCON	SOFT	91.022	13

	duration_sector_1	full_name	compound	lap_duration	lap_number
61	31.994	Daniel RICCIARDO	SOFT	91.129	2
55	32.099	ZHOU Guanyu	SOFT	91.067	5
300	32.241	Alexander ALBON	SOFT	90.533	17
349	32.267	Nico HULKENBERG	SOFT	91.139	16
14	32.482	Kevin MAGNUSSEN	MEDIUM	117.812	2

In [97]:

```
sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_1']
sectorPace[['duration_sector_2', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

Out[97]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
311	40.318	George RUSSELL	SOFT	89.918	19
316	40.438	Max VERSTAPPEN	SOFT	89.563	19
353	40.473	Carlos SAINZ	SOFT	90.171	22
322	40.529	Sergio PEREZ	SOFT	89.832	19
355	40.544	Charles LECLERC	SOFT	90.383	21
327	40.597	Fernando ALONSO	SOFT	90.082	20
319	40.631	Lewis HAMILTON	SOFT	90.037	17
300	40.632	Alexander ALBON	SOFT	90.533	17
109	40.640	Lando NORRIS	SOFT	90.199	2
326	40.717	Oscar PIASTRI	SOFT	90.226	15
324	40.774	Yuki TSUNODA	SOFT	90.341	15
317	40.826	Valtteri BOTTAS	SOFT	90.546	19
323	40.832	Daniel RICCIARDO	SOFT	90.682	18
345	40.924	Esteban OCON	SOFT	91.022	13
55	40.941	ZHOU Guanyu	SOFT	91.067	5
302	40.982	Logan SARGEANT	SOFT	91.452	14
321	41.019	Pierre GASLY	SOFT	91.141	13
347	41.022	Kevin MAGNUSSEN	SOFT	91.462	17
349	41.060	Nico HULKENBERG	SOFT	91.139	16
68	41.155	Lance STROLL	HARD	91.342	4

In [98]:

```
sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_2']
sectorPace[['duration_sector_3', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

Out[98]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
300	17.660	Alexander ALBON	SOFT	90.533	17
316	17.667	Max VERSTAPPEN	SOFT	89.563	19
323	17.786	Daniel RICCIARDO	SOFT	90.682	18
349	17.812	Nico HULKENBERG	SOFT	91.139	16
319	17.820	Lewis HAMILTON	SOFT	90.037	17

	duration_sector_3	full_name	compound	lap_duration	lap_number
327	17.822	Fernando ALONSO	SOFT	90.082	20
311	17.829	George RUSSELL	SOFT	89.918	19
317	17.832	Valtteri BOTTAS	SOFT	90.546	19
322	17.836	Sergio PEREZ	SOFT	89.832	19
302	17.842	Logan SARGEANT	SOFT	91.452	14
326	17.862	Oscar PIASTRI	SOFT	90.226	15
398	17.878	Carlos SAINZ	SOFT	91.210	25
324	17.881	Yuki TSUNODA	SOFT	90.341	15
347	17.888	Kevin MAGNUSSEN	SOFT	91.462	17
109	17.932	Lando NORRIS	SOFT	90.199	2
355	17.966	Charles LECLERC	SOFT	90.383	21
55	18.027	ZHOU Guanyu	SOFT	91.067	5
369	18.112	Pierre GASLY	SOFT	91.924	16
345	18.135	Esteban OCON	SOFT	91.022	13

## Mean pace with the different compound used on the session

In [99]: `race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and l  
race_pace`

Out[99]:

	lap_duration
compound	
SOFT	94.403311
HARD	95.457826
MEDIUM	96.047980

## Long runs

In [100... `MINIMUM_SECONDS = 94  
MAXIMUM_SECONDS = 100`

## Red Bull Racing

In [101... `stintInformation.query('driver_number == 1 or driver_number == 11')`

Out[101...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1232	9491	1	1	1	6	MEDIUM	
13	1232	9491	1	11	1	8	MEDIUM	
26	1232	9491	2	1	7	9	MEDIUM	
38	1232	9491	2	11	9	18	MEDIUM	
42	1232	9491	3	1	10	18	MEDIUM	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
62	1232	9491	4	1	19	21	SOFT	
66	1232	9491	3	11	19	26	SOFT	

In [102...

```
libraryDataF1.getinfo(longruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS,
```

Out[102...

	full_name	compound	date_start	lap_number	duration_sector_1
152	Max VERSTAPPEN	MEDIUM	2024-04-06T02:53:57.279000+00:00	10	34.635
168	Max VERSTAPPEN	MEDIUM	2024-04-06T02:55:33.861000+00:00	11	34.725
183	Max VERSTAPPEN	MEDIUM	2024-04-06T02:57:10.741000+00:00	12	34.879
200	Max VERSTAPPEN	MEDIUM	2024-04-06T02:58:47.523000+00:00	13	34.902
219	Max VERSTAPPEN	MEDIUM	2024-04-06T03:00:24.124000+00:00	14	34.808
238	Max VERSTAPPEN	MEDIUM	2024-04-06T03:02:00.948000+00:00	15	35.040
255	Max VERSTAPPEN	MEDIUM	2024-04-06T03:03:38.273000+00:00	16	34.914

In [103...

```
libraryDataF1.getinfo(longruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,
```

Out[103...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
78	Sergio PEREZ	MEDIUM	2024-04-06T02:41:54.114000+00:00	7	31.988	
149	Sergio PEREZ	MEDIUM	2024-04-06T02:53:35.740000+00:00	9	34.608	
163	Sergio PEREZ	MEDIUM	2024-04-06T02:55:12.208000+00:00	10	34.499	
179	Sergio PEREZ	MEDIUM	2024-04-06T02:56:48.483000+00:00	11	34.696	
196	Sergio PEREZ	MEDIUM	2024-04-06T02:58:25.301000+00:00	12	34.707	
215	Sergio PEREZ	MEDIUM	2024-04-06T03:00:01.822000+00:00	13	34.640	
234	Sergio PEREZ	MEDIUM	2024-04-06T03:01:38.349000+00:00	14	34.749	
251	Sergio PEREZ	MEDIUM	2024-04-06T03:03:15.128000+00:00	15	34.979	
266	Sergio PEREZ	MEDIUM	2024-04-06T03:04:52.916000+00:00	16	35.018	

## Ferrari

In [104...

```
libraryDataF1.getinfo(longruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS,
```

Out[104...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
76	Charles LECLERC	MEDIUM	2024-04-06T02:41:24.108000+00:00	6	31.926	
128	Charles LECLERC	MEDIUM	2024-04-06T02:50:47.326000+00:00	8	34.173	
140	Charles LECLERC	MEDIUM	2024-04-06T02:52:22.914000+00:00	9	34.417	
169	Charles LECLERC	MEDIUM	2024-04-06T02:55:40.138000+00:00	11	34.566	
184	Charles LECLERC	MEDIUM	2024-04-06T02:57:16.445000+00:00	12	34.457	
201	Charles LECLERC	MEDIUM	2024-04-06T02:58:52.604000+00:00	13	34.408	
220	Charles LECLERC	MEDIUM	2024-04-06T03:00:28.155000+00:00	14	34.420	
256	Charles LECLERC	MEDIUM	2024-04-06T03:03:46.111000+00:00	16	34.830	
271	Charles LECLERC	MEDIUM	2024-04-06T03:05:22.798000+00:00	17	35.061	
282	Charles LECLERC	MEDIUM	2024-04-06T03:06:59.828000+00:00	18	35.023	
289	Charles LECLERC	MEDIUM	2024-04-06T03:08:36.762000+00:00	19	35.057	

In [105...

```
libraryDataF1.getinfo(longruns(jointables2,55,'Ferrari',MINIMUM_SECONDS,MAX_SECONDS))
```

Out[105...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
150	Carlos SAINZ	MEDIUM	2024-04-06T02:53:43.498000+00:00	9	34.415	
165	Carlos SAINZ	MEDIUM	2024-04-06T02:55:19.349000+00:00	10	34.528	
180	Carlos SAINZ	MEDIUM	2024-04-06T02:56:55.383000+00:00	11	34.716	
197	Carlos SAINZ	MEDIUM	2024-04-06T02:58:31.675000+00:00	12	34.566	
216	Carlos SAINZ	MEDIUM	2024-04-06T03:00:07.957000+00:00	13	34.564	
253	Carlos SAINZ	MEDIUM	2024-04-06T03:03:25.061000+00:00	15	34.620	
268	Carlos SAINZ	MEDIUM	2024-04-06T03:05:01.269000+00:00	16	34.660	
280	Carlos SAINZ	MEDIUM	2024-04-06T03:06:37.301000+00:00	17	34.821	
293	Carlos SAINZ	MEDIUM	2024-04-06T03:09:55.483000+00:00	19	34.930	
296	Carlos SAINZ	MEDIUM	2024-04-06T03:11:32.175000+00:00	20	35.010	

Mercedes



In [106...

```
stintInformation.query('driver_number == 63 or driver_number == 44')
```

Out[106...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	3	1232	9491	1	44	1	4	SOFT
	19	1232	9491	1	63	1	15	MEDIUM
	21	1232	9491	2	44	5	6	SOFT
	28	1232	9491	3	44	7	16	SOFT
	53	1232	9491	2	63	16	18	MEDIUM
	57	1232	9491	4	44	17	19	SOFT
	64	1232	9491	3	63	19	21	SOFT
	68	1232	9491	5	44	20	22	SOFT
	73	1232	9491	4	63	22	25	SOFT

In [107...

```
libraryDataF1.getinfo(longruns(jointables2,44,'Mercedes',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[107...

	full_name	compound	date_start	lap_number	duration_sector_1	d
77	Lewis HAMILTON	SOFT	2024-04-06T02:41:30.022000+00:00	5	32.650	
141	Lewis HAMILTON	SOFT	2024-04-06T02:52:30.748000+00:00	7	34.015	
154	Lewis HAMILTON	SOFT	2024-04-06T02:54:05.676000+00:00	8	34.243	
185	Lewis HAMILTON	SOFT	2024-04-06T02:57:22.755000+00:00	10	34.016	
202	Lewis HAMILTON	SOFT	2024-04-06T02:58:58.193000+00:00	11	34.477	
221	Lewis HAMILTON	SOFT	2024-04-06T03:00:34.657000+00:00	12	34.405	
240	Lewis HAMILTON	SOFT	2024-04-06T03:02:10.982000+00:00	13	34.820	
257	Lewis HAMILTON	SOFT	2024-04-06T03:03:50.680000+00:00	14	34.937	

In [108...

```
libraryDataF1.getinfo(longruns(jointables2,63,'Mercedes',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[108...

	full_name	compound	date_start	lap_number	duration_sector_1	d
19	George RUSSELL	MEDIUM	2024-04-06T02:33:03.963000+00:00	2	34.438	
29	George RUSSELL	MEDIUM	2024-04-06T02:34:39.662000+00:00	3	34.278	
36	George RUSSELL	MEDIUM	2024-04-06T02:36:15.046000+00:00	4	33.801	
47	George RUSSELL	MEDIUM	2024-04-06T02:37:49.941000+00:00	5	33.745	

	full_name	compound	date_start	lap_number	duration_sector_1	du
62	George RUSSELL	MEDIUM	2024-04-06T02:39:24.511000+00:00	6	33.804	
74	George RUSSELL	MEDIUM	2024-04-06T02:40:59.218000+00:00	7	34.118	
85	George RUSSELL	MEDIUM	2024-04-06T02:42:34.894000+00:00	8	34.193	
90	George RUSSELL	MEDIUM	2024-04-06T02:44:10.189000+00:00	9	33.793	
101	George RUSSELL	MEDIUM	2024-04-06T02:45:44.681000+00:00	10	35.314	
110	George RUSSELL	MEDIUM	2024-04-06T02:47:21.435000+00:00	11	33.900	
119	George RUSSELL	MEDIUM	2024-04-06T02:48:56.527000+00:00	12	33.979	
126	George RUSSELL	MEDIUM	2024-04-06T02:50:31.732000+00:00	13	33.917	

## McLaren

In [109...

```
stintInformation.query('driver_number == 81 or driver_number == 4')
```

Out[109...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
1	1232	9491	1	4	1	4	SOFT	
5	1232	9491	1	81	1	4	SOFT	
22	1232	9491	2	4	5	7	SOFT	
25	1232	9491	2	81	5	14	SOFT	
29	1232	9491	3	4	8	12	SOFT	
46	1232	9491	4	4	13	15	SOFT	
51	1232	9491	3	81	15	17	SOFT	
59	1232	9491	4	81	18	20	SOFT	

In [110...

```
libraryDataF1.getinfo(longruns(jointables2,4,'McLaren',MINIMUM_SECONDS,MAXI
```

Out[110...

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_
-----------	----------	------------	------------	-------------------	-------------------	-----------

In [111...

```
libraryDataF1.getinfo(longruns(jointables2,81,'McLaren',MINIMUM_SECONDS,MAXI
```

Out[111...

	full_name	compound	date_start	lap_number	duration_sector_1	du
159	Oscar PIASTRI	SOFT	2024-04-06T02:54:55.106000+00:00	5	34.733	
175	Oscar PIASTRI	SOFT	2024-04-06T02:56:31.544000+00:00	6	34.884	
192	Oscar PIASTRI	SOFT	2024-04-06T02:58:08.401000+00:00	7	34.737	
211	Oscar PIASTRI	SOFT	2024-04-06T02:59:44.772000+00:00	8	34.737	

	full_name	compound	date_start	lap_number	duration_sector_1	du
229	Oscar PIASTRI	SOFT	2024-04-06T03:01:21.325000+00:00	9	34.872	
248	Oscar PIASTRI	SOFT	2024-04-06T03:02:58.341000+00:00	10	35.158	
263	Oscar PIASTRI	SOFT	2024-04-06T03:04:37.397000+00:00	11	35.157	
	Oscar					

Aston Martin

In [112...

```
stintInformation.query('driver_number == 18 or driver_number == 14')
```

Out[112...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
14	1232	9491	1	14	1	8	HARD	
15	1232	9491	1	18	1	8	HARD	
37	1232	9491	2	18	9	17	HARD	
39	1232	9491	2	14	9	19	HARD	
60	1232	9491	3	18	18	24	SOFT	
70	1232	9491	3	14	20	25	SOFT	

In [113...

```
libraryDataF1.getinfo(longruns(jointables2,14,'Aston Martin',MINIMUM_SECONDS=
```

Out[113...

	full_name	compound	date_start	lap_number	duration_sector_1	du
182	Fernando ALONSO	HARD	2024-04-06T02:57:06.246000+00:00	9	34.161	
199	Fernando ALONSO	HARD	2024-04-06T02:58:41.624000+00:00	10	34.430	
218	Fernando ALONSO	HARD	2024-04-06T03:00:16.924000+00:00	11	34.347	
237	Fernando ALONSO	HARD	2024-04-06T03:01:52.531000+00:00	12	34.390	
269	Fernando ALONSO	HARD	2024-04-06T03:05:11.812000+00:00	14	34.573	
281	Fernando ALONSO	HARD	2024-04-06T03:06:47.672000+00:00	15	34.420	
288	Fernando ALONSO	HARD	2024-04-06T03:08:23.676000+00:00	16	34.552	
294	Fernando ALONSO	HARD	2024-04-06T03:09:59.390000+00:00	17	34.555	

In [114...

```
libraryDataF1.getinfo(longruns(jointables2,18,'Aston Martin',MINIMUM_SECONDS=
```

Out[114...

	full_name	compound	date_start	lap_number	duration_sector_1	du
210	Lance STROLL	HARD	2024-04-06T02:59:33.872000+00:00	9	34.501	

	full_name	compound	date_start	lap_number	duration_sector_1	dt
227	Lance STROLL	HARD	2024-04-06T03:01:09.954000+00:00	10	34.576	
246	Lance STROLL	HARD	2024-04-06T03:02:45.730000+00:00	11	34.845	
276	Lance STROLL	HARD	2024-04-06T03:06:04.525000+00:00	13	34.795	
284	Lance STROLL	HARD	2024-04-06T03:07:41.157000+00:00	14	34.691	

RB

In [115...

```
stintInformation.query('driver_number == 3 or driver_number == 22')
```

Out[115...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
11	1232	9491	1	22	1	7	SOFT	
12	1232	9491	1	3	1	8	SOFT	
31	1232	9491	2	22	8	13	SOFT	
36	1232	9491	2	3	9	10	SOFT	
43	1232	9491	3	3	11	17	SOFT	
49	1232	9491	3	22	14	14	SOFT	
52	1232	9491	4	22	15	22	SOFT	
61	1232	9491	4	3	18	25	SOFT	

In [116...

```
libraryDataF1.getinfo(longruns(jointables2,3,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[116...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
156	Daniel RICCIARDO	SOFT	2024-04-06T02:54:21.949000+00:00	9	32.452	
224	Daniel RICCIARDO	SOFT	2024-04-06T03:00:52.631000+00:00	11	33.601	
243	Daniel RICCIARDO	SOFT	2024-04-06T03:02:26.807000+00:00	12	33.923	
260	Daniel RICCIARDO	SOFT	2024-04-06T03:04:02.171000+00:00	13	34.267	
273	Daniel RICCIARDO	SOFT	2024-04-06T03:05:37.571000+00:00	14	34.057	
283	Daniel RICCIARDO	SOFT	2024-04-06T03:07:12.828000+00:00	15	34.328	
290	Daniel RICCIARDO	SOFT	2024-04-06T03:08:48.439000+00:00	16	34.704	

In [117...

```
libraryDataF1.getinfo(longruns(jointables2,22,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[117...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
188	Yuki TSUNODA	SOFT	2024-04-06T02:57:36.757000+00:00	8	33.851	

	full_name	compound	date_start	lap_number	duration_sector_1	d
206	Yuki TSUNODA	SOFT	2024-04-06T02:59:11.526000+00:00	9	33.723	
223	Yuki TSUNODA	SOFT	2024-04-06T03:00:46.466000+00:00	10	34.223	
242	Yuki TSUNODA	SOFT	2024-04-06T03:02:23.033000+00:00	11	33.753	
---	Yuki	---	---	---	---	---

Haas

In [118...

```
libraryDataF1.getinfo(longruns(jointables2,20,'Haas F1 Team',MINIMUM_SECONDS=
```

Out[118...

	full_name	compound	date_start	lap_number	duration_sector_1	
129	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:50:56.462000+00:00	8	35.657	
142	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:52:34.442000+00:00	9	35.586	
155	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:54:12.530000+00:00	10	35.274	
171	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:55:50.106000+00:00	11	35.302	
186	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:57:27.928000+00:00	12	35.559	
204	Kevin MAGNUSSEN	MEDIUM	2024-04-06T02:59:06.114000+00:00	13	35.600	
222	Kevin MAGNUSSEN	MEDIUM	2024-04-06T03:00:44.391000+00:00	14	35.597	

In [119...

```
libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS=
```

Out[119...

	full_name	compound	date_start	lap_number	duration_sector_1	
132	Nico HULKENBERG	MEDIUM	2024-04-06T02:51:17.595000+00:00	7	35.464	
144	Nico HULKENBERG	MEDIUM	2024-04-06T02:52:55.050000+00:00	8	35.327	
158	Nico HULKENBERG	MEDIUM	2024-04-06T02:54:32.556000+00:00	9	35.194	
174	Nico HULKENBERG	MEDIUM	2024-04-06T02:56:09.641000+00:00	10	35.404	
191	Nico HULKENBERG	MEDIUM	2024-04-06T02:57:47.121000+00:00	11	35.337	
209	Nico HULKENBERG	MEDIUM	2024-04-06T02:59:24.667000+00:00	12	35.387	
226	Nico HULKENBERG	MEDIUM	2024-04-06T03:01:02.687000+00:00	13	35.817	

Alpine

In [120...

```
libraryDataF1.getinfo(longruns(jointables2,31,'Alpine',MINIMUM_SECONDS,MAXI
```

Out[120...

	full_name	compound	date_start	lap_number	duration_sector_1	du
167	Esteban OCON	SOFT	2024-04-06T02:55:25.706000+00:00	6	33.733	
181	Esteban OCON	SOFT	2024-04-06T02:57:00.466000+00:00	7	33.660	
198	Esteban OCON	SOFT	2024-04-06T02:58:34.672000+00:00	8	33.820	
217	Esteban OCON	SOFT	2024-04-06T03:00:09.834000+00:00	9	34.022	

In [121...

```
libraryDataF1.getinfo(longruns(jointables2,10,'Alpine',MINIMUM_SECONDS,MAXI
```

Out[121...

	full_name	compound	date_start	lap_number	duration_sector_1	du
161	Pierre GASLY	SOFT	2024-04-06T02:55:03.208000+00:00	6	34.621	
177	Pierre GASLY	SOFT	2024-04-06T02:56:39.474000+00:00	7	33.996	
194	Pierre GASLY	SOFT	2024-04-06T02:58:14.092000+00:00	8	34.208	
213	Pierre GASLY	SOFT	2024-04-06T02:59:50.598000+00:00	9	33.715	

## Williams

In [122...

```
libraryDataF1.getinfo(longruns(jointables2,23,'Williams',MINIMUM_SECONDS,MA
```

Out[122...

	full_name	compound	date_start	lap_number	duration_sector_1	du
162	Alexander ALBON	MEDIUM	2024-04-06T02:55:08.856000+00:00	10	34.332	
178	Alexander ALBON	MEDIUM	2024-04-06T02:56:43.981000+00:00	11	34.220	
195	Alexander ALBON	MEDIUM	2024-04-06T02:58:19.069000+00:00	12	34.240	
214	Alexander ALBON	MEDIUM	2024-04-06T02:59:54.350000+00:00	13	34.349	
232	Alexander ALBON	MEDIUM	2024-04-06T03:01:30.104000+00:00	14	34.433	
249	Alexander ALBON	MEDIUM	2024-04-06T03:03:05.877000+00:00	15	34.695	

In [123...

```
libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAXI
```

Out[123...

	full_name	compound	date_start	lap_number	duration_sector_1	du
252	Logan SARGEANT	MEDIUM	2024-04-06T03:03:18.085000+00:00	8	34.992	

	full_name	compound	date_start	lap_number	duration_sector_1
267	Logan SARGEANT	MEDIUM	2024-04-06T03:04:55.040000+00:00	9	34.931
279	Logan SARGEANT	MEDIUM	2024-04-06T03:06:34.738000+00:00	10	34.812
286	Logan SARGEANT	MEDIUM	2024-04-06T03:08:10.800000+00:00	11	34.768

Kick Sauber

In [124...

```
libraryDataF1.getinfo(longruns(jointables2,24,'Kick Sauber'),MINIMUM_SECONDS
```

Out[124...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
143	ZHOU Guanyu	SOFT	2024-04-06T02:52:54.109000+00:00	8	34.414	
157	ZHOU Guanyu	SOFT	2024-04-06T02:54:30.003000+00:00	9	34.430	
173	ZHOU Guanyu	SOFT	2024-04-06T02:56:06.500000+00:00	10	34.934	
190	ZHOU Guanyu	SOFT	2024-04-06T02:57:44.205000+00:00	11	35.271	
208	ZHOU Guanyu	SOFT	2024-04-06T02:59:23.124000+00:00	12	35.178	
225	ZHOU Guanyu	SOFT	2024-04-06T03:01:00.663000+00:00	13	35.491	
244	ZHOU Guanyu	SOFT	2024-04-06T03:02:39.212000+00:00	14	35.698	
261	ZHOU Guanyu	SOFT	2024-04-06T03:04:18.233000+00:00	15	35.940	

In [125...

```
libraryDataF1.getinfo(longruns(jointables2,77,'Kick Sauber'),MINIMUM_SECONDS
```

Out[125...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
124	Valtteri BOTTAS	SOFT	2024-04-06T02:50:07.953000+00:00	8	34.531	
135	Valtteri BOTTAS	SOFT	2024-04-06T02:51:44.451000+00:00	9	35.090	
146	Valtteri BOTTAS	SOFT	2024-04-06T02:53:21.773000+00:00	10	34.848	
160	Valtteri BOTTAS	SOFT	2024-04-06T02:54:58.761000+00:00	11	34.635	
176	Valtteri BOTTAS	SOFT	2024-04-06T02:56:35.977000+00:00	12	35.121	
193	Valtteri BOTTAS	SOFT	2024-04-06T02:58:12.601000+00:00	13	35.115	
212	Valtteri BOTTAS	SOFT	2024-04-06T02:59:50.206000+00:00	14	36.134	
250	Valtteri BOTTAS	SOFT	2024-04-06T03:03:11.213000+00:00	16	35.459	

# Qualyfinf

## Set up

First of all, it is neccesary to obtain the data about the qualyfinf

### Race control

This section has been added in order to know which laps has been deleted and knowing what happened on track during this session.

In [126...

```
libraryDataF1.obtain_information('race_control',session_key=9492)
```

Out[126...

	session_key	meeting_key	date	category	flag	lap_number
0	9492	1232	2024-04-06T06:00:00+00:00	Flag	GREEN	None
1	9492	1232	2024-04-06T06:05:52+00:00	Other	None	None
2	9492	1232	2024-04-06T06:06:01+00:00	Other	None	None
3	9492	1232	2024-04-06T06:18:00+00:00	Flag	CHEQUERED	None
4	9492	1232	2024-04-06T06:18:16+00:00	Other	None	None
5	9492	1232	2024-04-06T06:21:22+00:00	Other	None	None
6	9492	1232	2024-04-06T06:21:35+00:00	Other	None	None
7	9492	1232	2024-04-06T06:25:00+00:00	Flag	GREEN	None
8	9492	1232	2024-04-06T06:32:16+00:00	Other	None	None
9	9492	1232	2024-04-06T06:40:00+00:00	Flag	CHEQUERED	None



	session_key	meeting_key	date	category	flag	lap_number
10	9492	1232	2024-04-06T06:40:18+00:00	Other	None	None
11	9492	1232	2024-04-06T06:48:00+00:00	Flag	GREEN	None
12	9492	1232	2024-04-06T07:00:00+00:00	Flag	CHEQUERED	None
13	9492	1232	2024-04-06T07:00:17+00:00	Other	None	None
14	9492	1232	2024-04-06T07:00:22+00:00	Other	None	None

### Obtain setup

```
In [127... qualyfing = libraryDataF1.obtain_information('laps',session_key=9492)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9492)
drivers = libraryDataF1.obtain_information('drivers',session_key=9492)
```

To obtain a better analysis, those laptimes deleted will be removed from this analysis in order to obtain the data with valid values. So that,taking into account the race control table, it will be neccesary to consult the qualifying data to obtain the ids.

```
In [128... qualyfing = qualyfing.drop(116)
```

```
In [129... bestlap = qualyfing.loc[qualyfing.groupby(['driver_number'])['lap_duration']
bestlap[0:1]
```

```
Out[129...
```

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed
206	1232	9492	1	285	297	295

In this case, the fastest lap is 88.197 seconds (1.28.197= so that to obtain the competitive laps the fastest lap will be multiplied by 1.07 (94.370 seconds) due to, according to the rules all the drivers have to do unless one lap within this gap.

```
In [130... competitiveLaps = qualyfing.query("is_pit_out_lap == False and lap_duration < 94.370")
competitiveLaps
```

```
Out[130...
```

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed
1	1232	9492	20	286	297	296

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
16	1232	9492	2	285	303	298	2024-04-06T06:05:
18	1232	9492	23	284	304	299	2024-04-06T06:05:
19	1232	9492	11	286	299	297	2024-04-06T06:05:
22	1232	9492	1	286	299	297	2024-04-06T06:06:
...	...	...	...	...	...	...	
209	1232	9492	14	284	299	295	2024-04-06T06:58:
210	1232	9492	4	285	299	295	2024-04-06T06:58:
211	1232	9492	81	286	298	295	2024-04-06T06:59:
212	1232	9492	44	284	299	295	2024-04-06T06:59:
214	1232	9492	22	286	299	295	2024-04-06T06:59:

In [131]...

```
drivers_list = list(competitiveLaps['driver_number'].unique())
newdataset = pd.DataFrame()
for driver in drivers_list:
    newdataset =libraryDataF1.obtain_information_qualy(driver,competitiveLaps)
jointables = pd.merge(newdataset,drivers,on=['driver_number'])
jointables.sort_values(by=['fastest_lap'],ascending=True)
```

Out[131]...

