

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

FORMULA 1 STC SAUDI ARABIAN GRAND PRIX 2024

The Saudi Arabian Grand Prix (Arabic: جائزة السعودية الكبرى) is a Formula One motor racing event which took place for the first time in 2021. The inaugural edition of the race was held in Jeddah, in Saudi Arabia. It was the fifth full-night race title on the Formula One calendar, following the Singapore, Bahrain, Sakhir and Qatar Grands Prix.[1] Source: Wikipedia

Obtain session information

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

```
Out[2]:  
session_key session_name date_start date_end gmt_offset  
0 9473 Practice 1 2024-03-07T13:30:00+00:00 2024-03-07T14:30:00+00:00 03:00:00  
1 9474 Practice 2 2024-03-07T17:00:00+00:00 2024-03-07T18:00:00+00:00 03:00:00  
2 9475 Practice 3 2024-03-08T13:30:00+00:00 2024-03-08T14:30:00+00:00 03:00:00  
3 9476 Qualifying 2024-03-08T17:00:00+00:00 2024-03-08T18:00:00+00:00 03:00:00  
4 9480 Race 2024-03-09T17:00:00+00:00 2024-03-09T19:00:00+00:00 03:00:00
```

Free Practice 1

Obtain setup

```
In [3]:  
practice = libraryDataF1.obtain_information('laps', session_key=9473)  
stintInformation = libraryDataF1.obtain_information('stints', session_key=9473)  
drivers = libraryDataF1.obtain_information('drivers', session_key=9473)
```

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

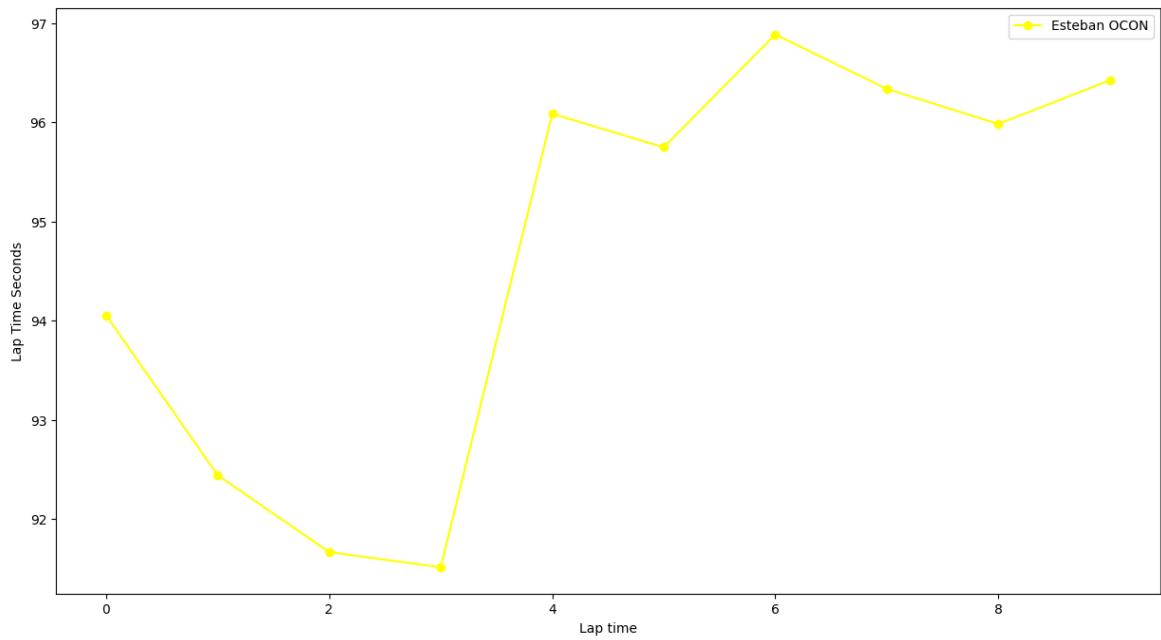
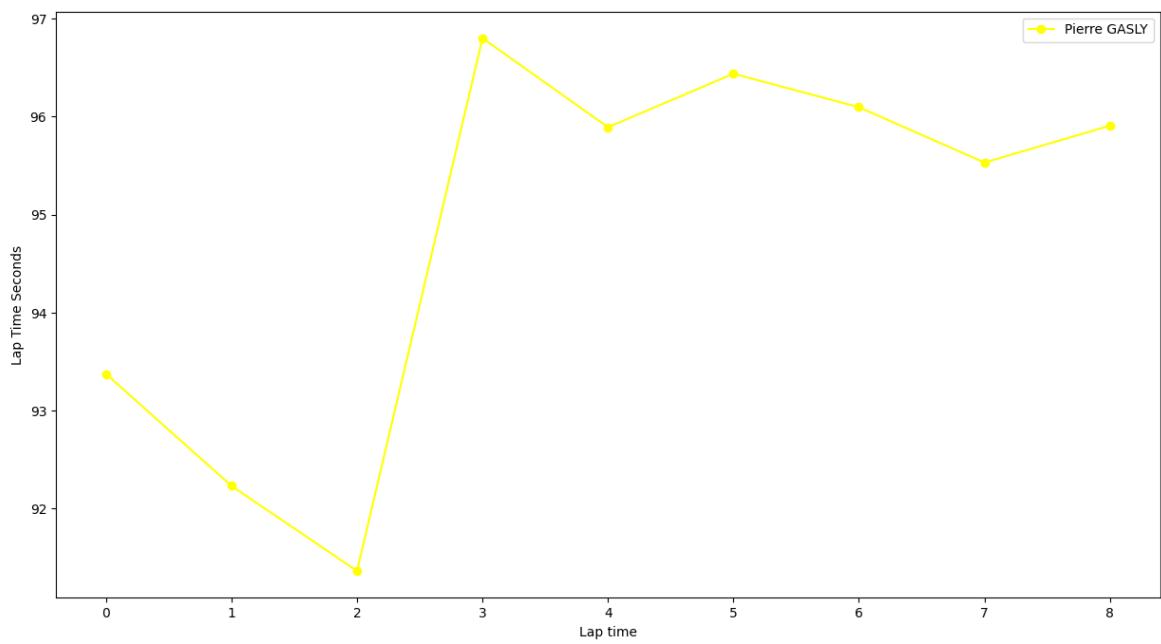
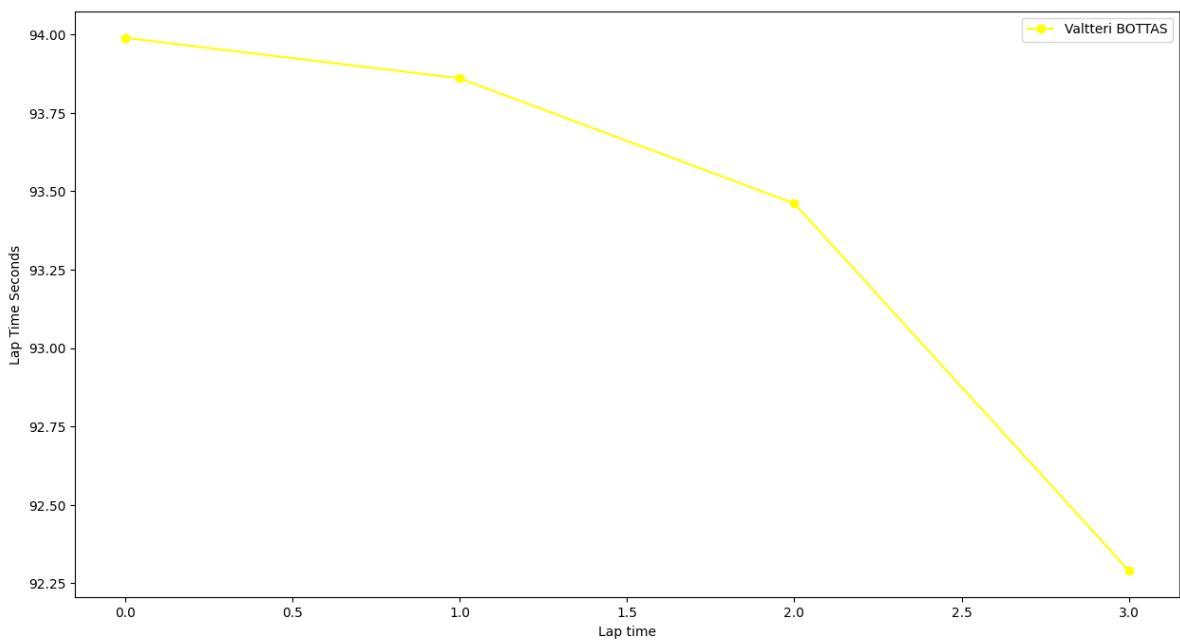
```
Out[4]:  
meeting_key session_key driver_number i1_speed i2_speed st_speed  
0 1230 9473 77 254.0 299 303 2024-03-07T13:30:  
1 1230 9473 44 269.0 312 163 2024-03-07T13:30:  
2 1230 9473 24 257.0 292 281 2024-03-07T13:30:
```

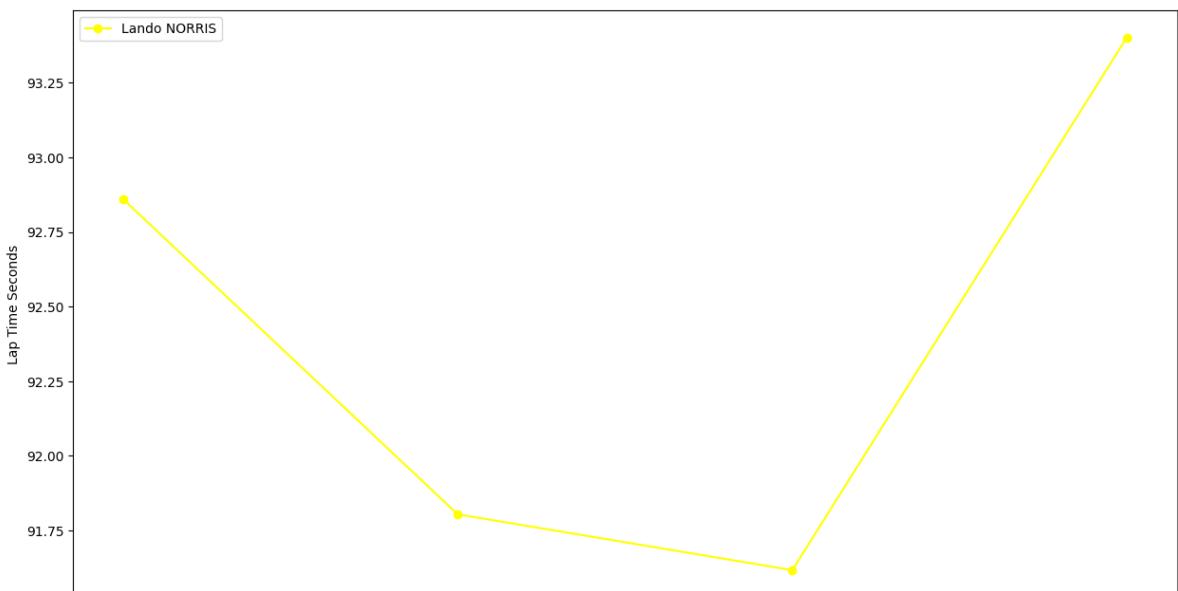
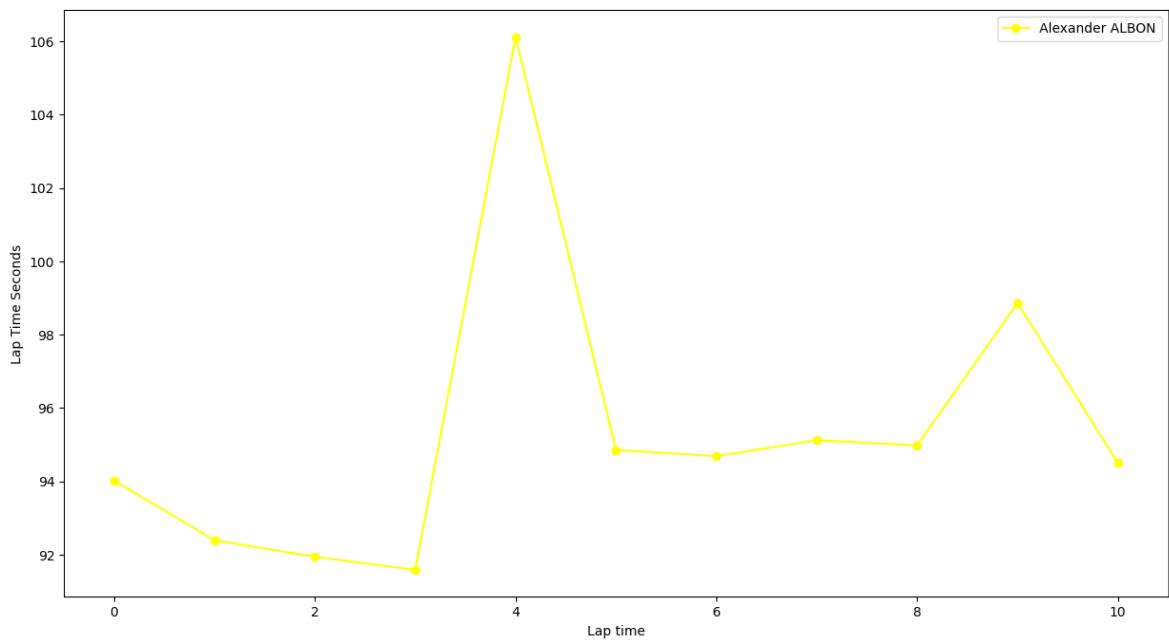
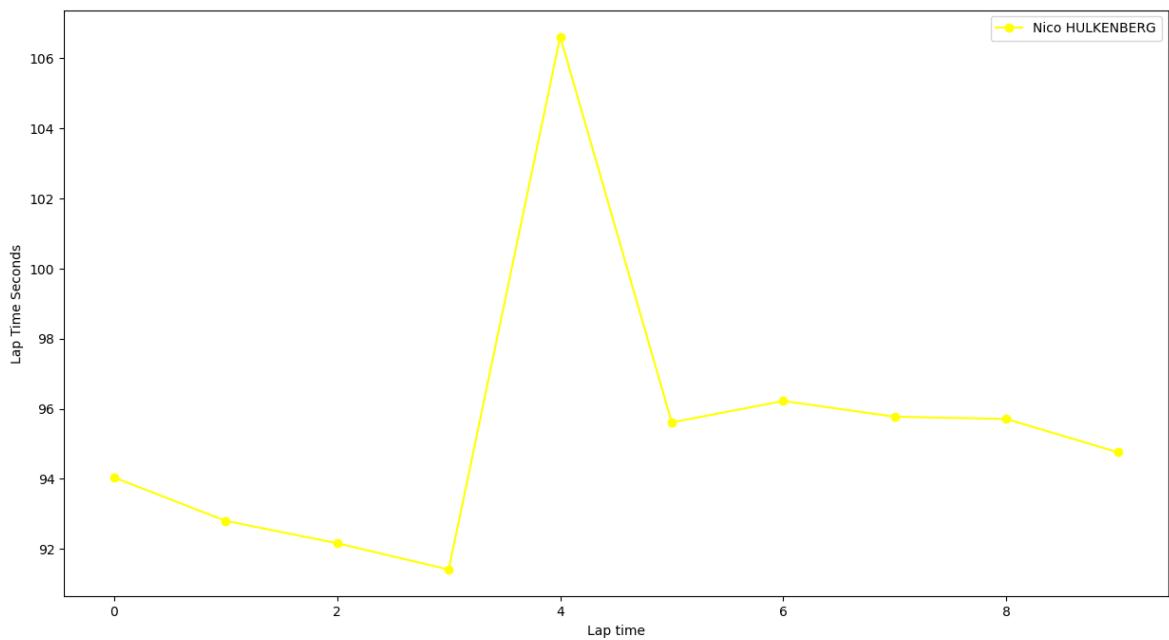
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
3	1230	9473	31	268.0	298	304	2024-03-07T13:30:
4	1230	9473	55	252.0	285	290	2024-03-07T13:30:
...
466	1230	9473	3	280.0	281	281	2024-03-07T14:33:
467	1230	9473	11	282.0	282	290	2024-03-07T14:33:
468	1230	9473	31	278.0	299	305	2024-03-07T14:33:
469	1230	9473	1	154.0	255	292	2024-03-07T14:33:
470	1230	9473	10	268.0	299	304	2024-03-07T14:33:

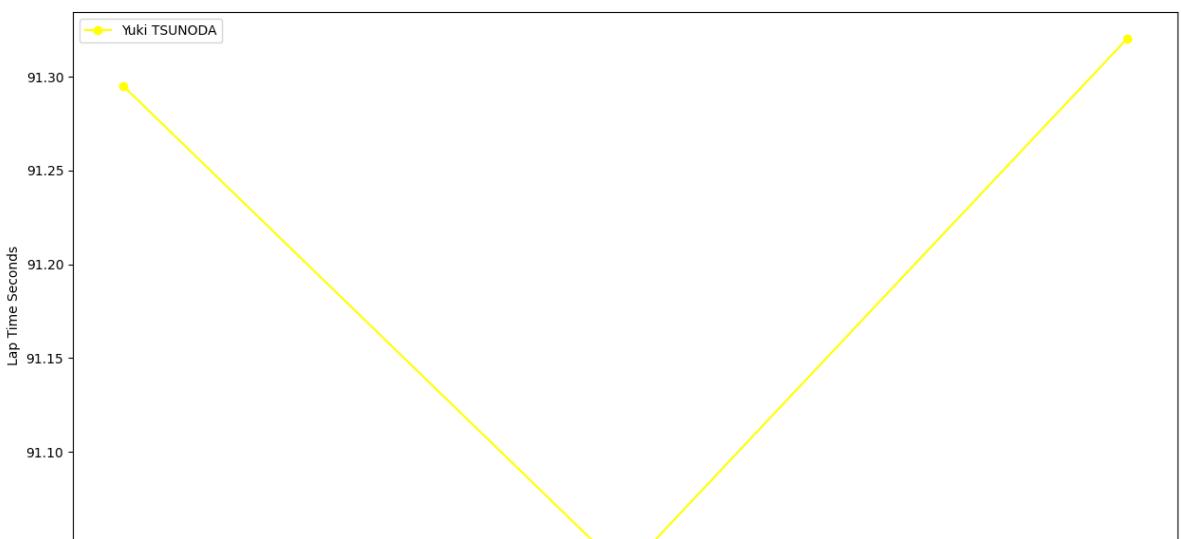
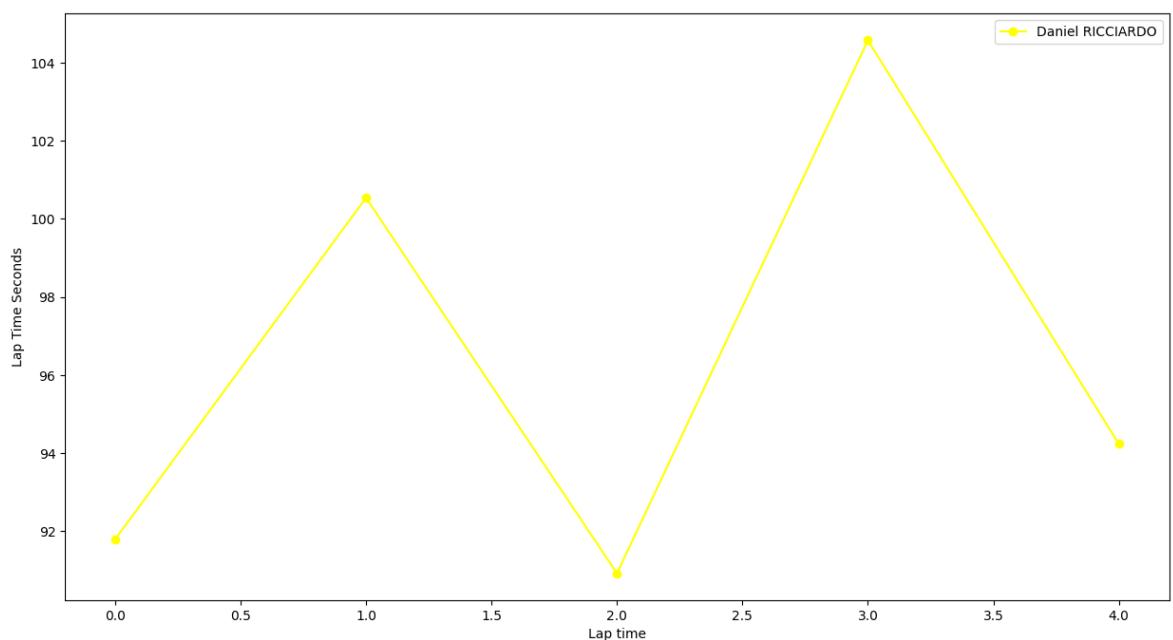
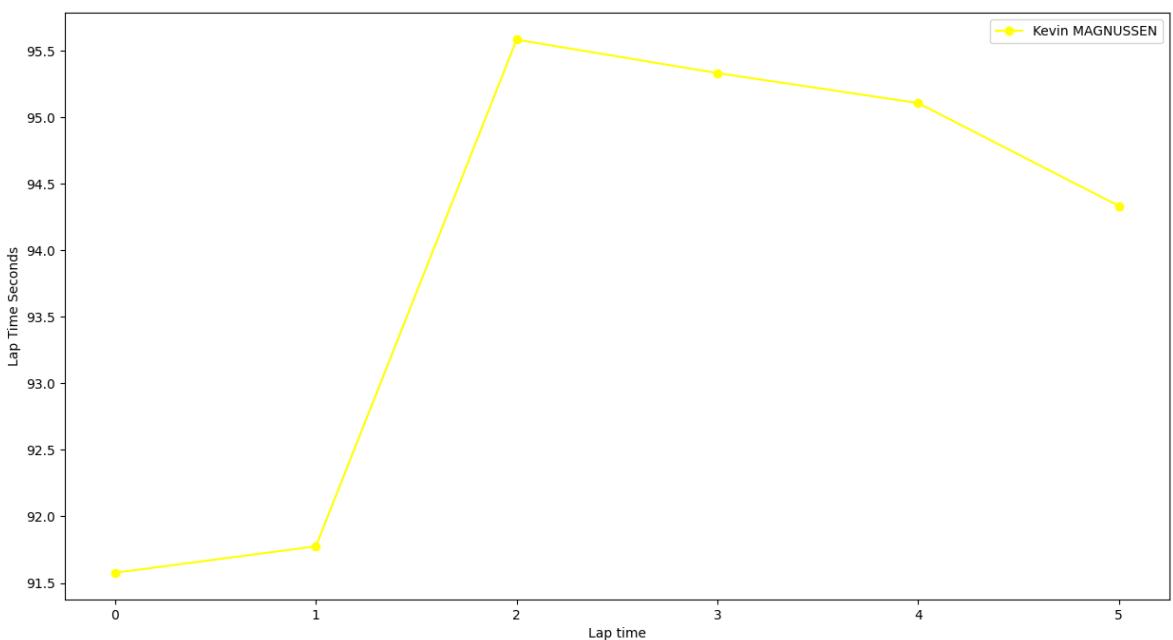
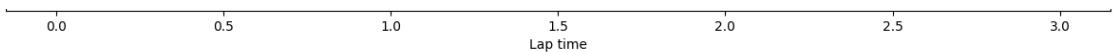
See race pace by means of the charts

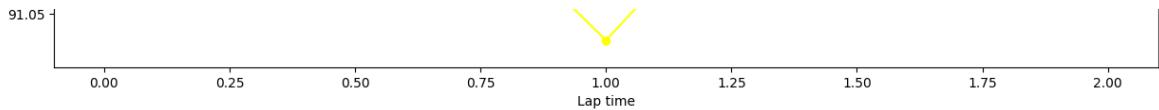
Medium tyres

```
In [5]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",108)
```





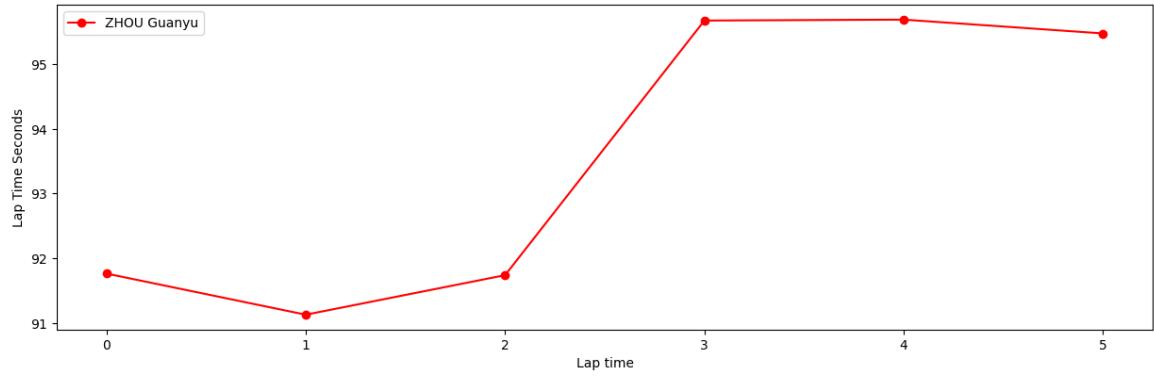
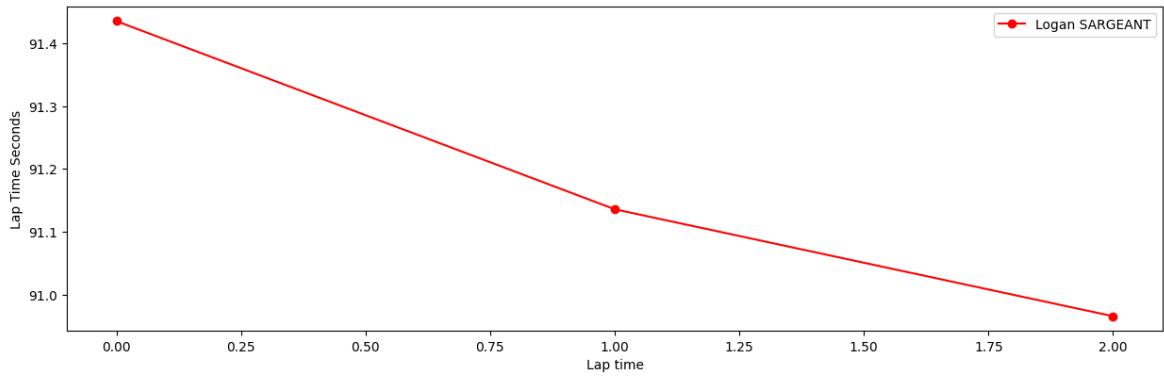
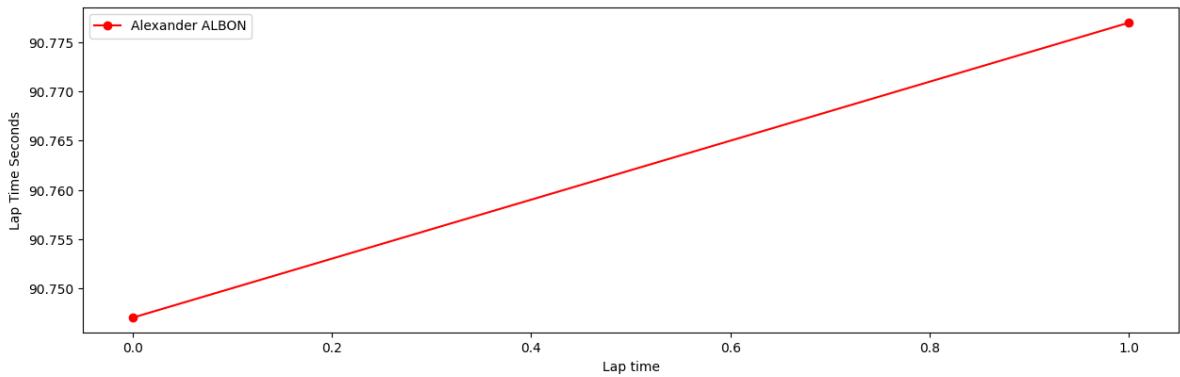
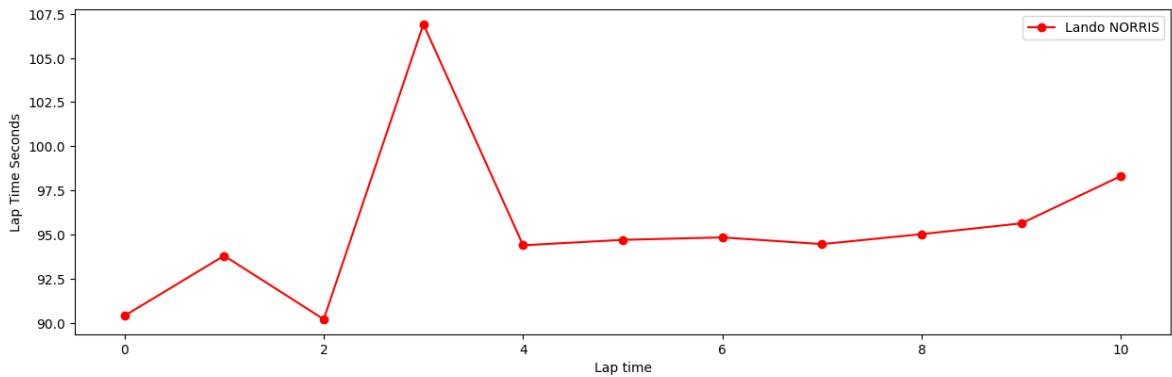
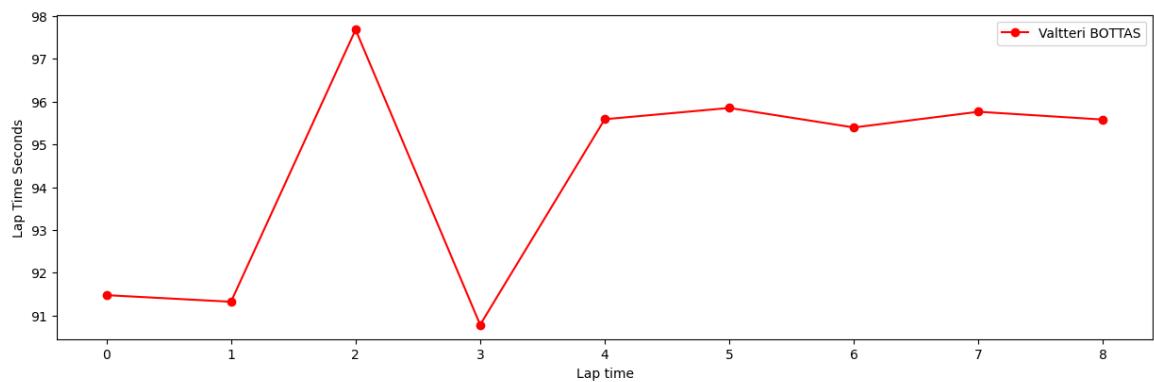


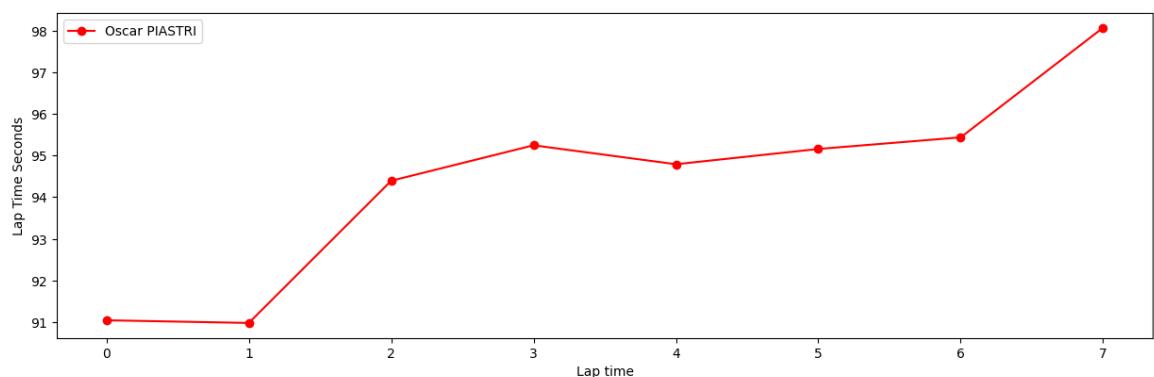
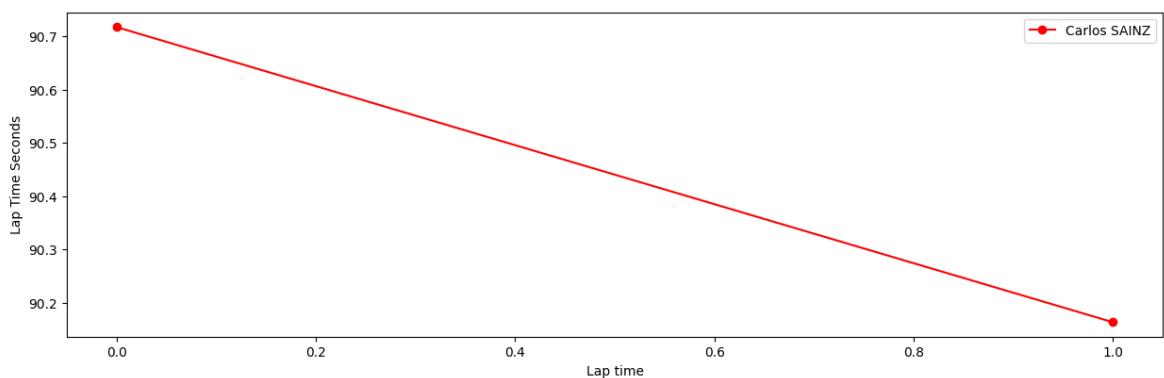
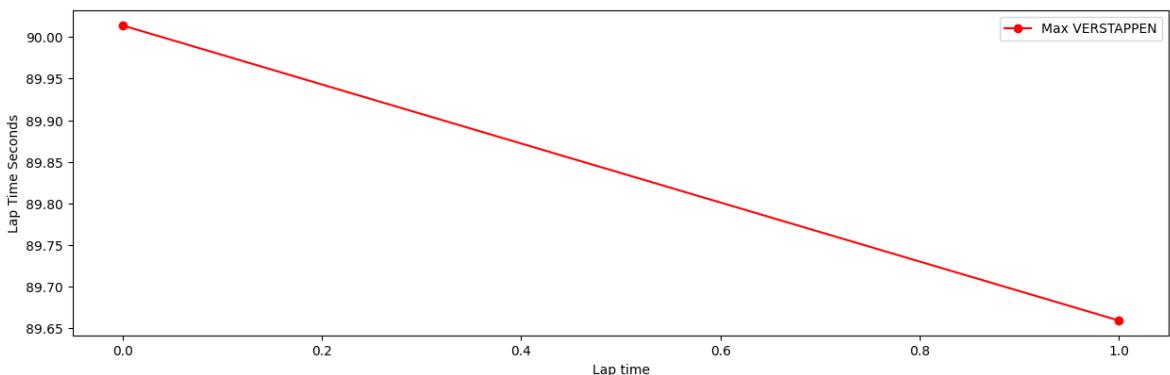
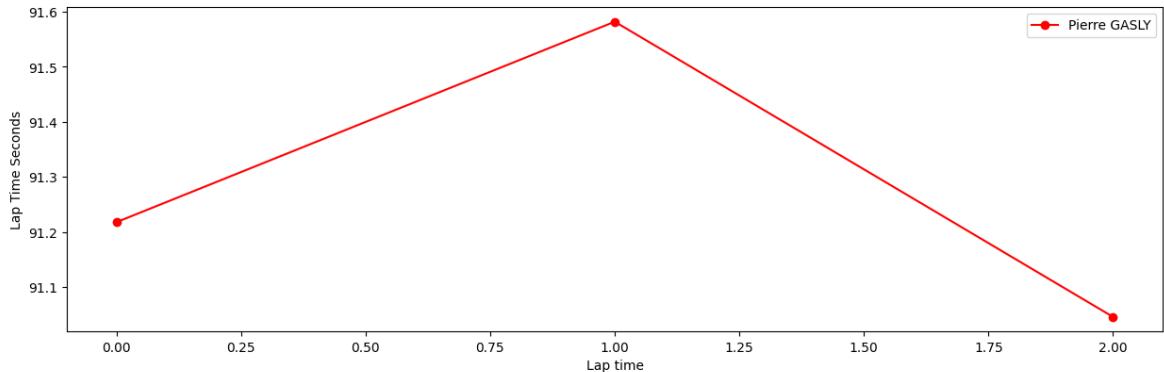
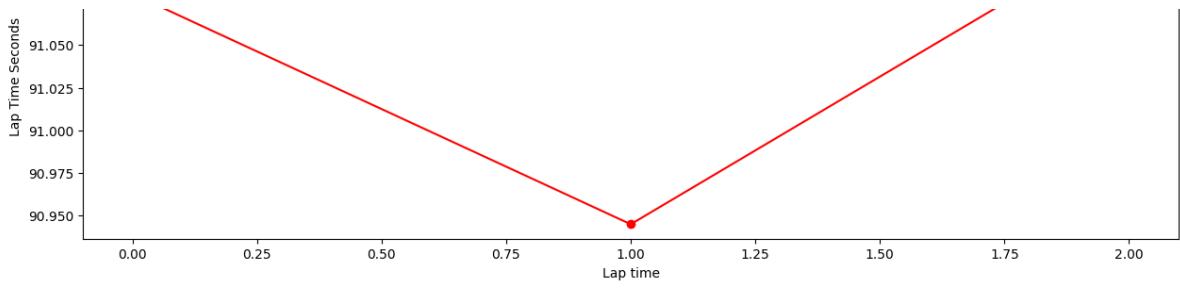


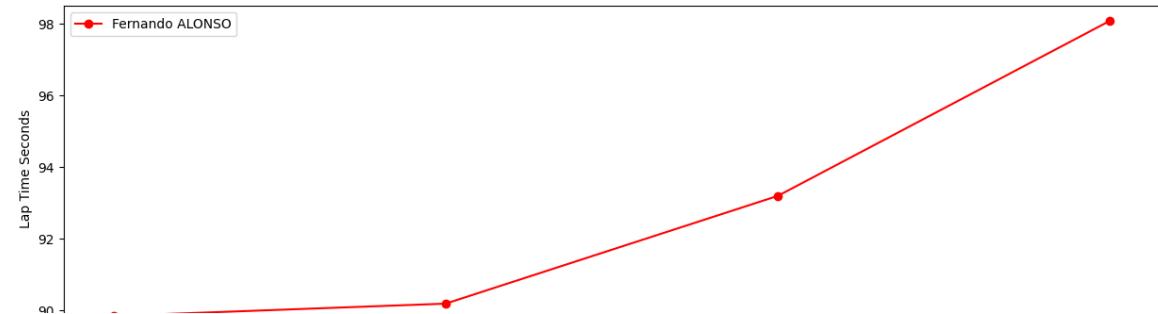
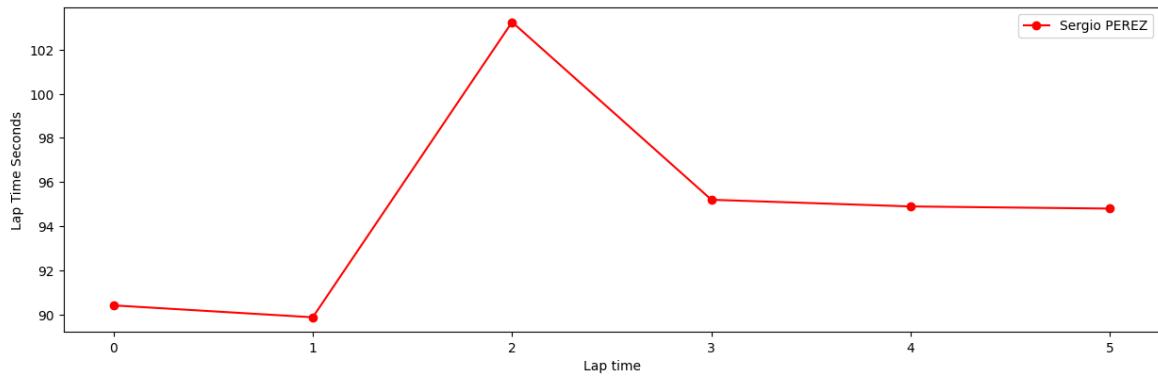
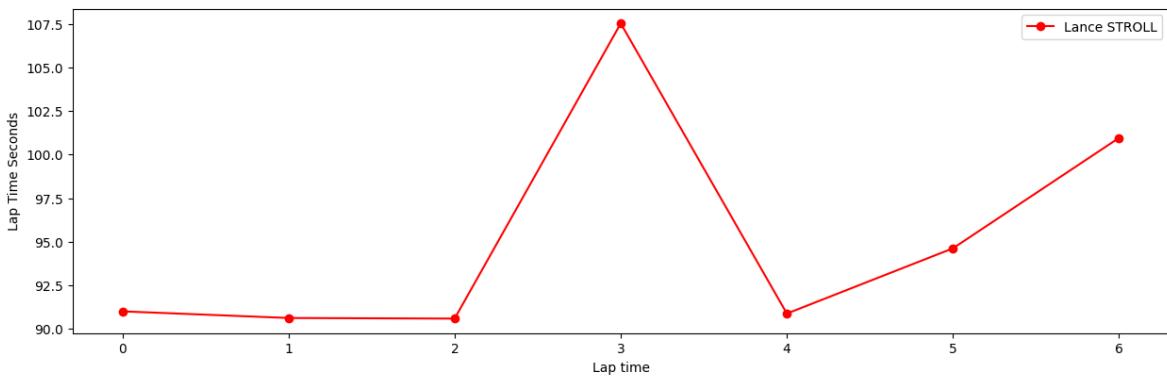
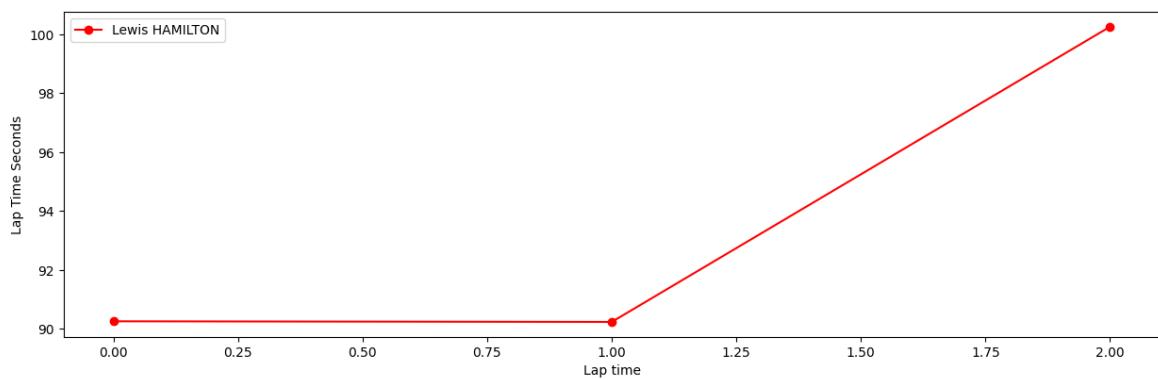
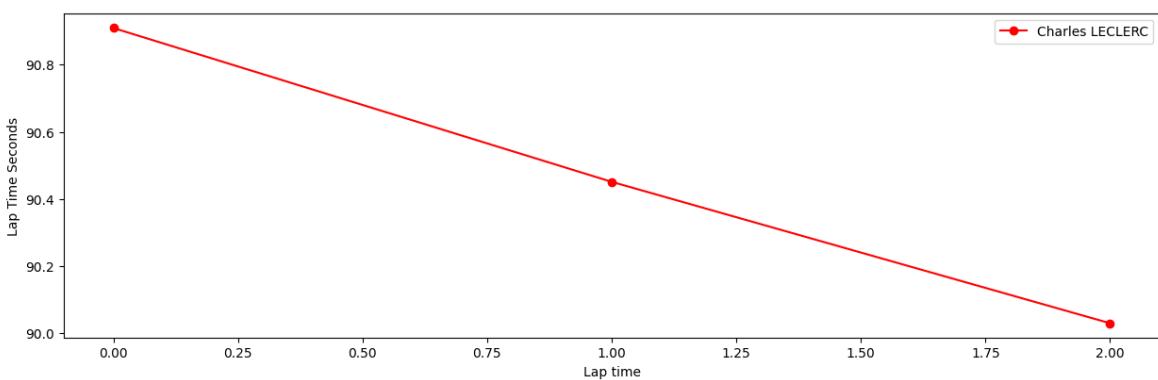
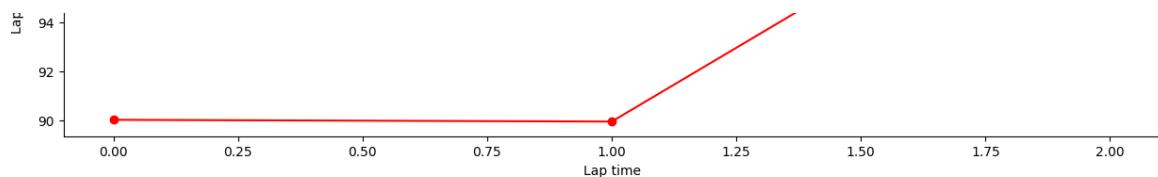
Soft tyres

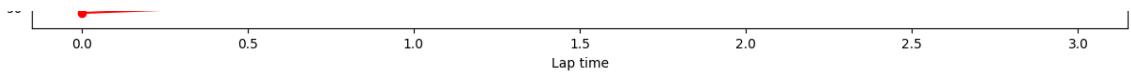
In [6]:

```
libraryDataF1.obtain_data_tyres(jointables2,"SOFT",108)
```



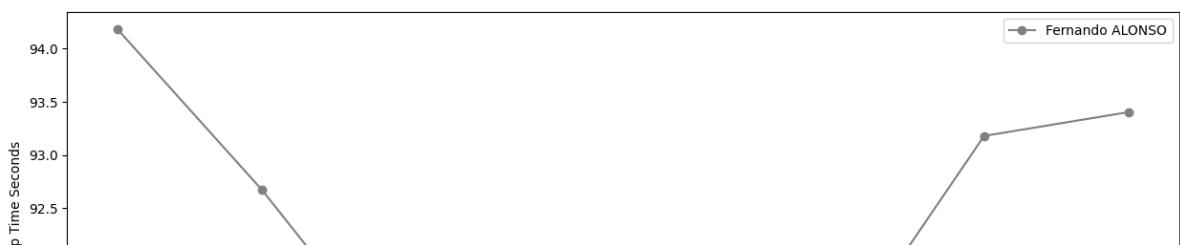
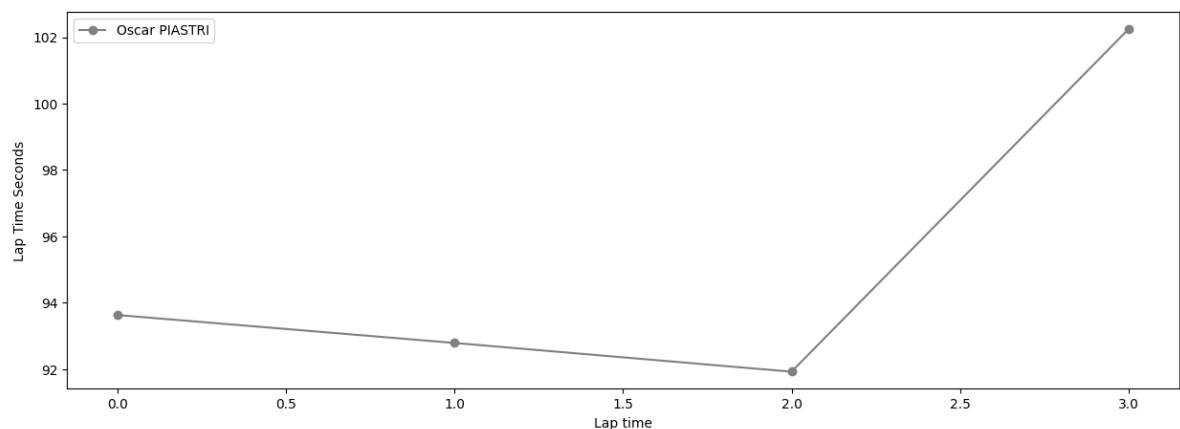
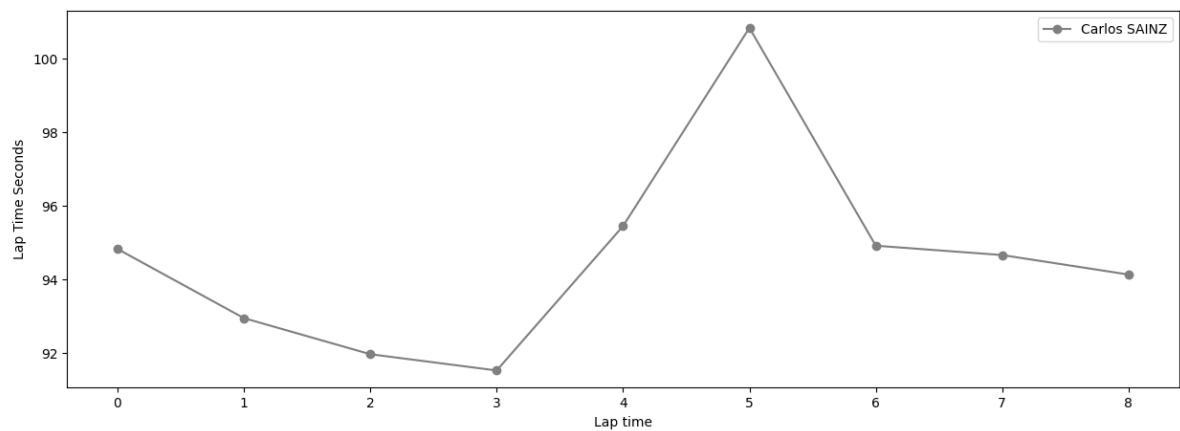
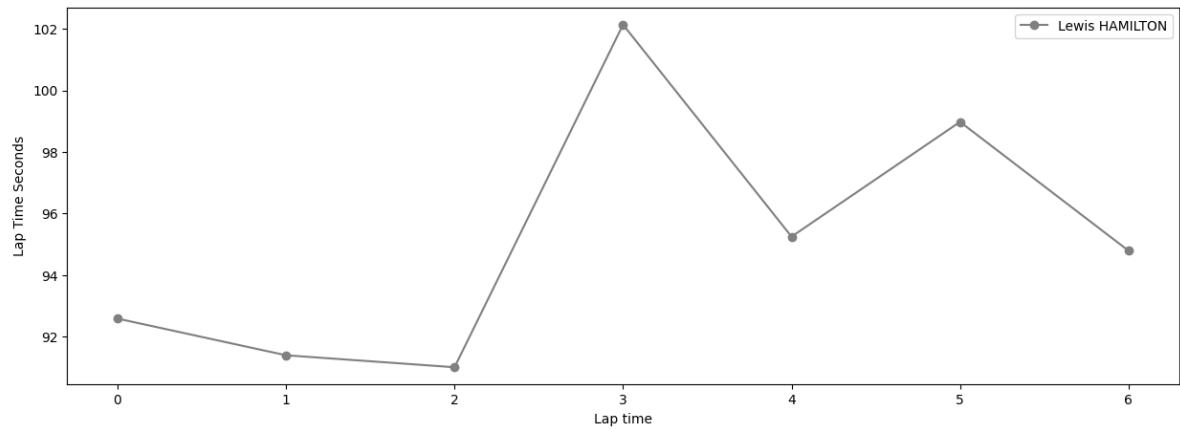
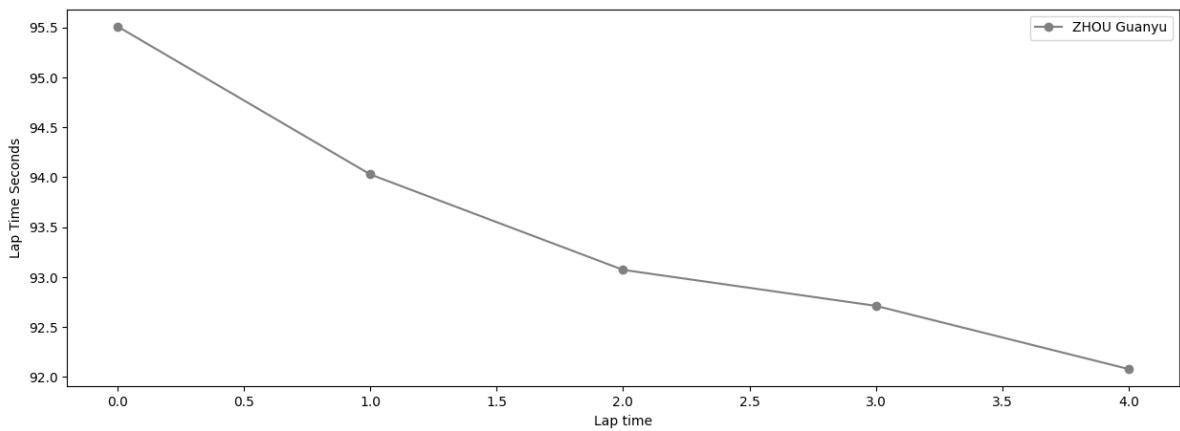