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
4	1	88.197	0.000	295	285	297	9492	1232
3	11	88.263	0.066	296	286	298	9492	1232
19	4	88.489	0.292	294	283	298	9492	1232
6	55	88.682	0.485	293	285	296	9492	1232
10	14	88.686	0.489	294	284	298	9492	1232
9	81	88.760	0.563	294	284	296	9492	1232
7	44	88.766	0.569	293	283	297	9492	1232
5	16	88.786	0.589	295	284	295	9492	1232

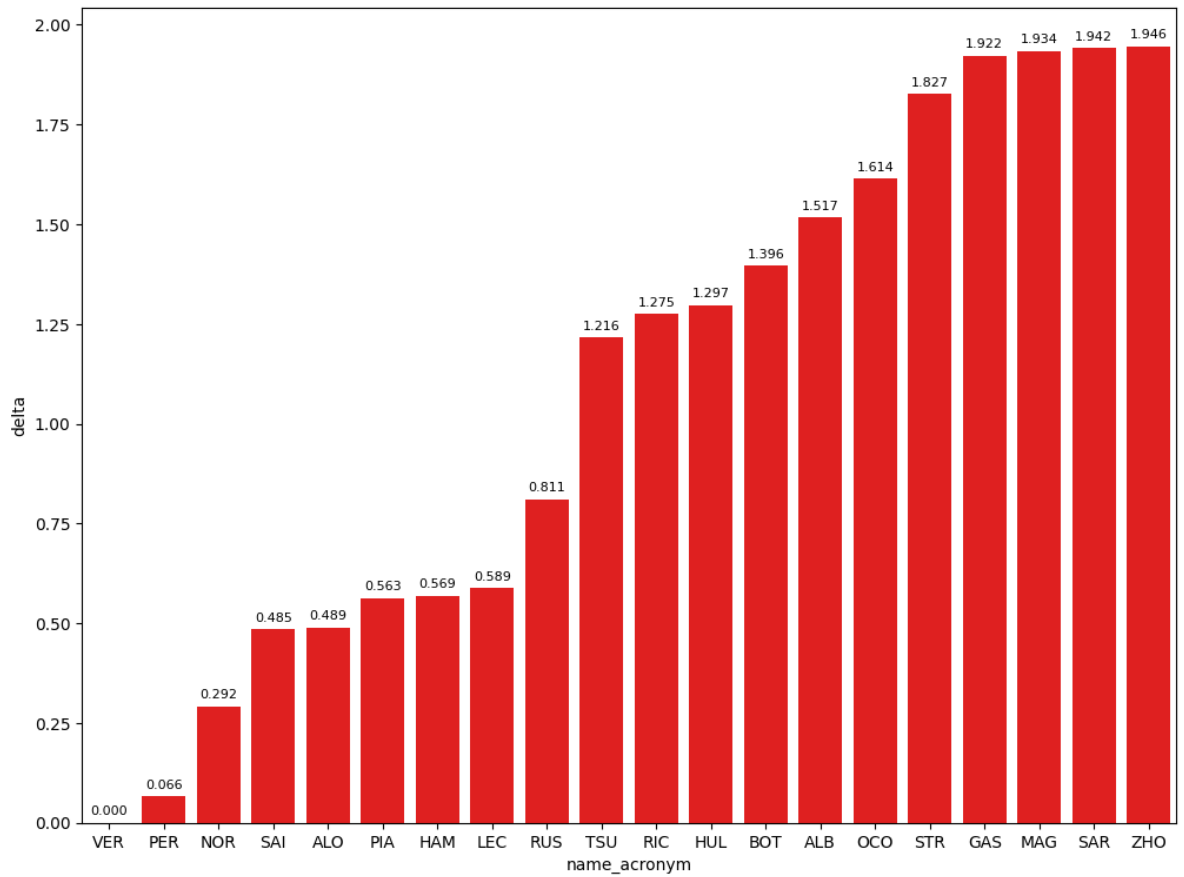
	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
<b>8</b>	63	89.008	0.811	294	282	298	9492	1232
<b>16</b>	22	89.413	1.216	297	284	298	9492	1232
<b>13</b>	3	89.472	1.275	296	283	297	9492	1232
<b>15</b>	27	89.494	1.297	299	287	302	9492	1232
<b>17</b>	77	89.593	1.396	290	281	294	9492	1232
<b>2</b>	23	89.714	1.517	299	284	302	9492	1232
<b>12</b>	31	89.811	1.614	295	285	298	9492	1232
<b>11</b>	18	90.024	1.827	293	282	296	9492	1232
<b>14</b>	10	90.119	1.922	294	285	297	9492	1232
<b>0</b>	20	90.131	1.934	296	286	297	9492	1232
<b>1</b>	2	90.139	1.942	298	284	303	9492	1232

### Best lap per driver compared with the best lap of the session

In this chart we can see the deltas with compared with the fastest lap of the session that it could be different than the pole. In this case, this happened with Leclerc taking the best time but not taking the pole because his cest time in Q3 was not the best time of the session.

In [132...

```
libraryDataF1.obtainchart("name_acronym","delta",jointables.sort_values(by=
```

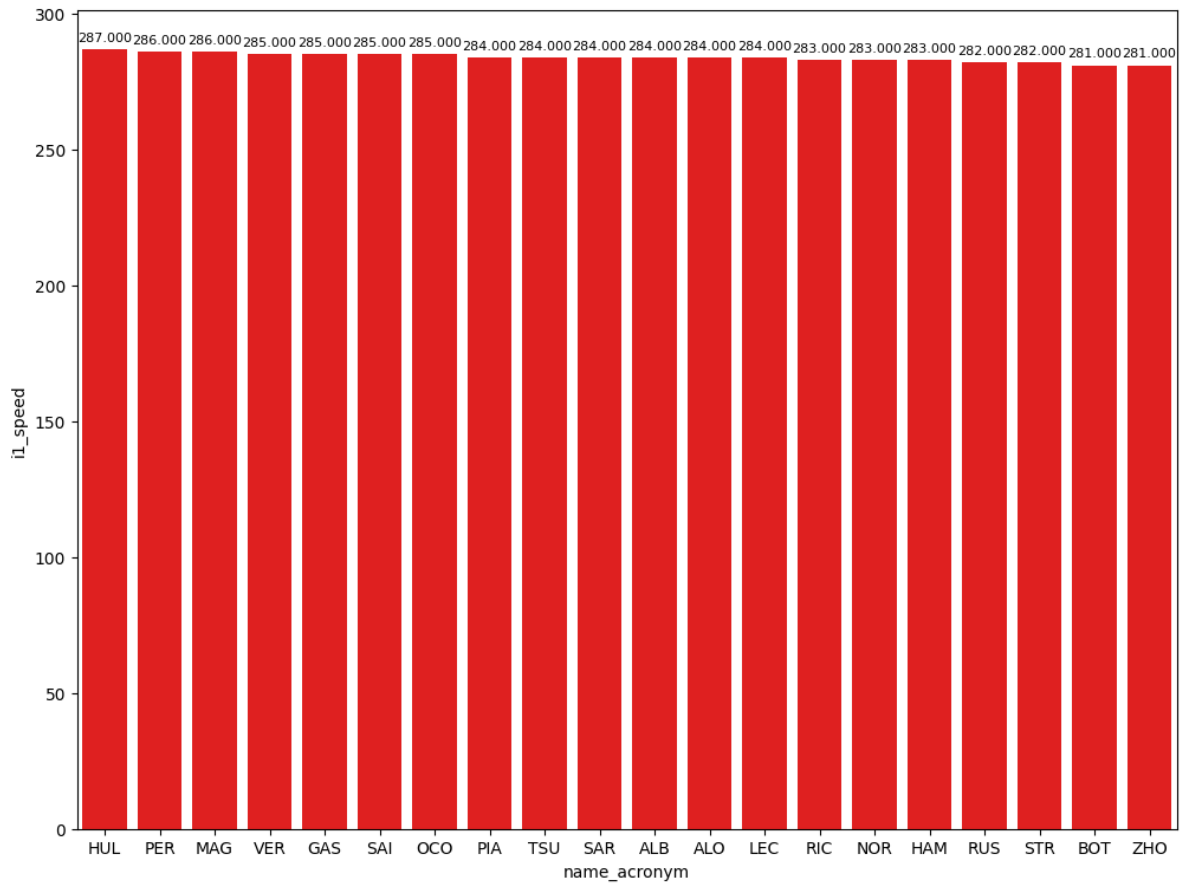


## Speed trap

Maximum speed per drivers

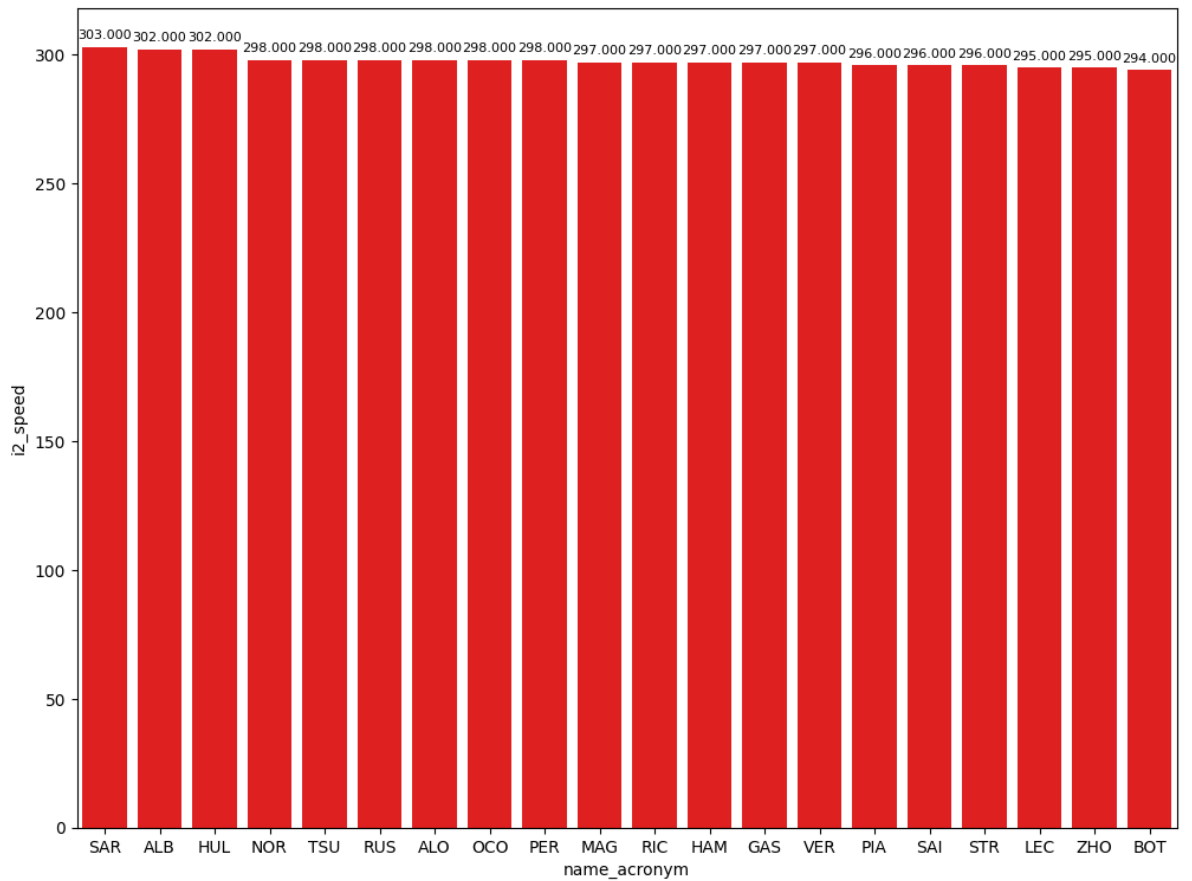
In [133...

```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['i1_speed']  
libraryDataFl.obtainchart("name_acronym", "i1_speed", top_speed)
```



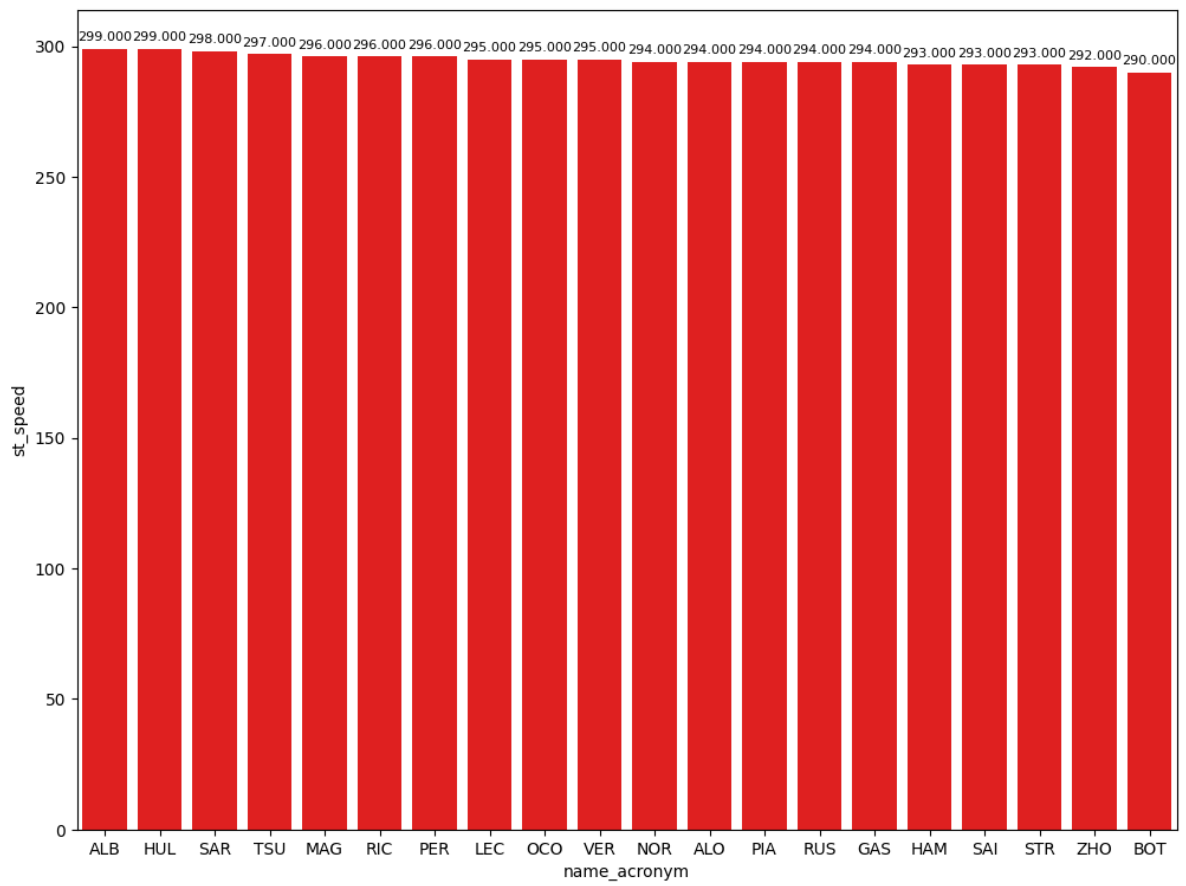
In [134...

```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['i2_speed']
libraryDataF1.obtainchart("name_acronym", "i2_speed", top_speed)
```



In [135...

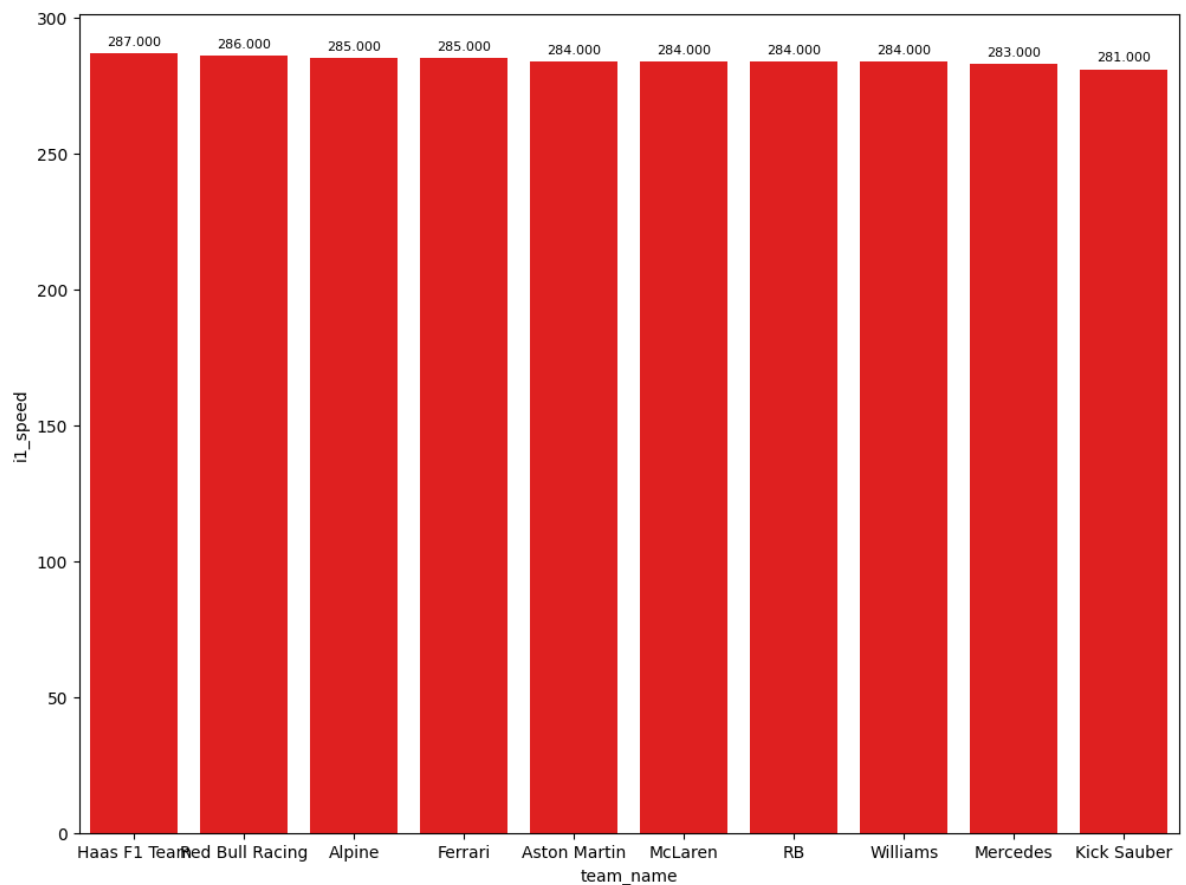
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['st_speed']  
libraryDataFl.obtainchart("name_acronym","st_speed",top_speed)
```



## Maximum speed per teams

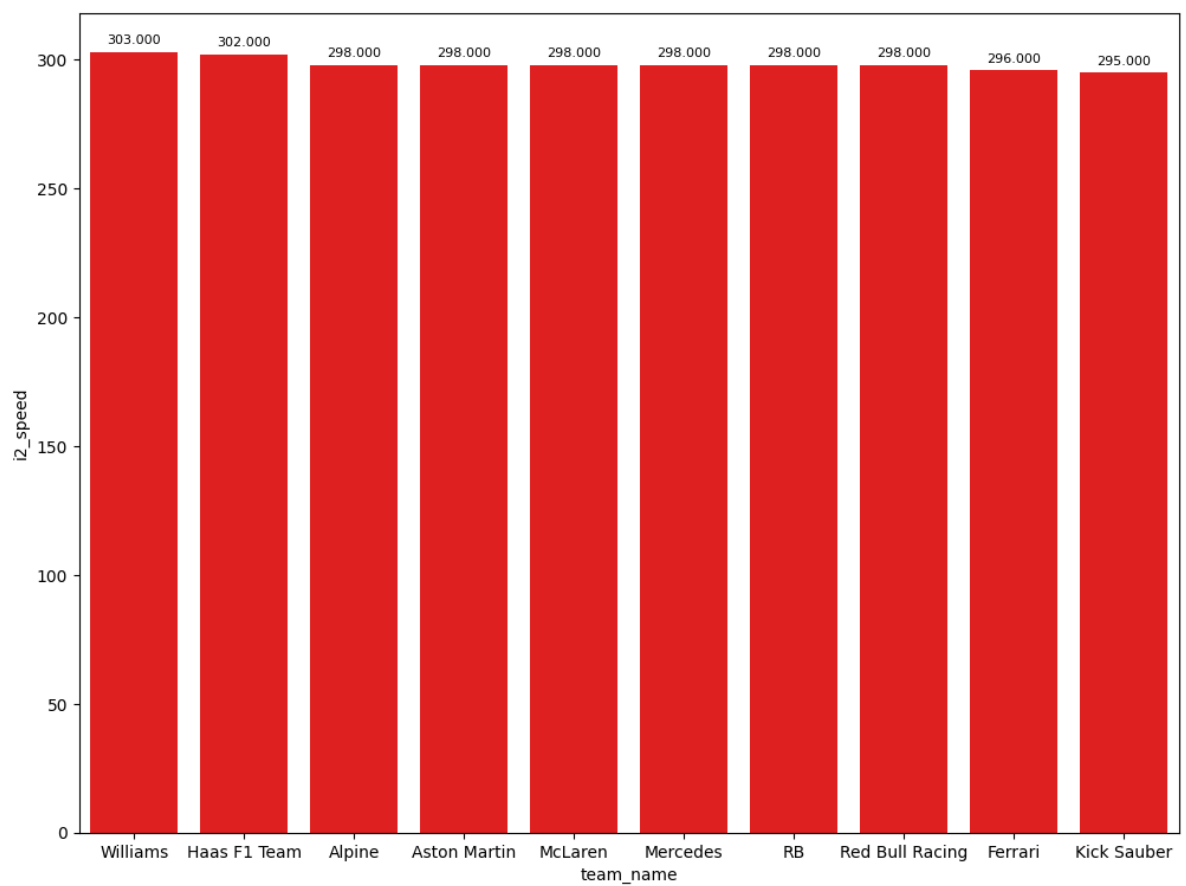
In [136...

```
top_speed = jointables.loc[jointables.groupby(['team_name'])['il_speed'].i  
libraryDataFl.obtainchart("team_name","il_speed",top_speed)
```

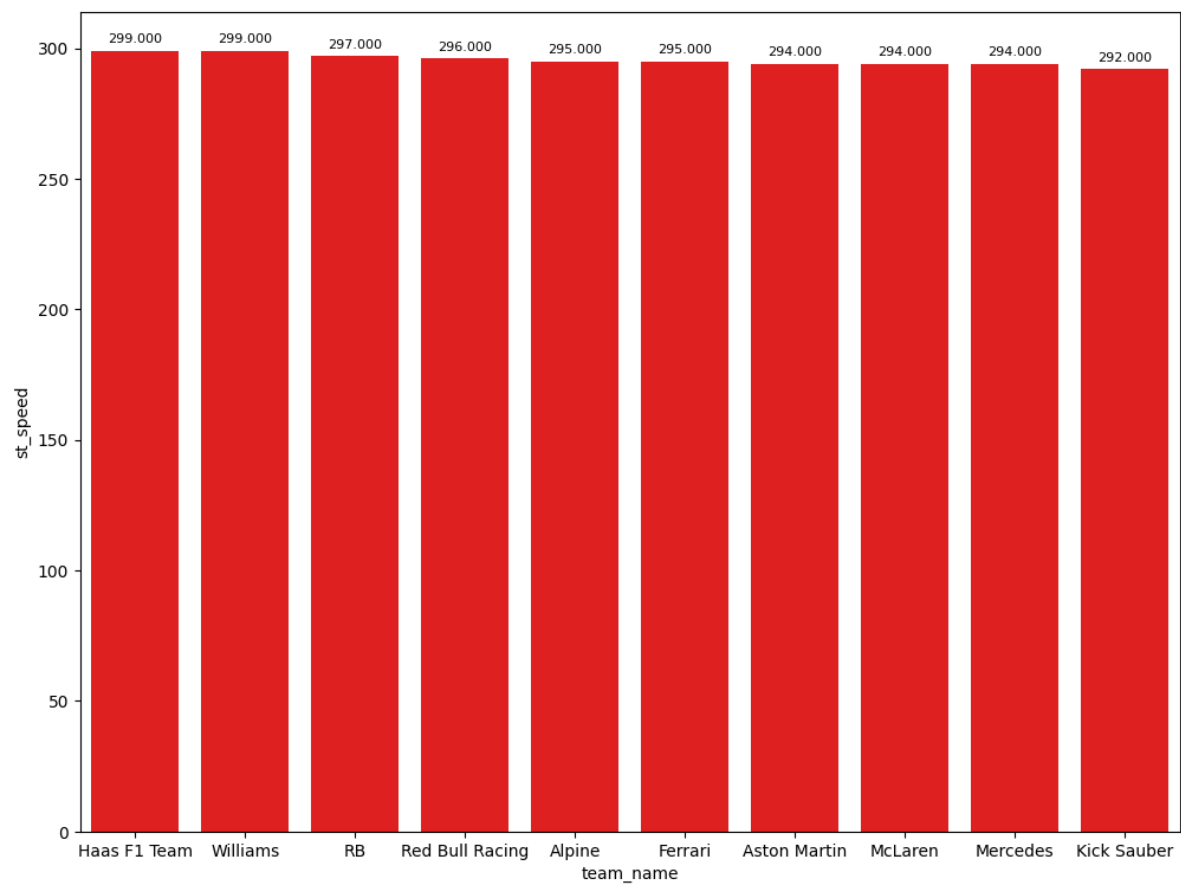


In [137...

```
top_speed = jointables.loc[jointables.groupby(['team_name'])['i2_speed'].i2_speed.agg('max')]
libraryDataF1.obtainchart("team_name", "i2_speed", top_speed)
```



```
In [138... top_speed = jointables.loc[jointables.groupby(['team_name'])['st_speed'].i
libraryDataF1.obtainchart("team_name","st_speed",top_speed)
```



```
In [139... mergequally = pd.merge(competitiveLaps,drivers,on=['driver_number'])
mergequally
```

meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
0	1232	9492	20	286	297	296 2024-04-06T06
1	1232	9492	20	288	303	299 2024-04-06T06
2	1232	9492	20	287	302	298 2024-04-06T06
3	1232	9492	2	285	303	298 2024-04-06T06
4	1232	9492	2	284	303	298 2024-04-06T06
...	...	...	...	...	...	...
68	1232	9492	24	282	295	293 2024-04-06T06
69	1232	9492	4	283	298	295 2024-04-06T06
70	1232	9492	4	285	300	295 2024-04-06T06
71	1232	9492	4	284	298	294 2024-04-06T06



	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
	72	1232	9492	4	285	299	295 2024-04-06T06

In order to know when each session finished, race control dataset will be consulted.

```
In [140...
maximumDateQ1 = "date_start <'2024-04-06T06:25:00'"
maximumDateQ2 = "date_start <'2024-04-06T06:48:00' and date_start >'2024-04-06T06:48:00'"
maximumDateQ3 = "date_start >'2024-04-06T06:48:00'"
```

## Qualyfyng 1

In this session the surprise came from Aston Martin with Stroll that knocked-out in Q1. The rest of the drivers were expected to be knocked-out

```
In [141...
q1Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly,maximumDateQ1,maximumDateQ2,maximumDateQ3)
q1Data
```

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
	12	1232	9492	1	286	299	297 2024-04-06T06
	38	1232	9492	14	285	300	296 2024-04-06T06
	8	1232	9492	11	286	299	297 2024-04-06T06
	17	1232	9492	16	284	297	295 2024-04-06T06
	34	1232	9492	81	284	299	296 2024-04-06T06
	20	1232	9492	55	285	298	295 2024-04-06T06
	69	1232	9492	4	283	298	295 2024-04-06T06
	64	1232	9492	77	282	295	293 2024-04-06T06
	24	1232	9492	44	284	300	297 2024-04-06T06
	49	1232	9492	3	284	298	297 2024-04-06T06
	58	1232	9492	22	284	299	297 2024-04-06T06
	29	1232	9492	63	282	301	295 2024-04-06T06
	45	1232	9492	31	286	298	295 2024-04-06T06
	55	1232	9492	27	288	302	299 2024-04-06T06
	6	1232	9492	23	285	302	299 2024-04-06T06
	42	1232	9492	18	282	297	295 2024-04-06T06

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
53	1232	9492	10	285	297	294	2024-04-06T06
2	1232	9492	20	287	302	298	2024-04-06T06
4	1232	9492	2	284	303	298	2024-04-06T06
68	1232	9492	24	282	295	293	2024-04-06T06

20 rows × 28 columns

Comparison with driver at risk

In this section with the fastest lap done for each driver (laptimes deleted will not be taken into account to do this analysis) it will do a comparison in order to see where the driver eliminated lost/gain time in their fastest lap.

In [142...

```
#Reference
P15 = q1Data[14:15]
P15
```

Out[142...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
6	1232	9492	23	285	302	299	2024-04-06T06::

1 rows × 28 columns

In [143...

```
print(
    "Driver:", P15.full_name.to_string(index=False),
    "Sector 1: ", P15.duration_sector_1.to_string(index=False),
    "Sector 2: ", P15.duration_sector_2.to_string(index=False),
    "Sector 3: ", P15.duration_sector_3.to_string(index=False)
)
```

Driver: Alexander ALBON Sector 1: 31.584 Sector 2: 40.602 Sector 3: 17.777

In [144...

```
q1Data[15::]
```

Out[144...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
42	1232	9492	18	282	297	295	2024-04-06T06
53	1232	9492	10	285	297	294	2024-04-06T06
2	1232	9492	20	287	302	298	2024-04-06T06
4	1232	9492	2	284	303	298	2024-04-06T06
68	1232	9492	24	282	295	293	2024-04-06T06

5 rows × 28 columns

Analysis of each sector of the driver at risk compared to the drivers eliminated.

It was a close battle to pass to Q2 with less of 2 tenths among the driver at risk and the last driver. Until the third sector, Stroll and Gasly had the chance to pass to Q2.

In [145...

```
newdataset2 = pd.DataFrame()
for index,row in q1Data[15:].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P15
newdataset2
```

Out[145...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	18	0.061	-0.086	-0.056	0.203	
1	10	0.156	-0.116	0.060	0.212	
2	20	0.168	0.202	-0.120	0.086	
3	2	0.176	0.160	-0.060	0.076	
4	24	0.180	0.101	-0.115	0.194	

Analysis with the drivers that finished better than the driver at risk

I bring this section in order to know where the driver at risk lost his chances to improve in the qualifying. Albon was able to pass Hulkenberg, but, unfortunately, his second sector was bad.

In [146...

```
newdataset2 = pd.DataFrame()
for index,row in q1Data[0:14].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P15
newdataset2
```

Out[146...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	n
0	1	-1.097	-0.493	-0.502	-0.102	
1	14	-0.709	-0.448	-0.330	0.069	
2	11	-0.660	-0.329	-0.384	0.053	
3	16	-0.625	-0.132	-0.518	0.025	
4	81	-0.538	-0.331	-0.235	0.028	
5	55	-0.450	-0.215	-0.310	0.075	
6	4	-0.427	-0.350	-0.085	0.008	
7	77	-0.361	-0.075	-0.243	-0.043	
8	44	-0.302	-0.176	-0.175	0.049	
9	3	-0.236	-0.194	-0.084	0.042	
10	22	-0.188	-0.226	0.019	0.019	
11	63	-0.164	0.095	-0.264	0.005	
12	31	-0.152	-0.079	-0.146	0.073	
13	27	-0.142	0.092	-0.208	-0.026	

Best sector per driver

In this section we can see the best sector of the session

```
In [147... pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_1'].min().sor
```

Out[147...

duration_sector_1	
name_acronym	
VER	31.091
ALO	31.136
NOR	31.234
PIA	31.253
PER	31.255
TSU	31.358
SAI	31.369
RIC	31.390
HAM	31.408
LEC	31.452
GAS	31.468
STR	31.498
OCO	31.505
BOT	31.509
ALB	31.584
HUL	31.676
RUS	31.679
ZHO	31.685
SAR	31.744
MAG	31.786

```
In [148... pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[148...

duration_sector_2	
name_acronym	
LEC	40.084
VER	40.100
PER	40.218
ALO	40.272
SAI	40.292
RUS	40.338
BOT	40.359
PIA	40.367
HUL	40.394

	duration_sector_2
name_acronym	
HAM	40.427
OCO	40.456
MAG	40.482
ZHO	40.487
NOR	40.517
RIC	40.518
SAR	40.542
STR	40.546
ALB	40.602

In [149... `pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_3'].min().sort...`

Out[149...

	duration_sector_3
name_acronym	
VER	17.675
BOT	17.734
HUL	17.751
ALB	17.777
RUS	17.782
NOR	17.785
TSU	17.796
LEC	17.802
PIA	17.805
RIC	17.819
HAM	17.826
PER	17.830
ALO	17.846
OCO	17.850
SAI	17.852
SAR	17.853
MAG	17.863
ZHO	17.971
STR	17.980
GAS	17.989

## Qualyfinf 2

In this session, there were not surprises

In [150...

```
q2Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly,maximumDateQ:
q2Data
```

Out[150...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
13	1232	9492	1	286	298	296	2024-04-06T06
9	1232	9492	11	286	298	298	2024-04-06T06
26	1232	9492	44	284	297	294	2024-04-06T06
70	1232	9492	4	285	300	295	2024-04-06T06
39	1232	9492	14	285	300	296	2024-04-06T06
21	1232	9492	55	286	298	295	2024-04-06T06
31	1232	9492	63	283	298	295	2024-04-06T06
35	1232	9492	81	286	300	298	2024-04-06T06
18	1232	9492	16	285	298	297	2024-04-06T06
60	1232	9492	22	285	299	297	2024-04-06T06
51	1232	9492	3	285	297	296	2024-04-06T06
56	1232	9492	27	289	302	300	2024-04-06T06
66	1232	9492	77	283	294	293	2024-04-06T06
7	1232	9492	23	285	302	299	2024-04-06T06
47	1232	9492	31	287	298	296	2024-04-06T06

15 rows × 28 columns

Comparaison with driver at risk

In this section with the fastest lap done for each driver (laptimes deleted will not be taken into account to do this analysis) it will be a comparaison in order to see where the driver eliminated lost/gain time in their fastest lap.

In [151...

```
#Reference
P10 = q2Data[9:10]
print(
    "Driver:",P10.full_name.to_string(index=False),
    "Sector 1: ",P10.duration_sector_1.to_string(index=False),
    "Sector 2: ",P10.duration_sector_2.to_string(index=False),
    "Sector 3: ",P10.duration_sector_3.to_string(index=False)
)
```

Driver: Yuki TSUNODA Sector 1: 31.283 Sector 2: 40.423 Sector 3: 17.711

Analysis of each sector of the driver at risk compared to the drivers eliminated.

RB had a good pace, as we can see in the standings. Tsunoda made it through Q2 and Ricciardo finished P11.

In [152...

```
newdataset2 = pd.DataFrame()
for index,row in q2Data[10:].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P10)

newdataset2
```

Out[152...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	3	0.055	0.069	-0.021	0.007	
1	27	0.077	0.275	-0.185	-0.013	
2	77	0.176	0.074	0.055	0.047	
3	23	0.297	0.334	-0.042	0.005	
4	31	0.399	0.191	0.058	0.150	

Analysis with the drivers that finished better than the driver at risk

I bring this section in order to know where the driver at risk lost his chances to improve in the qualifying. RB had a good pace but it was not enough to fight with the drivers that finished better than their drivers.

In [153...

```
newdataset2 = pd.DataFrame()
for index,row in q2Data[0:9].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P10)

newdataset2
```

Out[153...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	1	-0.677	-0.220	-0.367	-0.090	
1	11	-0.665	-0.236	-0.415	-0.014	
2	44	-0.530	-0.173	-0.373	0.016	
3	4	-0.477	-0.287	-0.193	0.003	
4	14	-0.335	-0.141	-0.244	0.050	
5	55	-0.318	-0.080	-0.249	0.011	
6	63	-0.277	0.047	-0.331	0.007	
7	81	-0.269	-0.263	-0.152	0.146	
8	16	-0.221	-0.037	-0.330	0.146	

### Best sector per driver

In this section we can see the best sector of the session

In [154...

```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_1'].min().sort)
```

Out[154...

duration_sector_1	
name_acronym	
NOR	30.996
PIA	31.020
PER	31.047
VER	31.063
HAM	31.110
ALO	31.142
SAI	31.203
LEC	31.246
TSU	31.283
RUS	31.330
RIC	31.352
BOT	31.357
OCO	31.474
HUL	31.558
ALB	31.617

In [155...

```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_2'].min().sort)
```

Out[155...

duration_sector_2	
name_acronym	
PER	40.008
HAM	40.050
VER	40.056
RUS	40.092
LEC	40.093
SAI	40.174
ALO	40.179
NOR	40.230
HUL	40.238
PIA	40.271
ALB	40.381
RIC	40.402
TSU	40.423
BOT	40.478
OCO	40.481

In [156...

```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_3'].min().sort)
```



Out [156...

duration_sector_3	
name_acronym	
VER	17.621
PER	17.697
HUL	17.698
TSU	17.711
NOR	17.714
ALB	17.716
RIC	17.718
RUS	17.718
SAI	17.722
HAM	17.727
BOT	17.758
ALO	17.761
LEC	17.857
PIA	17.857
OCO	17.861

### Qualyfinf 3

In [157...

```
q3Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly,maximumDateQ
q3Data
```

Out [157...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
15	1232	9492	1	285	297	295	2024-04-06T06
11	1232	9492	11	286	300	297	2024-04-06T06
71	1232	9492	4	284	298	294	2024-04-06T06
22	1232	9492	55	286	296	294	2024-04-06T06
41	1232	9492	14	284	299	295	2024-04-06T06
36	1232	9492	81	286	296	294	2024-04-06T06
27	1232	9492	44	285	297	293	2024-04-06T06
19	1232	9492	16	285	295	295	2024-04-06T06
32	1232	9492	63	284	299	294	2024-04-06T06
62	1232	9492	22	285	299	298	2024-04-06T06

10 rows × 28 columns

Comparison with poleman

In this section with the fastest lap done for each driver (laptimes deleted will not be taken into account to do this analysis) it will be a comparison in order to see where the driver eliminated lost/gain time in their fastest lap.

In [158...

```
#Reference
P1 = q3Data[:1]
print(
    "Driver:", P1.full_name.to_string(index=False),
    "Sector 1: ", P1.duration_sector_1.to_string(index=False),
    "Sector 2: ", P1.duration_sector_2.to_string(index=False),
    "Sector 3: ", P1.duration_sector_3.to_string(index=False)
)
```

Driver: Max VERSTAPPEN Sector 1: 30.777 Sector 2: 39.85 Sector 3: 17.57

Analysis of each sector of the driver at risk compared to the drivers eliminated.

Red Bull was dominant in Japan as we can see in qualifying. After finishing the second sector, Perez had a better laptime than Verstappen but a better sector from the Dutch driver afford to him to take the pole.

In [159...

```
newdataset2 = pd.DataFrame()
for index, row in q3Data[1:].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row, P1,
    newdataset2
```

Out[159...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	11	0.066	0.069	-0.087	0.084	
1	4	0.292	0.023	0.189	0.080	
2	55	0.485	0.191	0.139	0.155	
3	14	0.489	0.187	0.177	0.125	
4	81	0.563	0.060	0.377	0.126	
5	44	0.569	0.138	0.306	0.125	
6	16	0.589	0.332	0.016	0.241	
7	63	0.811	0.404	0.273	0.134	
8	22	1.216	0.541	0.398	0.277	

## Best sector per driver

In this section we can see the best sector of the session

In [160...

```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_1'].min().sort
```

Out[160...

name_acronym	duration_sector_1
VER	30.777

	duration_sector_1
name_acronym	
NOR	30.800
PIA	30.837
PER	30.846
HAM	30.915
ALO	30.964
SAI	30.968
LEC	31.109

In [161... `pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_2'].min().sort...`

Out[161...

	duration_sector_2
name_acronym	
PER	39.763
VER	39.850
LEC	39.866
SAI	39.989
ALO	40.027
NOR	40.039
RUS	40.123
HAM	40.156
PIA	40.227
TSU	40.248

In [162... `pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_1'].min().sort...`

Out[162...

	duration_sector_1
name_acronym	
VER	30.777
NOR	30.800
PIA	30.837
PER	30.846
HAM	30.915
ALO	30.964
SAI	30.968
LEC	31.109
RUS	31.181
TSU	31.318

## Best sector per driver of the session (in general)

In [163...

```
pd.DataFrame(mergequally.groupby("name_acronym")['duration_sector_1'].min())
```

Out[163...

duration_sector_1	
name_acronym	
VER	30.777
NOR	30.800
PIA	30.837
PER	30.846
HAM	30.915
ALO	30.964
SAI	30.968
RUS	31.073
LEC	31.109
TSU	31.283
RIC	31.352
BOT	31.357
STR	31.386
GAS	31.468
OCO	31.474
HUL	31.558
ALB	31.584
ZHO	31.685
SAR	31.744
MAG	31.786

In [164...

```
pd.DataFrame(mergequally.groupby("name_acronym")['duration_sector_2'].min())
```

Out[164...

duration_sector_2	
name_acronym	
PER	39.763
VER	39.850
LEC	39.866
SAI	39.989
HAM	40.008
ALO	40.027
NOR	40.039
RUS	40.092
PIA	40.227

	duration_sector_2
name_acronym	
HUL	40.238
TSU	40.248
BOT	40.359
ALB	40.381
RIC	40.402
OCO	40.456
MAG	40.482
ZHO	40.487
SAR	40.542

In [165...

```
pd.DataFrame(mergequally.groupby("name_acronym")['duration_sector_3'].min())
```

Out[165...

	duration_sector_3
name_acronym	
VER	17.503
NOR	17.634
PER	17.654
ALO	17.695
HAM	17.695
PIA	17.696
HUL	17.698
ALB	17.699
RUS	17.704
TSU	17.711
RIC	17.718
SAI	17.722
BOT	17.734
LEC	17.802
SAR	17.835
OCO	17.850
MAG	17.863
GAS	17.964
ZHO	17.971
STR	17.980

Race

Obtain setup

```
In [166... race = libraryDataF1.obtain_information('laps',session_key=9496)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9496)
drivers = libraryDataF1.obtain_information('drivers',session_key=9496)
```

```
In [167... stintsDataFrame =libraryDataF1.stint_configuration(drivers,stintInformation)
```

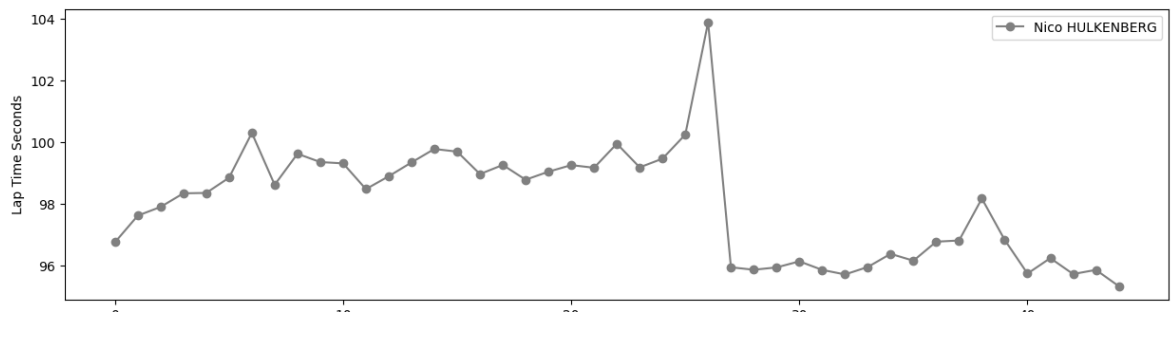
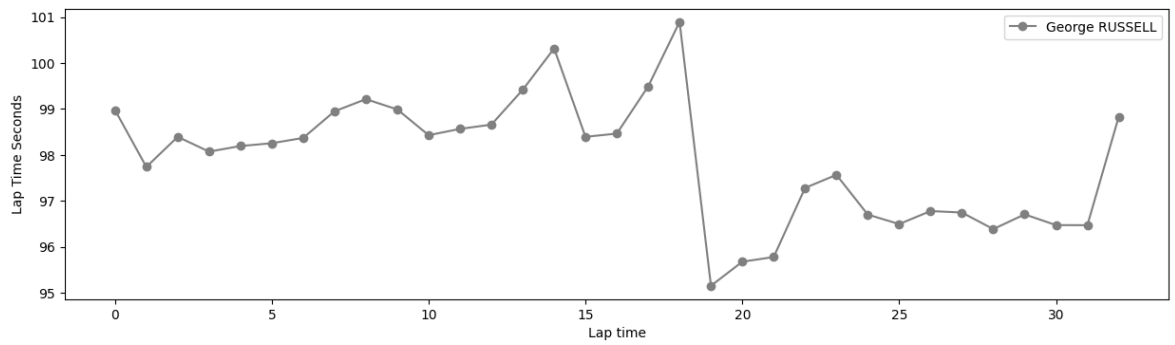
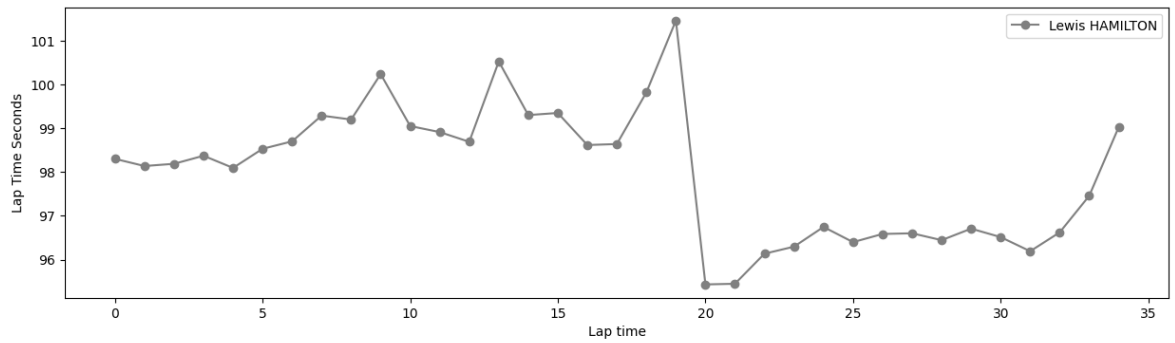
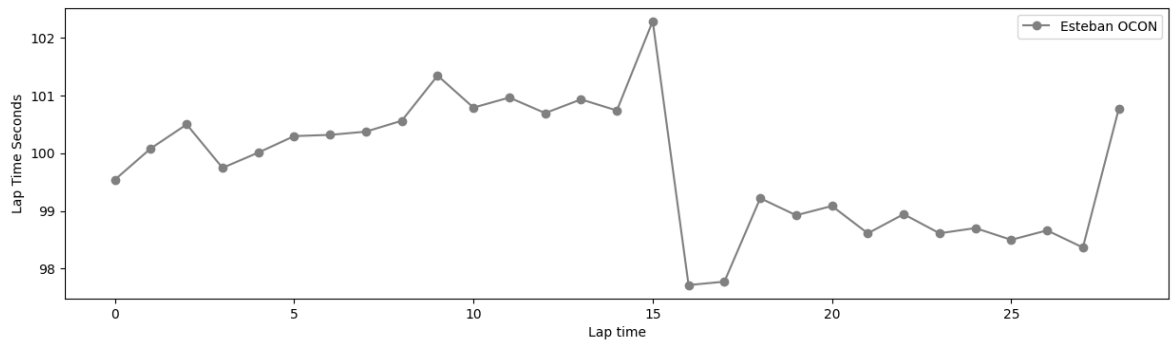
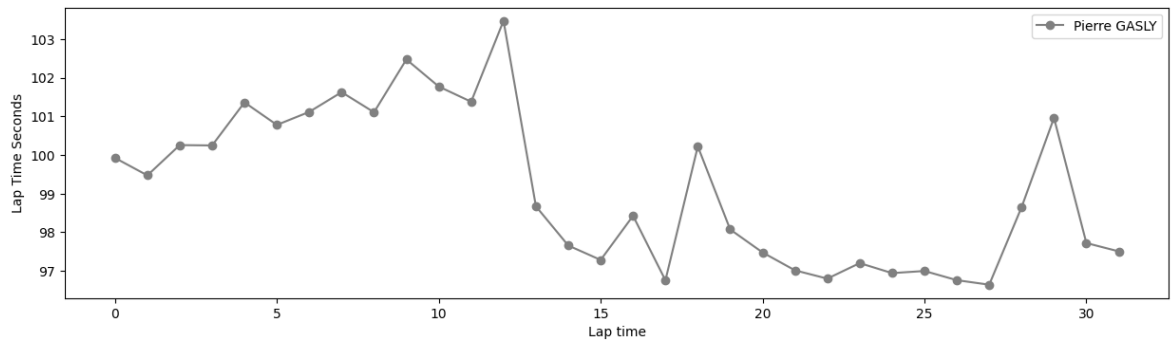
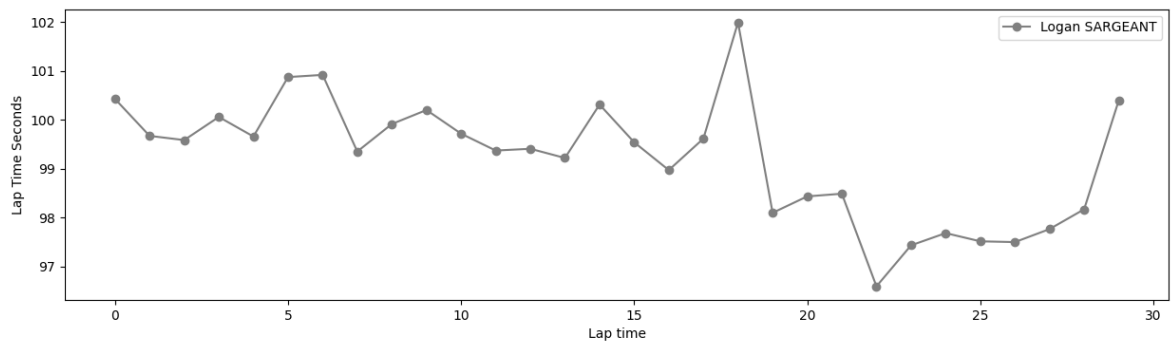
```
In [168... raceLaps = race.query("is_pit_out_lap == False")
jointables = pd.merge(raceLaps,stintsDataFrame,on=['lap_number','driver_number'])
```

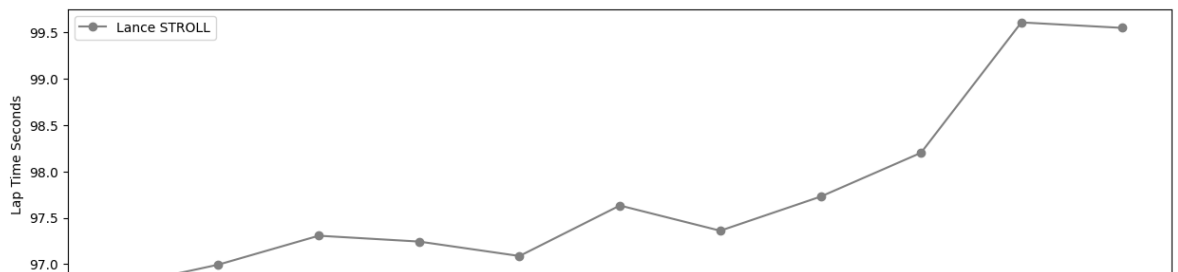
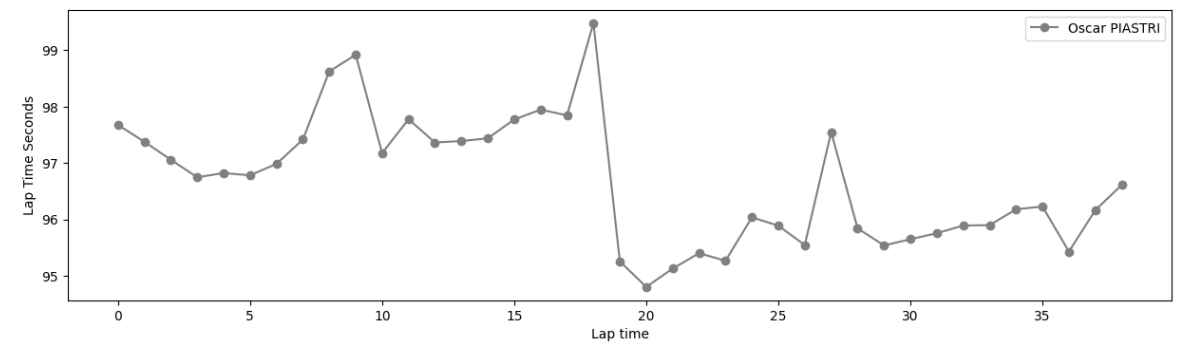
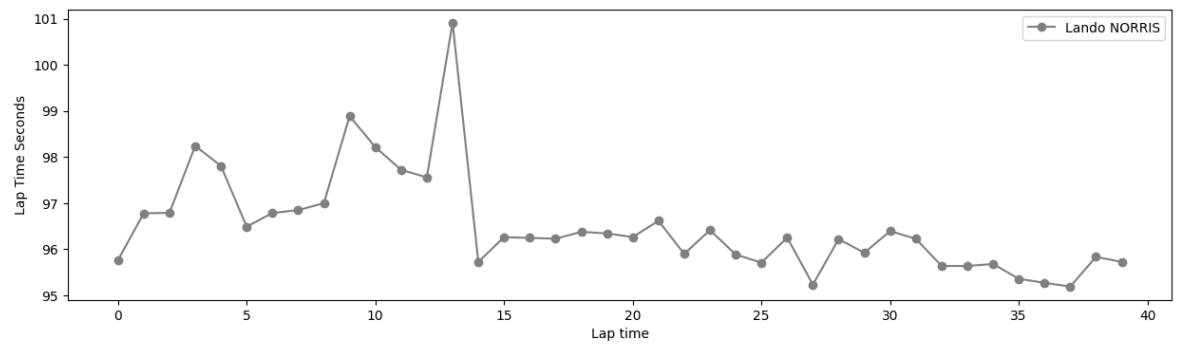
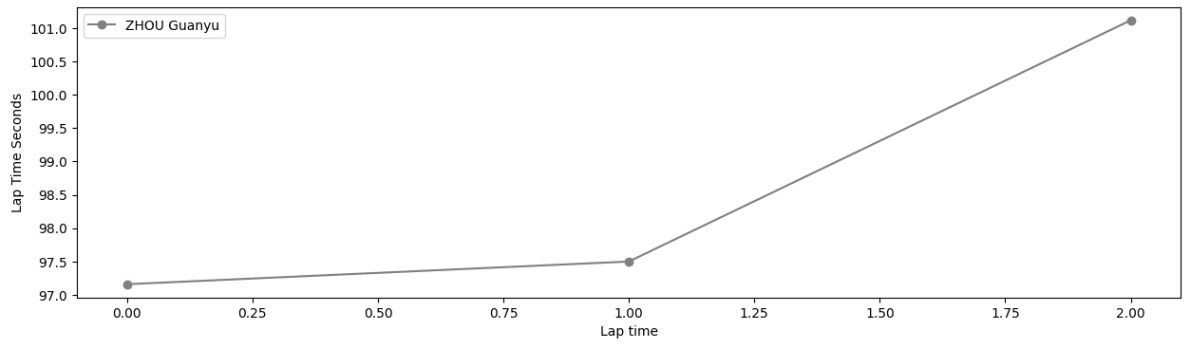
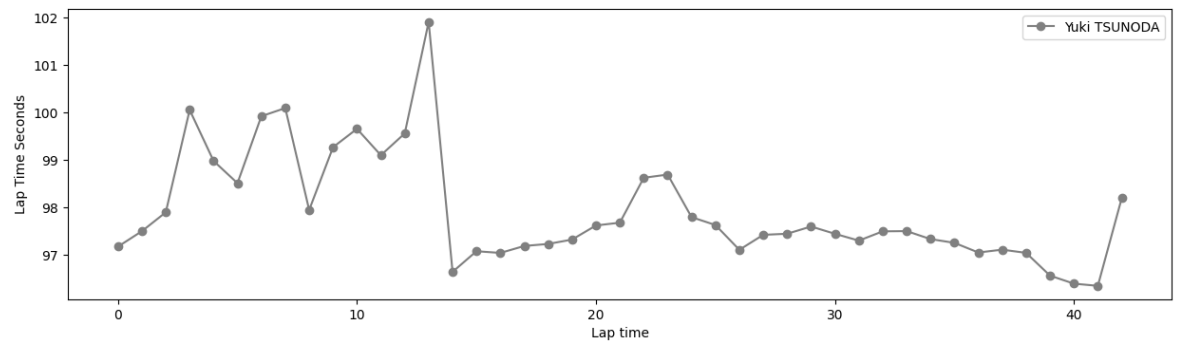
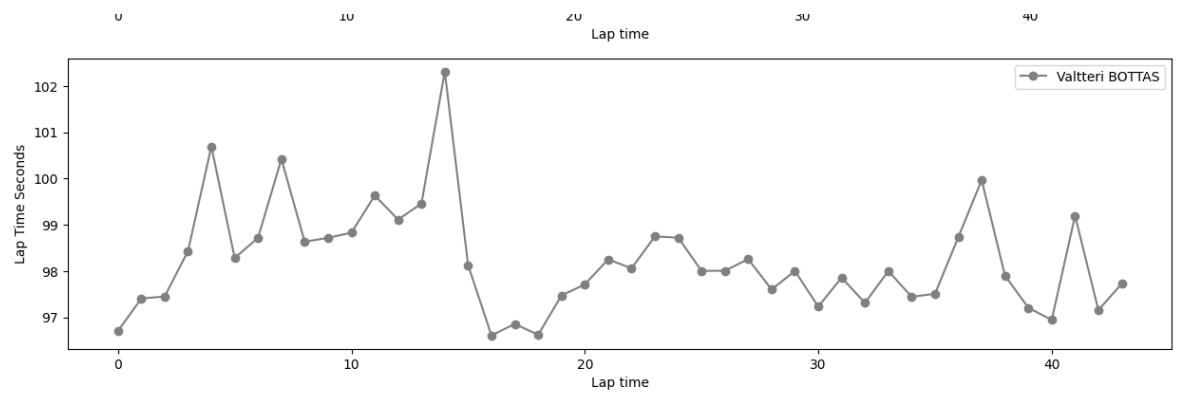
Obtain data tyres

## Hard tyres

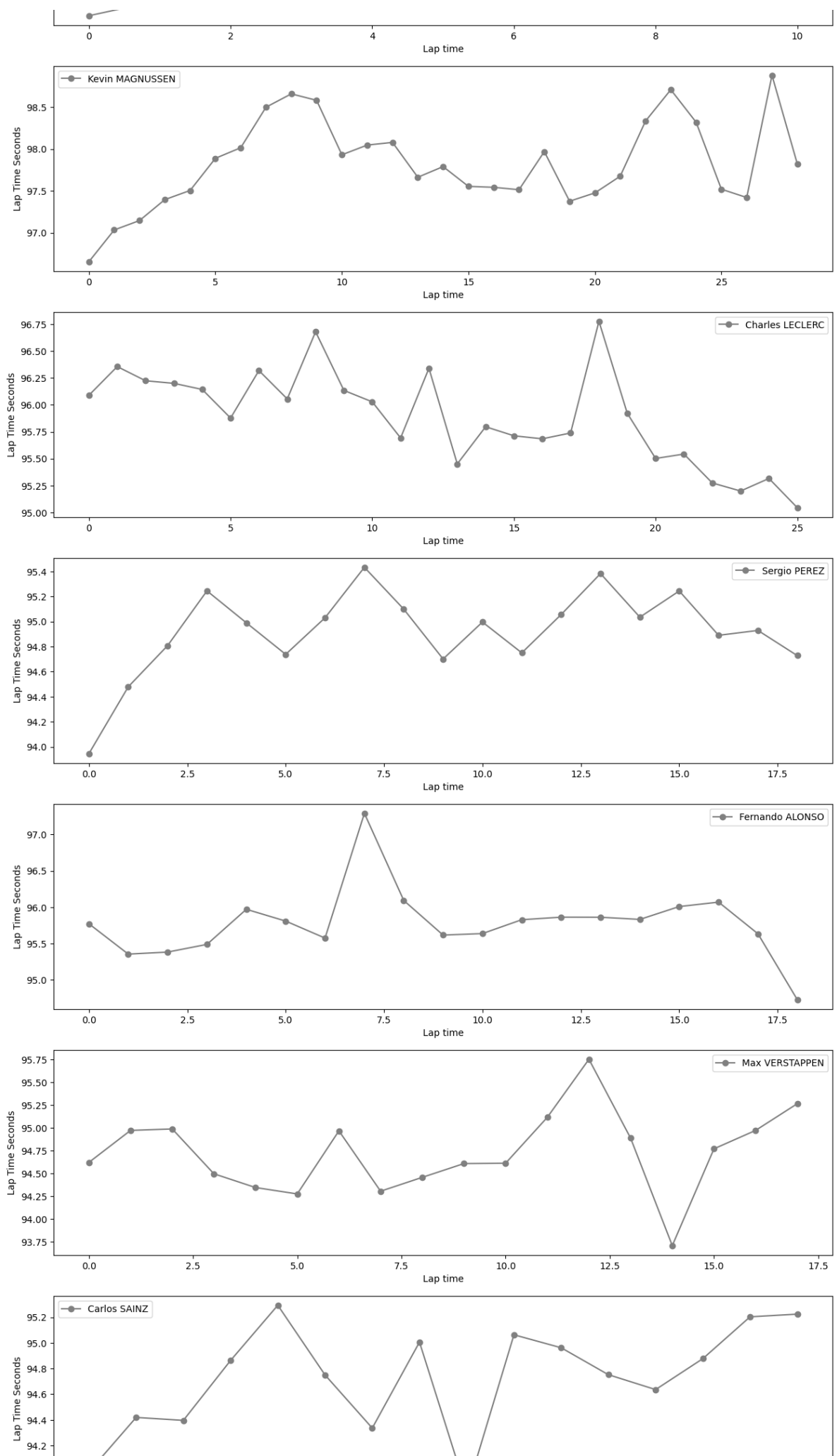
As Pirelli predicted, with this softest compounds that the Italian brand brought to Albert Park, it should stop two times and this occurred. With this compounds, As the MEDIUM, this compound was used twice in the race for the most of the drivers and the pace with this set was well. A case that I would want to stand out with this set is the Leclerc's pace with set. Ferrari's driver was able to keep on track during 20 laps with competitive lap-times and that it was favourable to him due to he decided to take the risk doing one stop. The pace that showed the Monegascan driver talks very well of how Ferrari worked in the tyres degradation during this weekend.