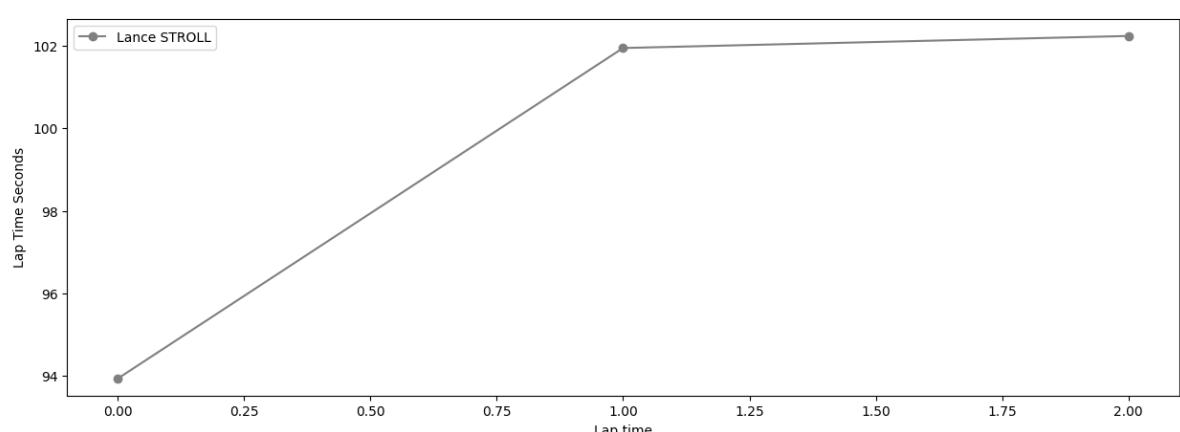
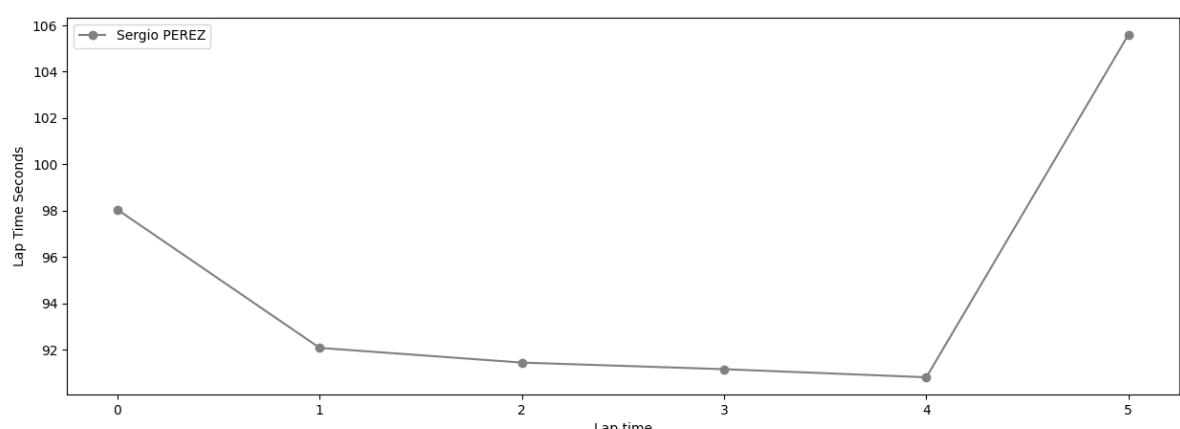
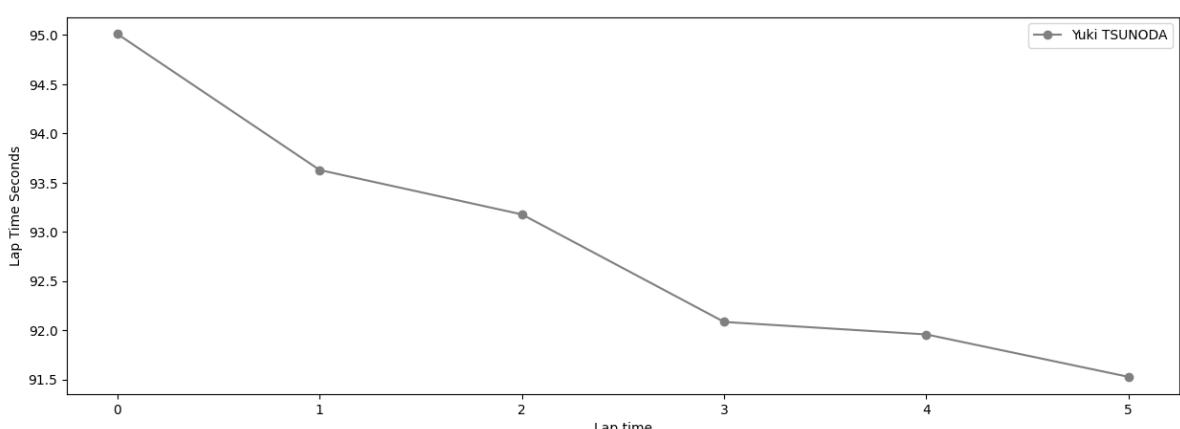
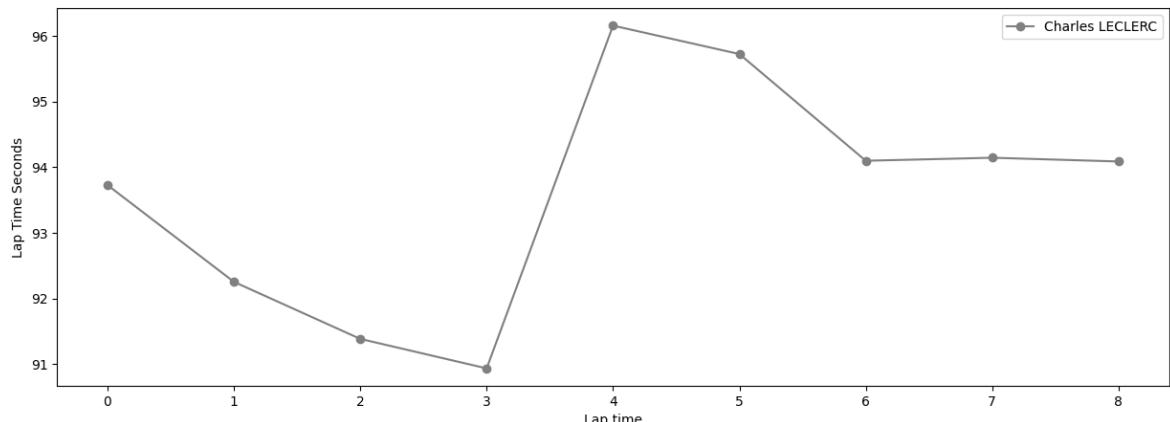
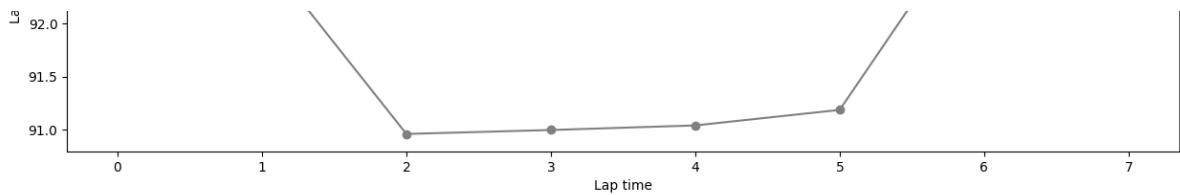


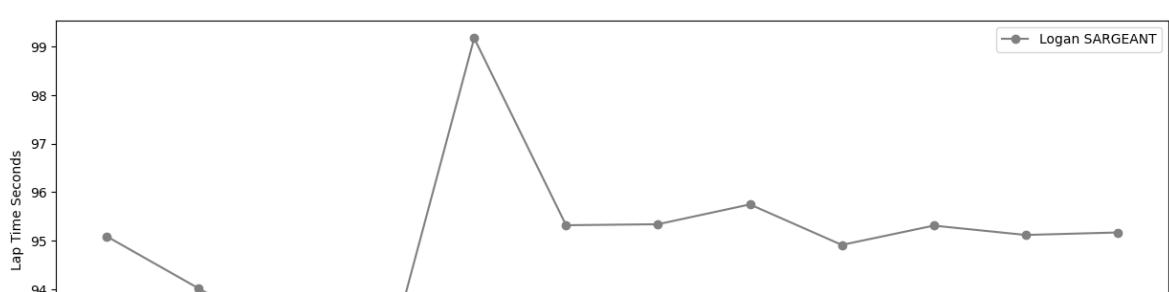
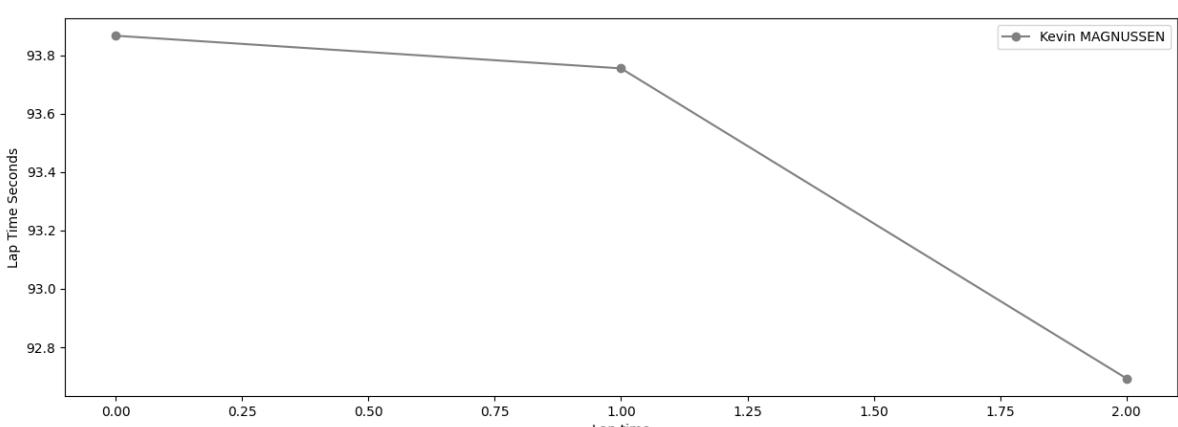
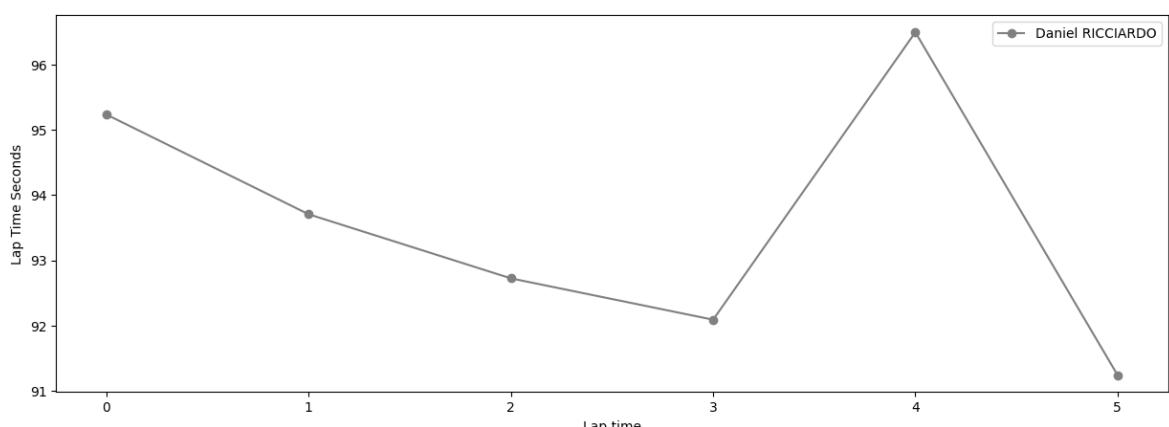
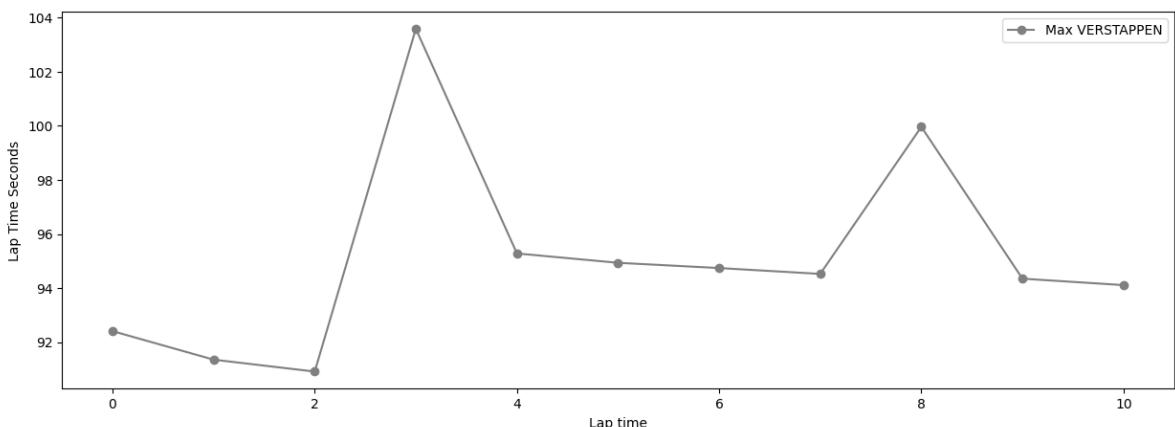
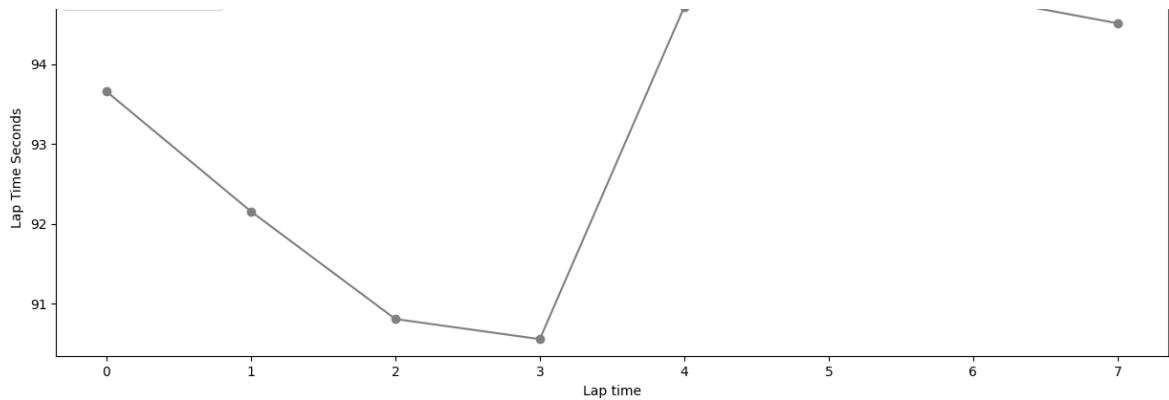


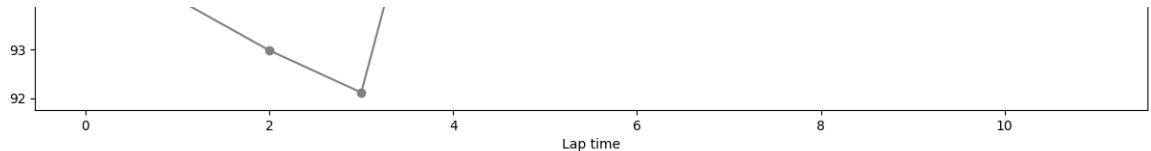
Hard tyres

```
In [7]: libraryDataF1.obtain_data_tyres(jointables2, "HARD", 108)
```





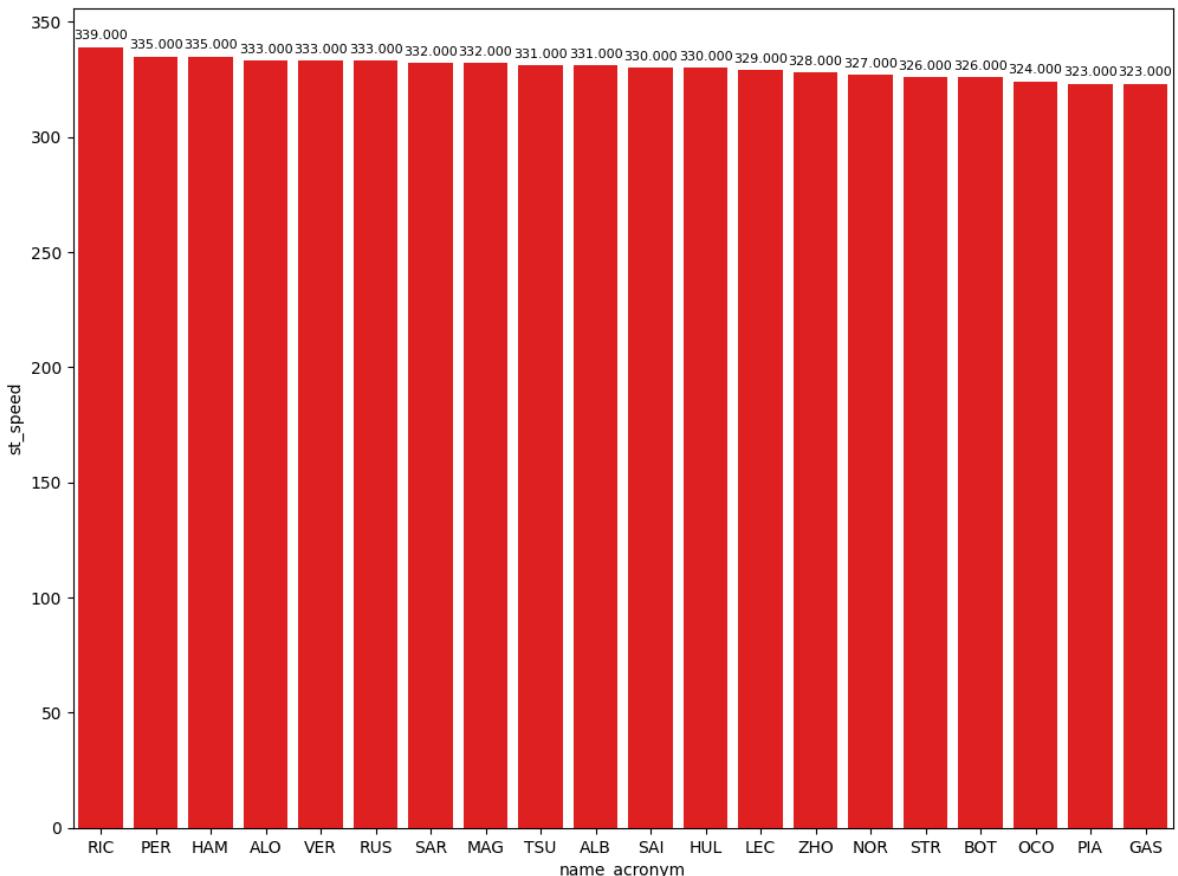




Speed trap

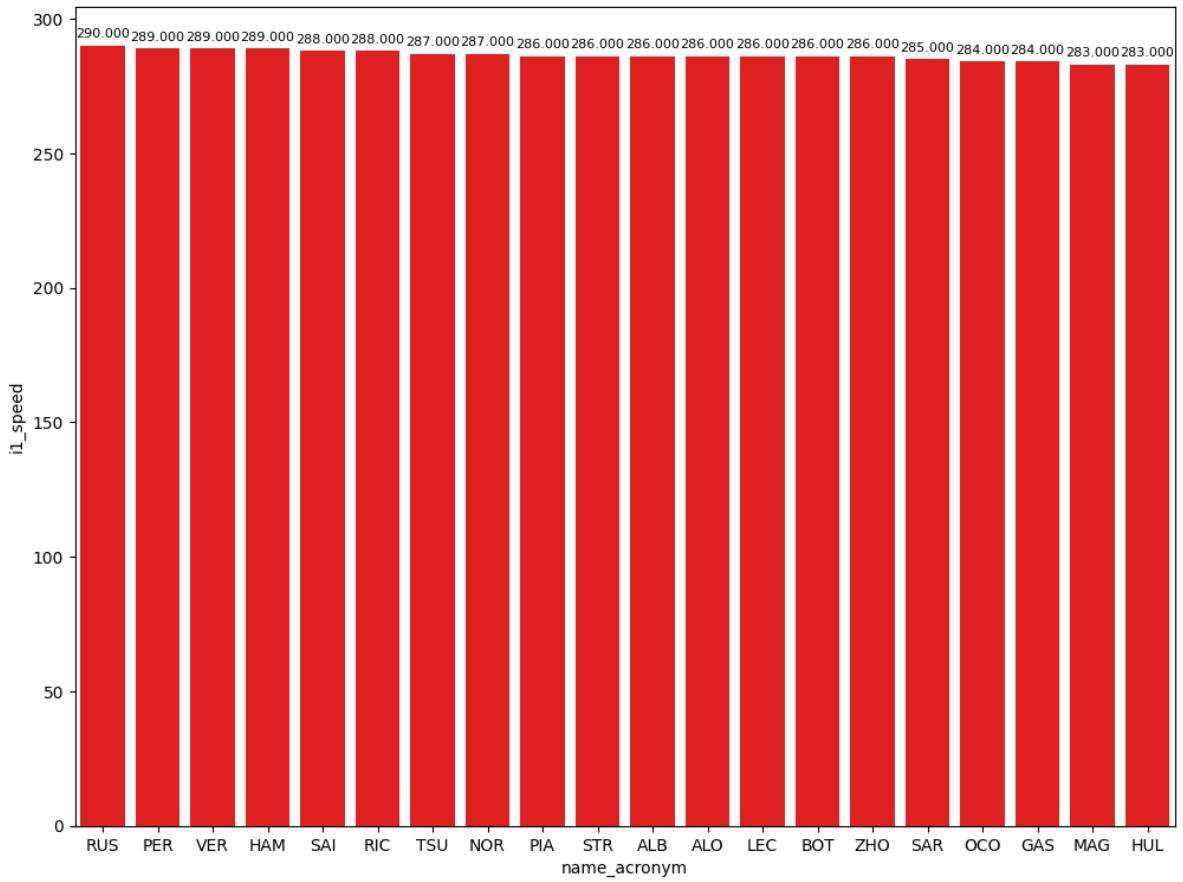
In [8]:

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



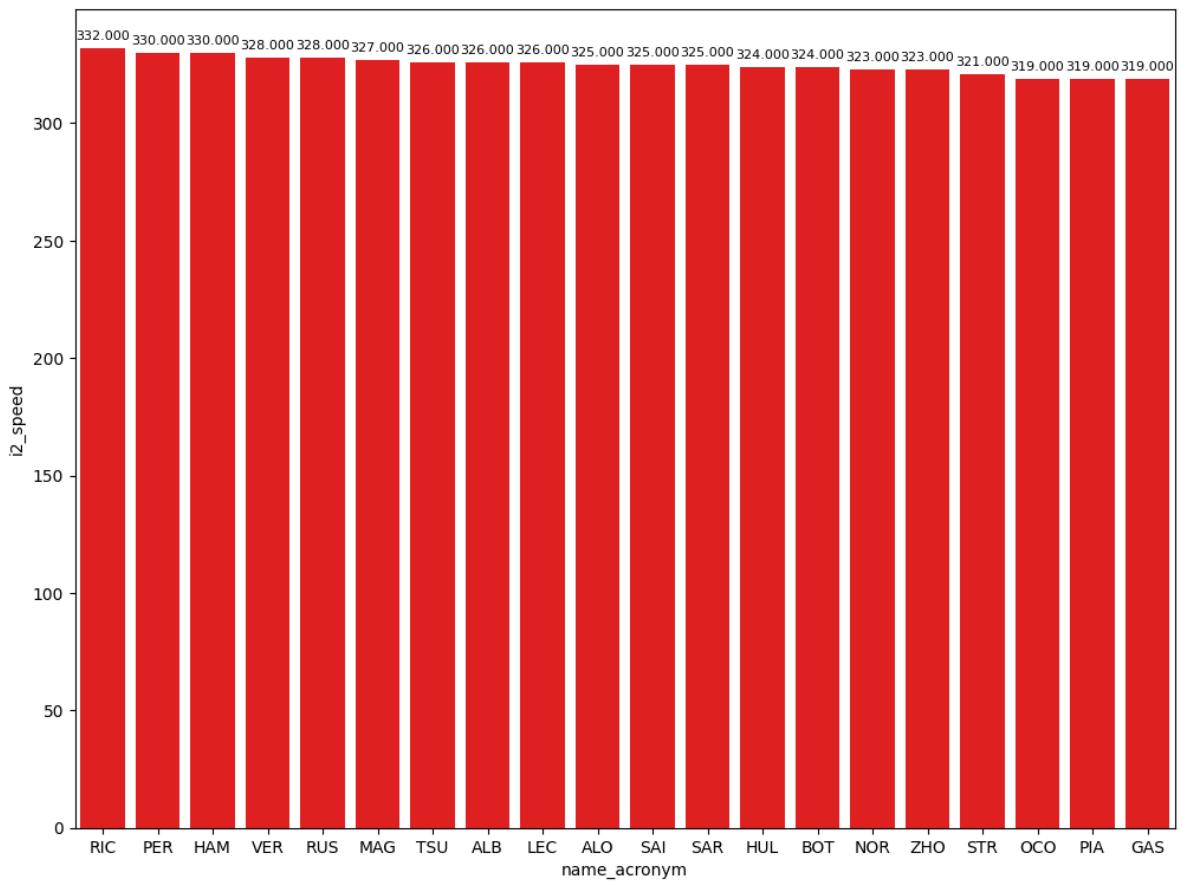
In [9]:

```
top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed'].max()]
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()]
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
152		George RUSSELL	HARD	33.078	28.482	28.994	9
340		Daniel RICCIARDO	MEDIUM	33.045	28.887	28.985	9
263		Max VERSTAPPEN	SOFT	32.615	28.428	28.616	8

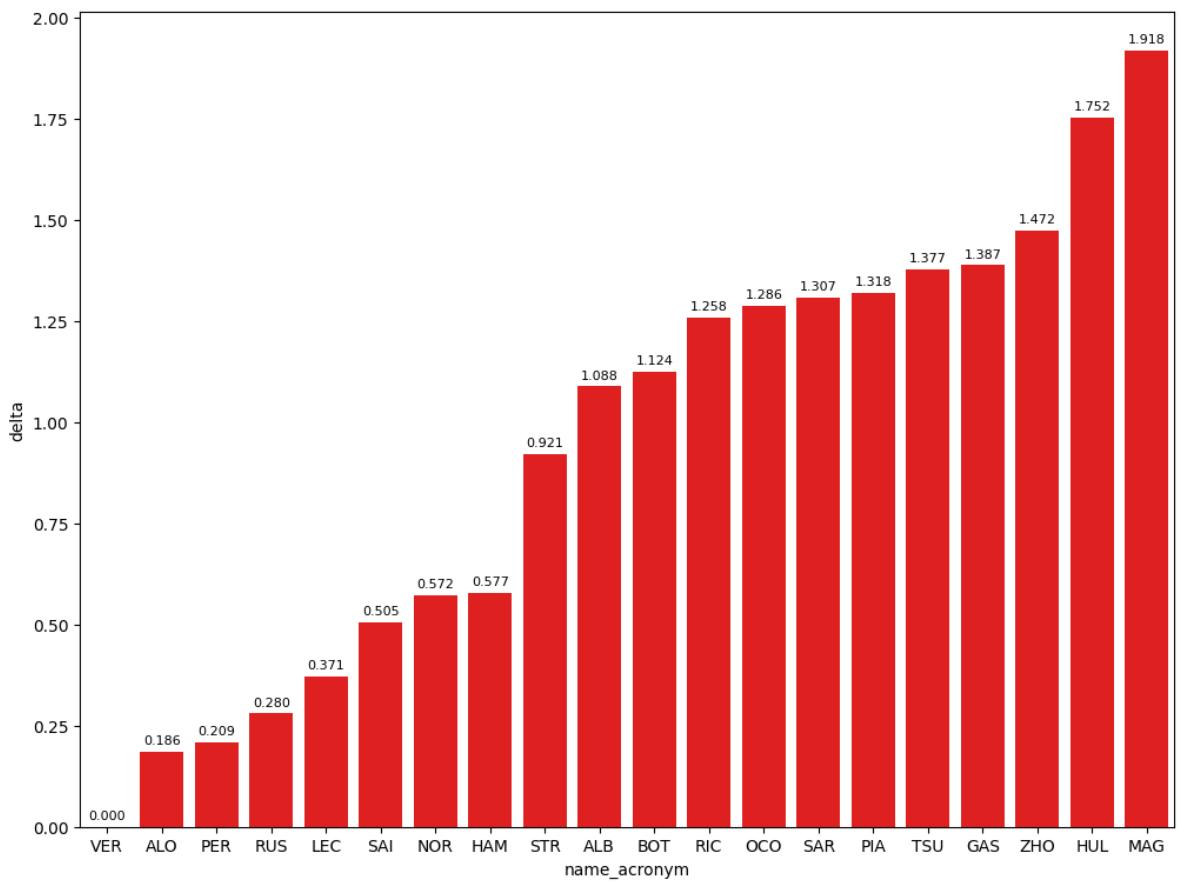
Deltas

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

```
In [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'].min()]
sectorPace[['duration_sector_1','full_name','compound','lap_duration','lap_number']]
```

Out[14]:	duration_sector_1	full_name	compound	lap_duration	lap_number
263	32.615	Max VERSTAPPEN	SOFT	89.659	13
234	32.638	Lando NORRIS	SOFT	90.231	13
314	32.656	Fernando ALONSO	SOFT	89.845	18
220	32.687	George RUSSELL	SOFT	90.011	12
269	32.717	Lance STROLL	SOFT	90.615	9
276	32.806	Oscar PIASTRI	SOFT	94.392	13
289	32.813	Carlos SAINZ	SOFT	90.164	16
241	32.859	Lewis HAMILTON	SOFT	90.257	11
301	32.862	Charles LECLERC	SOFT	90.030	16
305	32.880	Sergio PEREZ	SOFT	89.868	16
235	32.981	Esteban OCON	SOFT	90.945	14
340	33.045	Daniel RICCIARDO	MEDIUM	90.917	19
184	33.056	Alexander ALBON	SOFT	90.747	11
240	33.057	Pierre GASLY	SOFT	91.582	12

	duration_sector_1	full_name	compound	lap_duration	lap_number
267	33.169	Logan SARGEANT	SOFT	90.966	16
288	33.190	Valtteri BOTTAS	SOFT	90.783	17
318	33.250	Yuki TSUNODA	MEDIUM	91.036	18
231	33.291	ZHOU Guanyu	SOFT	91.131	14
229	33.415	Nico HULKENBERG	MEDIUM	91.411	10

In [15]:

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

Out[15]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
220	28.387	George RUSSELL	SOFT	90.011	12
293	28.411	Lewis HAMILTON	SOFT	90.236	14
263	28.428	Max VERSTAPPEN	SOFT	89.659	13
301	28.444	Charles LECLERC	SOFT	90.030	16
305	28.464	Sergio PEREZ	SOFT	89.868	16
314	28.497	Fernando ALONSO	SOFT	89.845	18
289	28.640	Carlos SAINZ	SOFT	90.164	16
234	28.646	Lando NORRIS	SOFT	90.231	13
231	28.651	ZHOU Guanyu	SOFT	91.131	14
288	28.668	Valtteri BOTTAS	SOFT	90.783	17
222	28.753	Alexander ALBON	SOFT	90.777	14
276	28.753	Oscar PIASTRI	SOFT	94.392	13
286	28.776	Pierre GASLY	SOFT	91.046	15
229	28.786	Nico HULKENBERG	MEDIUM	91.411	10
269	28.789	Lance STROLL	SOFT	90.615	9
217	28.809	Logan SARGEANT	SOFT	91.136	13
235	28.847	Esteban OCON	SOFT	90.945	14
318	28.862	Yuki TSUNODA	MEDIUM	91.036	18
170	28.872	Daniel RICCIARDO	HARD	91.240	11
219	28.880	Kevin MAGNUSSEN	MEDIUM	91.577	8

In [16]:

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

Out[16]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
305	28.524	Sergio PEREZ	SOFT	89.868	16
263	28.616	Max VERSTAPPEN	SOFT	89.659	13
314	28.692	Fernando ALONSO	SOFT	89.845	18
294	28.696	George RUSSELL	SOFT	89.939	15
289	28.711	Carlos SAINZ	SOFT	90.164	16

	duration_sector_3	full_name	compound	lap_duration	lap_number
301	28.724	Charles LECLERC	SOFT	90.030	16
200	28.843	Lando NORRIS	SOFT	93.819	11
293	28.893	Lewis HAMILTON	SOFT	90.236	14
267	28.895	Logan SARGEANT	SOFT	90.966	16
298	28.900	Lance STROLL	SOFT	90.580	11
222	28.913	Alexander ALBON	SOFT	90.777	14
170	28.924	Daniel RICCIARDO	HARD	91.240	11
318	28.924	Yuki TSUNODA	MEDIUM	91.036	18
288	28.925	Valtteri BOTTAS	SOFT	90.783	17
150	29.056	Esteban OCON	MEDIUM	91.513	9
258	29.083	Kevin MAGNUSEN	MEDIUM	91.775	10
207	29.126	Pierre GASLY	SOFT	91.218	10
249	29.135	Oscar PIASTRI	SOFT	90.977	11
231	29.189	ZHOU Guanyu	SOFT	91.131	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 lap_number > 10"))
race_pace
```

Out[17]:

	lap_duration
compound	
SOFT	93.566053
HARD	94.272567
MEDIUM	94.639274

Long runs

```
In [18]: MINIMUM_SECONDS = 93
MAXIMUM_SECONDS = 108
```

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
3	1230	9473	1	11	1	7	HARD	
9	1230	9473	1	1	1	9	HARD	
24	1230	9473	2	11	8	12	HARD	
31	1230	9473	2	1	10	15	SOFT	
43	1230	9473	3	11	13	15	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
54	1230	9473		4	11	16	18	SOFT
56	1230	9473		3	1	16	25	HARD

In [20]: `libraryDataF1.getinfolongruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
156	Max VERSTAPPEN	HARD	2024-03-07T13:47:08.958000+00:00	8	33.095	33.095	33.095
327	Max VERSTAPPEN	HARD	2024-03-07T14:20:15.072000+00:00	16	35.118	35.118	35.118
337	Max VERSTAPPEN	HARD	2024-03-07T14:21:50.414000+00:00	17	34.948	34.948	34.948
353	Max VERSTAPPEN	HARD	2024-03-07T14:23:25.347000+00:00	18	34.796	34.796	34.796
373	Max VERSTAPPEN	HARD	2024-03-07T14:25:00.146000+00:00	19	34.749	34.749	34.749
391	Max VERSTAPPEN	HARD	2024-03-07T14:26:34.638000+00:00	20	35.482	35.482	35.482
411	Max VERSTAPPEN	HARD	2024-03-07T14:28:14.527000+00:00	21	34.690	34.690	34.690
429	Max VERSTAPPEN	HARD	2024-03-07T14:29:48.866000+00:00	22	34.530	34.530	34.530

In [21]: `libraryDataF1.getinfolongruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
30	Sergio PEREZ	HARD	2024-03-07T13:33:22.998000+00:00	2	34.874	34.874	34.874
168	Sergio PEREZ	HARD	2024-03-07T13:50:28.245000+00:00	11	39.405	39.405	39.405
310	Sergio PEREZ	SOFT	2024-03-07T14:15:38.803000+00:00	17	37.081	37.081	37.081
392	Sergio PEREZ	SOFT	2024-03-07T14:26:45.162000+00:00	19	35.286	35.286	35.286
412	Sergio PEREZ	SOFT	2024-03-07T14:28:20.258000+00:00	20	35.195	35.195	35.195
431	Sergio PEREZ	SOFT	2024-03-07T14:29:55.233000+00:00	21	34.932	34.932	34.932

Ferrari

In [22]: `libraryDataF1.getinfolongruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
26	Charles LECLERC	HARD	2024-03-07T13:33:08.320000+00:00	2	34.515	34.515	34.515

	full_name	compound		date_start	lap_number	duration_sector_1	du
167	Charles LECLERC	HARD		2024-03-07T13:49:36.693000+00:00	10	33.530	
369	Charles LECLERC	HARD		2024-03-07T14:24:51.085000+00:00	19	35.535	
388	Charles LECLERC	HARD		2024-03-07T14:26:26.882000+00:00	20	34.693	
407	Charles LECLERC	HARD		2024-03-07T14:28:00.893000+00:00	21	34.319	

```
In [23]: libraryDataF1.getinfolongruns(jointables2,55,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_lap	duration_total
19 Carlos SAINZ	HARD	2024-03-07T13:32:25.970000+00:00	2	34.923				
145 Carlos SAINZ	HARD	2024-03-07T13:45:16.364000+00:00	9	33.393				
366 Carlos SAINZ	HARD	2024-03-07T14:24:34.723000+00:00	19	35.202				
386 Carlos SAINZ	HARD	2024-03-07T14:26:15.484000+00:00	20	34.862				
405 Carlos SAINZ	HARD	2024-03-07T14:27:50.425000+00:00	21	34.745				
425 Carlos SAINZ	HARD	2024-03-07T14:29:25.115000+00:00	22	34.647				

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	tyre
5	1230	9473	1	44	1	7	HARD	
17	1230	9473	1	63	1	11	HARD	
23	1230	9473	2	44	8	10	HARD	
35	1230	9473	3	44	11	13	SOFT	
39	1230	9473	2	63	12	14	SOFT	
46	1230	9473	4	44	14	16	SOFT	
51	1230	9473	3	63	15	17	SOFT	
58	1230	9473	5	44	17	22	HARD	
59	1230	9473	4	63	18	24	HARD	

```
In [25]: libraryDataF1.getinfolongruns(jointables2, 44, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

Out[25]:	full_name	compound	date_start	lap_number	duration_sector_1	d
153	Lewis HAMILTON	HARD	2024-03-07T13:46:37.159000+00:00	9	37.351	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
303	Lewis HAMILTON	SOFT	2024-03-07T14:13:45.386000+00:00		15		36.220
375	Lewis HAMILTON	HARD	2024-03-07T14:25:14.611000+00:00		17		35.190
394	Lewis HAMILTON	HARD	2024-03-07T14:26:49.858000+00:00		18		34.944

In [26]: `libraryDataF1.getinfolongruns(jointables2, 63, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)`

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
33	George RUSSELL	HARD	2024-03-07T13:33:35.532000+00:00		2		34.263
304	George RUSSELL	SOFT	2024-03-07T14:13:51.825000+00:00		16		37.744
361	George RUSSELL	HARD	2024-03-07T14:24:10.653000+00:00		18		34.931
380	George RUSSELL	HARD	2024-03-07T14:25:45.427000+00:00		19		34.894
400	George RUSSELL	HARD	2024-03-07T14:27:20.227000+00:00		20		34.854
419	George RUSSELL	HARD	2024-03-07T14:28:55.103000+00:00		21		34.706

McLaren

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
6	1230	9473	1	4	1	8	MEDIUM	
8	1230	9473	1	81	1	8	HARD	
27	1230	9473	2	81	9	14	SOFT	
28	1230	9473	2	4	9	15	SOFT	
53	1230	9473	3	81	15	20	SOFT	
55	1230	9473	3	4	16	23	SOFT	
71	1230	9473	4	81	21	23	HARD	
73	1230	9473	4	4	24	27	MEDIUM	

In [28]: `libraryDataF1.getinfolongruns(jointables2, 4, 'McLaren', MINIMUM_SECONDS, MAXIMUM_SECONDS)`

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
200	Lando NORRIS	SOFT	2024-03-07T14:00:34.888000+00:00		11		36.291
246	Lando NORRIS	SOFT	2024-03-07T14:06:01.862000+00:00		14		41.183

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_total
312	Lando NORRIS	SOFT	2024-03-07T14:16:19.246000+00:00		16				34.545
316	Lando NORRIS	SOFT	2024-03-07T14:17:53.678000+00:00		17				34.675
322	Lando NORRIS	SOFT	2024-03-07T14:19:28.357000+00:00		18				34.662
333	Lando NORRIS	SOFT	2024-03-07T14:21:03.301000+00:00		19				34.267
347	Lando NORRIS	SOFT	2024-03-07T14:22:37.835000+00:00		20				34.439
362	Lando NORRIS	SOFT	2024-03-07T14:24:12.842000+00:00		21				34.849
381	Lando NORRIS	SOFT	2024-03-07T14:25:48.471000+00:00		22				34.978

```
In [29]: libraryDataF1.getinfolongruns(jointables2, 81, 'McLaren', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_total
24	Oscar PIASTRI	HARD	2024-03-07T13:32:53.048000+00:00		2				34.429
116	Oscar PIASTRI	HARD	2024-03-07T13:41:38.200000+00:00		7				33.062
276	Oscar PIASTRI	SOFT	2024-03-07T14:09:53.815000+00:00		13				32.806
330	Oscar PIASTRI	SOFT	2024-03-07T14:20:37.226000+00:00		15				34.900
341	Oscar PIASTRI	SOFT	2024-03-07T14:22:12.482000+00:00		16				34.663
357	Oscar PIASTRI	SOFT	2024-03-07T14:23:47.321000+00:00		17				34.750
376	Oscar PIASTRI	SOFT	2024-03-07T14:25:22.425000+00:00		18				34.930
395	Oscar PIASTRI	SOFT	2024-03-07T14:26:57.892000+00:00		19				34.403

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
1	1230	9473	1	18	1	6	HARD	
11	1230	9473	1	14	1	9	HARD	
22	1230	9473	2	18	7	13	SOFT	
33	1230	9473	2	14	10	17	HARD	
48	1230	9473	3	18	14	19	SOFT	
60	1230	9473	3	14	18	25	SOFT	

```
In [31]: libraryDataF1.getinfolongruns(jointables2,14,'Aston Martin',MINIMUN_SECONDS)
```

```
Out[31]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
25	Fernando ALONSO	HARD	2024-03-07T13:33:00.606000+00:00	2	34.691	34.691
208	Fernando ALONSO	HARD	2024-03-07T14:01:53.484000+00:00	14	34.014	34.014
224	Fernando ALONSO	HARD	2024-03-07T14:03:27.229000+00:00	15	34.326	34.326
368	Fernando ALONSO	SOFT	2024-03-07T14:24:48.204000+00:00	22	34.216	34.216
387	Fernando ALONSO	SOFT	2024-03-07T14:26:21.381000+00:00	23	38.888	38.888

```
In [32]: libraryDataF1.getinfolongruns(jointables2,18,'Aston Martin',MINIMUN_SECONDS)
```

```
Out[32]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
31	Lance STROLL	HARD	2024-03-07T13:33:30.081000+00:00	2	34.434	34.434
51	Lance STROLL	HARD	2024-03-07T13:35:03.864000+00:00	3	38.472	38.472
69	Lance STROLL	HARD	2024-03-07T13:36:45.920000+00:00	4	37.745	37.745
306	Lance STROLL	SOFT	2024-03-07T14:14:25.714000+00:00	12	40.273	40.273
408	Lance STROLL	SOFT	2024-03-07T14:28:02.826000+00:00	15	34.621	34.621
427	Lance STROLL	SOFT	2024-03-07T14:29:37.377000+00:00	16	38.729	38.729

RB

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

```
Out[33]:
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
18	1230	9473	1	3	1	13	HARD	
19	1230	9473	1	22	1	13	HARD	
47	1230	9473	2	3	14	18	MEDIUM	
50	1230	9473	2	22	14	26	MEDIUM	
62	1230	9473	3	3	19	22	MEDIUM	
72	1230	9473	4	3	23	26	MEDIUM	

```
In [34]: libraryDataF1.getinfolongruns(jointables2,3,'RB',MINIMUN_SECONDS,MAXIMUM_SECONDS)
```

```
Out[34]:
```

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

	full_name	compound	date_start	lap_number	duration_sector_1
55	Daniel RICCIARDO	HARD	2024-03-07T13:35:30.875000+00:00	2	35.283
73	Daniel RICCIARDO	HARD	2024-03-07T13:37:05.967000+00:00	3	34.627
160	Daniel RICCIARDO	HARD	2024-03-07T13:47:50.743000+00:00	9	33.851
309	Daniel RICCIARDO	MEDIUM	2024-03-07T14:15:20.902000+00:00	17	33.406
383	Daniel RICCIARDO	MEDIUM	2024-03-07T14:26:00.289000+00:00	21	37.393

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
27	Yuki TSUNODA	HARD	2024-03-07T13:33:15.062000+00:00	2	35.108	34.900	34.645
46	Yuki TSUNODA	HARD	2024-03-07T13:34:49.903000+00:00	3	34.645	34.900	34.261
91	Yuki TSUNODA	HARD	2024-03-07T13:38:45.933000+00:00	5	34.261	34.900	34.645

Haas

In [36]: `libraryDataF1.getinfolongruns(jointables2, 20, 'Haas F1 Team', MINIMUM_SECONDS, MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
57	Kevin MAGNUSEN	HARD	2024-03-07T13:35:39.105000+00:00	2	34.537	34.900	34.520
75	Kevin MAGNUSEN	HARD	2024-03-07T13:37:13.041000+00:00	3	34.520	34.900	35.360
364	Kevin MAGNUSEN	MEDIUM	2024-03-07T14:24:17.604000+00:00	13	35.360	34.994	34.844
382	Kevin MAGNUSEN	MEDIUM	2024-03-07T14:25:53.331000+00:00	14	34.994	34.900	34.504
401	Kevin MAGNUSEN	MEDIUM	2024-03-07T14:27:28.542000+00:00	15	34.844	34.900	34.504
421	Kevin MAGNUSEN	MEDIUM	2024-03-07T14:29:03.954000+00:00	16	34.504	34.900	34.537

In [37]: `libraryDataF1.getinfolongruns(jointables2, 27, 'Haas F1 Team', MINIMUM_SECONDS, MAXIMUM_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
22	Nico HULKENBERG	MEDIUM	2024-03-07T13:32:41.761000+00:00	2	35.051	34.900	37.871
244	Nico HULKENBERG	MEDIUM	2024-03-07T14:05:41.772000+00:00	11	37.871	34.900	35.248
342	Nico HULKENBERG	MEDIUM	2024-03-07T14:22:16.612000+00:00	13	35.248	34.900	35.051

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
358	Nico HULKENBERG	MEDIUM	2024-03-07T14:23:52.322000+00:00		14	35.738	
377	Nico HULKENBERG	MEDIUM	2024-03-07T14:25:28.631000+00:00		15	35.241	
397	Nico HULKENBERG	MEDIUM	2024-03-07T14:27:04.225000+00:00		16	35.418	
416	Nico	MEDIUM	2024-03-07T14:29:20.081000+00:00		17	34.081	

Alpine

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

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
21	Esteban OCON	MEDIUM	2024-03-07T13:32:35.453000+00:00		2	34.719	
336	Esteban OCON	MEDIUM	2024-03-07T14:21:44.095000+00:00		20	35.246	
352	Esteban OCON	MEDIUM	2024-03-07T14:23:20.166000+00:00		21	35.026	
371	Esteban OCON	MEDIUM	2024-03-07T14:24:57.007000+00:00		22	35.194	
390	Esteban OCON	MEDIUM	2024-03-07T14:26:32.923000+00:00		23	35.438	
410	Esteban OCON	MEDIUM	2024-03-07T14:28:09.145000+00:00		24	35.247	
428	Esteban OCON	MEDIUM	2024-03-07T14:29:45.127000+00:00		25	35.555	

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

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
20	Pierre GASLY	MEDIUM	2024-03-07T13:32:29.329000+00:00		2	34.362	
338	Pierre GASLY	MEDIUM	2024-03-07T14:21:58.347000+00:00		18	35.586	
354	Pierre GASLY	MEDIUM	2024-03-07T14:23:35.204000+00:00		19	35.266	
374	Pierre GASLY	MEDIUM	2024-03-07T14:25:10.980000+00:00		20	35.310	
393	Pierre GASLY	MEDIUM	2024-03-07T14:26:47.445000+00:00		21	35.243	
413	Pierre GASLY	MEDIUM	2024-03-07T14:28:23.626000+00:00		22	35.229	
432	Pierre GASLY	MEDIUM	2024-03-07T14:29:59.968000+00:00		23	34.999	