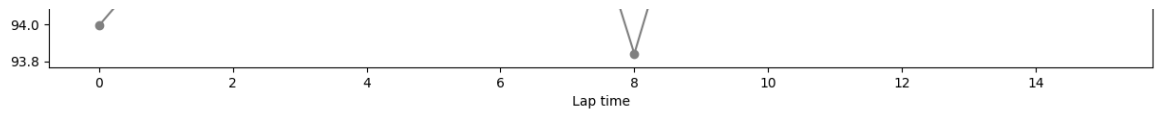
```
In [169... libraryDataF1.obtain_data_tyres(jointables,'HARD',110)
```









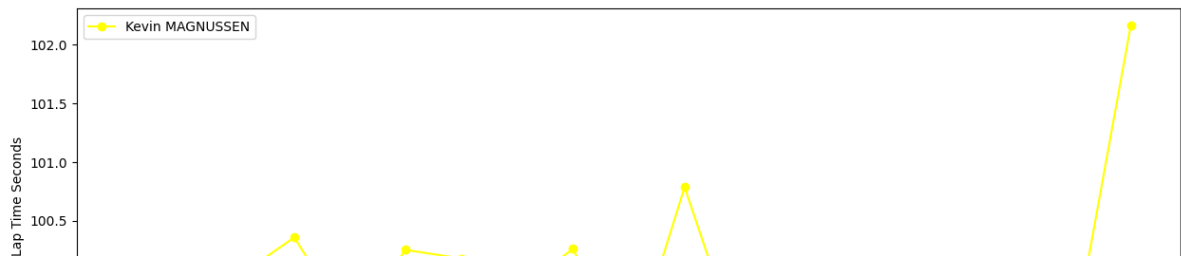
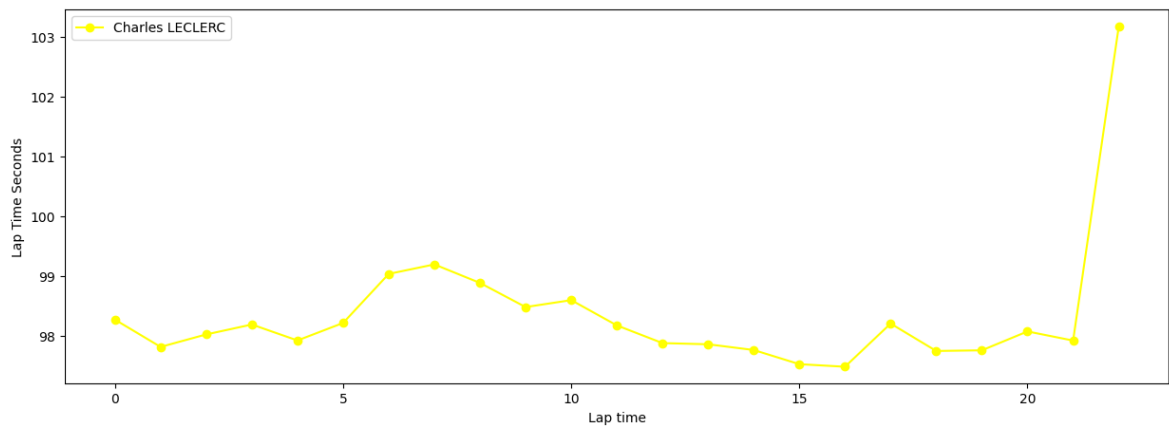
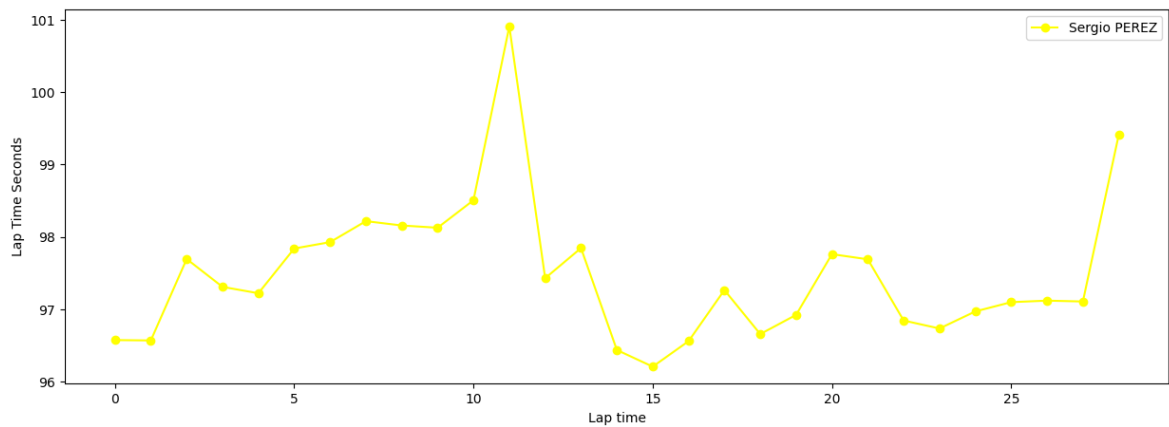
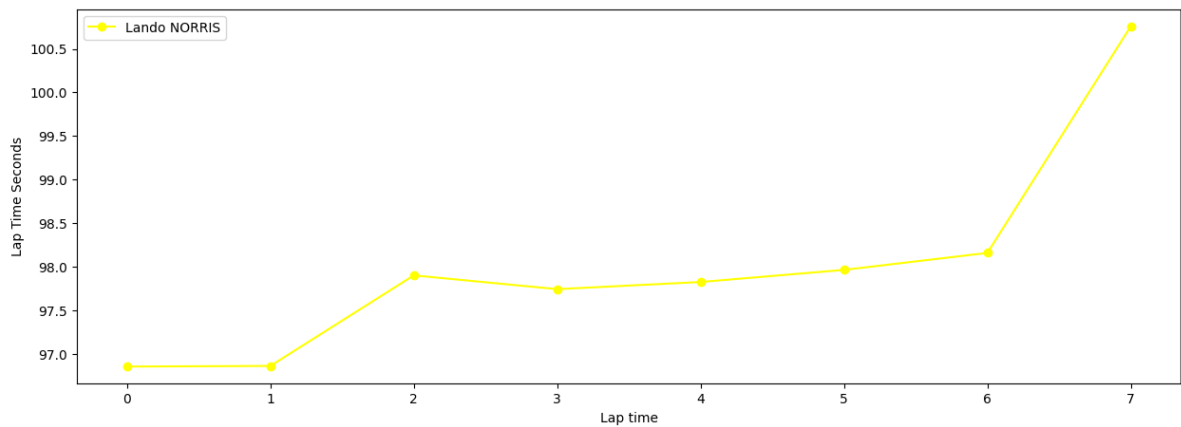
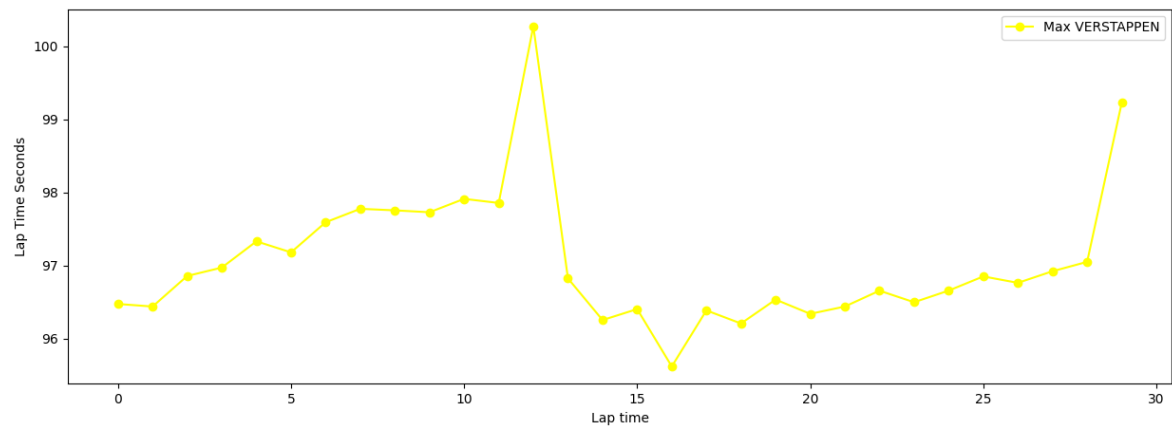


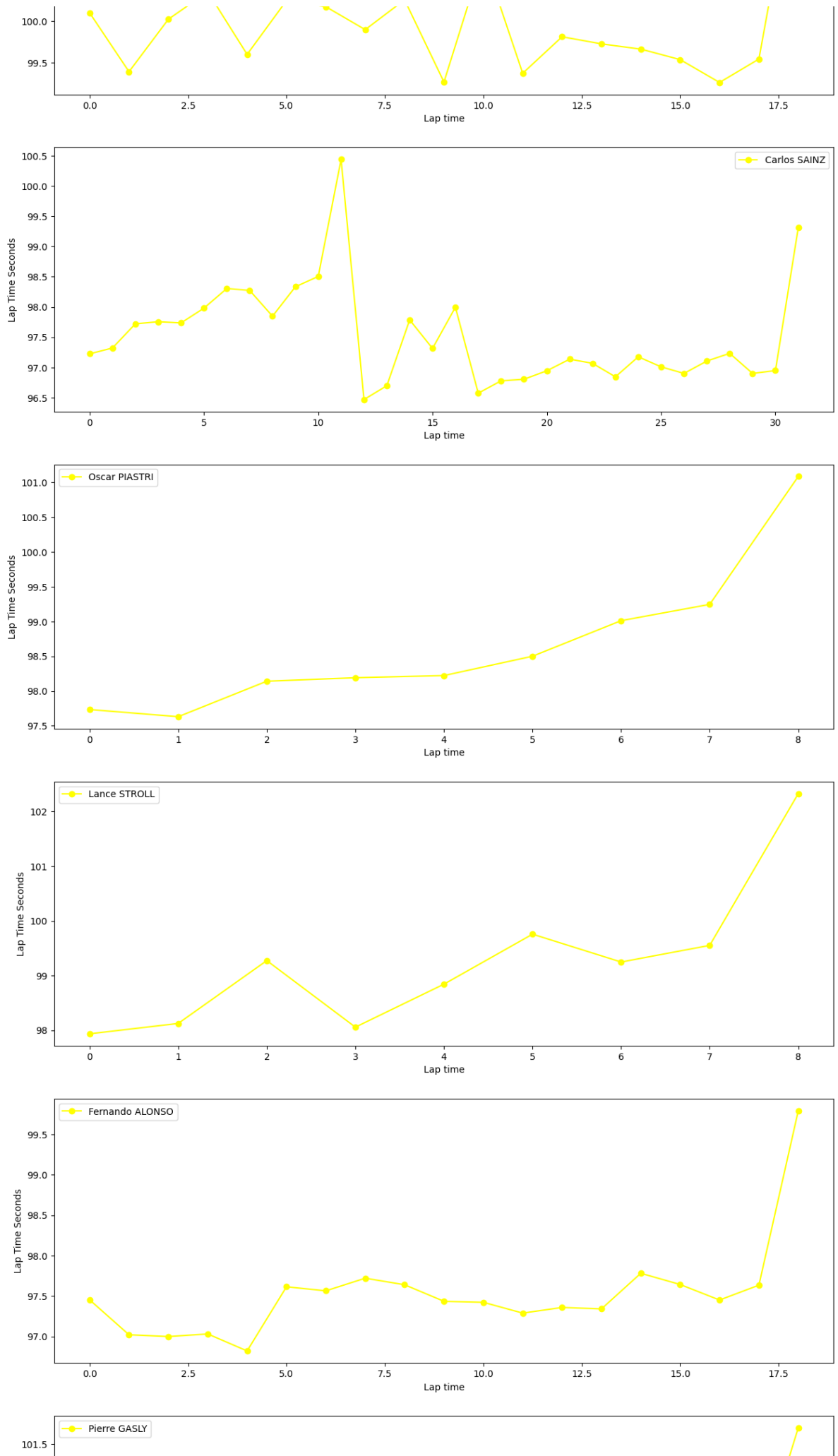
## Medium tyres

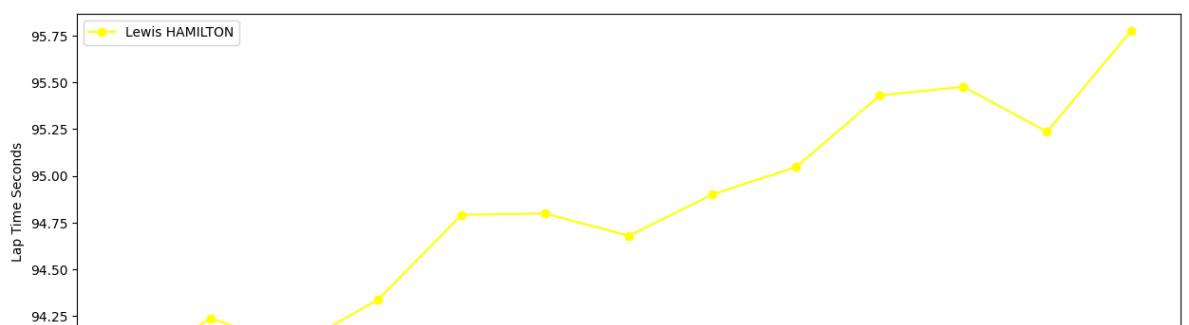
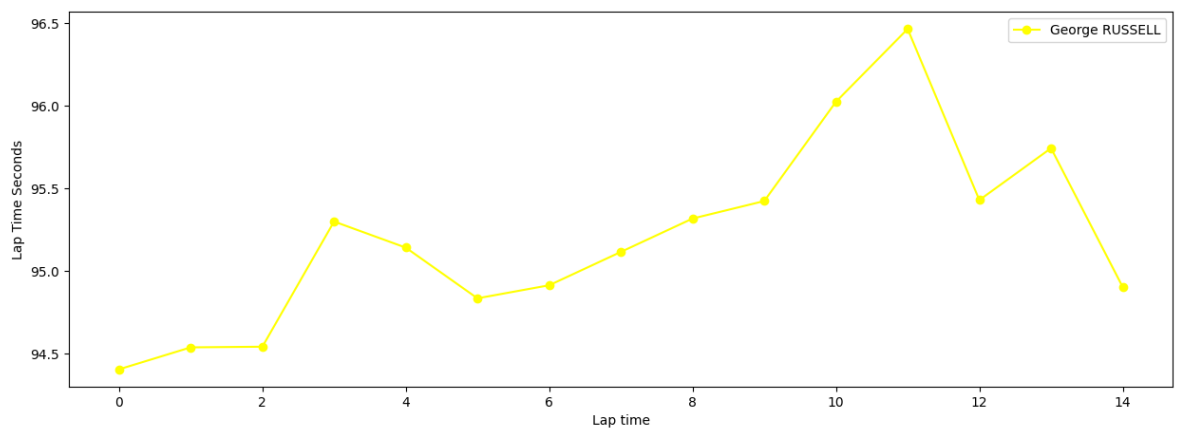
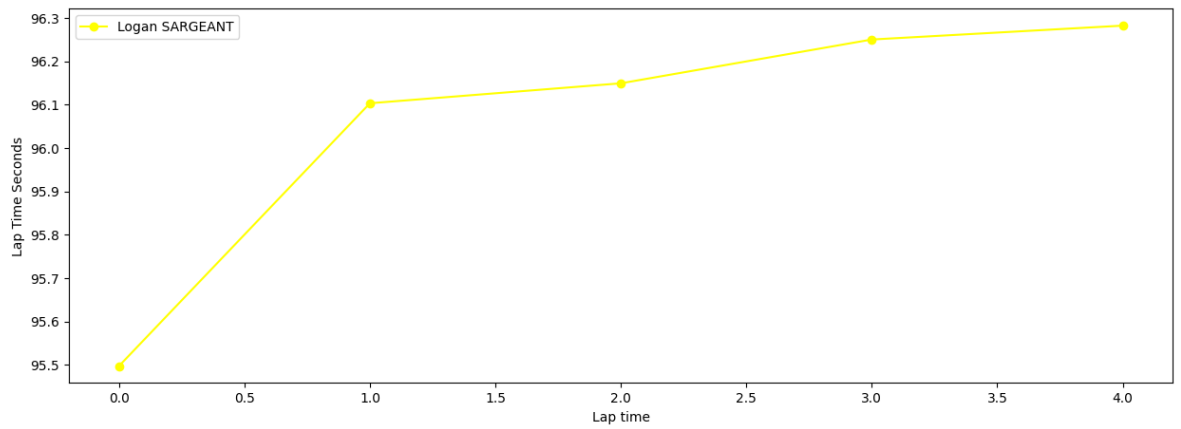
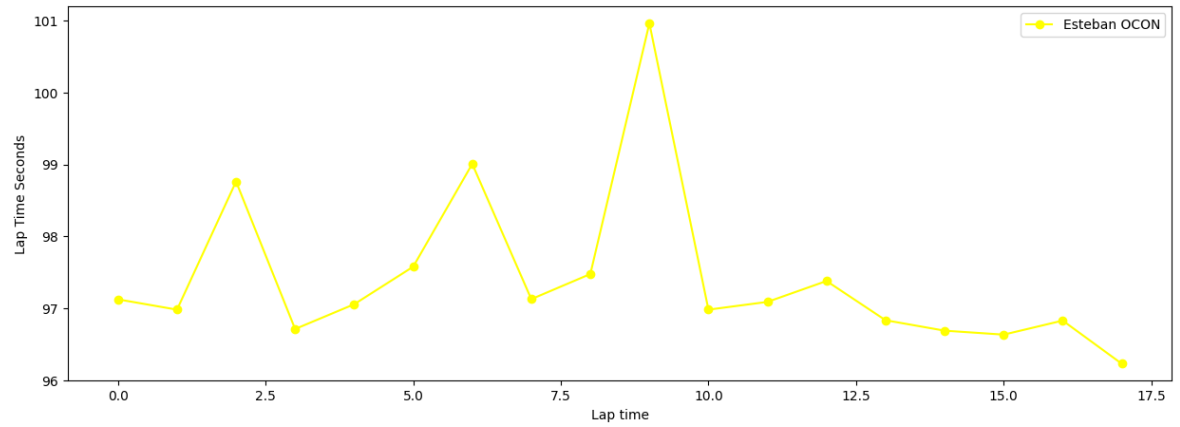
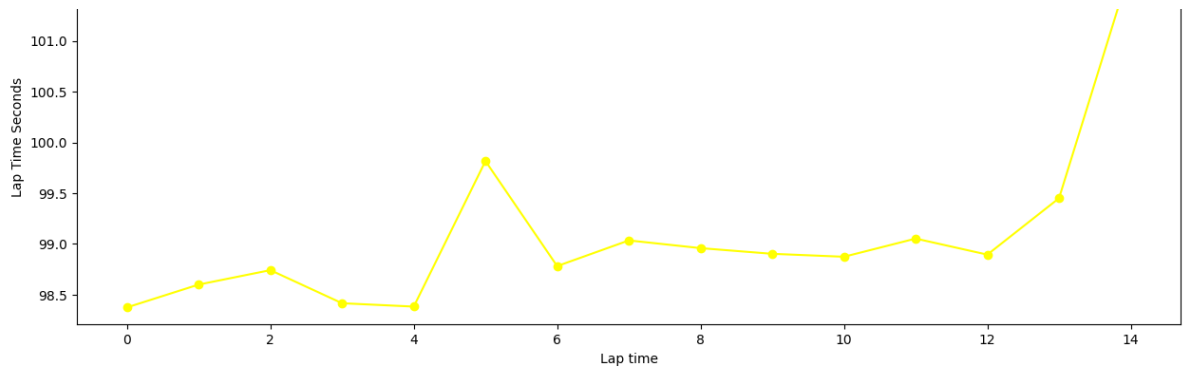
Some of the drivers decided to use this tyres in their three-stop strategies (due to safety car) using this set twice. In general, we can see in the race that in the first 30 minutes, the degradation of these sets were similar than the soft and also their pit-stop were earlier than the softs.

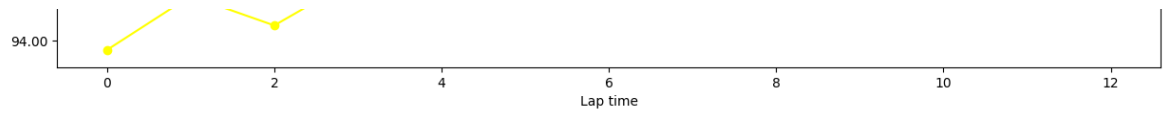
In [170...

```
libraryDataF1.obtain_data_tyres(jointables, 'MEDIUM', 110)
```







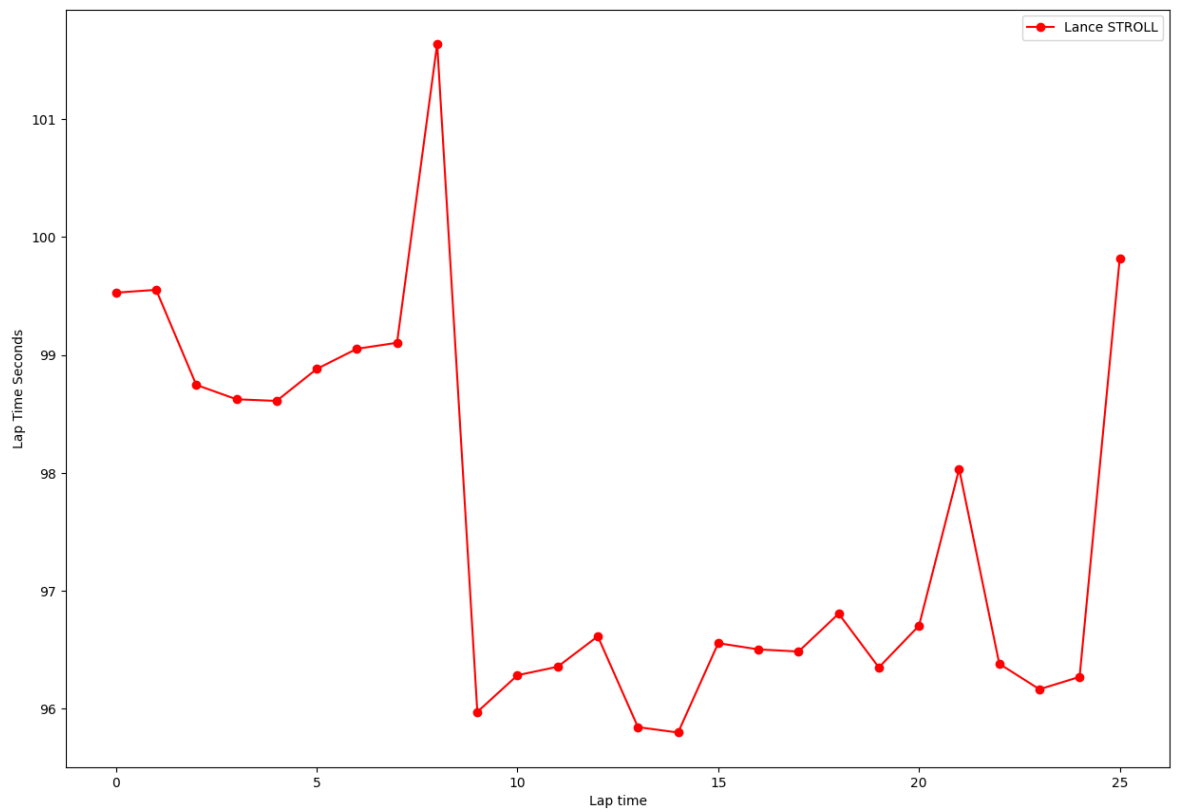
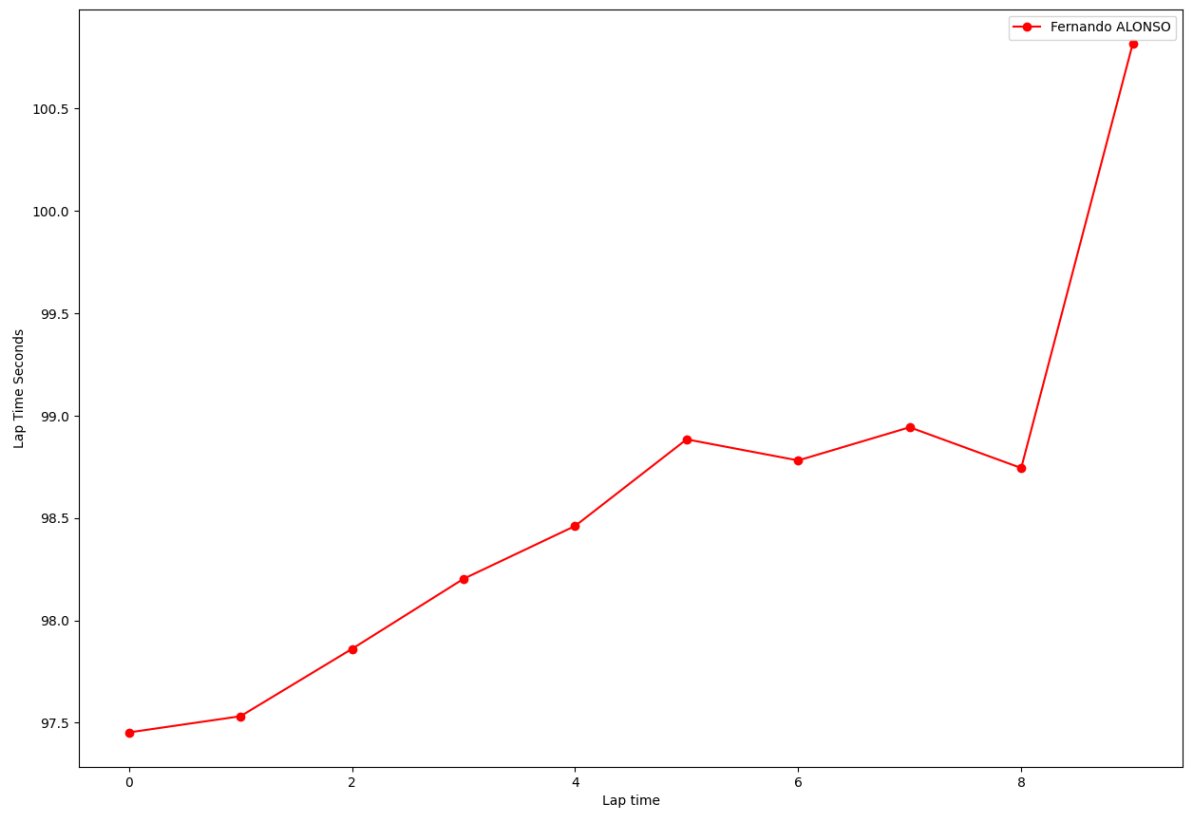


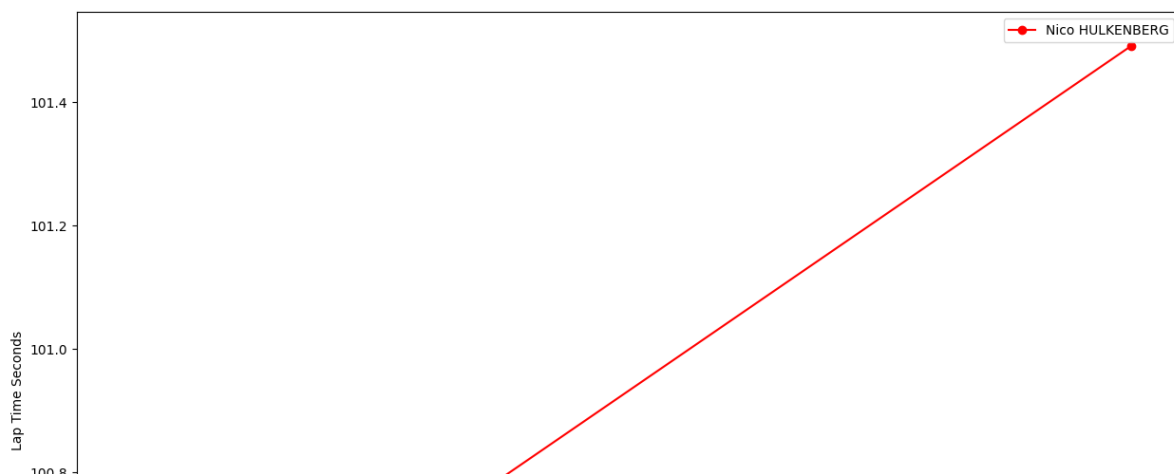
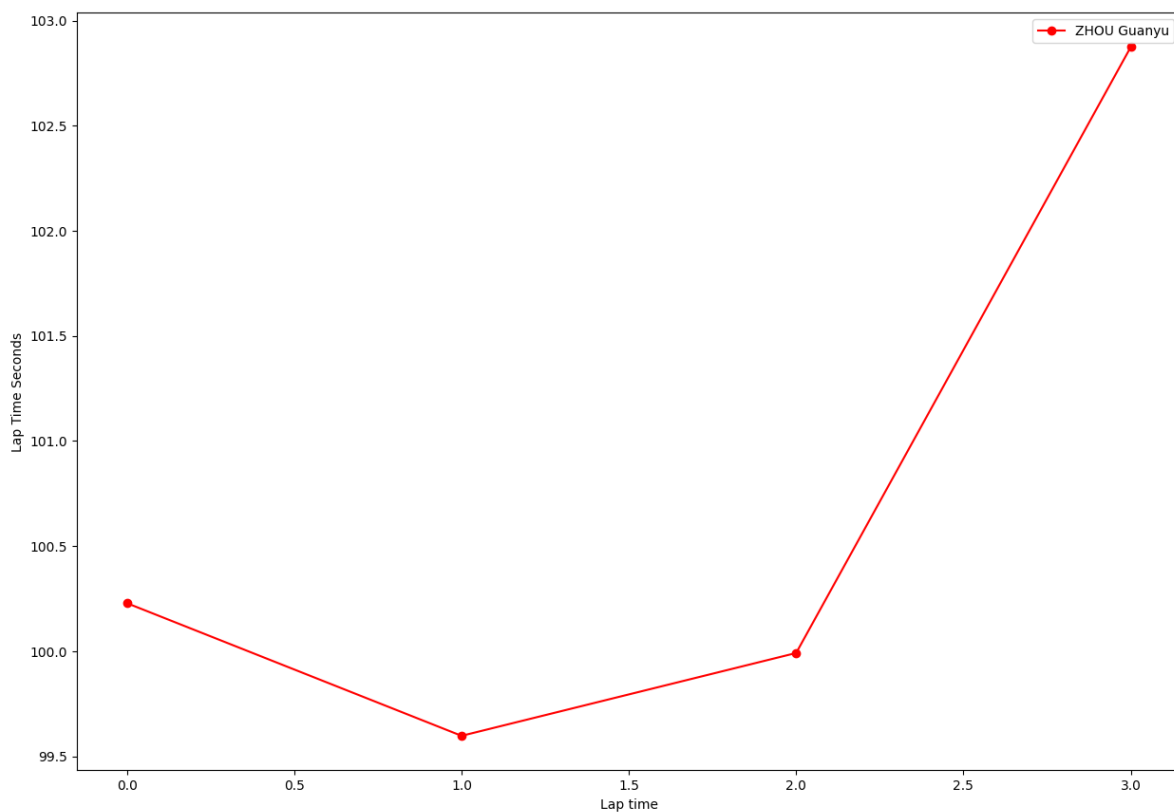
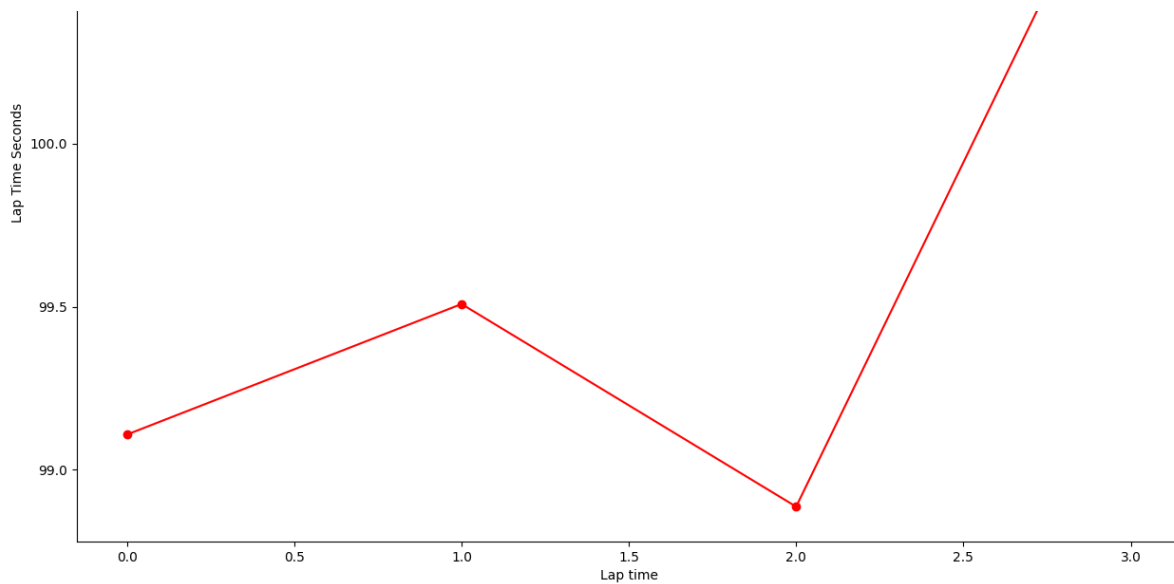
## Soft tyres

In the start of the race, some drivers decided to take the risk choosing the soft tyre to start the race to gain positions. Nevertheless, after Alex and Ricciardo's accident everybody except Fernando Alonso decided to change for a harder compound. In terms of long stints, it is interesting to see Fernando Alonso's racepace because with 5 laps(not included those laps lost by the red flag) he had competitive laps compared with the mediums.

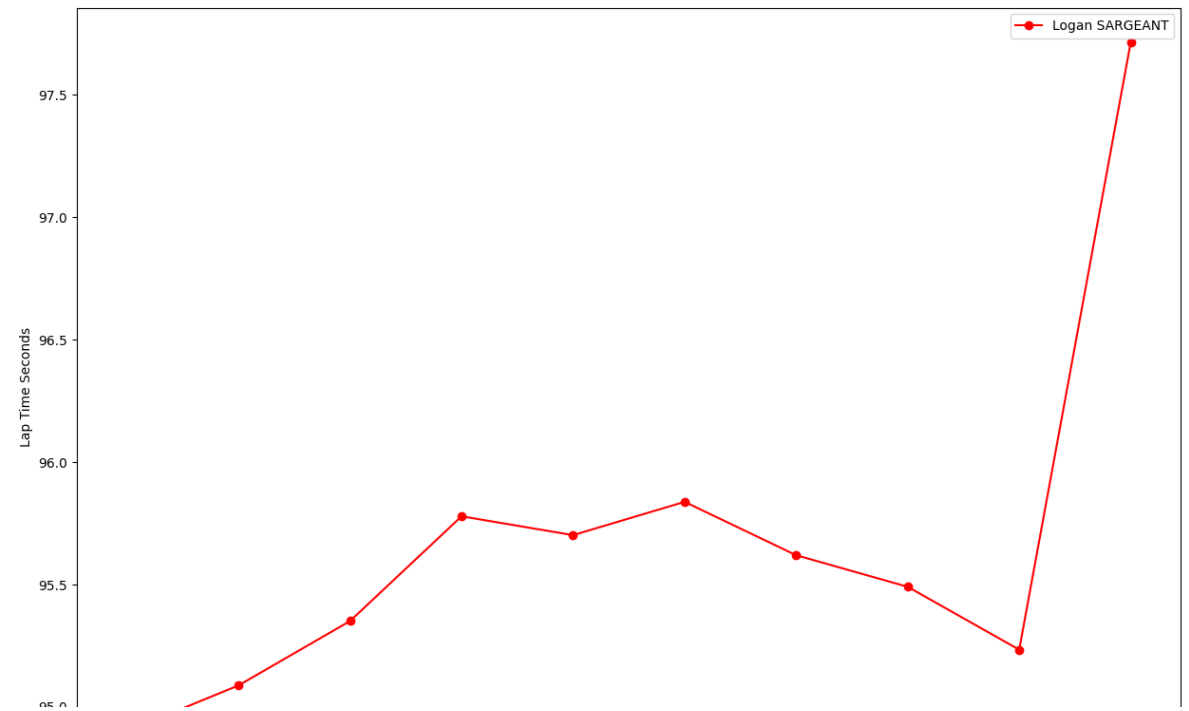
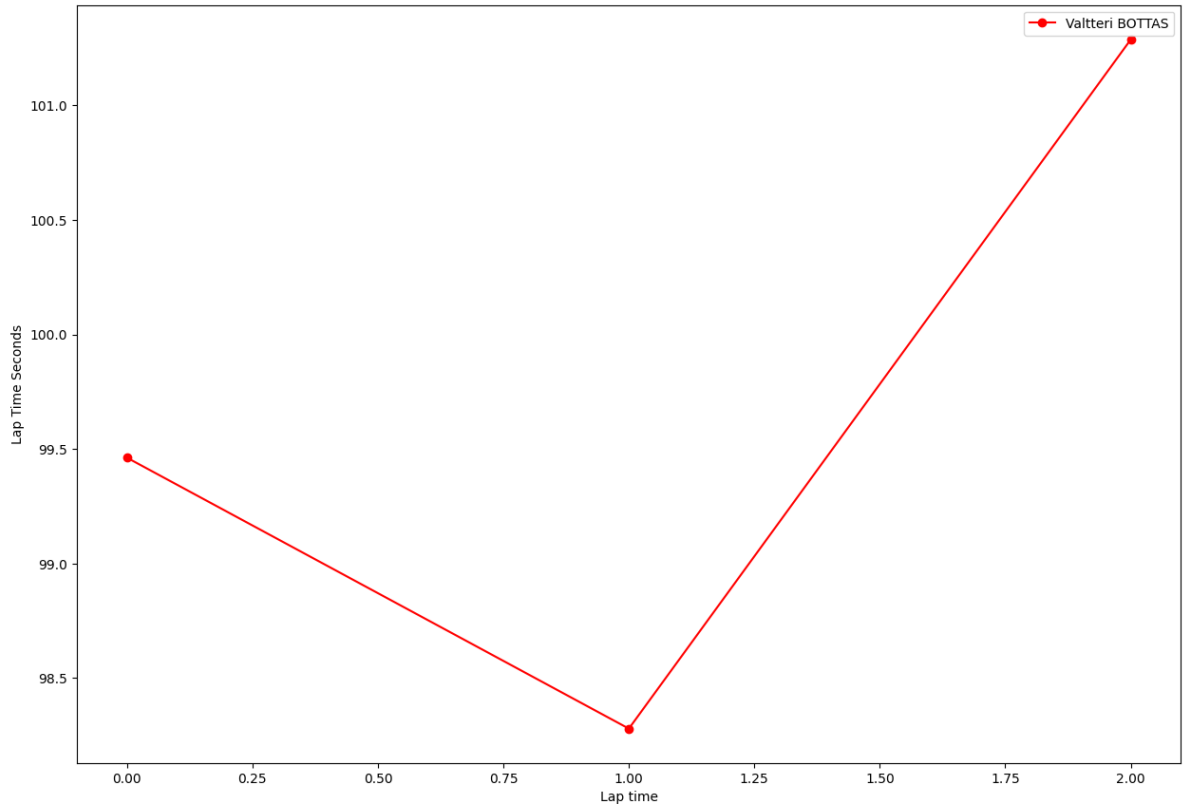
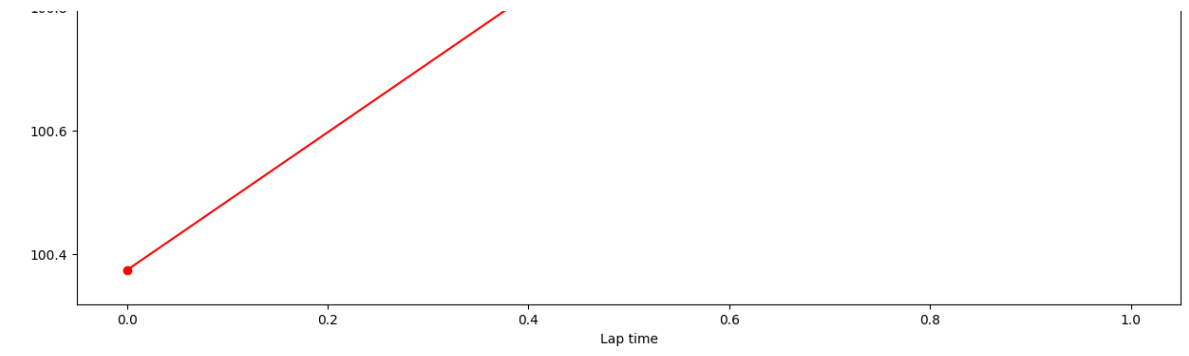
In [171...

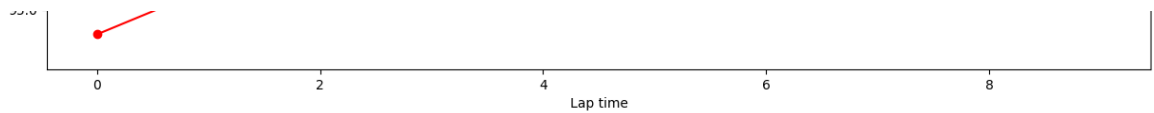
```
libraryDataF1.obtain_data_tyres(jointables, 'SOFT', 110)
```











## Mean pace with the different compound used on the session

In [172... `race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and la  
race_pace`

Out[172...

lap_duration	
compound	
HARD	97.499029
MEDIUM	97.619336
SOFT	97.985542

## Race pace

General explanation Explanation per teams

In [173... `race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and la  
race_pace`

Out[173...

lap_duration	
team_name	
Red Bull Racing	96.361966
Ferrari	96.791663
McLaren	96.849762
Mercedes	97.137127
Aston Martin	97.378122
Williams	98.119500
Haas F1 Team	98.378347
RB	98.442000
Kick Sauber	98.565289
Alpine	98.889108

## Mean race pace per sector

In this section, we can see the pace shown per each team in each sector sorted ascending.

### Sector 1

General explanation

In [174... `race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and la  
race_pace`

Out[174...

duration_sector_1	
team_name	
Red Bull Racing	34.669864
McLaren	34.910889
Ferrari	34.974964
Mercedes	35.072873
Aston Martin	35.192595
Williams	35.446312
Kick Sauber	35.585422
RB	35.643964
Haas F1 Team	35.840907
Alpine	35.867646

## Sector 2

General explanation

In [175...

```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and lap"))
race_pace
```

Out[175...

duration_sector_2	
team_name	
Red Bull Racing	43.015441
Ferrari	43.150855
McLaren	43.221302
Aston Martin	43.281311
Mercedes	43.299451
Williams	43.708750
Haas F1 Team	43.722107
RB	43.763500
Kick Sauber	43.953844
Alpine	44.012323

## Sector 3

General explanation

In [176...

```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and lap"))
race_pace
```

Out[176...

duration_sector_3	
team_name	
Ferrari	18.665843

	duration_sector_3
team_name	
Red Bull Racing	18.676661
McLaren	18.717571
Mercedes	18.764803
Haas F1 Team	18.815333
Aston Martin	18.904216
Williams	18.964437
Alpine	19.009138

## Comparaison beetween drivers

### Red Bull Racing

In [177...] `race.query("driver_number== 1 and lap_duration <= 110 and lap_duration > 84")`

Out[177...] 96.18327083333332

In [178...] `race.query("driver_number== 11 and lap_duration <= 110 and lap_duration > 84")`

Out[178...] 96.46979166666665

### Ferrari

In [179...] `race.query("driver_number== 16 and lap_duration <= 110 and lap_duration > 84")`

Out[179...] 97.0459387755102

In [180...] `race.query("driver_number== 55 and lap_duration <= 110 and lap_duration > 84")`

Out[180...] 96.58452083333333

### McLaren

In [181...] `race.query("driver_number== 4 and lap_duration <= 110 and lap_duration > 84")`

Out[181...] 96.75658333333335

In [182...] `race.query("driver_number== 81 and lap_duration <= 110 and lap_duration > 84")`

Out[182...] 97.05002083333333

### Mercedes

In [183...] `race.query("driver_number== 44 and lap_duration <= 110 and lap_duration > 84")`

Out[183...] 97.14195833333333

```
In [184... race.query("driver_number== 63 and lap_duration <= 110 and lap_duration > 80")
Out[184... 97.05958333333332
```

### Aston Martin

```
In [185... race.query("driver_number== 14 and lap_duration <= 110 and lap_duration > 80")
Out[185... 97.05191666666667
```

```
In [186... race.query("driver_number== 18 and lap_duration <= 110 and lap_duration > 80")
Out[186... 97.94069565217393
```

### Haas F1 Team

```
In [187... race.query("driver_number== 20 and lap_duration <= 110 and lap_duration > 80")
Out[187... 98.67041666666667
```

```
In [188... race.query("driver_number== 27 and lap_duration <= 110 and lap_duration > 80")
Out[188... 98.1193404255319
```

### RB

```
In [189... race.query("driver_number== 3 and lap_duration <= 110 and lap_duration > 80")
Out[189... nan
```

```
In [190... race.query("driver_number== 22 and lap_duration <= 110 and lap_duration > 80")
Out[190... 98.06646808510634
```

### Williams

```
In [191... race.query("driver_number== 2 and lap_duration <= 110 and lap_duration > 80")
Out[191... 98.08368888888889
```

```
In [192... race.query("driver_number== 23 and lap_duration <= 110 and lap_duration > 80")
Out[192... nan
```

### Alpine

```
In [193... race.query("driver_number== 10 and lap_duration <= 110 and lap_duration > 80")
Out[193... 99.12246808510635
```

In [194... race.query("driver\_number== 31 and lap\_duration <= 110 and lap\_duration > 80")

Out[194... 98.86168085106384

Kick Sauber

In [195... race.query("driver\_number== 24 and lap\_duration <= 110 and lap\_duration > 80")

Out[195... 99.78099999999998

In [196... race.query("driver\_number== 77 and lap\_duration <= 110 and lap\_duration > 80")

Out[196... 98.3203829787234

Race pace

In [197... MINIMUM\_SECONDS = 84  
MAXIMUM\_SECONDS = 110

Red Bull Racing

In [198... stintInformation.query('driver\_number == 1 or driver\_number == 11')

Out[198...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1232	9496	1	1	1	1	MEDIUM	
5	1232	9496	1	11	1	1	MEDIUM	
28	1232	9496	2	11	2	15	MEDIUM	
30	1232	9496	2	1	2	16	MEDIUM	
47	1232	9496	3	11	16	33	MEDIUM	
50	1232	9496	3	1	17	34	MEDIUM	
65	1232	9496	4	11	34	54	HARD	
69	1232	9496	4	1	35	54	HARD	

In [199... libraryDataF1.getinfo(longruns(jointables,1,'Red Bull Racing',MINIMUM\_SECONDS))

Out[199...

	full_name	compound	date_start	lap_number	duration_sector_1
36	Max VERSTAPPEN	MEDIUM	2024-04-07T05:37:17.389000+00:00	4	34.772
54	Max VERSTAPPEN	MEDIUM	2024-04-07T05:38:53.792000+00:00	5	34.690
72	Max VERSTAPPEN	MEDIUM	2024-04-07T05:40:30.215000+00:00	6	34.965
89	Max VERSTAPPEN	MEDIUM	2024-04-07T05:42:07.118000+00:00	7	34.987

	full_name	compound	date_start	lap_number	duration_sector_1
106	Max VERSTAPPEN	MEDIUM	2024-04-07T05:43:44.080000+00:00	8	35.112
122	Max VERSTAPPEN	MEDIUM	2024-04-07T05:45:21.406000+00:00	9	35.132
140	Max VERSTAPPEN	MEDIUM	2024-04-07T05:46:58.590000+00:00	10	35.450
158	Max VERSTAPPEN	MEDIUM	2024-04-07T05:48:36.141000+00:00	11	35.320
176	Max VERSTAPPEN	MEDIUM	2024-04-07T05:50:13.928000+00:00	12	35.415
192	Max VERSTAPPEN	MEDIUM	2024-04-07T05:51:51.589000+00:00	13	35.365
207	Max VERSTAPPEN	MEDIUM	2024-04-07T05:53:29.452000+00:00	14	35.432
223	Max VERSTAPPEN	MEDIUM	2024-04-07T05:55:07.284000+00:00	15	35.465
240	Max VERSTAPPEN	MEDIUM	2024-04-07T05:56:45.100000+00:00	16	35.594
270	Max VERSTAPPEN	MEDIUM	2024-04-07T06:00:21.943000+00:00	18	34.981
287	Max VERSTAPPEN	MEDIUM	2024-04-07T06:01:58.729000+00:00	19	34.857
304	Max VERSTAPPEN	MEDIUM	2024-04-07T06:03:34.976000+00:00	20	34.885
320	Max VERSTAPPEN	MEDIUM	2024-04-07T06:05:11.403000+00:00	21	34.242
337	Max VERSTAPPEN	MEDIUM	2024-04-07T06:06:46.958000+00:00	22	34.914
354	Max VERSTAPPEN	MEDIUM	2024-04-07T06:08:23.362000+00:00	23	34.810
365	Max VERSTAPPEN	MEDIUM	2024-04-07T06:09:59.554000+00:00	24	34.895
381	Max VERSTAPPEN	MEDIUM	2024-04-07T06:11:36.118000+00:00	25	34.677
398	Max VERSTAPPEN	MEDIUM	2024-04-07T06:13:12.443000+00:00	26	34.874
415	Max VERSTAPPEN	MEDIUM	2024-04-07T06:14:48.817000+00:00	27	34.936
430	Max VERSTAPPEN	MEDIUM	2024-04-07T06:16:25.497000+00:00	28	34.883
447	Max VERSTAPPEN	MEDIUM	2024-04-07T06:18:01.997000+00:00	29	35.020
464	Max VERSTAPPEN	MEDIUM	2024-04-07T06:19:38.628000+00:00	30	35.050
481	Max VERSTAPPEN	MEDIUM	2024-04-07T06:21:15.477000+00:00	31	34.998
498	Max VERSTAPPEN	MEDIUM	2024-04-07T06:22:52.278000+00:00	32	35.134
515	Max VERSTAPPEN	MEDIUM	2024-04-07T06:24:29.251000+00:00	33	35.182

	full_name	compound	date_start	lap_number	duration_sector_1
530	Max VERSTAPPEN	MEDIUM	2024-04-07T06:26:06.288000+00:00	34	35.038
557	Max VERSTAPPEN	HARD	2024-04-07T06:29:40.961000+00:00	36	34.203
574	Max VERSTAPPEN	HARD	2024-04-07T06:31:15.611000+00:00	37	34.373
590	Max VERSTAPPEN	HARD	2024-04-07T06:32:50.641000+00:00	38	34.217
606	Max VERSTAPPEN	HARD	2024-04-07T06:34:25.590000+00:00	39	34.097
623	Max VERSTAPPEN	HARD	2024-04-07T06:36:00.138000+00:00	40	33.952
639	Max VERSTAPPEN	HARD	2024-04-07T06:37:34.426000+00:00	41	33.997
656	Max VERSTAPPEN	HARD	2024-04-07T06:39:08.603000+00:00	42	33.901
672	Max VERSTAPPEN	HARD	2024-04-07T06:40:43.702000+00:00	43	33.837
689	Max VERSTAPPEN	HARD	2024-04-07T06:42:17.939000+00:00	44	33.813
706	Max VERSTAPPEN	HARD	2024-04-07T06:43:52.477000+00:00	45	34.085
723	Max VERSTAPPEN	HARD	2024-04-07T06:45:27.032000+00:00	46	34.073
740	Max VERSTAPPEN	HARD	2024-04-07T06:47:01.651000+00:00	47	34.210
757	Max VERSTAPPEN	HARD	2024-04-07T06:48:36.700000+00:00	48	34.496
774	Max VERSTAPPEN	HARD	2024-04-07T06:50:12.416000+00:00	49	34.097
791	Max VERSTAPPEN	HARD	2024-04-07T06:51:47.313000+00:00	50	33.404
808	Max VERSTAPPEN	HARD	2024-04-07T06:53:21.225000+00:00	51	33.964

In [200... `libraryDataF1.getinfo(longruns(jointables,11,'Red Bull Racing',MINIMUM_SECTOR_1))`

Out[200...