Williams

```
In [40]: libraryDataF1.getinfolongruns(jointables2,23,'Williams',MINIMUN_SECONDS,MAX)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
23	Alexander ALBON	MEDIUM		2024-03-07T13:32:45.995000+00:00	2	34.547	
147	Alexander ALBON	MEDIUM		2024-03-07T13:45:36.109000+00:00	9	38.500	
332	Alexander ALBON	MEDIUM		2024-03-07T14:20:46.676000+00:00	19	34.919	
343	Alexander ALBON	MEDIUM		2024-03-07T14:22:21.412000+00:00	20	34.784	
359	Alexander ALBON	MEDIUM		2024-03-07T14:23:56.189000+00:00	21	35.013	
378	Alexander ALBON	MEDIUM		2024-03-07T14:25:31.404000+00:00	22	34.877	
398	Alexander ALBON	MEDIUM		2024-03-07T14:27:06.269000+00:00	23	34.939	
417	Alexander ALBON	MEDIUM		2024-03-07T14:28:45.091000+00:00	24	34.434	

```
In [41]: libraryDataF1.getinfolongruns(jointables2,2,'Williams',MINIMUN_SECONDS,MAX)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
72	Logan SARGEANT	HARD		2024-03-07T13:37:03.964000+00:00	2	35.533	
88	Logan SARGEANT	HARD		2024-03-07T13:38:38.972000+00:00	3	34.624	
166	Logan SARGEANT	HARD		2024-03-07T13:49:31.146000+00:00	9	33.766	
323	Logan SARGEANT	HARD		2024-03-07T14:19:40.734000+00:00	19	35.283	
334	Logan SARGEANT	HARD		2024-03-07T14:21:15.993000+00:00	20	35.014	
349	Logan SARGEANT	HARD		2024-03-07T14:22:51.398000+00:00	21	35.426	
365	Logan SARGEANT	HARD		2024-03-07T14:24:27.128000+00:00	22	34.783	
384	Logan SARGEANT	HARD		2024-03-07T14:26:02.093000+00:00	23	35.202	
402	Logan SARGEANT	HARD		2024-03-07T14:27:37.325000+00:00	24	35.047	
422	Logan SARGEANT	HARD		2024-03-07T14:29:12.517000+00:00	25	35.138	

Kick Sauber

```
In [42]: libraryDataF1.getinfolongruns(jointables2,24,'Kick Sauber',MINIMUN_SECONDS)
```

Out[42]:

	full_name	compound		date_start	lap_number	duration_sector_1	du
17	ZHOU Guanyu	HARD	2024-03-07T13:32:03.946000+00:00		2	35.872	
34	ZHOU Guanyu	HARD	2024-03-07T13:33:39.240000+00:00		3	34.517	
76	ZHOU Guanyu	HARD	2024-03-07T13:37:26.918000+00:00		5	34.099	
385	ZHOU Guanyu	SOFT	2024-03-07T14:26:07.551000+00:00		20	35.098	
403	ZHOU Guanyu	SOFT	2024-03-07T14:27:43.351000+00:00		21	35.164	
423	ZHOU Guanyu	SOFT	2024-03-07T14:29:18.933000+00:00		22	35.097	

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

	full_name	compound		date_start	lap_number	duration_sector_1	du
16	Valtteri BOTTAS	MEDIUM	2024-03-07T13:31:48.172000+00:00		2	34.664	
29	Valtteri BOTTAS	MEDIUM	2024-03-07T13:33:22.162000+00:00		3	34.489	
48	Valtteri BOTTAS	MEDIUM	2024-03-07T13:34:55.978000+00:00		4	34.300	
237	Valtteri BOTTAS	SOFT	2024-03-07T14:04:50.288000+00:00		14	33.375	
345	Valtteri BOTTAS	SOFT	2024-03-07T14:22:27.863000+00:00		20	35.286	
360	Valtteri BOTTAS	SOFT	2024-03-07T14:24:01.790000+00:00		21	35.186	
379	Valtteri BOTTAS	SOFT	2024-03-07T14:25:37.704000+00:00		22	35.070	
399	Valtteri BOTTAS	SOFT	2024-03-07T14:27:13.093000+00:00		23	35.024	
418	Valtteri BOTTAS	SOFT	2024-03-07T14:28:49.053000+00:00		24	35.191	

Free Practice 2

Obtain setup

In [44]: `practice = libraryDataF1.obtain_information('laps', session_key=9474)
stintInformation = libraryDataF1.obtain_information('stints', session_key=9474)
drivers = libraryDataF1.obtain_information('drivers', session_key=9474)`

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

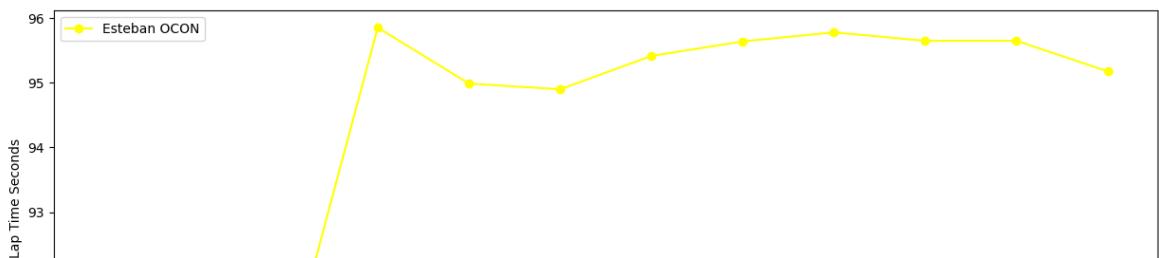
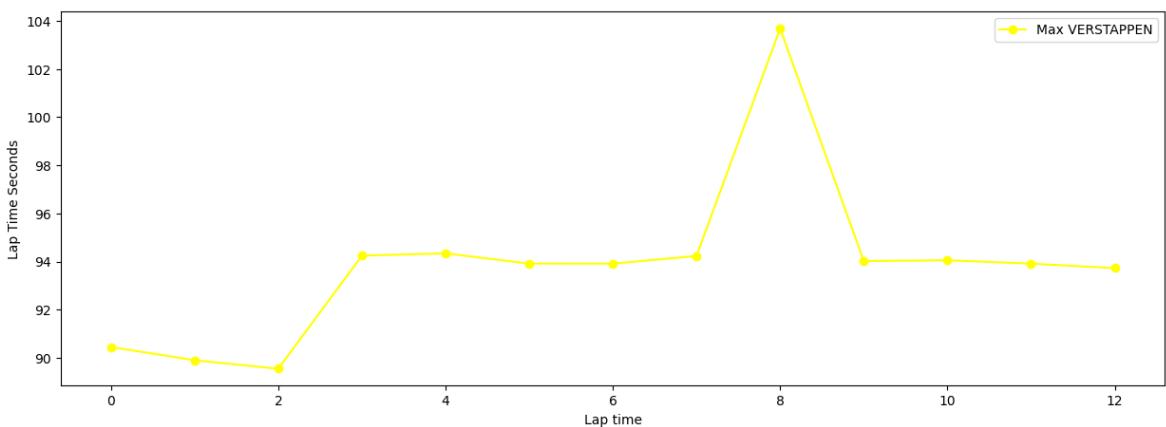
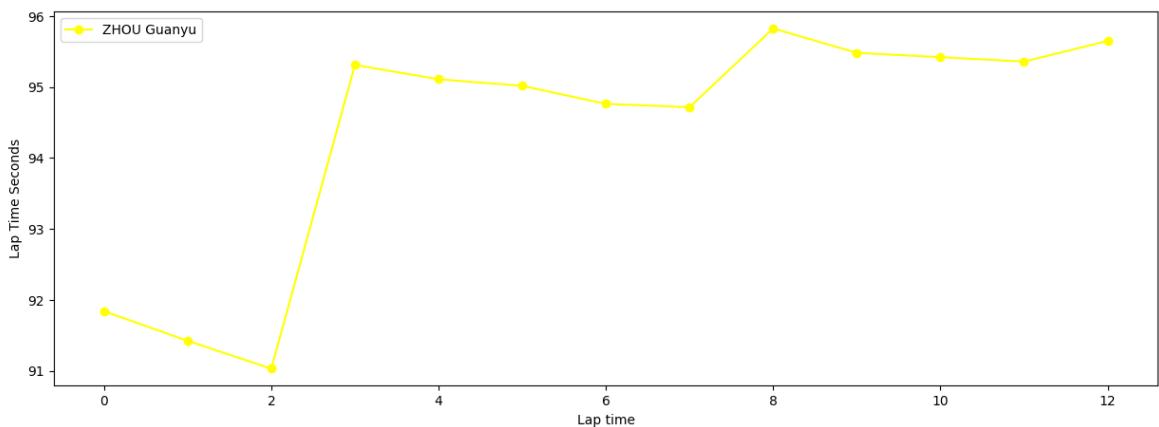
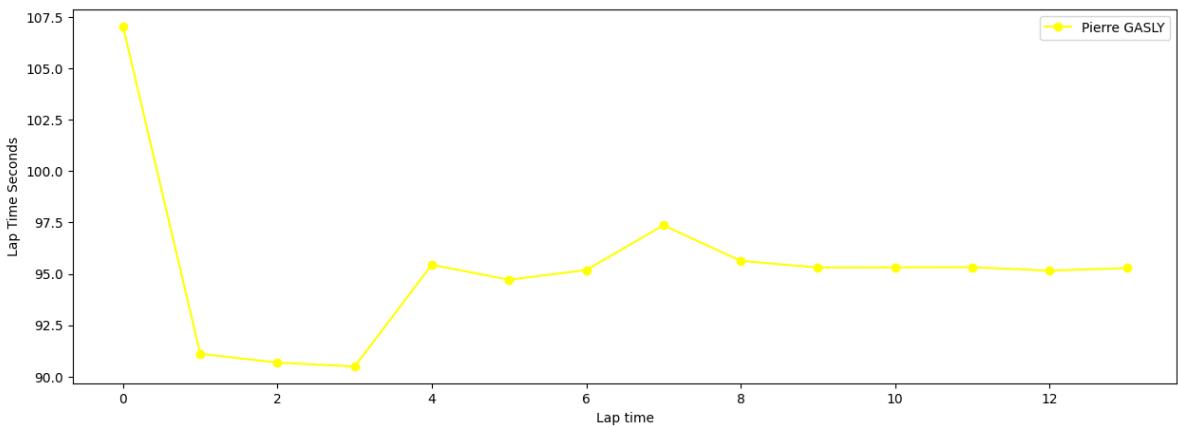
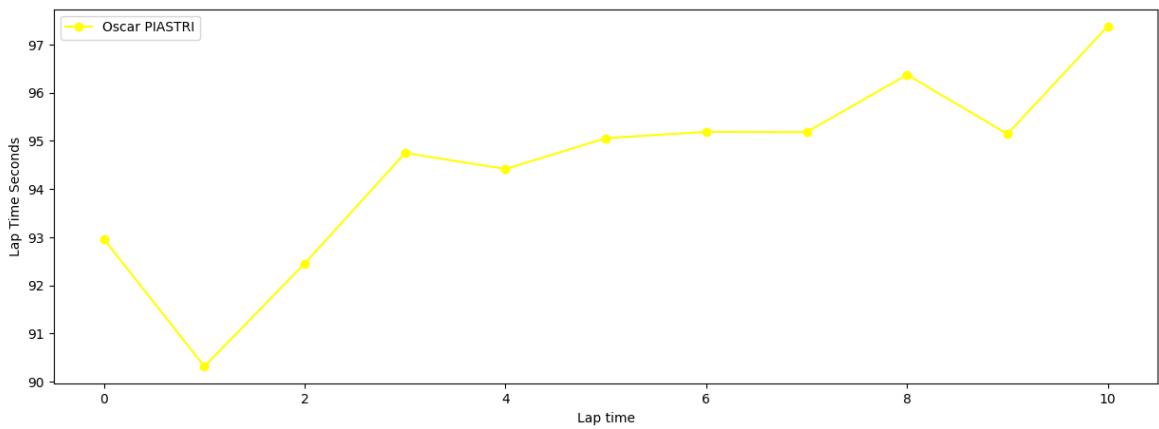
Out[45]: `meeting_key session_key driver_number i1_speed i2_speed st_speed`

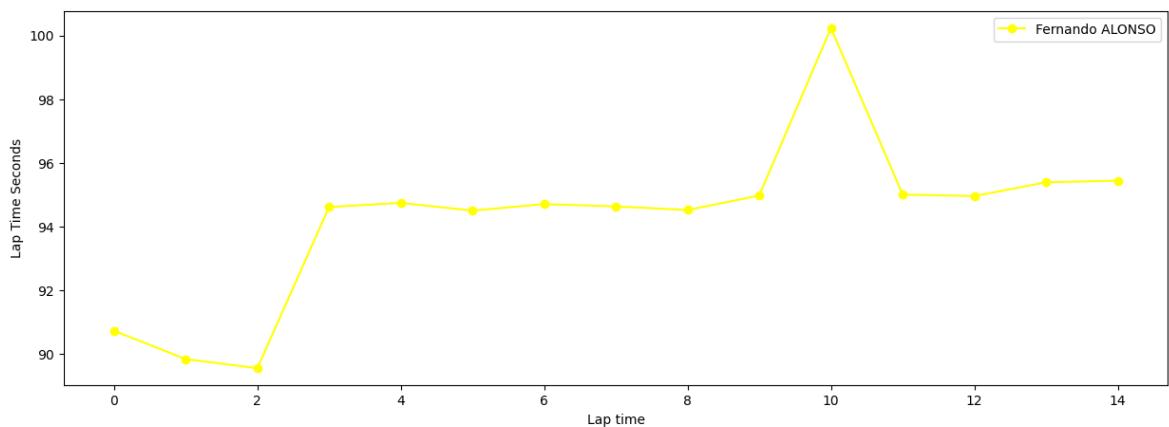
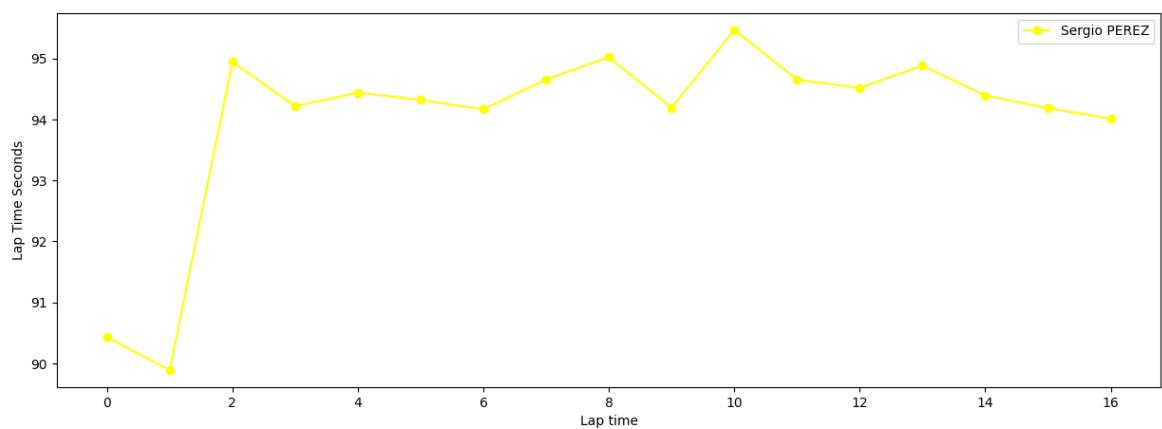
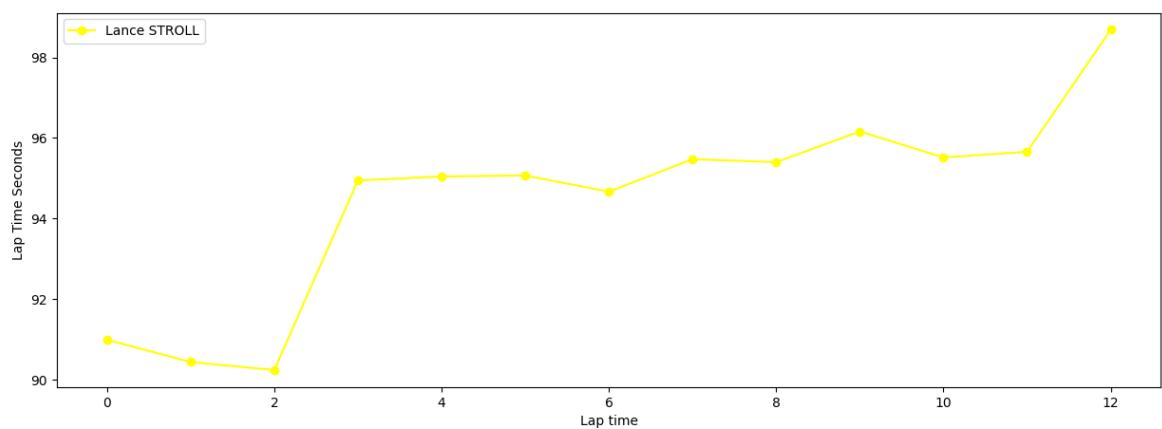
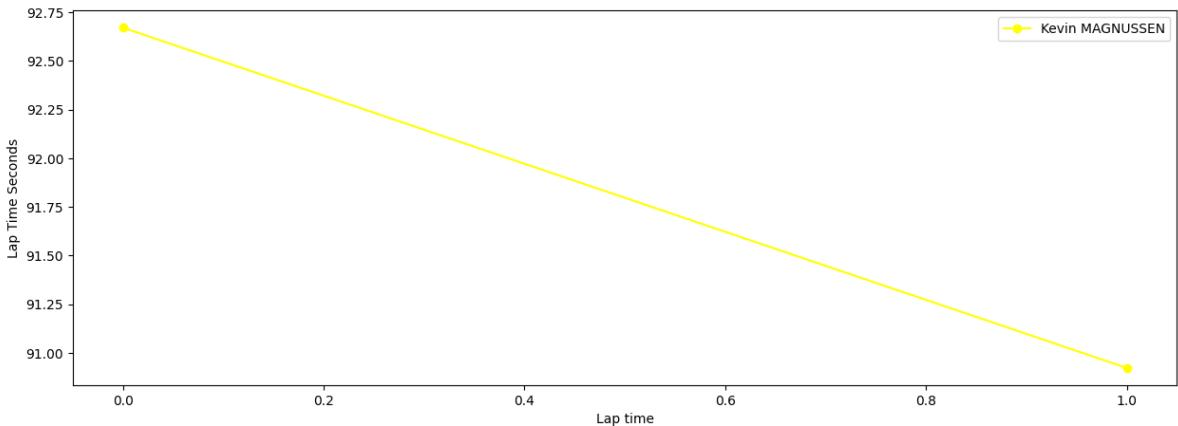
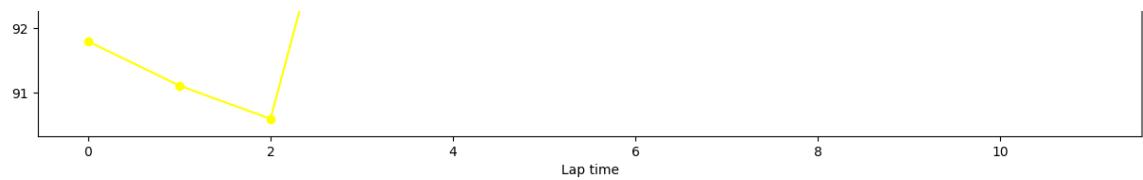
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1230	9474	81	263.0	276	301	2024-03-07T17:10:
1	1230	9474	24	260.0	296	281	2024-03-07T17:10:
2	1230	9474	23	277.0	301	307	2024-03-07T17:10:
3	1230	9474	10	265.0	311	301	2024-03-07T17:10:
4	1230	9474	77	262.0	304	274	2024-03-07T17:10:
...
523	1230	9474	55	272.0	189	192	2024-03-07T18:13:
524	1230	9474	24	278.0	240	292	2024-03-07T18:13:
525	1230	9474	10	278.0	293	287	2024-03-07T18:13:
526	1230	9474	77	278.0	175	255	2024-03-07T18:13:
527	1230	9474	11	282.0	296	287	2024-03-07T18:14:

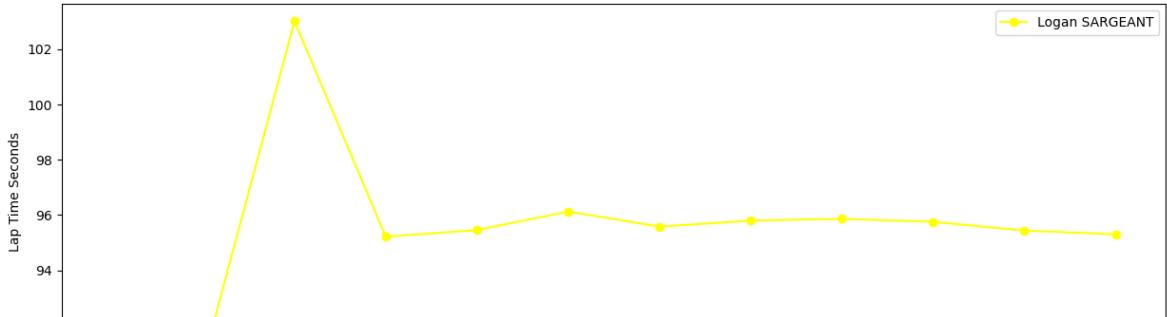
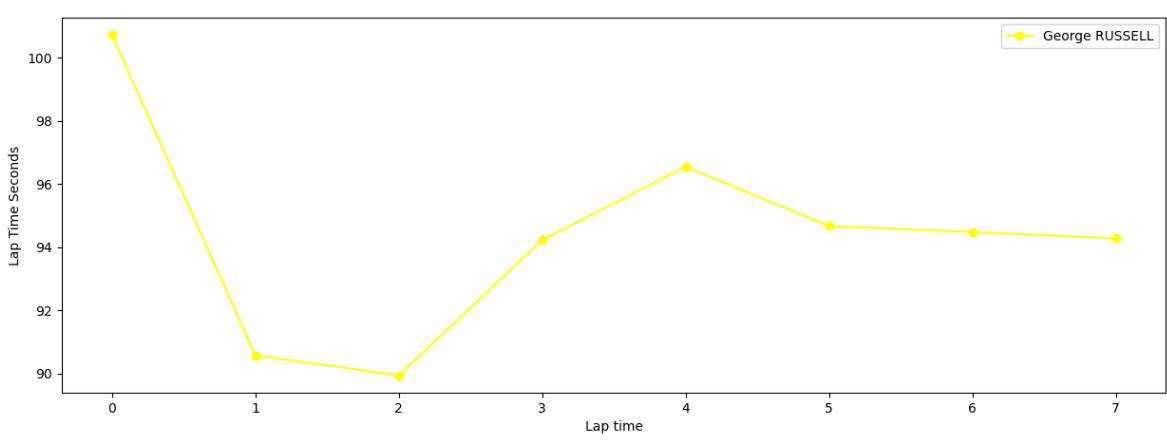
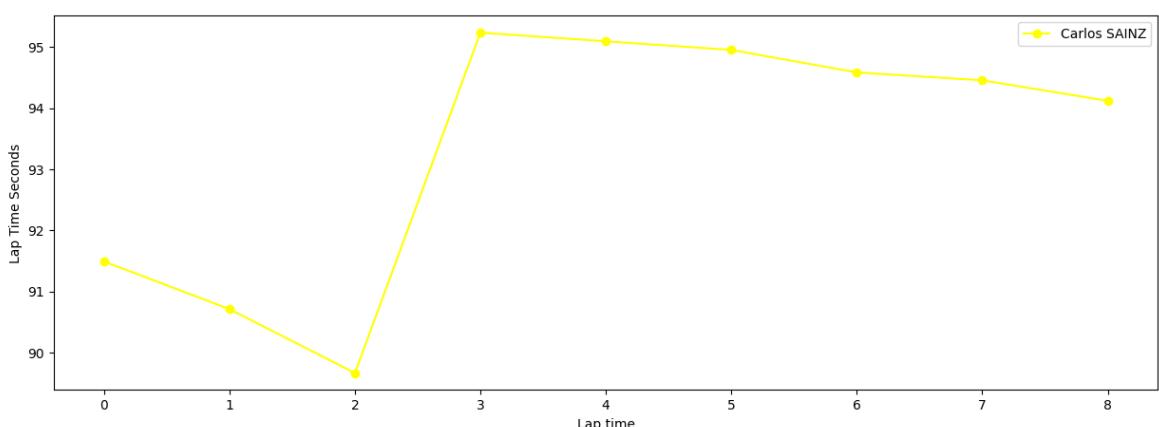
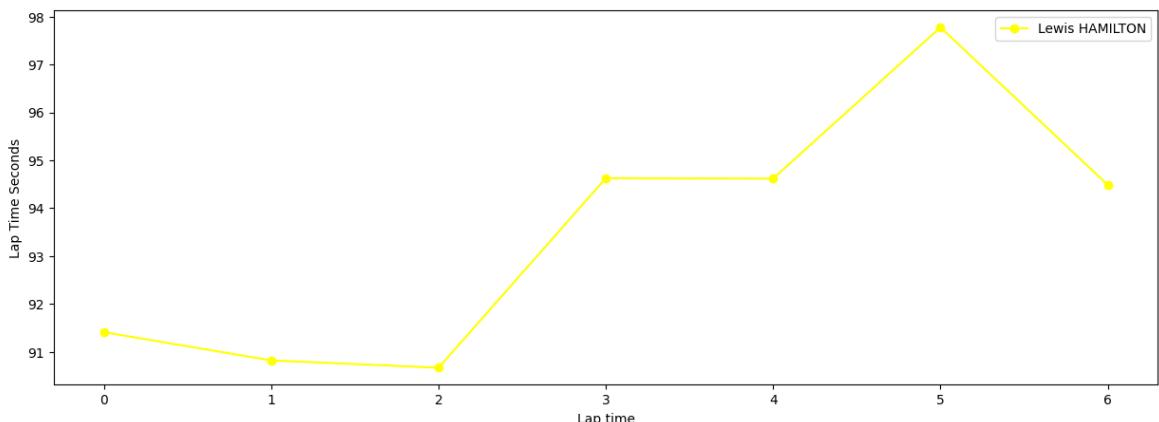
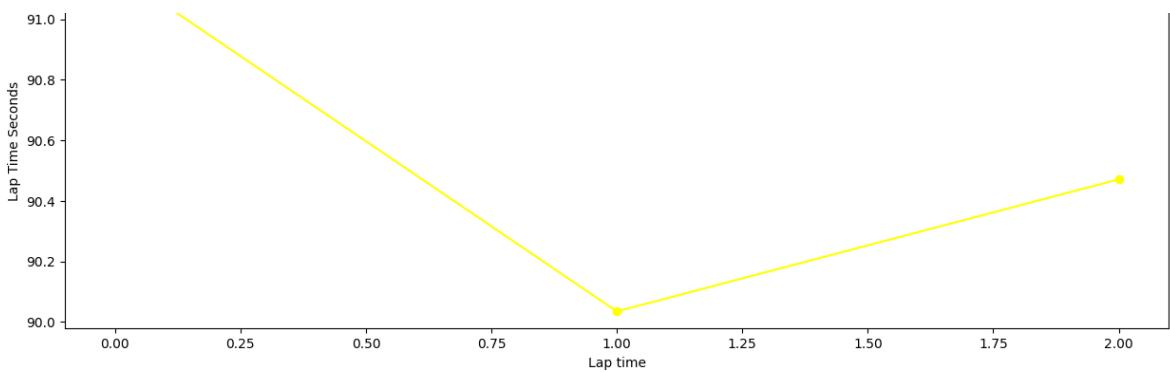
See race pace by means of the charts