	full_name	compound	date_start	lap_number	duration_sector_1	duration
40	Sergio PEREZ	MEDIUM	2024-04-07T05:37:18.352000+00:00	4	34.694	
58	Sergio PEREZ	MEDIUM	2024-04-07T05:38:54.878000+00:00	5	34.558	
76	Sergio PEREZ	MEDIUM	2024-04-07T05:40:31.368000+00:00	6	35.008	
93	Sergio PEREZ	MEDIUM	2024-04-07T05:42:09.146000+00:00	7	35.091	
110	Sergio PEREZ	MEDIUM	2024-04-07T05:43:46.373000+00:00	8	35.093	



	full_name	compound	date_start	lap_number	duration_sector_1	di
126	Sergio PEREZ	MEDIUM	2024-04-07T05:45:23.666000+00:00	9	35.370	
144	Sergio PEREZ	MEDIUM	2024-04-07T05:47:01.438000+00:00	10	35.593	
162	Sergio PEREZ	MEDIUM	2024-04-07T05:48:39.380000+00:00	11	35.512	
179	Sergio PEREZ	MEDIUM	2024-04-07T05:50:17.644000+00:00	12	35.539	
196	Sergio PEREZ	MEDIUM	2024-04-07T05:51:55.786000+00:00	13	35.462	
211	Sergio PEREZ	MEDIUM	2024-04-07T05:53:33.895000+00:00	14	35.721	
227	Sergio PEREZ	MEDIUM	2024-04-07T05:55:12.379000+00:00	15	35.617	
257	Sergio PEREZ	MEDIUM	2024-04-07T05:58:48.107000+00:00	17	34.678	
274	Sergio PEREZ	MEDIUM	2024-04-07T06:00:25.588000+00:00	18	35.342	
291	Sergio PEREZ	MEDIUM	2024-04-07T06:02:03.416000+00:00	19	34.925	
308	Sergio PEREZ	MEDIUM	2024-04-07T06:03:39.776000+00:00	20	34.808	
324	Sergio PEREZ	MEDIUM	2024-04-07T06:05:16.011000+00:00	21	34.994	
341	Sergio PEREZ	MEDIUM	2024-04-07T06:06:52.663000+00:00	22	34.920	
357	Sergio PEREZ	MEDIUM	2024-04-07T06:08:29.809000+00:00	23	34.723	
369	Sergio PEREZ	MEDIUM	2024-04-07T06:10:06.566000+00:00	24	34.839	
385	Sergio PEREZ	MEDIUM	2024-04-07T06:11:43.439000+00:00	25	35.304	
402	Sergio PEREZ	MEDIUM	2024-04-07T06:13:21.164000+00:00	26	35.496	
418	Sergio PEREZ	MEDIUM	2024-04-07T06:14:58.895000+00:00	27	34.947	
434	Sergio PEREZ	MEDIUM	2024-04-07T06:16:35.812000+00:00	28	34.875	
451	Sergio PEREZ	MEDIUM	2024-04-07T06:18:12.457000+00:00	29	35.035	
468	Sergio PEREZ	MEDIUM	2024-04-07T06:19:49.434000+00:00	30	35.201	
485	Sergio PEREZ	MEDIUM	2024-04-07T06:21:26.575000+00:00	31	35.150	
502	Sergio PEREZ	MEDIUM	2024-04-07T06:23:03.747000+00:00	32	35.061	
518	Sergio PEREZ	MEDIUM	2024-04-07T06:24:40.713000+00:00	33	35.006	
545	Sergio PEREZ	HARD	2024-04-07T06:28:15.185000+00:00	35	33.433	

	full_name	compound	date_start	lap_number	duration_sector_1	di
561	Sergio PEREZ	HARD	2024-04-07T06:29:49.188000+00:00	36	33.662	
578	Sergio PEREZ	HARD	2024-04-07T06:31:23.473000+00:00	37	34.020	
594	Sergio PEREZ	HARD	2024-04-07T06:32:58.208000+00:00	38	34.413	
610	Sergio PEREZ	HARD	2024-04-07T06:34:33.674000+00:00	39	34.223	
627	Sergio PEREZ	HARD	2024-04-07T06:36:08.655000+00:00	40	34.051	
643	Sergio PEREZ	HARD	2024-04-07T06:37:43.330000+00:00	41	34.136	
659	Sergio PEREZ	HARD	2024-04-07T06:39:18.391000+00:00	42	34.020	
676	Sergio PEREZ	HARD	2024-04-07T06:40:53.804000+00:00	43	33.973	
693	Sergio PEREZ	HARD	2024-04-07T06:42:28.877000+00:00	44	34.015	
710	Sergio PEREZ	HARD	2024-04-07T06:44:03.593000+00:00	45	34.100	
727	Sergio PEREZ	HARD	2024-04-07T06:45:38.583000+00:00	46	33.927	
744	Sergio PEREZ	HARD	2024-04-07T06:47:13.391000+00:00	47	34.058	
761	Sergio PEREZ	HARD	2024-04-07T06:48:48.445000+00:00	48	34.198	
778	Sergio PEREZ	HARD	2024-04-07T06:50:23.793000+00:00	49	34.003	
795	Sergio PEREZ	HARD	2024-04-07T06:51:58.827000+00:00	50	34.117	
812	Sergio PEREZ	HARD	2024-04-07T06:53:33.977000+00:00	51	33.957	

Ferrari

In [201...

```
stintInformation.query('driver_number == 16 or driver_number == 55')
```

Out[201...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
7	1232	9496	1	16	1	1	MEDIUM	
16	1232	9496	1	55	1	1	MEDIUM	
29	1232	9496	2	55	2	15	MEDIUM	
37	1232	9496	2	16	2	26	MEDIUM	
48	1232	9496	3	55	16	36	MEDIUM	
60	1232	9496	3	16	27	54	HARD	
70	1232	9496	4	55	37	54	HARD	

In [202...

libraryDataF1.getinfo(longruns(jointables,16,'Ferrari',MINIMUM\_SECONDS,MAXI

Out[202...

	full_name	compound	date_start	lap_number	duration_sector_1	du
42	Charles LECLERC	MEDIUM	2024-04-07T05:37:21.634000+00:00	4	35.805	
60	Charles LECLERC	MEDIUM	2024-04-07T05:38:59.995000+00:00	5	35.265	
78	Charles LECLERC	MEDIUM	2024-04-07T05:40:37.853000+00:00	6	35.450	
95	Charles LECLERC	MEDIUM	2024-04-07T05:42:15.751000+00:00	7	35.725	
112	Charles LECLERC	MEDIUM	2024-04-07T05:43:53.991000+00:00	8	35.499	
128	Charles LECLERC	MEDIUM	2024-04-07T05:45:31.968000+00:00	9	35.682	
146	Charles LECLERC	MEDIUM	2024-04-07T05:47:10.148000+00:00	10	36.074	
164	Charles LECLERC	MEDIUM	2024-04-07T05:48:49.230000+00:00	11	36.228	
181	Charles LECLERC	MEDIUM	2024-04-07T05:50:28.338000+00:00	12	35.996	
198	Charles LECLERC	MEDIUM	2024-04-07T05:52:07.150000+00:00	13	35.607	
212	Charles LECLERC	MEDIUM	2024-04-07T05:53:45.631000+00:00	14	35.883	
229	Charles LECLERC	MEDIUM	2024-04-07T05:55:24.379000+00:00	15	35.721	
245	Charles LECLERC	MEDIUM	2024-04-07T05:57:02.536000+00:00	16	35.533	
259	Charles LECLERC	MEDIUM	2024-04-07T05:58:40.347000+00:00	17	35.435	
276	Charles LECLERC	MEDIUM	2024-04-07T06:00:18.247000+00:00	18	35.551	
293	Charles LECLERC	MEDIUM	2024-04-07T06:01:55.985000+00:00	19	35.393	
310	Charles LECLERC	MEDIUM	2024-04-07T06:03:33.572000+00:00	20	35.344	
326	Charles LECLERC	MEDIUM	2024-04-07T06:05:11.056000+00:00	21	35.888	
343	Charles LECLERC	MEDIUM	2024-04-07T06:06:49.200000+00:00	22	35.399	
359	Charles LECLERC	MEDIUM	2024-04-07T06:08:26.932000+00:00	23	35.460	
371	Charles LECLERC	MEDIUM	2024-04-07T06:10:04.724000+00:00	24	35.654	
387	Charles LECLERC	MEDIUM	2024-04-07T06:11:42.719000+00:00	25	35.498	
404	Charles LECLERC	MEDIUM	2024-04-07T06:13:20.659000+00:00	26	35.536	

	full_name	compound	date_start	lap_number	duration_sector_1	di
436	Charles LECLERC	HARD	2024-04-07T06:16:59.462000+00:00	28	34.766	
453	Charles LECLERC	HARD	2024-04-07T06:18:35.632000+00:00	29	34.918	
470	Charles LECLERC	HARD	2024-04-07T06:20:11.930000+00:00	30	34.913	
487	Charles LECLERC	HARD	2024-04-07T06:21:48.095000+00:00	31	34.794	
504	Charles LECLERC	HARD	2024-04-07T06:23:24.321000+00:00	32	34.901	
520	Charles LECLERC	HARD	2024-04-07T06:25:00.594000+00:00	33	34.376	
534	Charles LECLERC	HARD	2024-04-07T06:26:36.400000+00:00	34	34.925	
547	Charles LECLERC	HARD	2024-04-07T06:28:12.543000+00:00	35	34.740	
563	Charles LECLERC	HARD	2024-04-07T06:29:48.788000+00:00	36	35.315	
580	Charles LECLERC	HARD	2024-04-07T06:31:25.395000+00:00	37	34.712	
596	Charles LECLERC	HARD	2024-04-07T06:33:01.513000+00:00	38	34.752	
612	Charles LECLERC	HARD	2024-04-07T06:34:37.541000+00:00	39	34.610	
629	Charles LECLERC	HARD	2024-04-07T06:36:13.361000+00:00	40	34.998	
645	Charles LECLERC	HARD	2024-04-07T06:37:49.648000+00:00	41	34.356	
661	Charles LECLERC	HARD	2024-04-07T06:39:25.100000+00:00	42	34.362	
678	Charles LECLERC	HARD	2024-04-07T06:41:00.860000+00:00	43	34.546	
695	Charles LECLERC	HARD	2024-04-07T06:42:36.569000+00:00	44	34.483	
712	Charles LECLERC	HARD	2024-04-07T06:44:12.303000+00:00	45	34.489	
729	Charles LECLERC	HARD	2024-04-07T06:45:48.028000+00:00	46	35.285	
746	Charles LECLERC	HARD	2024-04-07T06:47:24.847000+00:00	47	34.607	
763	Charles LECLERC	HARD	2024-04-07T06:49:00.761000+00:00	48	34.429	
780	Charles LECLERC	HARD	2024-04-07T06:50:36.152000+00:00	49	34.412	
797	Charles LECLERC	HARD	2024-04-07T06:52:11.815000+00:00	50	34.352	
814	Charles LECLERC	HARD	2024-04-07T06:53:47.083000+00:00	51	34.245	
831	Charles LECLERC	HARD	2024-04-07T06:55:22.262000+00:00	52	34.299	

In [203...

libraryDataFl.getinfo(longruns(jointables,55,'Ferrari',MINIMUM\_SECONDS,MAXI

Out[203...	full_name	compound	date_start	lap_number	duration_sector_1	di
50	Carlos SAINZ	MEDIUM	2024-04-07T05:37:19.728000+00:00	4	35.406	
68	Carlos SAINZ	MEDIUM	2024-04-07T05:38:56.881000+00:00	5	35.099	
85	Carlos SAINZ	MEDIUM	2024-04-07T05:40:34.198000+00:00	6	35.423	
103	Carlos SAINZ	MEDIUM	2024-04-07T05:42:11.947000+00:00	7	35.530	
118	Carlos SAINZ	MEDIUM	2024-04-07T05:43:49.734000+00:00	8	35.544	
136	Carlos SAINZ	MEDIUM	2024-04-07T05:45:27.406000+00:00	9	35.633	
154	Carlos SAINZ	MEDIUM	2024-04-07T05:47:05.503000+00:00	10	35.782	
172	Carlos SAINZ	MEDIUM	2024-04-07T05:48:43.773000+00:00	11	35.648	
188	Carlos SAINZ	MEDIUM	2024-04-07T05:50:21.944000+00:00	12	35.511	
204	Carlos SAINZ	MEDIUM	2024-04-07T05:51:59.789000+00:00	13	35.776	
219	Carlos SAINZ	MEDIUM	2024-04-07T05:53:38.174000+00:00	14	35.794	
236	Carlos SAINZ	MEDIUM	2024-04-07T05:55:16.679000+00:00	15	35.661	
266	Carlos SAINZ	MEDIUM	2024-04-07T05:58:53.231000+00:00	17	35.106	
283	Carlos SAINZ	MEDIUM	2024-04-07T06:00:29.708000+00:00	18	35.072	
300	Carlos SAINZ	MEDIUM	2024-04-07T06:02:06.395000+00:00	19	35.622	
316	Carlos SAINZ	MEDIUM	2024-04-07T06:03:44.051000+00:00	20	35.072	
333	Carlos SAINZ	MEDIUM	2024-04-07T06:05:21.570000+00:00	21	35.980	
350	Carlos SAINZ	MEDIUM	2024-04-07T06:06:59.369000+00:00	22	34.861	
363	Carlos SAINZ	MEDIUM	2024-04-07T06:08:36.024000+00:00	23	34.988	
377	Carlos SAINZ	MEDIUM	2024-04-07T06:10:12.839000+00:00	24	35.020	
394	Carlos SAINZ	MEDIUM	2024-04-07T06:11:49.775000+00:00	25	35.000	
411	Carlos SAINZ	MEDIUM	2024-04-07T06:13:26.613000+00:00	26	35.136	
426	Carlos SAINZ	MEDIUM	2024-04-07T06:15:03.783000+00:00	27	35.134	

	full_name	compound	date_start	lap_number	duration_sector_1	di
443	Carlos SAINZ	MEDIUM	2024-04-07T06:16:40.883000+00:00	28	35.048	
460	Carlos SAINZ	MEDIUM	2024-04-07T06:18:17.683000+00:00	29	35.255	
477	Carlos SAINZ	MEDIUM	2024-04-07T06:19:54.889000+00:00	30	35.234	
494	Carlos SAINZ	MEDIUM	2024-04-07T06:21:31.845000+00:00	31	35.184	
511	Carlos SAINZ	MEDIUM	2024-04-07T06:23:08.811000+00:00	32	35.216	
527	Carlos SAINZ	MEDIUM	2024-04-07T06:24:45.927000+00:00	33	35.178	
539	Carlos SAINZ	MEDIUM	2024-04-07T06:26:23.147000+00:00	34	35.252	
553	Carlos SAINZ	MEDIUM	2024-04-07T06:28:00.143000+00:00	35	35.136	
570	Carlos SAINZ	MEDIUM	2024-04-07T06:29:36.979000+00:00	36	35.183	
603	Carlos SAINZ	HARD	2024-04-07T06:33:11.389000+00:00	38	33.588	
619	Carlos SAINZ	HARD	2024-04-07T06:34:45.274000+00:00	39	34.056	
635	Carlos SAINZ	HARD	2024-04-07T06:36:19.873000+00:00	40	33.977	
652	Carlos SAINZ	HARD	2024-04-07T06:37:54.154000+00:00	41	34.232	
668	Carlos SAINZ	HARD	2024-04-07T06:39:29.047000+00:00	42	34.066	
685	Carlos SAINZ	HARD	2024-04-07T06:41:04.346000+00:00	43	33.970	
702	Carlos SAINZ	HARD	2024-04-07T06:42:39.046000+00:00	44	33.784	
719	Carlos SAINZ	HARD	2024-04-07T06:44:13.337000+00:00	45	34.293	
736	Carlos SAINZ	HARD	2024-04-07T06:45:48.360000+00:00	46	33.310	
753	Carlos SAINZ	HARD	2024-04-07T06:47:22.277000+00:00	47	34.257	
770	Carlos SAINZ	HARD	2024-04-07T06:48:57.303000+00:00	48	34.153	
787	Carlos SAINZ	HARD	2024-04-07T06:50:32.262000+00:00	49	33.935	
804	Carlos SAINZ	HARD	2024-04-07T06:52:06.928000+00:00	50	33.972	
821	Carlos SAINZ	HARD	2024-04-07T06:53:41.683000+00:00	51	34.124	
838	Carlos SAINZ	HARD	2024-04-07T06:55:16.490000+00:00	52	33.978	

Mercedes

In [204...

stintInformation.query('driver\_number == 44 or driver\_number == 63')

Out[204...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
15	1232	9496	1	44	1	1	MEDIUM	
17	1232	9496	1	63	1	1	MEDIUM	
35	1232	9496	2	63	2	22	HARD	
36	1232	9496	2	44	2	23	HARD	
54	1232	9496	3	63	23	37	HARD	
58	1232	9496	3	44	24	39	HARD	
71	1232	9496	4	63	38	54	MEDIUM	
72	1232	9496	4	44	40	54	MEDIUM	

In [205...

libraryDataF1.getinfoLongruns(jointables,44,'Mercedes',MINIMUM\_SECONDS,MAXI

Out[205...

	full_name	compound	date_start	lap_number	duration_sector_1	d
49	Lewis HAMILTON	HARD	2024-04-07T05:37:22.282000+00:00	4	35.858	
67	Lewis HAMILTON	HARD	2024-04-07T05:39:00.673000+00:00	5	35.536	
84	Lewis HAMILTON	HARD	2024-04-07T05:40:38.832000+00:00	6	35.579	
102	Lewis HAMILTON	HARD	2024-04-07T05:42:17.025000+00:00	7	35.608	
117	Lewis HAMILTON	HARD	2024-04-07T05:43:55.370000+00:00	8	35.574	
135	Lewis HAMILTON	HARD	2024-04-07T05:45:33.402000+00:00	9	35.734	
153	Lewis HAMILTON	HARD	2024-04-07T05:47:12.064000+00:00	10	35.851	
171	Lewis HAMILTON	HARD	2024-04-07T05:48:50.661000+00:00	11	35.838	
187	Lewis HAMILTON	HARD	2024-04-07T05:50:29.931000+00:00	12	35.899	
203	Lewis HAMILTON	HARD	2024-04-07T05:52:09.127000+00:00	13	35.824	
218	Lewis HAMILTON	HARD	2024-04-07T05:53:49.371000+00:00	14	35.984	
235	Lewis HAMILTON	HARD	2024-04-07T05:55:28.421000+00:00	15	35.941	
251	Lewis HAMILTON	HARD	2024-04-07T05:57:07.411000+00:00	16	35.818	
265	Lewis HAMILTON	HARD	2024-04-07T05:58:45.967000+00:00	17	36.398	
282	Lewis HAMILTON	HARD	2024-04-07T06:00:26.663000+00:00	18	36.162	

	full_name	compound	date_start	lap_number	duration_sector_1	d
299	Lewis HAMILTON	HARD	2024-04-07T06:02:05.901000+00:00	19	35.728	
315	Lewis HAMILTON	HARD	2024-04-07T06:03:45.265000+00:00	20	35.668	
332	Lewis HAMILTON	HARD	2024-04-07T06:05:23.952000+00:00	21	35.841	
349	Lewis HAMILTON	HARD	2024-04-07T06:07:02.520000+00:00	22	36.660	
362	Lewis HAMILTON	HARD	2024-04-07T06:08:42.405000+00:00	23	35.820	
393	Lewis HAMILTON	HARD	2024-04-07T06:12:18.927000+00:00	25	34.524	
410	Lewis HAMILTON	HARD	2024-04-07T06:13:54.491000+00:00	26	34.170	
425	Lewis HAMILTON	HARD	2024-04-07T06:15:29.812000+00:00	27	34.746	
442	Lewis HAMILTON	HARD	2024-04-07T06:17:05.882000+00:00	28	34.843	
459	Lewis HAMILTON	HARD	2024-04-07T06:18:42.212000+00:00	29	34.932	
476	Lewis HAMILTON	HARD	2024-04-07T06:20:18.914000+00:00	30	34.825	
493	Lewis HAMILTON	HARD	2024-04-07T06:21:55.411000+00:00	31	35.010	
510	Lewis HAMILTON	HARD	2024-04-07T06:23:32.030000+00:00	32	34.864	
526	Lewis HAMILTON	HARD	2024-04-07T06:25:08.613000+00:00	33	34.902	
538	Lewis HAMILTON	HARD	2024-04-07T06:26:45.022000+00:00	34	34.966	
552	Lewis HAMILTON	HARD	2024-04-07T06:28:21.638000+00:00	35	34.839	
569	Lewis HAMILTON	HARD	2024-04-07T06:29:58.257000+00:00	36	34.637	
586	Lewis HAMILTON	HARD	2024-04-07T06:31:34.492000+00:00	37	34.803	
602	Lewis HAMILTON	HARD	2024-04-07T06:33:10.981000+00:00	38	35.605	
618	Lewis HAMILTON	HARD	2024-04-07T06:34:48.478000+00:00	39	34.938	
651	Lewis HAMILTON	MEDIUM	2024-04-07T06:38:21.951000+00:00	41	33.633	
667	Lewis HAMILTON	MEDIUM	2024-04-07T06:39:55.939000+00:00	42	33.805	
684	Lewis HAMILTON	MEDIUM	2024-04-07T06:41:30.121000+00:00	43	33.727	
701	Lewis HAMILTON	MEDIUM	2024-04-07T06:43:04.193000+00:00	44	33.907	
718	Lewis HAMILTON	MEDIUM	2024-04-07T06:44:38.585000+00:00	45	34.053	



	full_name	compound	date_start	lap_number	duration_sector_1	d
735	Lewis HAMILTON	MEDIUM	2024-04-07T06:46:13.321000+00:00	46	34.144	
752	Lewis HAMILTON	MEDIUM	2024-04-07T06:47:48.118000+00:00	47	33.889	
769	Lewis HAMILTON	MEDIUM	2024-04-07T06:49:22.827000+00:00	48	33.944	
786	Lewis HAMILTON	MEDIUM	2024-04-07T06:50:57.653000+00:00	49	34.013	
803	Lewis HAMILTON	MEDIUM	2024-04-07T06:52:32.807000+00:00	50	34.170	
820	Lewis HAMILTON	MEDIUM	2024-04-07T06:54:08.283000+00:00	51	34.439	

In [206...

```
libraryDataF1.getinfo(longruns(jointables,63,'Mercedes',MINIMUM_SECONDS,MAX_SECONDS))
```

Out[206...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
51	George RUSSELL	HARD	2024-04-07T05:37:23.752000+00:00	4	36.014	
69	George RUSSELL	HARD	2024-04-07T05:39:02.723000+00:00	5	35.486	
86	George RUSSELL	HARD	2024-04-07T05:40:40.356000+00:00	6	35.689	
104	George RUSSELL	HARD	2024-04-07T05:42:18.823000+00:00	7	35.576	
119	George RUSSELL	HARD	2024-04-07T05:43:56.825000+00:00	8	35.712	
137	George RUSSELL	HARD	2024-04-07T05:45:35.101000+00:00	9	35.718	
155	George RUSSELL	HARD	2024-04-07T05:47:13.333000+00:00	10	35.700	
173	George RUSSELL	HARD	2024-04-07T05:48:51.717000+00:00	11	35.861	
189	George RUSSELL	HARD	2024-04-07T05:50:30.564000+00:00	12	35.925	
205	George RUSSELL	HARD	2024-04-07T05:52:09.875000+00:00	13	35.848	
220	George RUSSELL	HARD	2024-04-07T05:53:48.771000+00:00	14	35.474	
237	George RUSSELL	HARD	2024-04-07T05:55:27.171000+00:00	15	35.730	
252	George RUSSELL	HARD	2024-04-07T05:57:05.863000+00:00	16	35.693	
267	George RUSSELL	HARD	2024-04-07T05:58:44.430000+00:00	17	36.016	
284	George RUSSELL	HARD	2024-04-07T06:00:23.923000+00:00	18	36.537	
301	George RUSSELL	HARD	2024-04-07T06:02:04.190000+00:00	19	35.636	

	full_name	compound	date_start	lap_number	duration_sector_1	di
317	George RUSSELL	HARD	2024-04-07T06:03:42.630000+00:00	20	35.591	
334	George RUSSELL	HARD	2024-04-07T06:05:21.040000+00:00	21	36.048	
351	George RUSSELL	HARD	2024-04-07T06:07:00.580000+00:00	22	35.758	
378	George RUSSELL	HARD	2024-04-07T06:10:36.947000+00:00	24	34.356	
395	George RUSSELL	HARD	2024-04-07T06:12:12.215000+00:00	25	34.380	
412	George RUSSELL	HARD	2024-04-07T06:13:47.805000+00:00	26	34.524	
427	George RUSSELL	HARD	2024-04-07T06:15:23.618000+00:00	27	35.722	
444	George RUSSELL	HARD	2024-04-07T06:17:00.841000+00:00	28	35.752	
461	George RUSSELL	HARD	2024-04-07T06:18:38.389000+00:00	29	35.090	
478	George RUSSELL	HARD	2024-04-07T06:20:15.111000+00:00	30	34.974	
495	George RUSSELL	HARD	2024-04-07T06:21:51.606000+00:00	31	35.019	
512	George RUSSELL	HARD	2024-04-07T06:23:28.413000+00:00	32	34.984	
528	George RUSSELL	HARD	2024-04-07T06:25:05.185000+00:00	33	34.868	
540	George RUSSELL	HARD	2024-04-07T06:26:41.453000+00:00	34	35.021	
554	George RUSSELL	HARD	2024-04-07T06:28:18.187000+00:00	35	34.850	
571	George RUSSELL	HARD	2024-04-07T06:29:54.681000+00:00	36	34.718	
587	George RUSSELL	HARD	2024-04-07T06:31:31.191000+00:00	37	34.759	
620	George RUSSELL	MEDIUM	2024-04-07T06:35:03.873000+00:00	39	34.005	
636	George RUSSELL	MEDIUM	2024-04-07T06:36:38.380000+00:00	40	33.931	
653	George RUSSELL	MEDIUM	2024-04-07T06:38:12.826000+00:00	41	34.130	
669	George RUSSELL	MEDIUM	2024-04-07T06:39:47.427000+00:00	42	34.104	
686	George RUSSELL	MEDIUM	2024-04-07T06:41:22.758000+00:00	43	34.286	
703	George RUSSELL	MEDIUM	2024-04-07T06:42:57.872000+00:00	44	34.142	
720	George RUSSELL	MEDIUM	2024-04-07T06:44:32.675000+00:00	45	34.097	
737	George RUSSELL	MEDIUM	2024-04-07T06:46:07.573000+00:00	46	34.155	

	full_name	compound	date_start	lap_number	duration_sector_1	dt
754	George RUSSELL	MEDIUM	2024-04-07T06:47:42.703000+00:00	47	34.285	
771	George RUSSELL	MEDIUM	2024-04-07T06:49:18.087000+00:00	48	34.368	
788	George RUSSELL	MEDIUM	2024-04-07T06:50:53.496000+00:00	49	34.458	
805	George RUSSELL	MEDIUM	2024-04-07T06:52:29.496000+00:00	50	34.683	
822	George RUSSELL	MEDIUM	2024-04-07T06:54:05.958000+00:00	51	34.260	

## Aston Martin

In [207...

```
stintInformation.query('driver_number == 14 or driver_number == 18')
```

Out[207...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1232	9496	1	14	1	1	SOFT	
8	1232	9496	1	18	1	1	SOFT	
25	1232	9496	2	18	2	12	SOFT	
27	1232	9496	2	14	2	13	SOFT	
44	1232	9496	3	18	13	22	MEDIUM	
46	1232	9496	3	14	14	33	MEDIUM	
53	1232	9496	4	18	23	34	HARD	
66	1232	9496	4	14	34	54	HARD	
68	1232	9496	5	18	35	53	SOFT	

In [208...

```
libraryDataF1.getinfo(longruns(jointables,14,'Aston Martin',MINIMUM_SECONDS
```