Medium tyres

```
In [46]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",108)
```





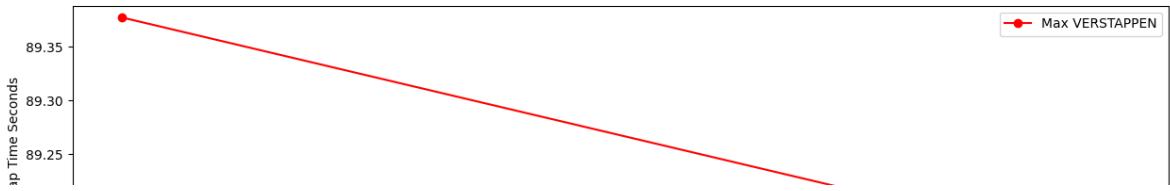
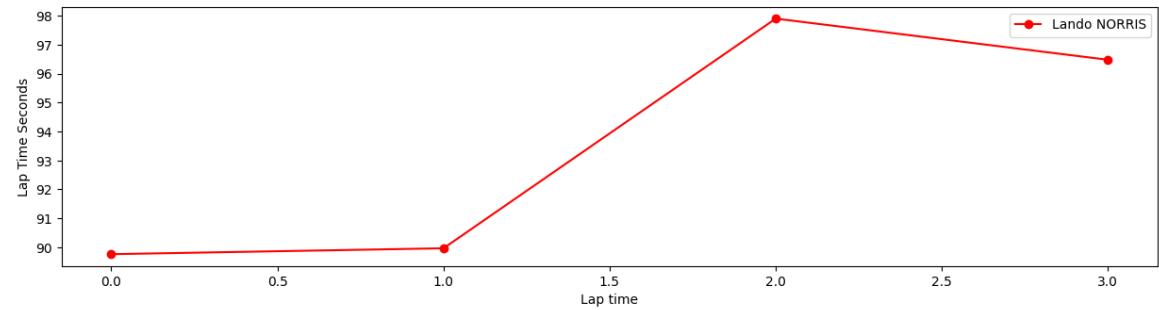
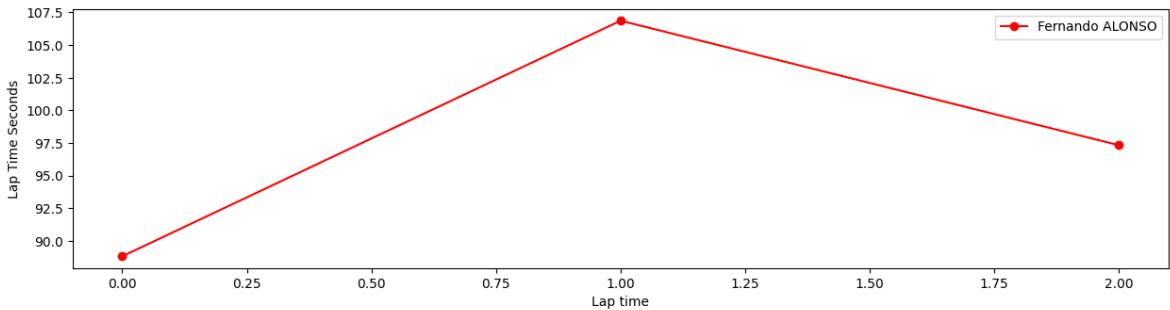
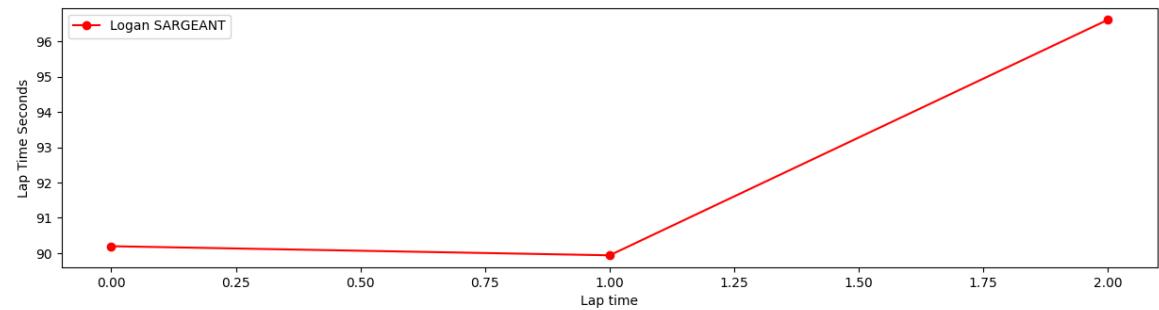
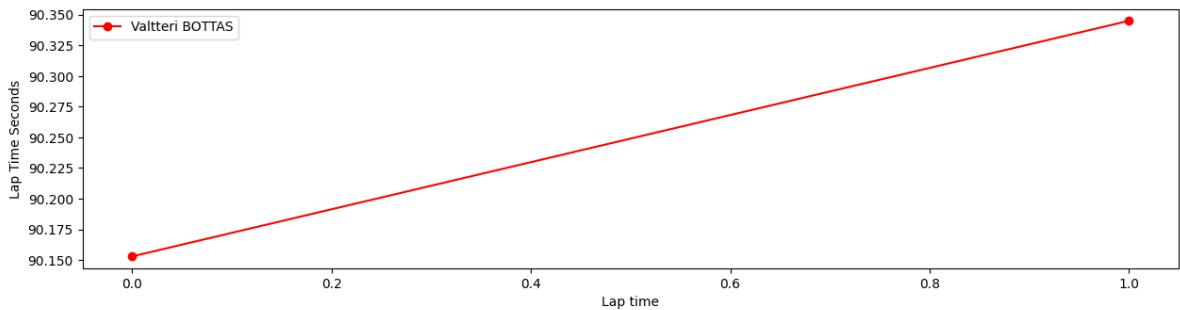
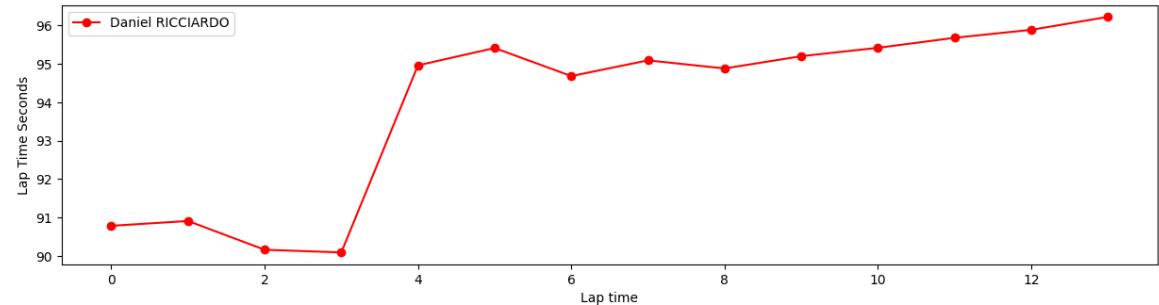
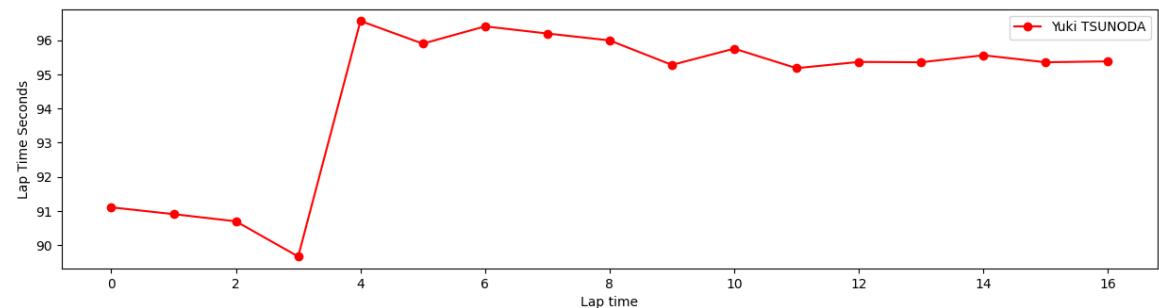


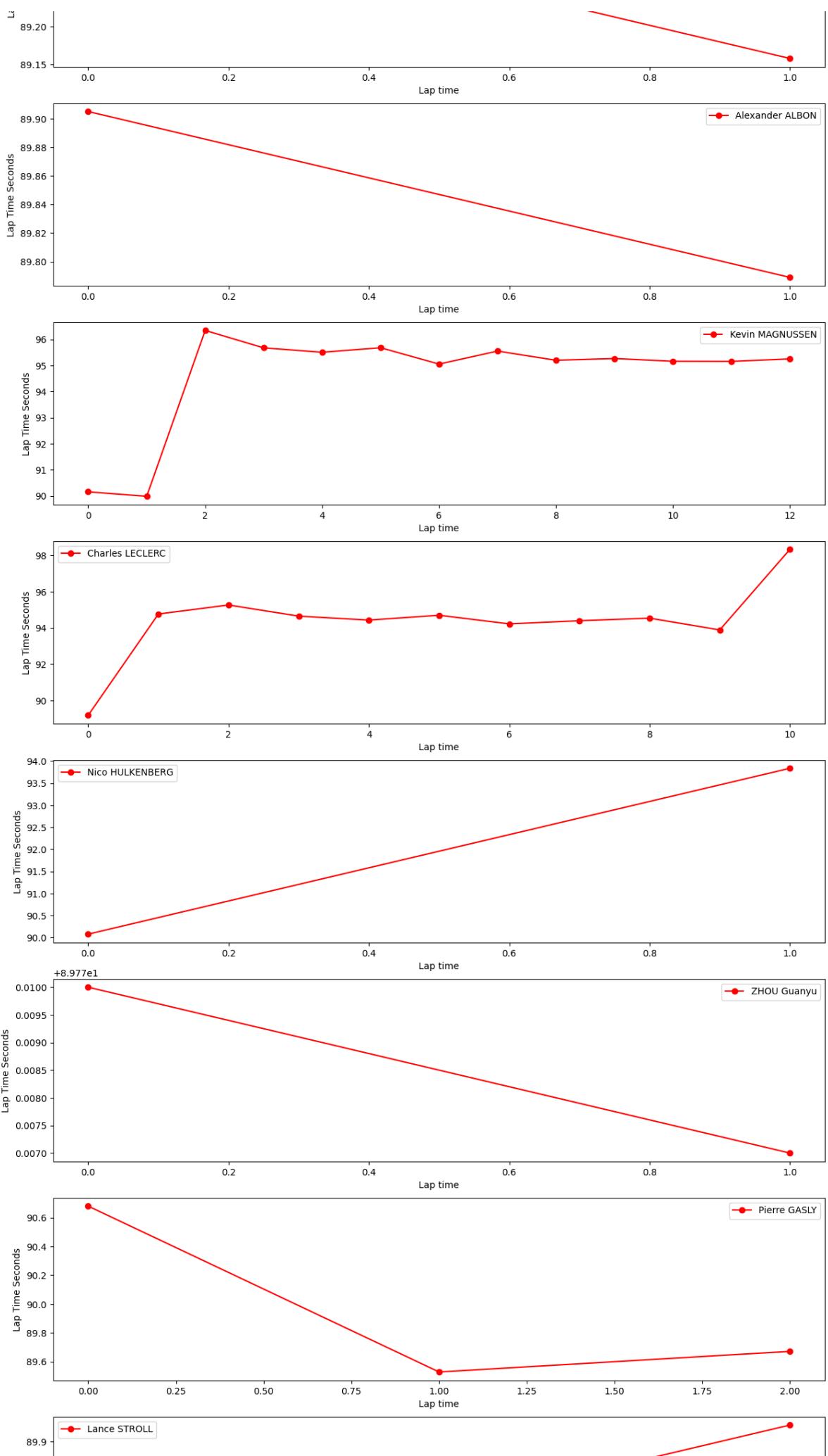


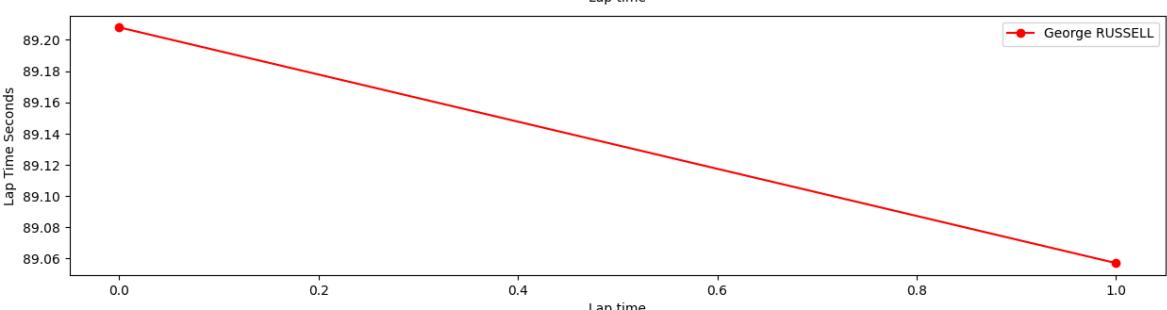
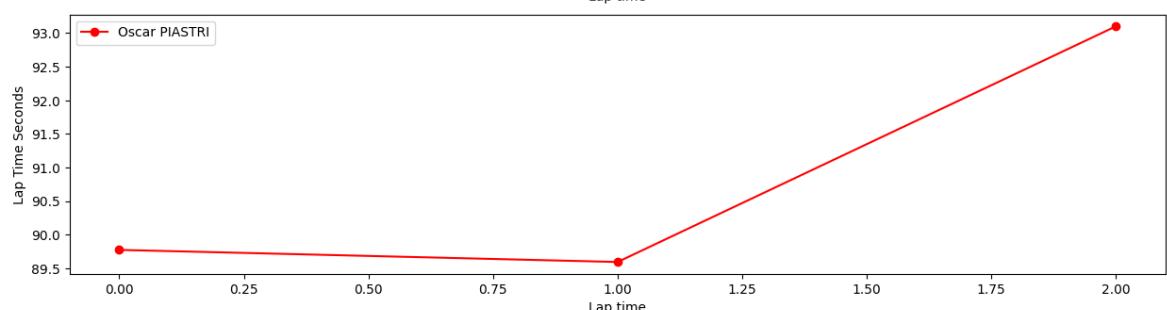
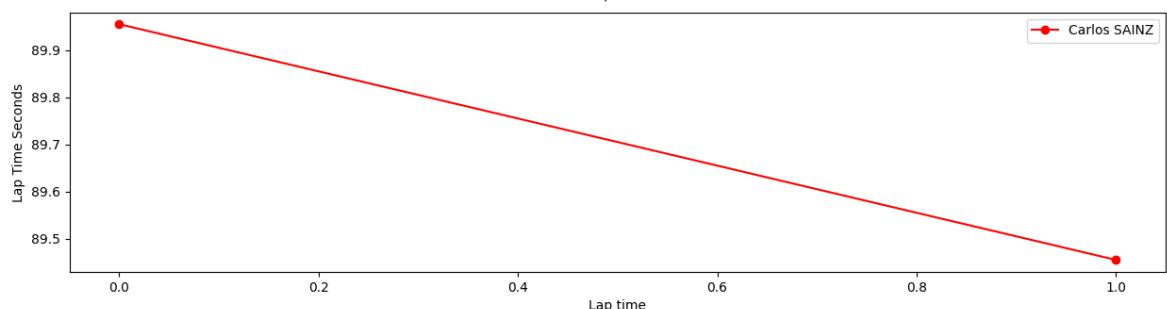
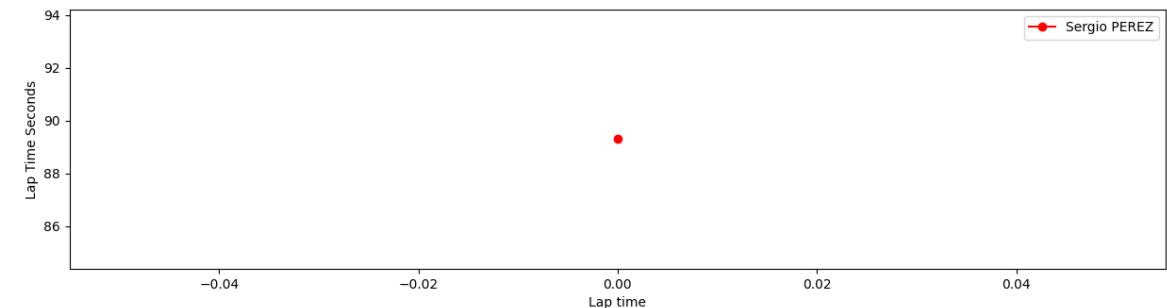
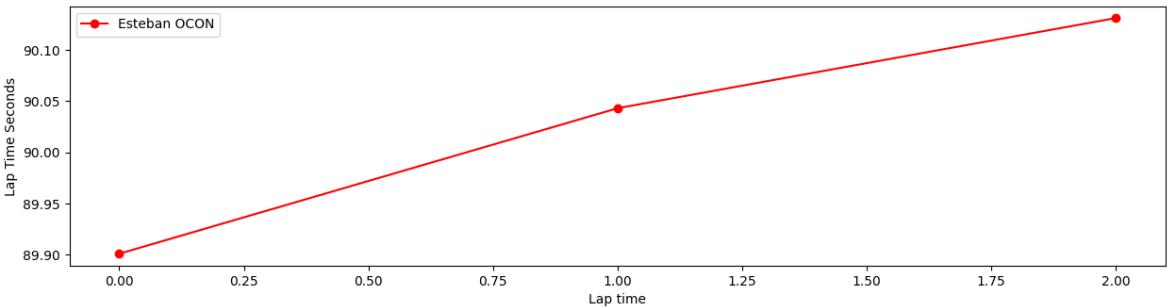
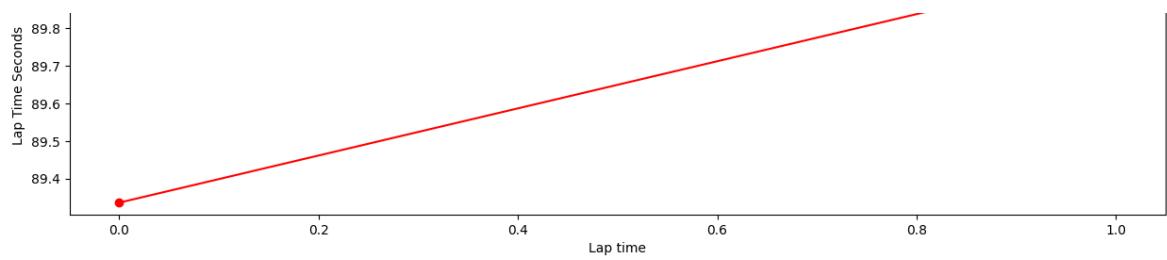
Soft tyres

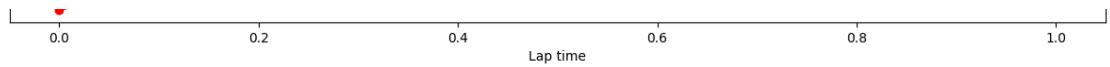
In [47]:

```
libraryDataF1.obtain_data_tyres(jointables2, "SOFT", 108)
```





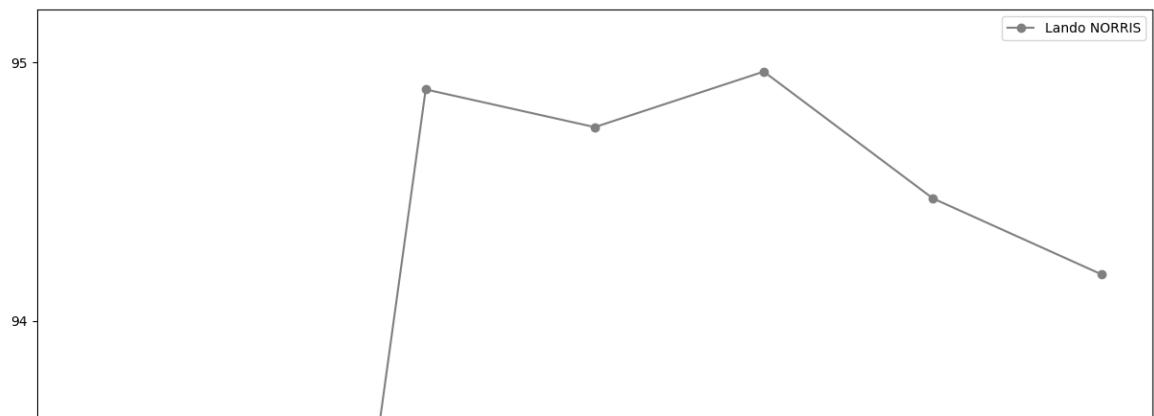
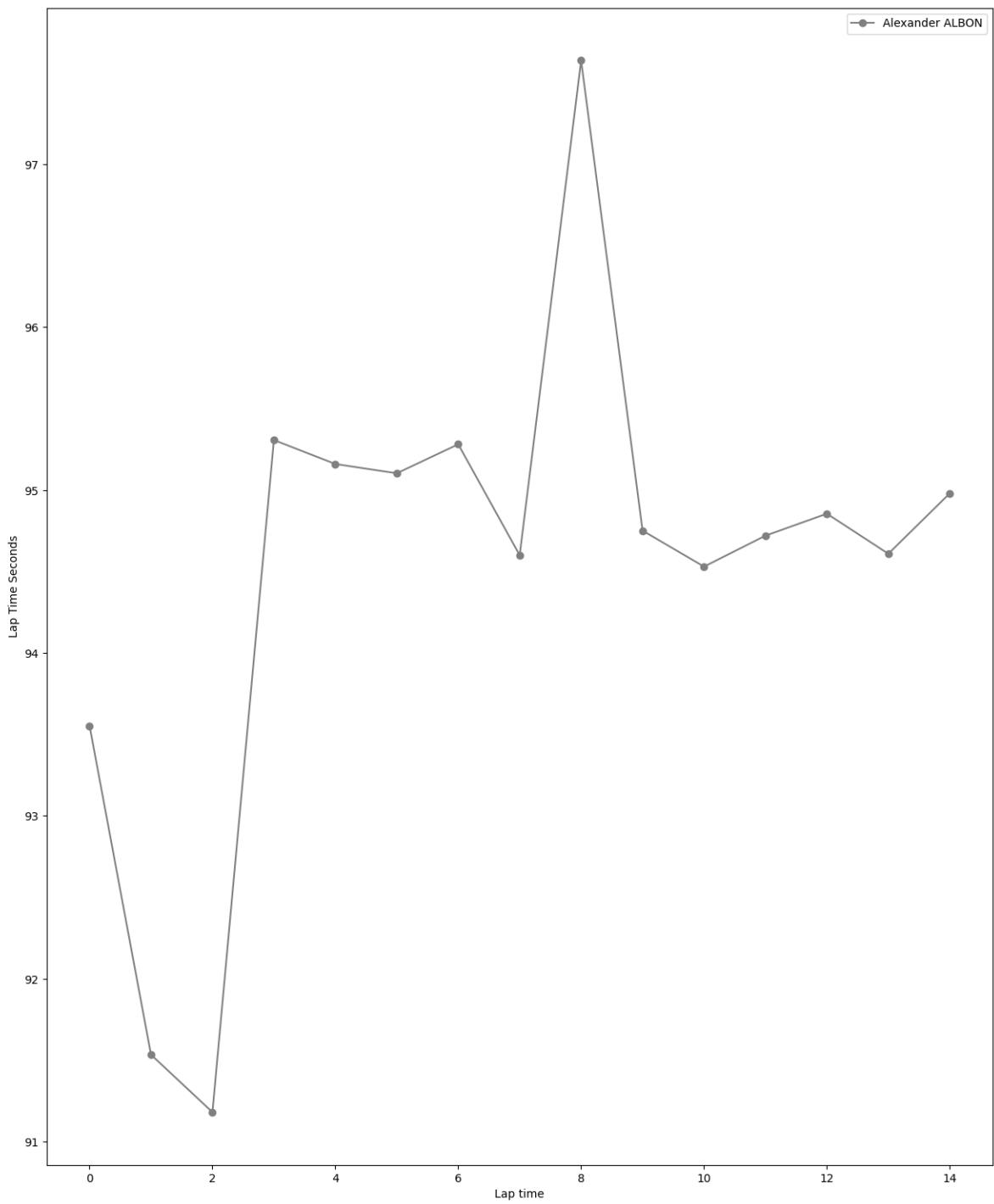