Out[208...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
41	Fernando ALONSO	SOFT	2024-04-07T05:37:20.270000+00:00	4	35.510	
59	Fernando ALONSO	SOFT	2024-04-07T05:38:57.721000+00:00	5	35.258	
77	Fernando ALONSO	SOFT	2024-04-07T05:40:35.294000+00:00	6	35.400	
94	Fernando ALONSO	SOFT	2024-04-07T05:42:13.149000+00:00	7	35.735	
111	Fernando ALONSO	SOFT	2024-04-07T05:43:51.401000+00:00	8	35.782	
127	Fernando ALONSO	SOFT	2024-04-07T05:45:29.677000+00:00	9	35.887	
145	Fernando ALONSO	SOFT	2024-04-07T05:47:08.674000+00:00	10	35.987	
163	Fernando ALONSO	SOFT	2024-04-07T05:48:47.462000+00:00	11	35.987	

	full_name	compound	date_start	lap_number	duration_sector_1	di
180	Fernando ALONSO	SOFT	2024-04-07T05:50:26.439000+00:00	12	35.830	
197	Fernando ALONSO	SOFT	2024-04-07T05:52:05.020000+00:00	13	35.625	
228	Fernando ALONSO	MEDIUM	2024-04-07T05:55:42.518000+00:00	15	35.447	
244	Fernando ALONSO	MEDIUM	2024-04-07T05:57:19.962000+00:00	16	35.357	
258	Fernando ALONSO	MEDIUM	2024-04-07T05:58:57.052000+00:00	17	35.356	
275	Fernando ALONSO	MEDIUM	2024-04-07T06:00:33.991000+00:00	18	35.309	
292	Fernando ALONSO	MEDIUM	2024-04-07T06:02:10.926000+00:00	19	35.098	
309	Fernando ALONSO	MEDIUM	2024-04-07T06:03:47.770000+00:00	20	35.392	
325	Fernando ALONSO	MEDIUM	2024-04-07T06:05:25.496000+00:00	21	35.334	
342	Fernando ALONSO	MEDIUM	2024-04-07T06:07:03.070000+00:00	22	35.144	
358	Fernando ALONSO	MEDIUM	2024-04-07T06:08:40.607000+00:00	23	35.236	
370	Fernando ALONSO	MEDIUM	2024-04-07T06:10:18.507000+00:00	24	35.253	
386	Fernando ALONSO	MEDIUM	2024-04-07T06:11:55.794000+00:00	25	35.220	
403	Fernando ALONSO	MEDIUM	2024-04-07T06:13:33.158000+00:00	26	35.247	
419	Fernando ALONSO	MEDIUM	2024-04-07T06:15:10.559000+00:00	27	35.232	
435	Fernando ALONSO	MEDIUM	2024-04-07T06:16:47.741000+00:00	28	35.174	
452	Fernando ALONSO	MEDIUM	2024-04-07T06:18:25.185000+00:00	29	35.509	
469	Fernando ALONSO	MEDIUM	2024-04-07T06:20:02.948000+00:00	30	35.337	
486	Fernando ALONSO	MEDIUM	2024-04-07T06:21:40.679000+00:00	31	35.308	
503	Fernando ALONSO	MEDIUM	2024-04-07T06:23:18.106000+00:00	32	35.348	
519	Fernando ALONSO	MEDIUM	2024-04-07T06:24:55.732000+00:00	33	35.389	
546	Fernando ALONSO	HARD	2024-04-07T06:28:30.575000+00:00	35	34.693	
562	Fernando ALONSO	HARD	2024-04-07T06:30:06.382000+00:00	36	34.613	
579	Fernando ALONSO	HARD	2024-04-07T06:31:41.718000+00:00	37	34.542	
595	Fernando ALONSO	HARD	2024-04-07T06:33:17.095000+00:00	38	34.657	

	full_name	compound	date_start	lap_number	duration_sector_1	di
611	Fernando ALONSO	HARD	2024-04-07T06:34:52.494000+00:00	39	34.824	
628	Fernando ALONSO	HARD	2024-04-07T06:36:28.530000+00:00	40	34.714	
644	Fernando ALONSO	HARD	2024-04-07T06:38:04.307000+00:00	41	34.409	
660	Fernando ALONSO	HARD	2024-04-07T06:39:39.903000+00:00	42	34.560	
677	Fernando ALONSO	HARD	2024-04-07T06:41:17.170000+00:00	43	34.687	
694	Fernando ALONSO	HARD	2024-04-07T06:42:53.253000+00:00	44	34.544	
711	Fernando ALONSO	HARD	2024-04-07T06:44:28.986000+00:00	45	34.420	
728	Fernando ALONSO	HARD	2024-04-07T06:46:04.453000+00:00	46	34.625	
745	Fernando ALONSO	HARD	2024-04-07T06:47:40.463000+00:00	47	34.693	
762	Fernando ALONSO	HARD	2024-04-07T06:49:16.259000+00:00	48	34.490	
779	Fernando ALONSO	HARD	2024-04-07T06:50:52.088000+00:00	49	34.375	
796	Fernando ALONSO	HARD	2024-04-07T06:52:27.882000+00:00	50	34.511	
813	Fernando ALONSO	HARD	2024-04-07T06:54:03.952000+00:00	51	34.329	
	Fernando					

In [209...

```
libraryDataF1.getinfo(longruns(jointables,18,'Aston Martin',MINIMUM_SECONDS
```

Out[209...

	full_name	compound	date_start	lap_number	duration_sector_1	di
43	Lance STROLL	SOFT	2024-04-07T05:37:25.201000+00:00	4	36.379	
61	Lance STROLL	SOFT	2024-04-07T05:39:04.803000+00:00	5	36.195	
79	Lance STROLL	SOFT	2024-04-07T05:40:44.361000+00:00	6	35.622	
96	Lance STROLL	SOFT	2024-04-07T05:42:23.093000+00:00	7	35.863	
113	Lance STROLL	SOFT	2024-04-07T05:44:01.763000+00:00	8	35.783	
129	Lance STROLL	SOFT	2024-04-07T05:45:40.246000+00:00	9	35.977	
147	Lance STROLL	SOFT	2024-04-07T05:47:19.266000+00:00	10	36.006	
165	Lance STROLL	SOFT	2024-04-07T05:48:58.325000+00:00	11	35.978	
182	Lance STROLL	SOFT	2024-04-07T05:50:37.421000+00:00	12	36.035	

	full_name	compound	date_start	lap_number	duration_sector_1	di
213	Lance STROLL	MEDIUM	2024-04-07T05:54:15.282000+00:00	14	35.636	
230	Lance STROLL	MEDIUM	2024-04-07T05:55:53.242000+00:00	15	35.618	
246	Lance STROLL	MEDIUM	2024-04-07T05:57:31.272000+00:00	16	35.918	
260	Lance STROLL	MEDIUM	2024-04-07T05:59:10.677000+00:00	17	35.629	
277	Lance STROLL	MEDIUM	2024-04-07T06:00:48.560000+00:00	18	35.501	
294	Lance STROLL	MEDIUM	2024-04-07T06:02:27.578000+00:00	19	36.330	
311	Lance STROLL	MEDIUM	2024-04-07T06:04:07.324000+00:00	20	35.822	
327	Lance STROLL	MEDIUM	2024-04-07T06:05:46.459000+00:00	21	35.859	
344	Lance STROLL	MEDIUM	2024-04-07T06:07:26.157000+00:00	22	36.035	
372	Lance STROLL	HARD	2024-04-07T06:11:05.135000+00:00	24	34.994	
388	Lance STROLL	HARD	2024-04-07T06:12:41.870000+00:00	25	35.236	
405	Lance STROLL	HARD	2024-04-07T06:14:18.984000+00:00	26	35.367	
420	Lance STROLL	HARD	2024-04-07T06:15:56.279000+00:00	27	35.314	
437	Lance STROLL	HARD	2024-04-07T06:17:33.422000+00:00	28	35.185	
454	Lance STROLL	HARD	2024-04-07T06:19:10.523000+00:00	29	35.486	
471	Lance STROLL	HARD	2024-04-07T06:20:48.151000+00:00	30	35.342	
488	Lance STROLL	HARD	2024-04-07T06:22:25.601000+00:00	31	35.408	
505	Lance STROLL	HARD	2024-04-07T06:24:03.337000+00:00	32	35.605	
521	Lance STROLL	HARD	2024-04-07T06:25:41.517000+00:00	33	36.585	
535	Lance STROLL	HARD	2024-04-07T06:27:21.040000+00:00	34	35.382	
564	Lance STROLL	SOFT	2024-04-07T06:30:54.337000+00:00	36	34.832	
581	Lance STROLL	SOFT	2024-04-07T06:32:30.357000+00:00	37	34.782	
597	Lance STROLL	SOFT	2024-04-07T06:34:06.618000+00:00	38	34.904	
613	Lance STROLL	SOFT	2024-04-07T06:35:42.992000+00:00	39	35.212	
630	Lance STROLL	SOFT	2024-04-07T06:37:19.641000+00:00	40	34.592	

	full_name	compound	date_start	lap_number	duration_sector_1	du
646	Lance STROLL	SOFT	2024-04-07T06:38:55.439000+00:00	41	34.430	
662	Lance STROLL	SOFT	2024-04-07T06:40:31.188000+00:00	42	34.711	
679	Lance STROLL	SOFT	2024-04-07T06:42:07.718000+00:00	43	34.749	
696	Lance STROLL	SOFT	2024-04-07T06:43:44.275000+00:00	44	34.701	
713	Lance STROLL	SOFT	2024-04-07T06:45:20.811000+00:00	45	34.907	
730	Lance STROLL	SOFT	2024-04-07T06:46:57.570000+00:00	46	34.609	
747	Lance STROLL	SOFT	2024-04-07T06:48:33.904000+00:00	47	34.800	
764	Lance STROLL	SOFT	2024-04-07T06:50:10.662000+00:00	48	34.619	
781	Lance STROLL	SOFT	2024-04-07T06:51:48.680000+00:00	49	34.751	
798	Lance STROLL	SOFT	2024-04-07T06:53:25.020000+00:00	50	34.462	
---	Lance	---	---	---	---	---

McLaren

In [210... `stintInformation.query('driver_number == 4 or driver_number == 81')`

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1232	9496	1	4	1	1	MEDIUM	
19	1232	9496	1	81	1	1	MEDIUM	
24	1232	9496	2	4	2	11	MEDIUM	
26	1232	9496	2	81	2	12	MEDIUM	
43	1232	9496	3	4	12	26	HARD	
45	1232	9496	3	81	13	32	HARD	
59	1232	9496	4	4	27	54	HARD	
62	1232	9496	4	81	33	54	HARD	

In [211... `libraryDataF1.getinfo(longruns(jointables,4,'McLaren'),MINIMUM_SECONDS,MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	du
38	Lando NORRIS	MEDIUM	2024-04-07T05:37:19.227000+00:00	4	35.062	
56	Lando NORRIS	MEDIUM	2024-04-07T05:38:56.078000+00:00	5	34.856	
74	Lando NORRIS	MEDIUM	2024-04-07T05:40:32.911000+00:00	6	35.298	
91	Lando NORRIS	MEDIUM	2024-04-07T05:42:10.895000+00:00	7	35.209	

	full_name	compound	date_start	lap_number	duration_sector_1	di
108	Lando NORRIS	MEDIUM	2024-04-07T05:43:48.473000+00:00	8	35.208	
124	Lando NORRIS	MEDIUM	2024-04-07T05:45:26.353000+00:00	9	35.354	
142	Lando NORRIS	MEDIUM	2024-04-07T05:47:04.316000+00:00	10	35.536	
160	Lando NORRIS	MEDIUM	2024-04-07T05:48:42.444000+00:00	11	35.613	
194	Lando NORRIS	HARD	2024-04-07T05:52:18.891000+00:00	13	34.413	
209	Lando NORRIS	HARD	2024-04-07T05:53:54.723000+00:00	14	34.874	
225	Lando NORRIS	HARD	2024-04-07T05:55:31.436000+00:00	15	34.892	
242	Lando NORRIS	HARD	2024-04-07T05:57:08.203000+00:00	16	35.411	
256	Lando NORRIS	HARD	2024-04-07T05:58:46.366000+00:00	17	35.129	
272	Lando NORRIS	HARD	2024-04-07T06:00:24.275000+00:00	18	34.632	
289	Lando NORRIS	HARD	2024-04-07T06:02:00.618000+00:00	19	34.957	
306	Lando NORRIS	HARD	2024-04-07T06:03:37.597000+00:00	20	34.961	
322	Lando NORRIS	HARD	2024-04-07T06:05:14.443000+00:00	21	34.980	
339	Lando NORRIS	HARD	2024-04-07T06:06:51.329000+00:00	22	35.207	
355	Lando NORRIS	HARD	2024-04-07T06:08:30.258000+00:00	23	35.567	
367	Lando NORRIS	HARD	2024-04-07T06:10:08.503000+00:00	24	35.327	
383	Lando NORRIS	HARD	2024-04-07T06:11:46.224000+00:00	25	35.294	
400	Lando NORRIS	HARD	2024-04-07T06:13:23.833000+00:00	26	35.271	
432	Lando NORRIS	HARD	2024-04-07T06:17:01.369000+00:00	28	34.468	
449	Lando NORRIS	HARD	2024-04-07T06:18:36.978000+00:00	29	34.941	
466	Lando NORRIS	HARD	2024-04-07T06:20:13.220000+00:00	30	34.846	
483	Lando NORRIS	HARD	2024-04-07T06:21:49.503000+00:00	31	34.969	
500	Lando NORRIS	HARD	2024-04-07T06:23:25.691000+00:00	32	34.975	
517	Lando NORRIS	HARD	2024-04-07T06:25:02.101000+00:00	33	34.957	
532	Lando NORRIS	HARD	2024-04-07T06:26:38.424000+00:00	34	35.070	



	full_name	compound	date_start	lap_number	duration_sector_1	di
543	Lando NORRIS	HARD	2024-04-07T06:28:14.743000+00:00	35	35.221	
559	Lando NORRIS	HARD	2024-04-07T06:29:51.294000+00:00	36	34.657	
576	Lando NORRIS	HARD	2024-04-07T06:31:27.215000+00:00	37	34.655	
592	Lando NORRIS	HARD	2024-04-07T06:33:03.626000+00:00	38	34.650	
608	Lando NORRIS	HARD	2024-04-07T06:34:39.641000+00:00	39	34.492	
625	Lando NORRIS	HARD	2024-04-07T06:36:15.197000+00:00	40	34.624	
641	Lando NORRIS	HARD	2024-04-07T06:37:51.491000+00:00	41	34.119	
657	Lando NORRIS	HARD	2024-04-07T06:39:26.775000+00:00	42	34.524	
674	Lando NORRIS	HARD	2024-04-07T06:41:02.960000+00:00	43	34.335	
691	Lando NORRIS	HARD	2024-04-07T06:42:38.845000+00:00	44	35.127	
708	Lando NORRIS	HARD	2024-04-07T06:44:15.281000+00:00	45	34.733	
725	Lando NORRIS	HARD	2024-04-07T06:45:51.431000+00:00	46	34.390	
742	Lando NORRIS	HARD	2024-04-07T06:47:27.082000+00:00	47	34.419	
759	Lando NORRIS	HARD	2024-04-07T06:49:02.693000+00:00	48	34.492	
776	Lando NORRIS	HARD	2024-04-07T06:50:38.465000+00:00	49	34.321	
793	Lando NORRIS	HARD	2024-04-07T06:52:13.722000+00:00	50	34.244	
810	Lando NORRIS	HARD	2024-04-07T06:53:49.079000+00:00	51	34.220	
827	Lando NORRIS	HARD	2024-04-07T06:55:24.238000+00:00	52	34.175	

In [212...

```
libraryDataFl.getinfo(longruns(jointables,81,'McLaren',MINIMUM_SECONDS,MAXI
```

Out[212...

	full_name	compound	date_start	lap_number	duration_sector_1	di
53	Oscar PIASTRI	MEDIUM	2024-04-07T05:37:21.178000+00:00	4	35.541	
71	Oscar PIASTRI	MEDIUM	2024-04-07T05:38:58.859000+00:00	5	35.214	
88	Oscar PIASTRI	MEDIUM	2024-04-07T05:40:36.502000+00:00	6	35.443	
105	Oscar PIASTRI	MEDIUM	2024-04-07T05:42:14.640000+00:00	7	35.722	

	full_name	compound	date_start	lap_number	duration_sector_1	di
121	Oscar PIASTRI	MEDIUM	2024-04-07T05:43:52.790000+00:00	8	35.648	
139	Oscar PIASTRI	MEDIUM	2024-04-07T05:45:31.111000+00:00	9	35.870	
157	Oscar PIASTRI	MEDIUM	2024-04-07T05:47:09.838000+00:00	10	36.082	
175	Oscar PIASTRI	MEDIUM	2024-04-07T05:48:48.594000+00:00	11	36.199	
191	Oscar PIASTRI	MEDIUM	2024-04-07T05:50:27.808000+00:00	12	35.769	
222	Oscar PIASTRI	HARD	2024-04-07T05:54:07.534000+00:00	14	35.136	
239	Oscar PIASTRI	HARD	2024-04-07T05:55:45.147000+00:00	15	35.232	
254	Oscar PIASTRI	HARD	2024-04-07T05:57:22.553000+00:00	16	34.970	
269	Oscar PIASTRI	HARD	2024-04-07T05:58:59.605000+00:00	17	35.099	
286	Oscar PIASTRI	HARD	2024-04-07T06:00:36.310000+00:00	18	35.010	
303	Oscar PIASTRI	HARD	2024-04-07T06:02:13.110000+00:00	19	35.051	
319	Oscar PIASTRI	HARD	2024-04-07T06:03:49.856000+00:00	20	35.098	
336	Oscar PIASTRI	HARD	2024-04-07T06:05:26.843000+00:00	21	35.276	
353	Oscar PIASTRI	HARD	2024-04-07T06:07:04.375000+00:00	22	35.613	
364	Oscar PIASTRI	HARD	2024-04-07T06:08:42.905000+00:00	23	35.757	
380	Oscar PIASTRI	HARD	2024-04-07T06:10:21.740000+00:00	24	35.019	
397	Oscar PIASTRI	HARD	2024-04-07T06:11:59.024000+00:00	25	35.295	
414	Oscar PIASTRI	HARD	2024-04-07T06:13:36.785000+00:00	26	35.168	
429	Oscar PIASTRI	HARD	2024-04-07T06:15:14.156000+00:00	27	35.266	
446	Oscar PIASTRI	HARD	2024-04-07T06:16:51.610000+00:00	28	35.217	
463	Oscar PIASTRI	HARD	2024-04-07T06:18:28.950000+00:00	29	35.343	
480	Oscar PIASTRI	HARD	2024-04-07T06:20:06.802000+00:00	30	35.300	
497	Oscar PIASTRI	HARD	2024-04-07T06:21:44.823000+00:00	31	35.356	
514	Oscar PIASTRI	HARD	2024-04-07T06:23:22.600000+00:00	32	35.221	
542	Oscar PIASTRI	HARD	2024-04-07T06:26:57.523000+00:00	34	34.409	

	full_name	compound	date_start	lap_number	duration_sector_1	di
556	Oscar PIASTRI	HARD	2024-04-07T06:28:32.799000+00:00	35	34.135	
573	Oscar PIASTRI	HARD	2024-04-07T06:30:07.626000+00:00	36	34.246	
589	Oscar PIASTRI	HARD	2024-04-07T06:31:42.748000+00:00	37	34.278	
605	Oscar PIASTRI	HARD	2024-04-07T06:33:18.158000+00:00	38	34.347	
622	Oscar PIASTRI	HARD	2024-04-07T06:34:53.319000+00:00	39	34.647	
638	Oscar PIASTRI	HARD	2024-04-07T06:36:29.395000+00:00	40	34.505	
655	Oscar PIASTRI	HARD	2024-04-07T06:38:05.209000+00:00	41	34.323	
671	Oscar PIASTRI	HARD	2024-04-07T06:39:40.876000+00:00	42	34.548	
688	Oscar PIASTRI	HARD	2024-04-07T06:41:18.480000+00:00	43	34.549	
705	Oscar PIASTRI	HARD	2024-04-07T06:42:54.201000+00:00	44	34.265	
722	Oscar PIASTRI	HARD	2024-04-07T06:44:29.850000+00:00	45	34.356	
739	Oscar PIASTRI	HARD	2024-04-07T06:46:05.534000+00:00	46	34.416	
756	Oscar PIASTRI	HARD	2024-04-07T06:47:41.173000+00:00	47	34.506	
773	Oscar PIASTRI	HARD	2024-04-07T06:49:17.088000+00:00	48	34.538	
790	Oscar PIASTRI	HARD	2024-04-07T06:50:53.075000+00:00	49	34.313	
807	Oscar PIASTRI	HARD	2024-04-07T06:52:29.180000+00:00	50	34.548	
824	Oscar PIASTRI	HARD	2024-04-07T06:54:05.489000+00:00	51	34.133	

RB

In [213...

```
stintInformation.query('driver_number == 3 or driver_number == 22')
```

Out[213...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
2	1232	9496	1	3	1	1	MEDIUM	
10	1232	9496	1	22	1	1	MEDIUM	
22	1232	9496	2	22	2	7	SOFT	
41	1232	9496	3	22	8	22	HARD	
56	1232	9496	4	22	23	53	HARD	

In [214...

```
libraryDataF1.getinfo(longruns(jointables,3,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[214... full\_name compound date\_start lap\_number duration\_sector\_1 duration\_sector\_2 duration\_

```
In [215... libraryDataF1.getinfo(longruns(jointables,22,'RB',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[215...	full_name	compound	date_start	lap_number	duration_sector_1	d
	45	Yuki TSUNODA	SOFT	2024-04-07T05:37:23.327000+00:00	4	35.860
	63	Yuki TSUNODA	SOFT	2024-04-07T05:39:02.309000+00:00	5	36.475
	81	Yuki TSUNODA	SOFT	2024-04-07T05:40:41.840000+00:00	6	35.735
	98	Yuki TSUNODA	SOFT	2024-04-07T05:42:20.742000+00:00	7	36.025
	131	Yuki TSUNODA	HARD	2024-04-07T05:45:59.762000+00:00	9	35.101
	149	Yuki TSUNODA	HARD	2024-04-07T05:47:36.915000+00:00	10	35.203
	167	Yuki TSUNODA	HARD	2024-04-07T05:49:14.517000+00:00	11	35.353
	184	Yuki TSUNODA	HARD	2024-04-07T05:50:52.310000+00:00	12	35.858
	200	Yuki TSUNODA	HARD	2024-04-07T05:52:32.415000+00:00	13	36.358
	215	Yuki TSUNODA	HARD	2024-04-07T05:54:11.270000+00:00	14	35.514
	232	Yuki TSUNODA	HARD	2024-04-07T05:55:49.863000+00:00	15	35.947
	248	Yuki TSUNODA	HARD	2024-04-07T05:57:29.895000+00:00	16	36.519
	262	Yuki TSUNODA	HARD	2024-04-07T05:59:09.975000+00:00	17	35.252
	279	Yuki TSUNODA	HARD	2024-04-07T06:00:47.829000+00:00	18	35.750
	296	Yuki TSUNODA	HARD	2024-04-07T06:02:27.195000+00:00	19	36.249
	313	Yuki TSUNODA	HARD	2024-04-07T06:04:06.881000+00:00	20	35.735
	329	Yuki TSUNODA	HARD	2024-04-07T06:05:45.909000+00:00	21	35.840
	346	Yuki TSUNODA	HARD	2024-04-07T06:07:25.445000+00:00	22	35.995
	374	Yuki TSUNODA	HARD	2024-04-07T06:11:04.523000+00:00	24	34.996
	390	Yuki TSUNODA	HARD	2024-04-07T06:12:41.241000+00:00	25	35.392
	407	Yuki TSUNODA	HARD	2024-04-07T06:14:18.295000+00:00	26	35.304
	422	Yuki TSUNODA	HARD	2024-04-07T06:15:55.296000+00:00	27	35.460

	full_name	compound	date_start	lap_number	duration_sector_1	d
439	Yuki TSUNODA	HARD	2024-04-07T06:17:32.557000+00:00	28	35.392	
456	Yuki TSUNODA	HARD	2024-04-07T06:19:09.776000+00:00	29	35.475	
473	Yuki TSUNODA	HARD	2024-04-07T06:20:47.131000+00:00	30	35.559	
490	Yuki TSUNODA	HARD	2024-04-07T06:22:24.656000+00:00	31	35.451	
507	Yuki TSUNODA	HARD	2024-04-07T06:24:02.304000+00:00	32	35.816	
523	Yuki TSUNODA	HARD	2024-04-07T06:25:40.993000+00:00	33	36.191	
537	Yuki TSUNODA	HARD	2024-04-07T06:27:19.587000+00:00	34	35.510	
549	Yuki TSUNODA	HARD	2024-04-07T06:28:57.568000+00:00	35	35.486	
566	Yuki TSUNODA	HARD	2024-04-07T06:30:35.078000+00:00	36	35.104	
583	Yuki TSUNODA	HARD	2024-04-07T06:32:12.260000+00:00	37	35.247	
599	Yuki TSUNODA	HARD	2024-04-07T06:33:49.623000+00:00	38	35.197	
615	Yuki TSUNODA	HARD	2024-04-07T06:35:27.137000+00:00	39	35.475	
632	Yuki TSUNODA	HARD	2024-04-07T06:37:04.658000+00:00	40	35.316	
648	Yuki TSUNODA	HARD	2024-04-07T06:38:42.118000+00:00	41	35.296	
664	Yuki TSUNODA	HARD	2024-04-07T06:40:19.414000+00:00	42	35.328	
681	Yuki TSUNODA	HARD	2024-04-07T06:41:56.927000+00:00	43	35.495	
698	Yuki TSUNODA	HARD	2024-04-07T06:43:34.377000+00:00	44	35.264	
715	Yuki TSUNODA	HARD	2024-04-07T06:45:11.787000+00:00	45	35.295	
732	Yuki TSUNODA	HARD	2024-04-07T06:46:48.976000+00:00	46	35.179	
749	Yuki TSUNODA	HARD	2024-04-07T06:48:26.002000+00:00	47	35.120	
766	Yuki TSUNODA	HARD	2024-04-07T06:50:03.136000+00:00	48	35.184	
783	Yuki TSUNODA	HARD	2024-04-07T06:51:40.155000+00:00	49	34.954	
800	Yuki TSUNODA	HARD	2024-04-07T06:53:16.747000+00:00	50	34.779	
817	Yuki TSUNODA	HARD	2024-04-07T06:54:53.097000+00:00	51	34.822	

Haas F1 Team

In [216...

```
stintInformation.query('driver_number == 20 or driver_number == 27')
```

Out[216...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
<b>9</b>	1232	9496	1	20	1	1	MEDIUM	
<b>13</b>	1232	9496	1	27	1	1	SOFT	
<b>20</b>	1232	9496	2	27	2	5	SOFT	
<b>34</b>	1232	9496	2	20	2	22	MEDIUM	
<b>38</b>	1232	9496	3	27	6	33	HARD	
<b>55</b>	1232	9496	3	20	23	53	HARD	
<b>63</b>	1232	9496	4	27	34	53	HARD	

In [217...

```
libraryDataF1.getinfoLongruns(jointables,20,'Haas F1 Team',MINIMUM_SECONDS
```

Out[217...

	full_name	compound	date_start	lap_number	duration_sector 1
<b>44</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:37:26.070000+00:00	4	36.735
<b>62</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:39:06.386000+00:00	5	36.288
<b>80</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:40:45.764000+00:00	6	36.586
<b>97</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:42:25.716000+00:00	7	36.824
<b>114</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:44:06.009000+00:00	8	36.395
<b>130</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:45:45.670000+00:00	9	36.807
<b>148</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:47:25.984000+00:00	10	36.841
<b>166</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:49:06.191000+00:00	11	36.701
<b>183</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:50:46.065000+00:00	12	36.607
<b>199</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:52:26.244000+00:00	13	36.061
<b>214</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:54:05.455000+00:00	14	36.900
<b>231</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:55:46.382000+00:00	15	36.273
<b>247</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:57:25.757000+00:00	16	36.699
<b>261</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T05:59:05.528000+00:00	17	36.516
<b>278</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T06:00:45.266000+00:00	18	36.424
<b>295</b>	Kevin MAGNUSSEN	MEDIUM	2024-04-07T06:02:24.909000+00:00	19	36.438

	full_name	compound	date_start	lap_number	duration_sector_1
312	Kevin MAGNUSSEN	MEDIUM	2024-04-07T06:04:04.452000+00:00	20	36.242
328	Kevin MAGNUSSEN	MEDIUM	2024-04-07T06:05:43.731000+00:00	21	36.376
345	Kevin MAGNUSSEN	MEDIUM	2024-04-07T06:07:23.325000+00:00	22	36.533
373	Kevin MAGNUSSEN	HARD	2024-04-07T06:11:07.036000+00:00	24	35.152
389	Kevin MAGNUSSEN	HARD	2024-04-07T06:12:43.656000+00:00	25	35.287
406	Kevin MAGNUSSEN	HARD	2024-04-07T06:14:20.713000+00:00	26	35.497
421	Kevin MAGNUSSEN	HARD	2024-04-07T06:15:57.824000+00:00	27	35.533
438	Kevin MAGNUSSEN	HARD	2024-04-07T06:17:35.296000+00:00	28	35.641
455	Kevin MAGNUSSEN	HARD	2024-04-07T06:19:12.740000+00:00	29	35.705
472	Kevin MAGNUSSEN	HARD	2024-04-07T06:20:50.675000+00:00	30	35.748
489	Kevin MAGNUSSEN	HARD	2024-04-07T06:22:28.695000+00:00	31	35.900
506	Kevin MAGNUSSEN	HARD	2024-04-07T06:24:07.203000+00:00	32	36.033
522	Kevin MAGNUSSEN	HARD	2024-04-07T06:25:45.829000+00:00	33	35.912
536	Kevin MAGNUSSEN	HARD	2024-04-07T06:27:24.332000+00:00	34	35.636
548	Kevin MAGNUSSEN	HARD	2024-04-07T06:29:02.266000+00:00	35	35.670
565	Kevin MAGNUSSEN	HARD	2024-04-07T06:30:40.398000+00:00	36	35.813
582	Kevin MAGNUSSEN	HARD	2024-04-07T06:32:18.452000+00:00	37	35.455
598	Kevin MAGNUSSEN	HARD	2024-04-07T06:33:56.132000+00:00	38	35.622
614	Kevin MAGNUSSEN	HARD	2024-04-07T06:35:33.949000+00:00	39	35.416
631	Kevin MAGNUSSEN	HARD	2024-04-07T06:37:11.462000+00:00	40	35.427
647	Kevin MAGNUSSEN	HARD	2024-04-07T06:38:48.934000+00:00	41	35.384
663	Kevin MAGNUSSEN	HARD	2024-04-07T06:40:26.570000+00:00	42	35.401
680	Kevin MAGNUSSEN	HARD	2024-04-07T06:42:04.519000+00:00	43	35.358
697	Kevin MAGNUSSEN	HARD	2024-04-07T06:43:41.846000+00:00	44	35.457
714	Kevin MAGNUSSEN	HARD	2024-04-07T06:45:19.298000+00:00	45	35.407

	full_name	compound	date_start	lap_number	duration_sector_1
731	Kevin MAGNUSSEN	HARD	2024-04-07T06:46:57.037000+00:00	46	35.790
748	Kevin MAGNUSSEN	HARD	2024-04-07T06:48:35.385000+00:00	47	35.559
765	Kevin MAGNUSSEN	HARD	2024-04-07T06:50:14.057000+00:00	48	36.163
782	Kevin MAGNUSSEN	HARD	2024-04-07T06:51:52.327000+00:00	49	35.374
799	Kevin MAGNUSSEN	HARD	2024-04-07T06:53:29.849000+00:00	50	35.312