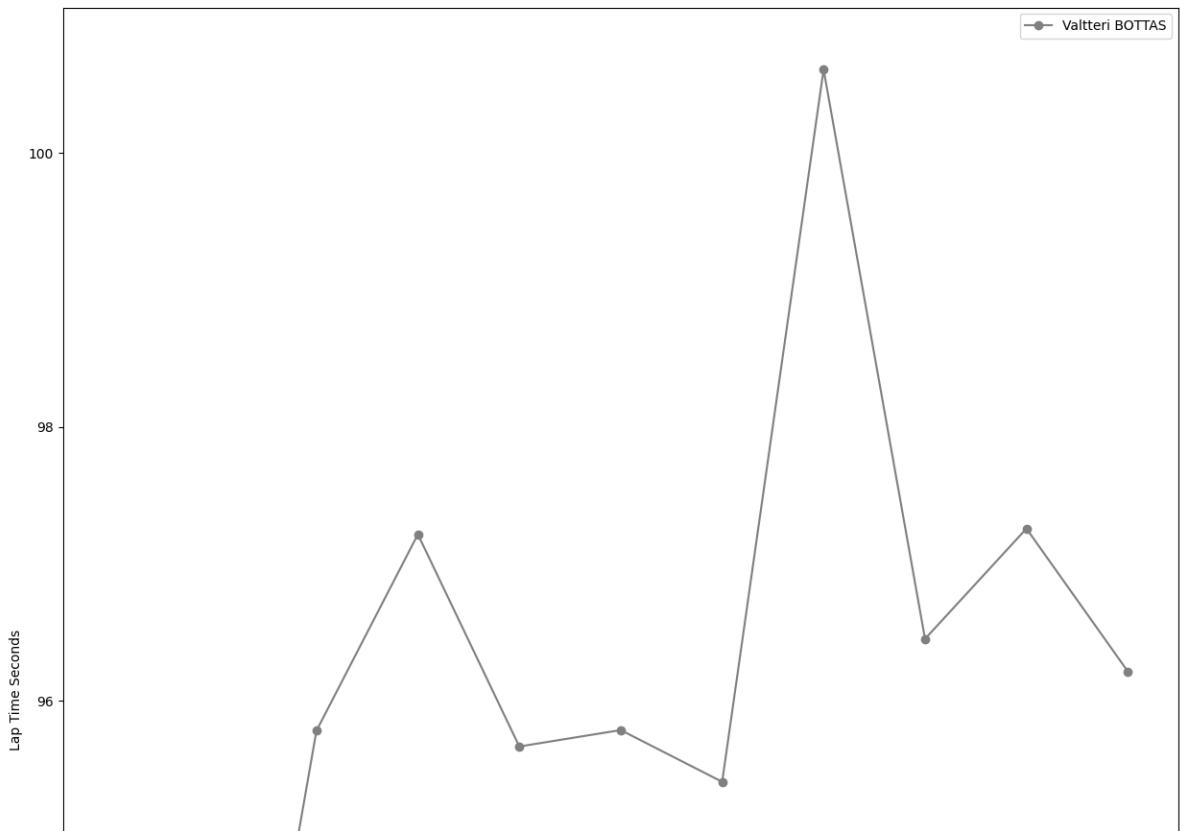
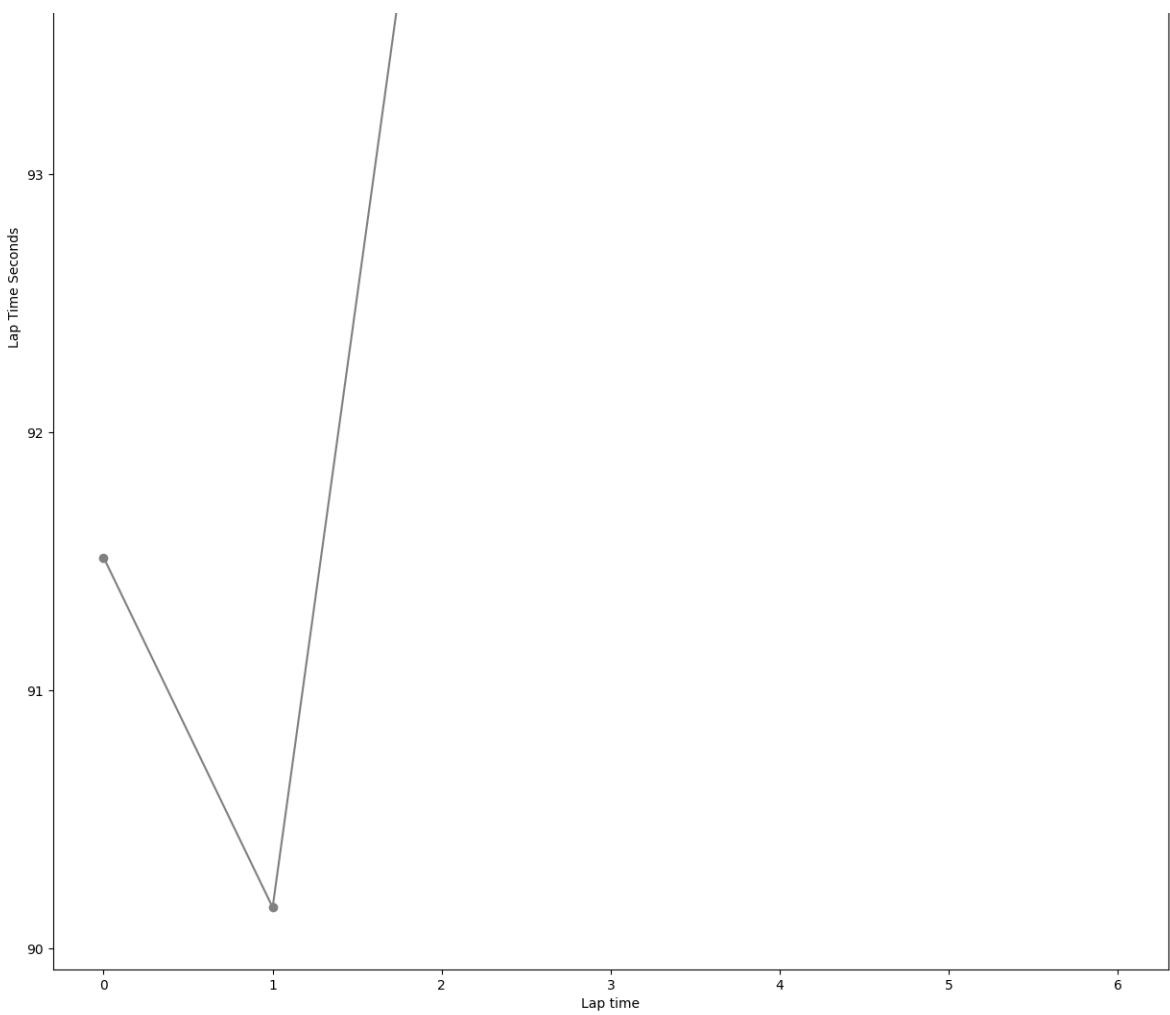


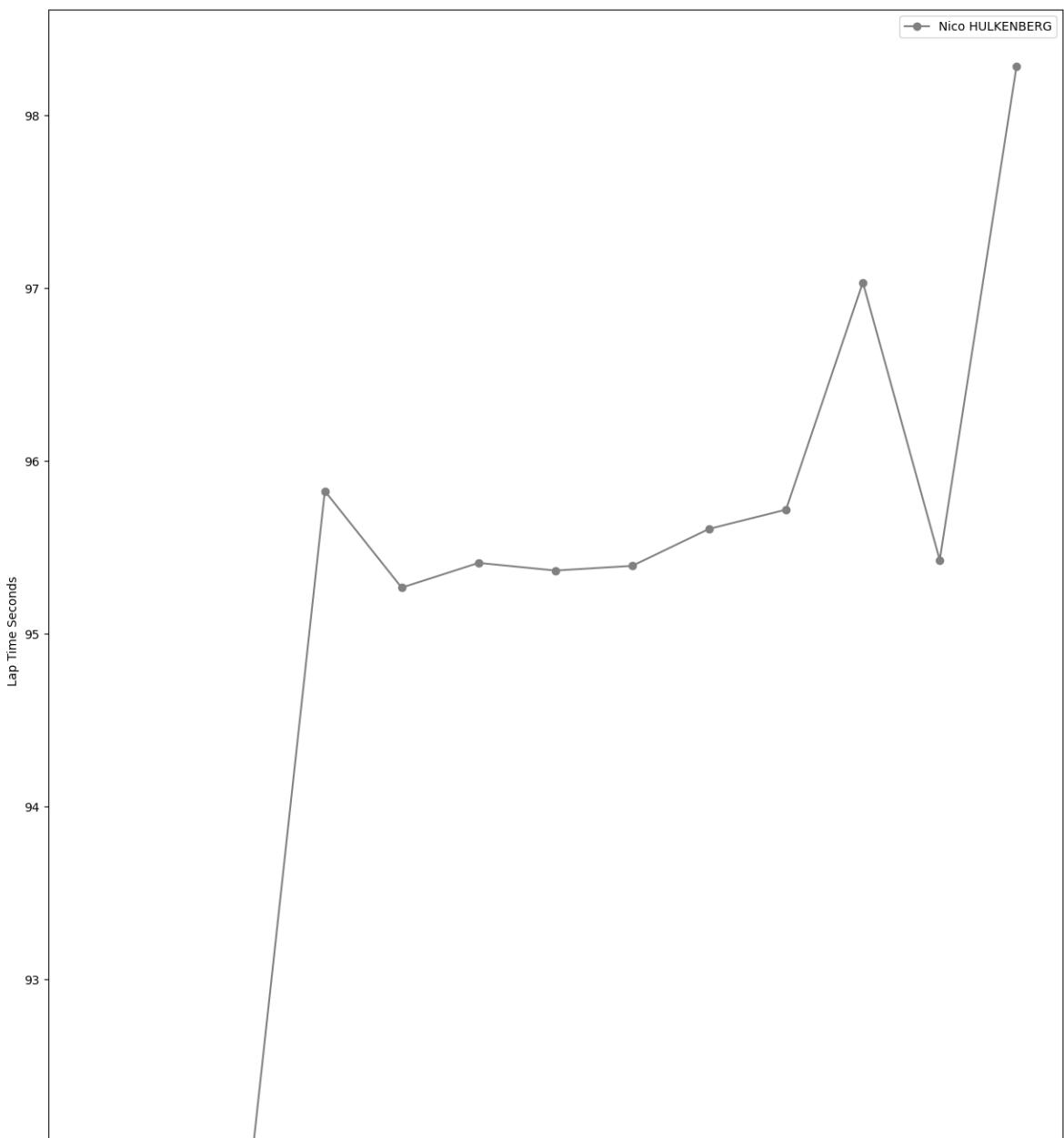
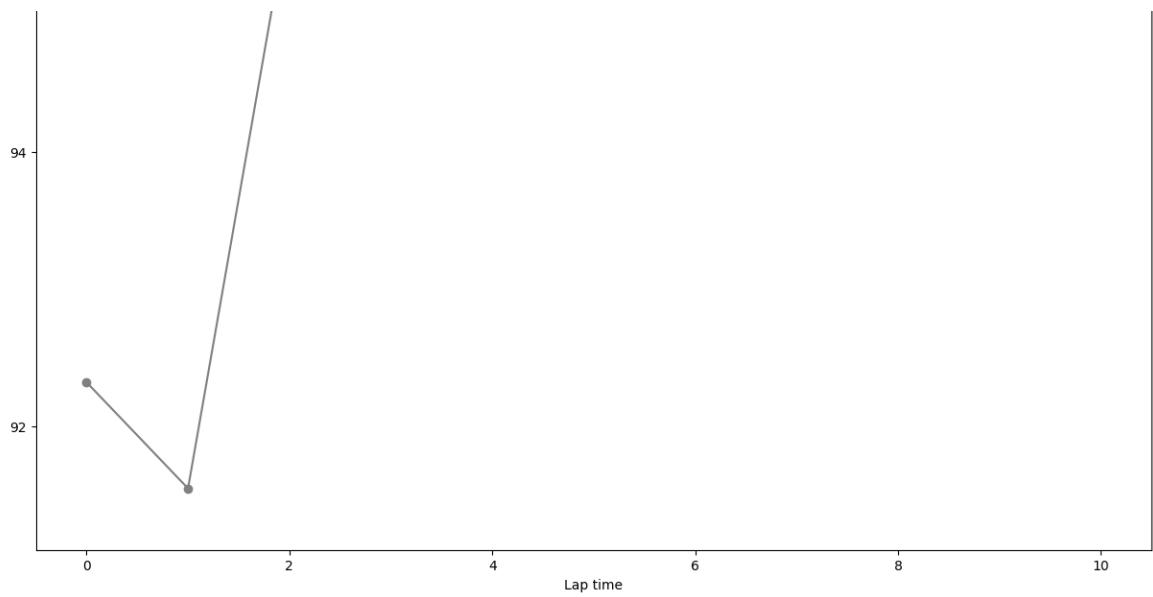
Hard tyres

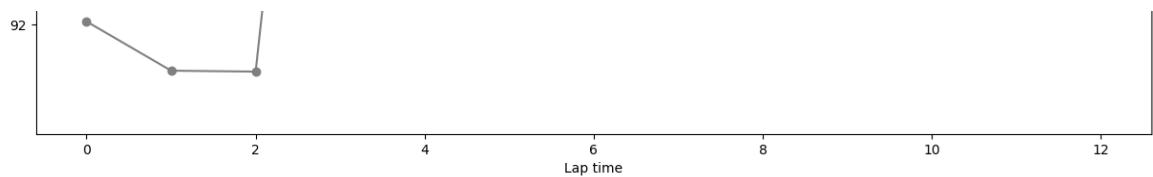
In [48]:

```
libraryDataF1.obtain_data_tyres(jointables2, "HARD", 108)
```





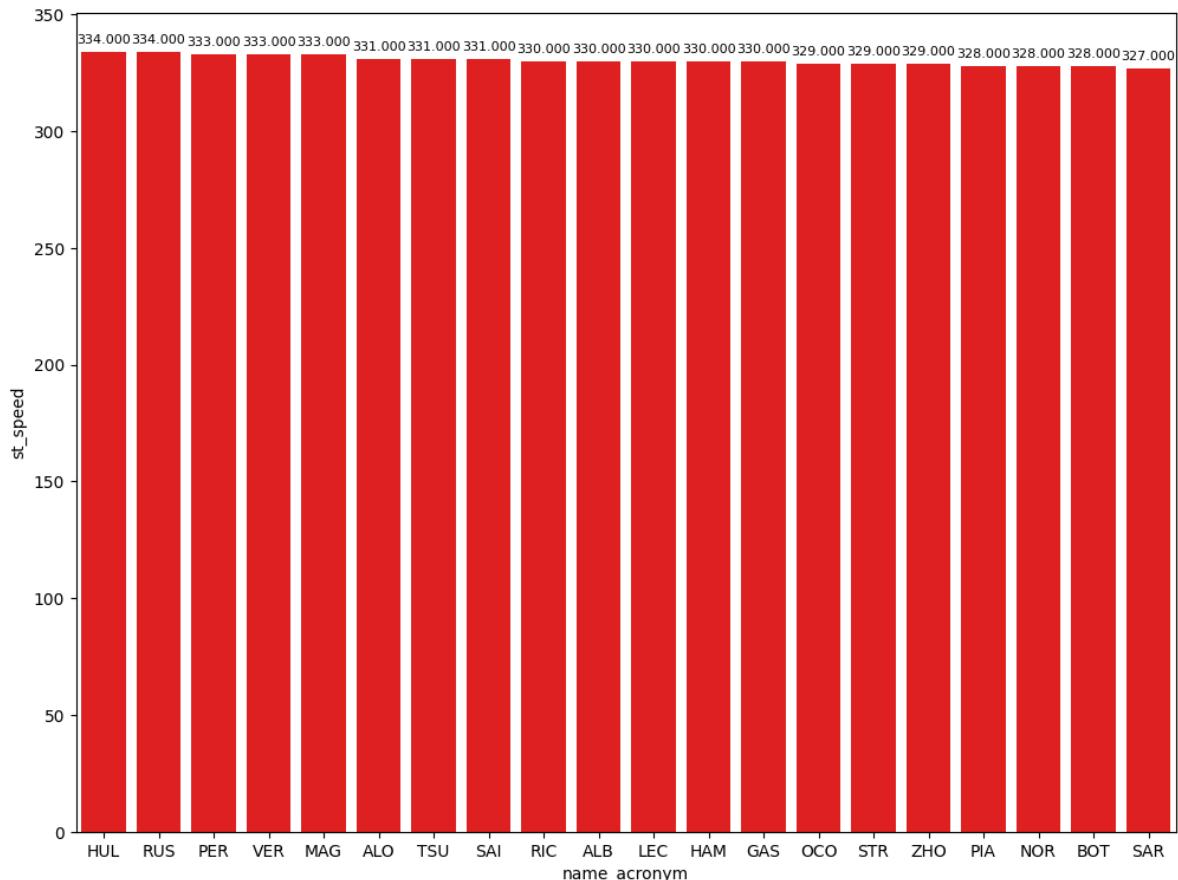




Speed trap

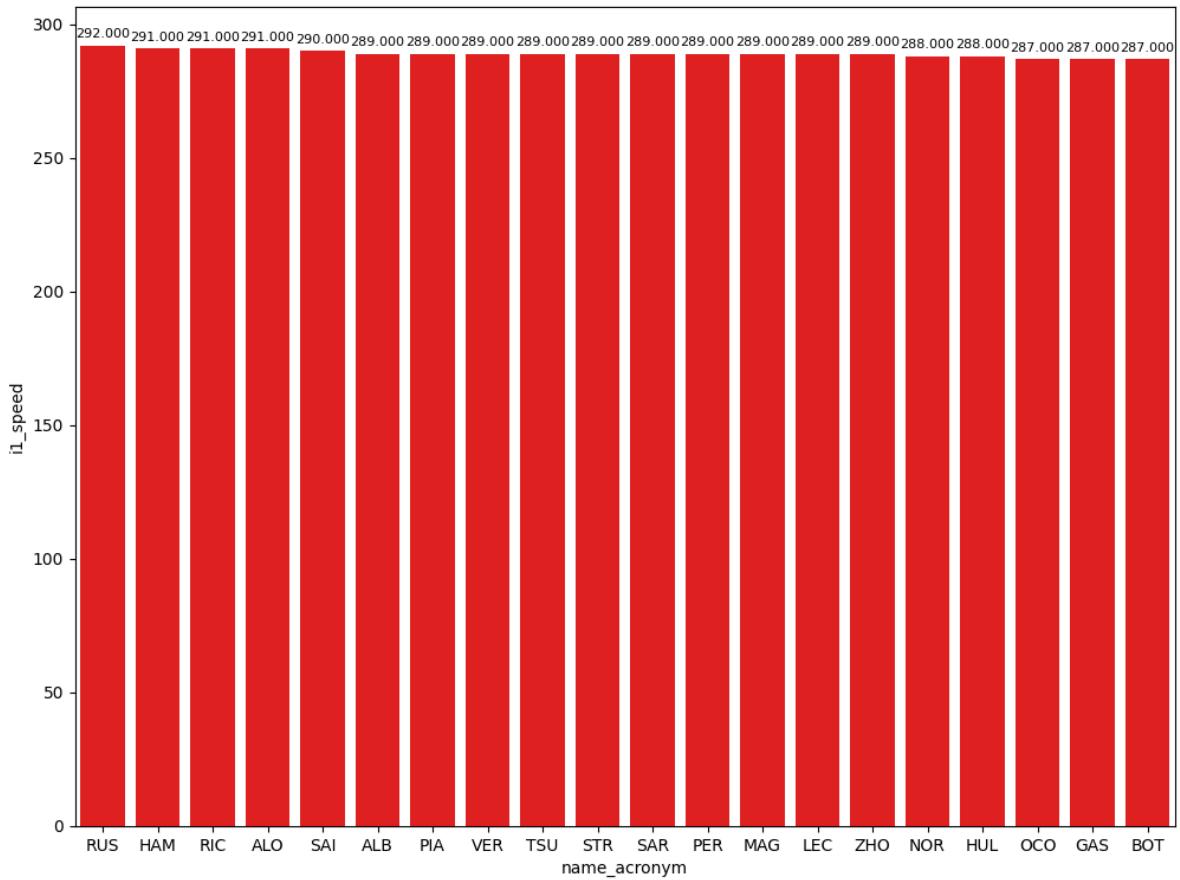
In [49]:

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



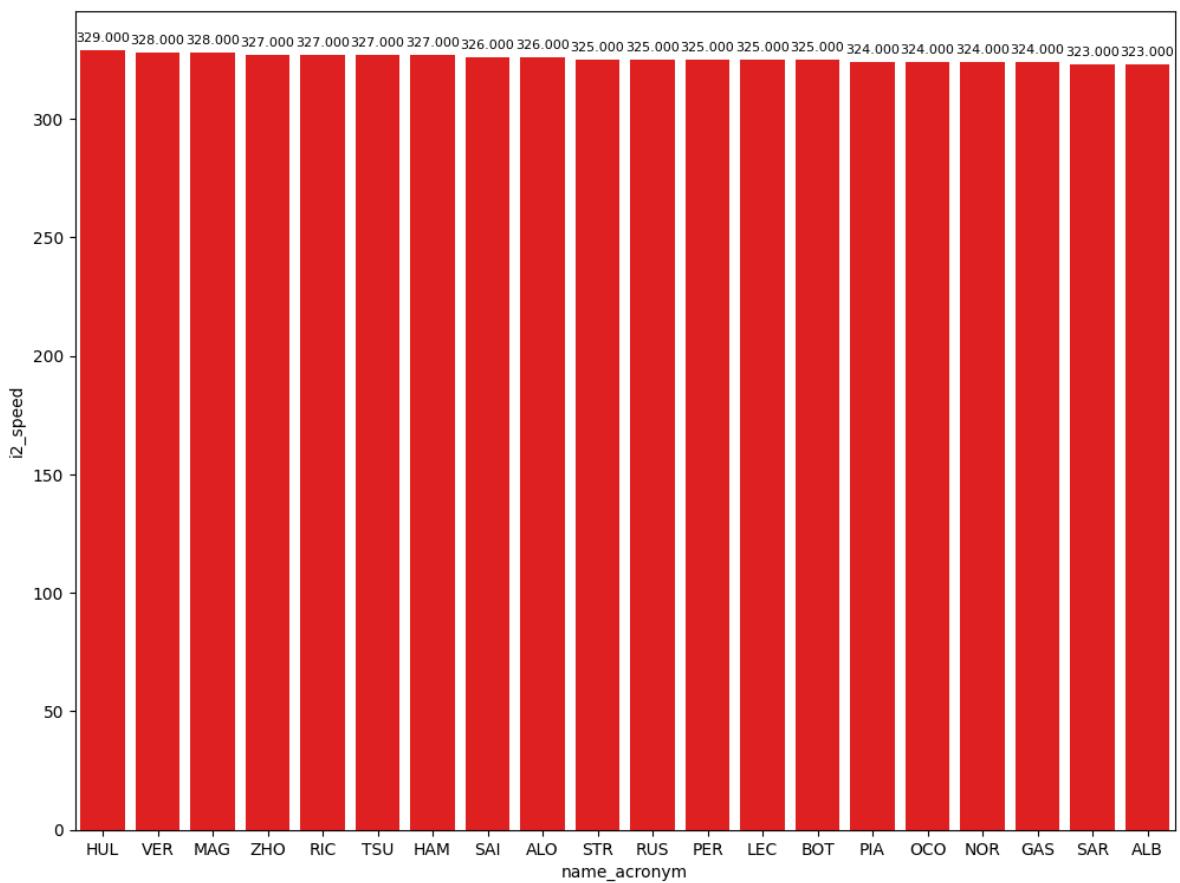
In [50]:

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



In [51]:

```
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 [52]:

```
compoundsPace = jointables2.loc[jointables2.groupby(['compound'])['lap_duration'].mean()]
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
71		Lando NORRIS	HARD	32.983	28.486	28.691	9
123		Max VERSTAPPEN	MEDIUM	32.438	28.415	28.690	8
164		Fernando ALONSO	SOFT	32.260	28.222	28.345	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