In [218...

```
libraryDataF1.getinfo(longruns(jointables,27,'Haas F1 Team',MINIMUM_SECONDS
```

Out[218...

	full_name	compound	date_start	lap_number	duration_sector_1
47	Nico HULKENBERG	SOFT	2024-04-07T05:37:26.971000+00:00	4	36.724
65	Nico HULKENBERG	SOFT	2024-04-07T05:39:07.327000+00:00	5	36.317
100	Nico HULKENBERG	HARD	2024-04-07T05:42:46.205000+00:00	7	35.290
115	Nico HULKENBERG	HARD	2024-04-07T05:44:22.845000+00:00	8	35.737
133	Nico HULKENBERG	HARD	2024-04-07T05:46:00.583000+00:00	9	35.756
151	Nico HULKENBERG	HARD	2024-04-07T05:47:38.320000+00:00	10	35.956
169	Nico HULKENBERG	HARD	2024-04-07T05:49:16.655000+00:00	11	35.956
185	Nico HULKENBERG	HARD	2024-04-07T05:50:54.989000+00:00	12	36.090
201	Nico HULKENBERG	HARD	2024-04-07T05:52:33.881000+00:00	13	36.470
216	Nico HULKENBERG	HARD	2024-04-07T05:54:14.290000+00:00	14	36.000
233	Nico HULKENBERG	HARD	2024-04-07T05:55:52.745000+00:00	15	36.409
249	Nico HULKENBERG	HARD	2024-04-07T05:57:32.447000+00:00	16	36.317
263	Nico HULKENBERG	HARD	2024-04-07T05:59:11.842000+00:00	17	36.357
280	Nico HULKENBERG	HARD	2024-04-07T06:00:51.207000+00:00	18	35.880
297	Nico HULKENBERG	HARD	2024-04-07T06:02:29.513000+00:00	19	36.190
314	Nico HULKENBERG	HARD	2024-04-07T06:04:08.519000+00:00	20	36.269
330	Nico HULKENBERG	HARD	2024-04-07T06:05:47.804000+00:00	21	36.500



	full_name	compound	date_start	lap_number	duration_sector_1
347	Nico HULKENBERG	HARD	2024-04-07T06:07:27.631000+00:00	22	36.496
360	Nico HULKENBERG	HARD	2024-04-07T06:09:07.240000+00:00	23	36.135
375	Nico HULKENBERG	HARD	2024-04-07T06:10:46.236000+00:00	24	36.178
391	Nico HULKENBERG	HARD	2024-04-07T06:12:25.575000+00:00	25	35.917
408	Nico HULKENBERG	HARD	2024-04-07T06:14:04.346000+00:00	26	36.155
423	Nico HULKENBERG	HARD	2024-04-07T06:15:43.369000+00:00	27	36.185
440	Nico HULKENBERG	HARD	2024-04-07T06:17:22.595000+00:00	28	36.128
457	Nico HULKENBERG	HARD	2024-04-07T06:19:01.816000+00:00	29	36.380
474	Nico HULKENBERG	HARD	2024-04-07T06:20:41.681000+00:00	30	36.235
491	Nico HULKENBERG	HARD	2024-04-07T06:22:20.867000+00:00	31	36.237
508	Nico HULKENBERG	HARD	2024-04-07T06:24:00.637000+00:00	32	36.718
524	Nico HULKENBERG	HARD	2024-04-07T06:25:40.609000+00:00	33	37.314
550	Nico HULKENBERG	HARD	2024-04-07T06:29:21.919000+00:00	35	35.062
567	Nico HULKENBERG	HARD	2024-04-07T06:30:57.747000+00:00	36	34.917
584	Nico HULKENBERG	HARD	2024-04-07T06:32:33.762000+00:00	37	34.946
600	Nico HULKENBERG	HARD	2024-04-07T06:34:09.665000+00:00	38	35.264
616	Nico HULKENBERG	HARD	2024-04-07T06:35:45.719000+00:00	39	35.052
633	Nico HULKENBERG	HARD	2024-04-07T06:37:21.635000+00:00	40	34.876
649	Nico HULKENBERG	HARD	2024-04-07T06:38:57.325000+00:00	41	34.935
665	Nico HULKENBERG	HARD	2024-04-07T06:40:33.288000+00:00	42	35.084
682	Nico HULKENBERG	HARD	2024-04-07T06:42:09.672000+00:00	43	35.015
699	Nico HULKENBERG	HARD	2024-04-07T06:43:45.771000+00:00	44	35.335
716	Nico HULKENBERG	HARD	2024-04-07T06:45:22.621000+00:00	45	35.284
733	Nico HULKENBERG	HARD	2024-04-07T06:46:59.379000+00:00	46	34.725
750	Nico HULKENBERG	HARD	2024-04-07T06:48:37.550000+00:00	47	35.200

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
767	Nico HULKENBERG	HARD	2024-04-07T06:50:14.435000+00:00	48	34.465	34.465
784	Nico HULKENBERG	HARD	2024-04-07T06:51:50.093000+00:00	49	34.930	34.930
801	Nico HULKENBERG	HARD	2024-04-07T06:53:26.319000+00:00	50	34.800	34.800
818	Nico HULKENBERG	HARD	2024-04-07T06:55:02.086000+00:00	51	34.800	34.800

Kick Sauber

In [219...

stintInformation.query('driver\_number == 24 or driver\_number == 77')

Out[219...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
12	1232	9496	1	24	1	1	MEDIUM	
18	1232	9496	1	77	1	1	SOFT	
21	1232	9496	2	77	2	6	SOFT	
23	1232	9496	2	24	2	7	SOFT	
39	1232	9496	3	77	7	22	HARD	
40	1232	9496	3	24	8	11	HARD	
42	1232	9496	4	24	12	13	HARD	
57	1232	9496	4	77	23	53	HARD	

In [220...

libraryDataF1.getinfo(longruns(jointables,24,'Kick Sauber',MINIMUM\_SECONDS,1

Out[220...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
46	ZHOU Guanyu	SOFT	2024-04-07T05:37:26.365000+00:00	4	36.656	36.656
64	ZHOU Guanyu	SOFT	2024-04-07T05:39:06.629000+00:00	5	36.238	36.238
82	ZHOU Guanyu	SOFT	2024-04-07T05:40:46.211000+00:00	6	36.364	36.364
99	ZHOU Guanyu	SOFT	2024-04-07T05:42:26.288000+00:00	7	36.610	36.610
132	ZHOU Guanyu	HARD	2024-04-07T05:46:07.516000+00:00	9	35.194	35.194
150	ZHOU Guanyu	HARD	2024-04-07T05:47:44.696000+00:00	10	35.186	35.186
168	ZHOU Guanyu	HARD	2024-04-07T05:49:22.182000+00:00	11	35.334	35.334

In [221...

libraryDataF1.getinfo(longruns(jointables,77,'Kick Sauber',MINIMUM\_SECONDS,1

Out[221...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
52	Valtteri BOTTAS	SOFT	2024-04-07T05:37:24.899000+00:00	4	36.346	36.346

	full_name	compound	date_start	lap_number	duration_sector_1	di
70	Valtteri BOTTAS	SOFT	2024-04-07T05:39:04.266000+00:00	5	35.077	
87	Valtteri BOTTAS	SOFT	2024-04-07T05:40:42.575000+00:00	6	35.946	
120	Valtteri BOTTAS	HARD	2024-04-07T05:44:21.338000+00:00	8	34.647	
138	Valtteri BOTTAS	HARD	2024-04-07T05:45:57.922000+00:00	9	35.119	
156	Valtteri BOTTAS	HARD	2024-04-07T05:47:35.397000+00:00	10	35.294	
174	Valtteri BOTTAS	HARD	2024-04-07T05:49:12.859000+00:00	11	35.641	
190	Valtteri BOTTAS	HARD	2024-04-07T05:50:51.356000+00:00	12	36.340	
206	Valtteri BOTTAS	HARD	2024-04-07T05:52:31.909000+00:00	13	35.372	
221	Valtteri BOTTAS	HARD	2024-04-07T05:54:10.116000+00:00	14	35.551	
238	Valtteri BOTTAS	HARD	2024-04-07T05:55:48.992000+00:00	15	36.412	
253	Valtteri BOTTAS	HARD	2024-04-07T05:57:29.427000+00:00	16	35.531	
268	Valtteri BOTTAS	HARD	2024-04-07T05:59:08.007000+00:00	17	35.635	
285	Valtteri BOTTAS	HARD	2024-04-07T06:00:46.727000+00:00	18	35.478	
302	Valtteri BOTTAS	HARD	2024-04-07T06:02:25.449000+00:00	19	36.228	
318	Valtteri BOTTAS	HARD	2024-04-07T06:04:05.253000+00:00	20	36.034	
335	Valtteri BOTTAS	HARD	2024-04-07T06:05:44.366000+00:00	21	36.279	
352	Valtteri BOTTAS	HARD	2024-04-07T06:07:23.706000+00:00	22	36.345	
379	Valtteri BOTTAS	HARD	2024-04-07T06:11:07.802000+00:00	24	35.673	
396	Valtteri BOTTAS	HARD	2024-04-07T06:12:45.855000+00:00	25	34.464	
413	Valtteri BOTTAS	HARD	2024-04-07T06:14:22.375000+00:00	26	35.057	
428	Valtteri BOTTAS	HARD	2024-04-07T06:15:59.402000+00:00	27	34.846	
445	Valtteri BOTTAS	HARD	2024-04-07T06:17:35.938000+00:00	28	35.328	
462	Valtteri BOTTAS	HARD	2024-04-07T06:19:13.419000+00:00	29	35.456	
479	Valtteri BOTTAS	HARD	2024-04-07T06:20:51.228000+00:00	30	35.768	
496	Valtteri BOTTAS	HARD	2024-04-07T06:22:29.453000+00:00	31	35.462	

	full_name	compound	date_start	lap_number	duration_sector_1	di
513	Valtteri BOTTAS	HARD	2024-04-07T06:24:07.380000+00:00	32	36.036	
529	Valtteri BOTTAS	HARD	2024-04-07T06:25:46.236000+00:00	33	35.807	
541	Valtteri BOTTAS	HARD	2024-04-07T06:27:24.947000+00:00	34	35.614	
555	Valtteri BOTTAS	HARD	2024-04-07T06:29:02.937000+00:00	35	35.400	
572	Valtteri BOTTAS	HARD	2024-04-07T06:30:40.907000+00:00	36	35.589	
588	Valtteri BOTTAS	HARD	2024-04-07T06:32:19.204000+00:00	37	35.295	
604	Valtteri BOTTAS	HARD	2024-04-07T06:33:56.853000+00:00	38	35.557	
621	Valtteri BOTTAS	HARD	2024-04-07T06:35:34.834000+00:00	39	35.030	
637	Valtteri BOTTAS	HARD	2024-04-07T06:37:11.940000+00:00	40	35.403	
654	Valtteri BOTTAS	HARD	2024-04-07T06:38:49.846000+00:00	41	35.033	
670	Valtteri BOTTAS	HARD	2024-04-07T06:40:27.152000+00:00	42	35.378	
687	Valtteri BOTTAS	HARD	2024-04-07T06:42:05.216000+00:00	43	35.154	
704	Valtteri BOTTAS	HARD	2024-04-07T06:43:42.582000+00:00	44	35.075	
721	Valtteri BOTTAS	HARD	2024-04-07T06:45:20.210000+00:00	45	36.119	
738	Valtteri BOTTAS	HARD	2024-04-07T06:46:58.806000+00:00	46	36.116	
755	Valtteri BOTTAS	HARD	2024-04-07T06:48:38.880000+00:00	47	35.235	
772	Valtteri BOTTAS	HARD	2024-04-07T06:50:16.767000+00:00	48	34.903	
789	Valtteri BOTTAS	HARD	2024-04-07T06:51:54.036000+00:00	49	34.930	
806	Valtteri BOTTAS	HARD	2024-04-07T06:53:30.862000+00:00	50	34.838	
823	Valtteri BOTTAS	HARD	2024-04-07T06:55:10.070000+00:00	51	34.800	

Williams

In [222...

stintInformation.query('driver\_number == 23 or driver\_number == 2')

Out[222...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
1	1232	9496	1	2	1	1	SOFT	
11	1232	9496	1	23	1	1	SOFT	
33	1232	9496	2	2	2	22	HARD	
52	1232	9496	3	2	23	34	HARD	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
67	1232	9496	4	2	35	41	MEDIUM	
73	1232	9496	5	2	42	50	SOFT	

In [223... `libraryDataFl.getinfo(longruns(jointables,23,'Williams',MINIMUM_SECONDS,MAXI`

Out[223... `full_name compound date_start lap_number duration_sector_1 duration_sector_2 duration_`

In [224... `libraryDataFl.getinfo(longruns(jointables,2,'Williams',MINIMUM_SECONDS,MAXI`

Out[224... `full_name compound date_start lap_number duration_sector_1`

	full_name	compound	date_start	lap_number	duration_sector_1
37	Logan SARGEANT	HARD	2024-04-07T05:37:28.176000+00:00	4	36.434
55	Logan SARGEANT	HARD	2024-04-07T05:39:08.449000+00:00	5	36.207
73	Logan SARGEANT	HARD	2024-04-07T05:40:48.052000+00:00	6	36.092
90	Logan SARGEANT	HARD	2024-04-07T05:42:27.739000+00:00	7	36.282
107	Logan SARGEANT	HARD	2024-04-07T05:44:07.852000+00:00	8	36.250
123	Logan SARGEANT	HARD	2024-04-07T05:45:47.405000+00:00	9	36.826
141	Logan SARGEANT	HARD	2024-04-07T05:47:28.397000+00:00	10	36.700
159	Logan SARGEANT	HARD	2024-04-07T05:49:09.195000+00:00	11	35.793
177	Logan SARGEANT	HARD	2024-04-07T05:50:48.549000+00:00	12	36.178
193	Logan SARGEANT	HARD	2024-04-07T05:52:28.449000+00:00	13	36.308
208	Logan SARGEANT	HARD	2024-04-07T05:54:08.689000+00:00	14	36.063
224	Logan SARGEANT	HARD	2024-04-07T05:55:48.357000+00:00	15	35.940
241	Logan SARGEANT	HARD	2024-04-07T05:57:27.725000+00:00	16	36.187
255	Logan SARGEANT	HARD	2024-04-07T05:59:07.232000+00:00	17	36.019
271	Logan SARGEANT	HARD	2024-04-07T06:00:46.458000+00:00	18	36.778
288	Logan SARGEANT	HARD	2024-04-07T06:02:26.728000+00:00	19	36.269
305	Logan SARGEANT	HARD	2024-04-07T06:04:06.271000+00:00	20	35.840
321	Logan SARGEANT	HARD	2024-04-07T06:05:45.248000+00:00	21	36.089
338	Logan SARGEANT	HARD	2024-04-07T06:07:24.830000+00:00	22	35.981

	full_name	compound	date_start	lap_number	duration_sector_1
366	Logan SARGEANT	HARD	2024-04-07T06:11:08.655000+00:00	24	35.154
382	Logan SARGEANT	HARD	2024-04-07T06:12:46.707000+00:00	25	35.477
399	Logan SARGEANT	HARD	2024-04-07T06:14:25.170000+00:00	26	36.002
416	Logan SARGEANT	HARD	2024-04-07T06:16:03.747000+00:00	27	34.705
431	Logan SARGEANT	HARD	2024-04-07T06:17:40.238000+00:00	28	35.237
448	Logan SARGEANT	HARD	2024-04-07T06:19:17.780000+00:00	29	35.398
465	Logan SARGEANT	HARD	2024-04-07T06:20:55.404000+00:00	30	35.392
482	Logan SARGEANT	HARD	2024-04-07T06:22:32.905000+00:00	31	35.395
499	Logan SARGEANT	HARD	2024-04-07T06:24:10.475000+00:00	32	35.405
516	Logan SARGEANT	HARD	2024-04-07T06:25:48.263000+00:00	33	35.552
531	Logan SARGEANT	HARD	2024-04-07T06:27:26.270000+00:00	34	35.473
558	Logan SARGEANT	MEDIUM	2024-04-07T06:31:02.920000+00:00	36	34.280
575	Logan SARGEANT	MEDIUM	2024-04-07T06:32:38.380000+00:00	37	34.776
591	Logan SARGEANT	MEDIUM	2024-04-07T06:34:14.500000+00:00	38	34.663
607	Logan SARGEANT	MEDIUM	2024-04-07T06:35:50.709000+00:00	39	34.824
624	Logan SARGEANT	MEDIUM	2024-04-07T06:37:26.918000+00:00	40	34.792
673	Logan SARGEANT	SOFT	2024-04-07T06:43:22.091000+00:00	43	34.268
690	Logan SARGEANT	SOFT	2024-04-07T06:44:57.129000+00:00	44	34.258
707	Logan SARGEANT	SOFT	2024-04-07T06:46:32.102000+00:00	45	34.427
724	Logan SARGEANT	SOFT	2024-04-07T06:48:07.535000+00:00	46	34.664
741	Logan SARGEANT	SOFT	2024-04-07T06:49:43.269000+00:00	47	34.592
758	Logan SARGEANT	SOFT	2024-04-07T06:51:19.001000+00:00	48	34.679
775	Logan SARGEANT	SOFT	2024-04-07T06:52:54.894000+00:00	49	34.393
792	Logan SARGEANT	SOFT	2024-04-07T06:54:30.351000+00:00	50	34.275
809	Logan SARGEANT	SOFT	2024-04-07T06:56:05.980000+00:00	51	34.224

Alpine

```
In [225... stintInformation.query('driver_number == 10 or driver_number == 31')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	4	1232	9496	1	10	1	1	SOFT
	14	1232	9496	1	31	1	1	SOFT
	31	1232	9496	2	10	2	16	HARD
	32	1232	9496	2	31	2	19	HARD
	49	1232	9496	3	10	17	32	MEDIUM
	51	1232	9496	3	31	20	33	HARD
	61	1232	9496	4	10	33	53	HARD
	64	1232	9496	4	31	34	53	MEDIUM

```
In [226... libraryDataF1.getinfoLongruns(jointables,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
48	Esteban OCON	HARD	2024-04-07T05:37:24.445000+00:00	4	36.369	
66	Esteban OCON	HARD	2024-04-07T05:39:04.069000+00:00	5	36.454	
83	Esteban OCON	HARD	2024-04-07T05:40:44.140000+00:00	6	36.780	
101	Esteban OCON	HARD	2024-04-07T05:42:24.664000+00:00	7	36.288	
116	Esteban OCON	HARD	2024-04-07T05:44:04.267000+00:00	8	36.225	
134	Esteban OCON	HARD	2024-04-07T05:45:44.382000+00:00	9	36.268	
152	Esteban OCON	HARD	2024-04-07T05:47:24.665000+00:00	10	36.333	
170	Esteban OCON	HARD	2024-04-07T05:49:05.033000+00:00	11	36.426	
186	Esteban OCON	HARD	2024-04-07T05:50:45.284000+00:00	12	36.536	
202	Esteban OCON	HARD	2024-04-07T05:52:25.947000+00:00	13	37.253	
217	Esteban OCON	HARD	2024-04-07T05:54:07.204000+00:00	14	36.925	
234	Esteban OCON	HARD	2024-04-07T05:55:48.102000+00:00	15	37.115	
250	Esteban OCON	HARD	2024-04-07T05:57:29.049000+00:00	16	37.008	
264	Esteban OCON	HARD	2024-04-07T05:59:09.696000+00:00	17	36.929	

	full_name	compound	date_start	lap_number	duration_sector_1	di
281	Esteban OCON	HARD	2024-04-07T06:00:50.655000+00:00	18	37.084	
298	Esteban OCON	HARD	2024-04-07T06:02:31.334000+00:00	19	36.254	
331	Esteban OCON	HARD	2024-04-07T06:06:12.029000+00:00	21	35.355	
348	Esteban OCON	HARD	2024-04-07T06:07:49.807000+00:00	22	35.349	
361	Esteban OCON	HARD	2024-04-07T06:09:27.468000+00:00	23	36.493	
376	Esteban OCON	HARD	2024-04-07T06:11:06.679000+00:00	24	36.307	
392	Esteban OCON	HARD	2024-04-07T06:12:45.750000+00:00	25	36.212	
409	Esteban OCON	HARD	2024-04-07T06:14:24.819000+00:00	26	35.898	
424	Esteban OCON	HARD	2024-04-07T06:16:03.361000+00:00	27	36.166	
441	Esteban OCON	HARD	2024-04-07T06:17:42.312000+00:00	28	35.712	
458	Esteban OCON	HARD	2024-04-07T06:19:20.884000+00:00	29	35.779	
475	Esteban OCON	HARD	2024-04-07T06:20:59.658000+00:00	30	35.656	
492	Esteban OCON	HARD	2024-04-07T06:22:38.218000+00:00	31	35.716	
509	Esteban OCON	HARD	2024-04-07T06:24:16.848000+00:00	32	35.533	
525	Esteban OCON	HARD	2024-04-07T06:25:55.110000+00:00	33	35.559	
551	Esteban OCON	MEDIUM	2024-04-07T06:29:33.708000+00:00	35	35.156	
568	Esteban OCON	MEDIUM	2024-04-07T06:31:10.820000+00:00	36	35.117	
585	Esteban OCON	MEDIUM	2024-04-07T06:32:47.811000+00:00	37	35.182	
601	Esteban OCON	MEDIUM	2024-04-07T06:34:26.579000+00:00	38	34.880	
617	Esteban OCON	MEDIUM	2024-04-07T06:36:03.387000+00:00	39	34.945	
634	Esteban OCON	MEDIUM	2024-04-07T06:37:40.464000+00:00	40	35.037	
650	Esteban OCON	MEDIUM	2024-04-07T06:39:17.938000+00:00	41	36.091	
666	Esteban OCON	MEDIUM	2024-04-07T06:40:56.976000+00:00	42	34.865	
683	Esteban OCON	MEDIUM	2024-04-07T06:42:34.180000+00:00	43	35.112	
700	Esteban OCON	MEDIUM	2024-04-07T06:44:11.605000+00:00	44	37.447	



	full_name	compound	date_start	lap_number	duration_sector_1	du
717	Esteban OCON	MEDIUM	2024-04-07T06:45:52.579000+00:00	45	34.933	
734	Esteban OCON	MEDIUM	2024-04-07T06:47:29.568000+00:00	46	35.059	
751	Esteban OCON	MEDIUM	2024-04-07T06:49:06.582000+00:00	47	35.056	
768	Esteban OCON	MEDIUM	2024-04-07T06:50:43.995000+00:00	48	34.810	
785	Esteban OCON	MEDIUM	2024-04-07T06:52:20.869000+00:00	49	34.735	
802	Esteban OCON	MEDIUM	2024-04-07T06:53:57.542000+00:00	50	34.620	

In [227...

```
libraryDataF1.getinfo(longruns(jointables,10,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[227...

	full_name	compound	date_start	lap_number	duration_sector_1	du
39	Pierre GASLY	HARD	2024-04-07T05:37:25.752000+00:00	4	36.680	
57	Pierre GASLY	HARD	2024-04-07T05:39:05.766000+00:00	5	36.122	
75	Pierre GASLY	HARD	2024-04-07T05:40:45.191000+00:00	6	36.667	
92	Pierre GASLY	HARD	2024-04-07T05:42:25.517000+00:00	7	36.461	
109	Pierre GASLY	HARD	2024-04-07T05:44:05.624000+00:00	8	37.525	
125	Pierre GASLY	HARD	2024-04-07T05:45:47.078000+00:00	9	36.840	
143	Pierre GASLY	HARD	2024-04-07T05:47:27.937000+00:00	10	36.846	
161	Pierre GASLY	HARD	2024-04-07T05:49:08.971000+00:00	11	37.365	
178	Pierre GASLY	HARD	2024-04-07T05:50:50.536000+00:00	12	36.798	
195	Pierre GASLY	HARD	2024-04-07T05:52:31.666000+00:00	13	37.619	
210	Pierre GASLY	HARD	2024-04-07T05:54:14.080000+00:00	14	37.405	
226	Pierre GASLY	HARD	2024-04-07T05:55:55.951000+00:00	15	37.047	
243	Pierre GASLY	HARD	2024-04-07T05:57:37.344000+00:00	16	36.884	
273	Pierre GASLY	MEDIUM	2024-04-07T06:01:19.587000+00:00	18	35.683	
290	Pierre GASLY	MEDIUM	2024-04-07T06:02:57.945000+00:00	19	35.764	
307	Pierre GASLY	MEDIUM	2024-04-07T06:04:36.518000+00:00	20	35.953	

	full_name	compound	date_start	lap_number	duration_sector_1	di
323	Pierre GASLY	MEDIUM	2024-04-07T06:06:15.313000+00:00	21	35.664	
340	Pierre GASLY	MEDIUM	2024-04-07T06:07:53.736000+00:00	22	35.706	
356	Pierre GASLY	MEDIUM	2024-04-07T06:09:32.060000+00:00	23	36.281	
368	Pierre GASLY	MEDIUM	2024-04-07T06:11:11.850000+00:00	24	35.817	
384	Pierre GASLY	MEDIUM	2024-04-07T06:12:50.651000+00:00	25	35.854	
401	Pierre GASLY	MEDIUM	2024-04-07T06:14:29.632000+00:00	26	36.002	
417	Pierre GASLY	MEDIUM	2024-04-07T06:16:08.624000+00:00	27	35.940	
433	Pierre GASLY	MEDIUM	2024-04-07T06:17:47.597000+00:00	28	35.958	
450	Pierre GASLY	MEDIUM	2024-04-07T06:19:26.433000+00:00	29	36.038	
467	Pierre GASLY	MEDIUM	2024-04-07T06:21:05.442000+00:00	30	35.924	
484	Pierre GASLY	MEDIUM	2024-04-07T06:22:44.291000+00:00	31	36.074	
501	Pierre GASLY	MEDIUM	2024-04-07T06:24:23.844000+00:00	32	36.112	
533	Pierre GASLY	HARD	2024-04-07T06:28:03.348000+00:00	34	35.397	
544	Pierre GASLY	HARD	2024-04-07T06:29:42.070000+00:00	35	35.565	
560	Pierre GASLY	HARD	2024-04-07T06:31:19.783000+00:00	36	35.261	
577	Pierre GASLY	HARD	2024-04-07T06:32:57.005000+00:00	37	36.064	
593	Pierre GASLY	HARD	2024-04-07T06:34:35.333000+00:00	38	34.950	
609	Pierre GASLY	HARD	2024-04-07T06:36:12.241000+00:00	39	36.267	
626	Pierre GASLY	HARD	2024-04-07T06:37:52.435000+00:00	40	35.041	
642	Pierre GASLY	HARD	2024-04-07T06:39:30.451000+00:00	41	34.976	
658	Pierre GASLY	HARD	2024-04-07T06:41:07.852000+00:00	42	34.965	
675	Pierre GASLY	HARD	2024-04-07T06:42:44.935000+00:00	43	35.047	
692	Pierre GASLY	HARD	2024-04-07T06:44:21.742000+00:00	44	35.111	
709	Pierre GASLY	HARD	2024-04-07T06:45:58.973000+00:00	45	35.011	
726	Pierre GASLY	HARD	2024-04-07T06:47:35.931000+00:00	46	35.067	

	full_name	compound	date_start	lap_number	duration_sector_1	di
743	Pierre GASLY	HARD	2024-04-07T06:49:12.929000+00:00	47	34.987	
760	Pierre GASLY	HARD	2024-04-07T06:50:49.679000+00:00	48	34.847	
777	Pierre GASLY	HARD	2024-04-07T06:52:26.269000+00:00	49	34.862	
794	Pierre GASLY	HARD	2024-04-07T06:54:04.871000+00:00	50	37.653	

## Pits

Before to finish the analysis, I added the Pits sections where it can see how much time teams spent in the box.

In [228...

```
pit = libraryDataF1.obtain_information('pit',session_key=9496)
```

In [229...

```
jointables = pd.merge(drivers,pit,on=['driver_number']).query("pit_duration<25")
jointables
pit_duration = pd.DataFrame(jointables.groupby('team_name')['pit_duration'].mean())
pit_duration
```

Out[229...

	pit_duration
team_name	
Red Bull Racing	23.025000
Aston Martin	23.080000
McLaren	23.100000
Ferrari	23.266667
RB	23.350000
Mercedes	23.400000
Alpine	23.575000
Williams	24.300000
Haas F1 Team	24.533333
Kick Sauber	25.300000