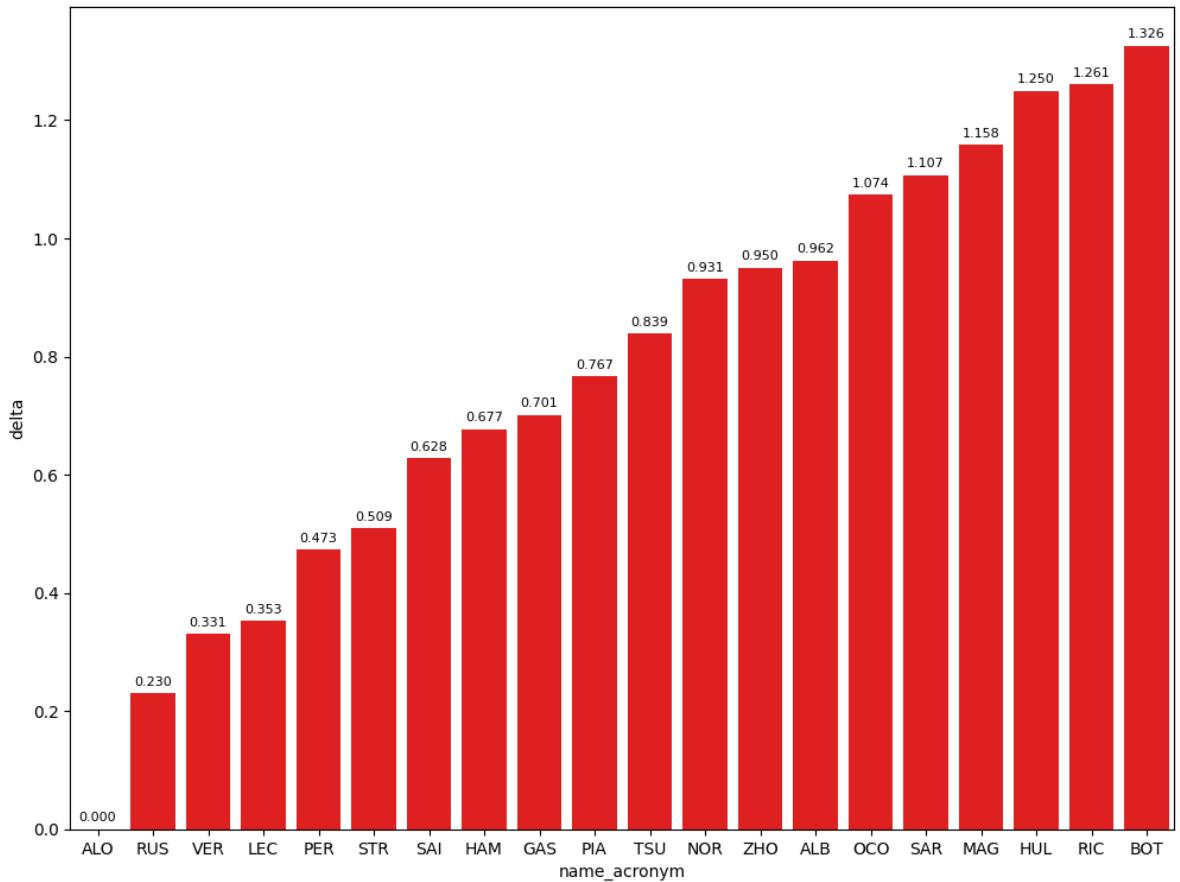
In [53]:

```
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
164	32.260	Fernando ALONSO	SOFT	88.827	9
176	32.378	Lance STROLL	SOFT	89.336	9
222	32.427	Max VERSTAPPEN	SOFT	89.158	13
145	32.461	Oscar PIASTRI	MEDIUM	92.454	8
170	32.465	Charles LECLERC	SOFT	89.180	9
181	32.540	Sergio PEREZ	SOFT	89.300	8
254	32.569	George RUSSELL	SOFT	89.057	14
280	32.572	Lando NORRIS	SOFT	97.906	13
205	32.574	Alexander ALBON	SOFT	89.789	11
179	32.597	Esteban OCON	SOFT	89.901	9
173	32.604	Yuki TSUNODA	SOFT	89.666	10
226	32.661	Pierre GASLY	SOFT	89.528	13
118	32.688	Carlos SAINZ	MEDIUM	89.665	6
257	32.742	Lewis HAMILTON	SOFT	95.548	13

	duration_sector_1	full_name	compound	lap_duration	lap_number
172	32.808	ZHOU Guanyu	SOFT	89.780	10
201	32.896	Logan SARGEANT	SOFT	89.934	11
171	32.919	Nico HULKENBERG	SOFT	90.077	10
140	32.928	Daniel RICCIARDO	SOFT	90.158	9
206	33.021	Valtteri BOTTAS	SOFT	90.345	11

In [56]:

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

Out[56]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
254	28.116	George RUSSELL	SOFT	89.057	14
145	28.195	Oscar PIASTRI	MEDIUM	92.454	8
164	28.222	Fernando ALONSO	SOFT	88.827	9
226	28.302	Pierre GASLY	SOFT	89.528	13
170	28.327	Charles LECLERC	SOFT	89.180	9
237	28.328	Lewis HAMILTON	SOFT	89.504	11
225	28.328	ZHOU Guanyu	SOFT	89.777	13
181	28.330	Sergio PEREZ	SOFT	89.300	8
222	28.340	Max VERSTAPPEN	SOFT	89.158	13
209	28.343	Kevin MAGNUSSEN	SOFT	89.985	9
176	28.354	Lance STROLL	SOFT	89.336	9
263	28.370	Carlos SAINZ	SOFT	89.455	15
168	28.428	Alexander ALBON	SOFT	89.905	9
246	28.428	Daniel RICCIARDO	SOFT	90.088	15
166	28.434	Lando NORRIS	SOFT	89.758	7
154	28.457	Valtteri BOTTAS	SOFT	90.153	8
201	28.462	Logan SARGEANT	SOFT	89.934	11
173	28.492	Yuki TSUNODA	SOFT	89.666	10
179	28.501	Esteban OCON	SOFT	89.901	9
171	28.535	Nico HULKENBERG	SOFT	90.077	10

In [57]:

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

Out[57]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
164	28.345	Fernando ALONSO	SOFT	88.827	9
254	28.372	George RUSSELL	SOFT	89.057	14
263	28.387	Carlos SAINZ	SOFT	89.455	15
170	28.388	Charles LECLERC	SOFT	89.180	9
222	28.391	Max VERSTAPPEN	SOFT	89.158	13

	duration_sector_3	full_name	compound	lap_duration	lap_number
237	28.428	Lewis HAMILTON	SOFT	89.504	11
181	28.430	Sergio PEREZ	SOFT	89.300	8
169	28.516	Kevin MAGNUSSEN	SOFT	90.156	7
225	28.530	ZHOU Guanyu	SOFT	89.777	13
226	28.565	Pierre GASLY	SOFT	89.528	13
173	28.570	Yuki TSUNODA	SOFT	89.666	10
201	28.576	Logan SARGEANT	SOFT	89.934	11
205	28.592	Alexander ALBON	SOFT	89.789	11
176	28.604	Lance STROLL	SOFT	89.336	9
244	28.607	Oscar PIASTRI	SOFT	89.594	13
171	28.623	Nico HULKENBERG	SOFT	90.077	10
246	28.644	Daniel RICCIARDO	SOFT	90.088	15
154	28.672	Valtteri BOTTAS	SOFT	90.153	8
71	28.691	Lando NORRIS	HARD	90.160	4
---	---	---	---	---	---

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 > 10").groupby("compound").mean())
race_pace
```

```
Out[58]:      lap_duration
compound
SOFT    93.119570
MEDIUM  94.253638
HARD    94.822848
```

Long runs

```
In [59]: MINIMUM_SECONDS = 93
MAXIMUM_SECONDS = 108
```

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
1          1230        9474           1              1            1         1       4 MEDIUM
2          1230        9474           1             11            1         1       4 MEDIUM
21         1230        9474           2             11            5         7 MEDIUM
22         1230        9474           2              1            5         9 MEDIUM
26         1230        9474           3             11            8        10      SOFT
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
40	1230	9474	3	1	10	15	SOFT	
44	1230	9474	4	11	11	28	MEDIUM	

In [61]: libraryDataF1.getinfolongruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS)

	full_name	compound	date_start	lap_number	duration_sector_1
300	Max VERSTAPPEN	MEDIUM	2024-03-07T17:54:15.188000+00:00	16	34.401
317	Max VERSTAPPEN	MEDIUM	2024-03-07T17:55:49.540000+00:00	17	34.547
334	Max VERSTAPPEN	MEDIUM	2024-03-07T17:57:23.828000+00:00	18	34.450
354	Max VERSTAPPEN	MEDIUM	2024-03-07T17:58:57.660000+00:00	19	34.407
374	Max VERSTAPPEN	MEDIUM	2024-03-07T18:00:31.999000+00:00	20	34.527
394	Max VERSTAPPEN	MEDIUM	2024-03-07T18:02:05.831000+00:00	21	34.430
414	Max VERSTAPPEN	MEDIUM	2024-03-07T18:03:49.518000+00:00	22	34.481
433	Max VERSTAPPEN	MEDIUM	2024-03-07T18:05:23.584000+00:00	23	34.401
451	Max VERSTAPPEN	MEDIUM	2024-03-07T18:06:57.656000+00:00	24	34.354
469	Max VERSTAPPEN	MEDIUM	2024-03-07T18:08:31.548000+00:00	25	34.268

In [62]: libraryDataF1.getinfolongruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS)

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
265	Sergio PEREZ	MEDIUM	2024-03-07T17:47:50.069000+00:00	11	34.848		
269	Sergio PEREZ	MEDIUM	2024-03-07T17:49:24.978000+00:00	12	34.562		
276	Sergio PEREZ	MEDIUM	2024-03-07T17:50:59.270000+00:00	13	34.660		
284	Sergio PEREZ	MEDIUM	2024-03-07T17:52:33.671000+00:00	14	34.576		
299	Sergio PEREZ	MEDIUM	2024-03-07T17:54:08.066000+00:00	15	34.551		
316	Sergio PEREZ	MEDIUM	2024-03-07T17:55:42.209000+00:00	16	34.800		
333	Sergio PEREZ	MEDIUM	2024-03-07T17:57:16.841000+00:00	17	35.065		
353	Sergio PEREZ	MEDIUM	2024-03-07T17:58:51.829000+00:00	18	34.842		
373	Sergio PEREZ	MEDIUM	2024-03-07T18:00:25.990000+00:00	19	35.587		

	full_name	compound	date_start	lap_number	duration_sector_1	dt
393	Sergio PEREZ	MEDIUM	2024-03-07T18:02:01.641000+00:00	20	34.893	
411	Sergio PEREZ	MEDIUM	2024-03-07T18:03:36.221000+00:00	21	34.668	
430	Sergio PEREZ	MEDIUM	2024-03-07T18:05:10.628000+00:00	22	35.245	
448	Sergio PEREZ	MEDIUM	2024-03-07T18:06:45.544000+00:00	23	34.704	
466	Sergio PEREZ	MEDIUM	2024-03-07T18:08:19.898000+00:00	24	34.641	
486	Sergio	MEDIUM	2024-03-07T18:09:54.173000+00:00	25	34.594	

Ferrari

In [63]: `libraryDataF1.getinfolongruns(jointables2, 16, 'Ferrari', MINIMUM_SECONDS, MAX_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	dt
234	Charles LECLERC	SOFT	2024-03-07T17:41:52+00:00	12	32.689	
311	Charles LECLERC	SOFT	2024-03-07T17:55:19.152000+00:00	14	34.768	
327	Charles LECLERC	SOFT	2024-03-07T17:56:54.457000+00:00	15	34.617	
347	Charles LECLERC	SOFT	2024-03-07T17:58:29.068000+00:00	16	34.666	
366	Charles LECLERC	SOFT	2024-03-07T18:00:03.654000+00:00	17	34.733	
385	Charles LECLERC	SOFT	2024-03-07T18:01:38.308000+00:00	18	34.350	
405	Charles LECLERC	SOFT	2024-03-07T18:03:12.368000+00:00	19	34.374	
425	Charles LECLERC	SOFT	2024-03-07T18:04:46.895000+00:00	20	34.346	
444	Charles LECLERC	SOFT	2024-03-07T18:06:21.391000+00:00	21	34.321	
463	Charles LECLERC	SOFT	2024-03-07T18:07:55.144000+00:00	22	34.641	

In [64]: `libraryDataF1.getinfolongruns(jointables2, 55, 'Ferrari', MINIMUM_SECONDS, MAX_SECONDS)`

	full_name	compound	date_start	lap_number	duration_sector_1	dt
364	Carlos SAINZ	MEDIUM	2024-03-07T17:59:53.391000+00:00	18	35.029	
383	Carlos SAINZ	MEDIUM	2024-03-07T18:01:28.691000+00:00	19	34.887	
403	Carlos SAINZ	MEDIUM	2024-03-07T18:03:03.770000+00:00	20	34.778	
423	Carlos SAINZ	MEDIUM	2024-03-07T18:04:38.810000+00:00	21	34.534	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
442	Carlos SAINZ	MEDIUM	2024-03-07T18:06:13.389000+00:00		22	34.420	
461	Carlos	MEDIUM	2024-03-07T18:07:47.752000+00:00		23	34.306	

Mercedes

```
In [65]: stintInformation.query('driver_number == 63 or driver_number == 44')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1230	9474	1	63	1	3	MEDIUM	
18	1230	9474	1	44	1	9	MEDIUM	
20	1230	9474	2	63	4	9	MEDIUM	
39	1230	9474	2	44	10	14	SOFT	
41	1230	9474	3	63	10	16	SOFT	
55	1230	9474	3	44	15	20	MEDIUM	
64	1230	9474	4	63	17	19	MEDIUM	
71	1230	9474	5	63	20	25	MEDIUM	
72	1230	9474	4	44	21	23	MEDIUM	

```
In [66]: libraryDataF1.getinfolongruns(jointables2, 44, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
257	Lewis HAMILTON	SOFT	2024-03-07T17:46:18.619000+00:00		13	32.742	
329	Lewis HAMILTON	MEDIUM	2024-03-07T17:57:02.240000+00:00		15	34.992	
349	Lewis HAMILTON	MEDIUM	2024-03-07T17:58:36.820000+00:00		16	34.878	
368	Lewis HAMILTON	MEDIUM	2024-03-07T18:00:11.560000+00:00		17	35.492	
388	Lewis HAMILTON	MEDIUM	2024-03-07T18:01:49.247000+00:00		18	34.698	

```
In [67]: libraryDataF1.getinfolongruns(jointables2, 63, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
45	George RUSSELL	MEDIUM	2024-03-07T17:14:03.342000+00:00		2	33.456	
369	George RUSSELL	MEDIUM	2024-03-07T18:00:16.167000+00:00		17	34.796	
389	George RUSSELL	MEDIUM	2024-03-07T18:01:50.524000+00:00		18	34.825	
432	George RUSSELL	MEDIUM	2024-03-07T18:05:20.008000+00:00		20	35.025	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_lap
450	George RUSSELL	MEDIUM	2024-03-07T18:06:54.667000+00:00		21		34.922	

McLaren

```
In [68]: stintInformation.query('driver_number == 81 or driver_number == 4')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
3	1230	9474	1	81	1	5	MEDIUM	
4	1230	9474	1	4	1	6	HARD	
23	1230	9474	2	81	6	9	MEDIUM	
24	1230	9474	2	4	7	9	SOFT	
37	1230	9474	3	4	10	14	SOFT	
42	1230	9474	3	81	10	16	SOFT	
54	1230	9474	4	4	15	16	SOFT	
65	1230	9474	5	4	17	24	HARD	
66	1230	9474	4	81	17	25	MEDIUM	
76	1230	9474	5	81	26	28	SOFT	

```
In [69]: libraryDataF1.getinfolongruns(jointables2,4,'McLaren',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_lap
280	Lando NORRIS	SOFT	2024-03-07T17:51:26.915000+00:00		13	32.572		
363	Lando NORRIS	SOFT	2024-03-07T17:59:45.288000+00:00		15	34.274		
406	Lando NORRIS	HARD	2024-03-07T18:03:14.157000+00:00		17	34.770		
426	Lando NORRIS	HARD	2024-03-07T18:04:49.092000+00:00		18	34.734		
445	Lando NORRIS	HARD	2024-03-07T18:06:23.812000+00:00		19	34.726		
464	Lando NORRIS	HARD	2024-03-07T18:07:58.767000+00:00		20	34.555		
483	Lando NORRIS	HARD	2024-03-07T18:09:33.400000+00:00		21	34.402		

```
In [70]: libraryDataF1.getinfolongruns(jointables2,81,'McLaren',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_lap
259	Oscar PIASTRI	SOFT	2024-03-07T17:46:36.192000+00:00		15	32.866		
314	Oscar PIASTRI	MEDIUM	2024-03-07T17:55:35.292000+00:00		17	34.707		

	full_name	compound	date_start	lap_number	duration_sector_1	dt
331	Oscar PIASTRI	MEDIUM	2024-03-07T17:57:09.943000+00:00	18	34.575	
351	Oscar PIASTRI	MEDIUM	2024-03-07T17:58:44.428000+00:00	19	34.883	
371	Oscar PIASTRI	MEDIUM	2024-03-07T18:00:19.408000+00:00	20	35.014	
391	Oscar PIASTRI	MEDIUM	2024-03-07T18:01:54.528000+00:00	21	35.087	
410	Oscar PIASTRI	MEDIUM	2024-03-07T18:03:29.722000+00:00	22	35.250	
428	Oscar PIASTRI	MEDIUM	2024-03-07T18:05:06.191000+00:00	23	34.979	

Aston Martin

In [71]: `stintInformation.query('driver_number == 18 or driver_number == 14')`

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
8	1230	9474	1	14	1	8	MEDIUM	
10	1230	9474	1	18	1	8	MEDIUM	
32	1230	9474	2	14	9	14	SOFT	
33	1230	9474	2	18	9	14	SOFT	
56	1230	9474	3	18	15	25	MEDIUM	
57	1230	9474	3	14	15	29	MEDIUM	
75	1230	9474	4	18	26	28	SOFT	

In [72]: `libraryDataF1.getinfolongruns(jointables2, 14, 'Aston Martin', MINIMUN_SECOND)`

	full_name	compound	date_start	lap_number	duration_sector_1	dt
218	Fernando ALONSO	SOFT	2024-03-07T17:39:45.201000+00:00	12	32.604	
231	Fernando ALONSO	SOFT	2024-03-07T17:41:32.143000+00:00	13	32.287	
279	Fernando ALONSO	MEDIUM	2024-03-07T17:51:19.635000+00:00	15	34.750	
289	Fernando ALONSO	MEDIUM	2024-03-07T17:52:55.025000+00:00	16	34.766	
305	Fernando ALONSO	MEDIUM	2024-03-07T17:54:28.930000+00:00	17	34.645	
321	Fernando ALONSO	MEDIUM	2024-03-07T17:56:03.393000+00:00	18	34.723	
338	Fernando ALONSO	MEDIUM	2024-03-07T17:57:38.208000+00:00	19	34.710	
358	Fernando ALONSO	MEDIUM	2024-03-07T17:59:12.767000+00:00	20	34.906	
377	Fernando ALONSO	MEDIUM	2024-03-07T18:00:47.350000+00:00	21	35.025	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
397	Fernando ALONSO	MEDIUM	2024-03-07T18:02:22.351000+00:00		22	35.399	
417	Fernando ALONSO	MEDIUM	2024-03-07T18:04:02.545000+00:00		23	34.774	
436	Fernando ALONSO	MEDIUM	2024-03-07T18:05:37.569000+00:00		24	34.700	
455	Fernando ALONSO	MEDIUM	2024-03-07T18:07:12.511000+00:00		25	34.925	
...	Fernando	MEDIUM	2024-03-07T18:09:47.000000+00:00		26	35.100	

In [73]: `libraryDataF1.getinfolongruns(jointables2, 18, 'Aston Martin', MINIMUM_SECONDS)`

	full_name	compound		date_start	lap_number	duration_sector_1	dt
291	Lance STROLL	MEDIUM	2024-03-07T17:53:01.223000+00:00		15	34.912	
306	Lance STROLL	MEDIUM	2024-03-07T17:54:36.119000+00:00		16	35.033	
322	Lance STROLL	MEDIUM	2024-03-07T17:56:11.308000+00:00		17	34.833	
339	Lance STROLL	MEDIUM	2024-03-07T17:57:46.290000+00:00		18	34.695	
359	Lance STROLL	MEDIUM	2024-03-07T17:59:20.986000+00:00		19	35.053	
379	Lance STROLL	MEDIUM	2024-03-07T18:00:56.688000+00:00		20	34.899	
399	Lance STROLL	MEDIUM	2024-03-07T18:02:31.733000+00:00		21	35.249	
419	Lance STROLL	MEDIUM	2024-03-07T18:04:07.950000+00:00		22	34.975	
438	Lance STROLL	MEDIUM	2024-03-07T18:05:43.619000+00:00		23	34.987	
457	Lance STROLL	MEDIUM	2024-03-07T18:07:19.164000+00:00		24	35.425	

RB

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
16	1230	9474	1	22	1	9	SOFT	
19	1230	9474	1	3	1	11	SOFT	
38	1230	9474	2	22	10	14	SOFT	
46	1230	9474	2	3	12	17	SOFT	
58	1230	9474	3	22	15	29	SOFT	
69	1230	9474	3	3	18	30	SOFT	

```
In [75]: libraryDataF1.getinfolongruns(jointables2,3,'RB',MINIMUN_SECONDS,MAXIMUM_SI
```

	full_name	compound	date_start	lap_number	duration_sector_1
307	Daniel RICCIARDO	SOFT	2024-03-07T17:54:47.054000+00:00	18	34.975
324	Daniel RICCIARDO	SOFT	2024-03-07T17:56:22.064000+00:00	19	35.097
343	Daniel RICCIARDO	SOFT	2024-03-07T17:57:57.483000+00:00	20	34.738
361	Daniel RICCIARDO	SOFT	2024-03-07T17:59:32.065000+00:00	21	34.969
381	Daniel RICCIARDO	SOFT	2024-03-07T18:01:07.121000+00:00	22	34.974
401	Daniel RICCIARDO	SOFT	2024-03-07T18:02:42.064000+00:00	23	35.080
421	Daniel RICCIARDO	SOFT	2024-03-07T18:04:17.201000+00:00	24	35.106
440	Daniel RICCIARDO	SOFT	2024-03-07T18:05:52.706000+00:00	25	35.151
459	Daniel RICCIARDO	SOFT	2024-03-07T18:07:28.314000+00:00	26	35.210
477	Daniel RICCIARDO	SOFT	2024-03-07T18:09:04.225000+00:00	27	35.377

```
In [76]: libraryDataF1.getinfolongruns(jointables2,22,'RB',MINIMUN_SECONDS,MAXIMUM_SI
```

	full_name	compound	date_start	lap_number	duration_sector_1	d
232	Yuki TSUNODA	SOFT	2024-03-07T17:41:38.648000+00:00	13	33.030	
278	Yuki TSUNODA	SOFT	2024-03-07T17:51:07.058000+00:00	15	35.520	
287	Yuki TSUNODA	SOFT	2024-03-07T17:52:42.872000+00:00	16	35.627	
302	Yuki TSUNODA	SOFT	2024-03-07T17:54:19.316000+00:00	17	35.626	
319	Yuki TSUNODA	SOFT	2024-03-07T17:55:55.484000+00:00	18	35.450	
336	Yuki TSUNODA	SOFT	2024-03-07T17:57:31.504000+00:00	19	35.172	
356	Yuki TSUNODA	SOFT	2024-03-07T17:59:06.763000+00:00	20	35.496	
375	Yuki TSUNODA	SOFT	2024-03-07T18:00:42.461000+00:00	21	35.049	
395	Yuki TSUNODA	SOFT	2024-03-07T18:02:17.701000+00:00	22	35.085	
415	Yuki TSUNODA	SOFT	2024-03-07T18:03:53.123000+00:00	23	35.093	
434	Yuki TSUNODA	SOFT	2024-03-07T18:05:28.408000+00:00	24	35.210	

	full_name	compound		date_start	lap_number	duration_sector_1	d
452	Yuki TSUNODA	SOFT	2024-03-07T18:07:04.057000+00:00		25		35.119
--	Yuki	--	--	--	--	--	--

Haas

In [77]: `libraryDataF1.getinfolongruns(jointables2, 20, 'Haas F1 Team', MINIMUN_SECOND)`

	full_name	compound		date_start	lap_number	duration_sector_1
288	Kevin MAGNUSEN	SOFT	2024-03-07T17:52:48.056000+00:00		12	35.905
304	Kevin MAGNUSEN	SOFT	2024-03-07T17:54:25.208000+00:00		13	35.442
320	Kevin MAGNUSEN	SOFT	2024-03-07T17:56:00.067000+00:00		14	35.131
337	Kevin MAGNUSEN	SOFT	2024-03-07T17:57:35.487000+00:00		15	35.361
357	Kevin MAGNUSEN	SOFT	2024-03-07T17:59:11.074000+00:00		16	34.866
376	Kevin MAGNUSEN	SOFT	2024-03-07T18:00:46.170000+00:00		17	35.040
396	Kevin MAGNUSEN	SOFT	2024-03-07T18:02:21.839000+00:00		18	34.983
416	Kevin MAGNUSEN	SOFT	2024-03-07T18:03:57.065000+00:00		19	34.919
435	Kevin MAGNUSEN	SOFT	2024-03-07T18:05:32.250000+00:00		20	34.827
453	Kevin MAGNUSEN	SOFT	2024-03-07T18:07:07.414000+00:00		21	34.840
472	Kevin MAGNUSEN	SOFT	2024-03-07T18:08:42.568000+00:00		22	35.029

In [78]: `libraryDataF1.getinfolongruns(jointables2, 27, 'Haas F1 Team', MINIMUN_SECOND)`

	full_name	compound		date_start	lap_number	duration_sector_1
274	Nico HULKENBERG	HARD	2024-03-07T17:50:52.657000+00:00		13	35.420
283	Nico HULKENBERG	HARD	2024-03-07T17:52:28.434000+00:00		14	35.084
298	Nico HULKENBERG	HARD	2024-03-07T17:54:03.710000+00:00		15	35.130
315	Nico HULKENBERG	HARD	2024-03-07T17:55:39.182000+00:00		16	35.134
332	Nico HULKENBERG	HARD	2024-03-07T17:57:14.437000+00:00		17	35.092
352	Nico HULKENBERG	HARD	2024-03-07T17:58:49.774000+00:00		18	35.251
372	Nico HULKENBERG	HARD	2024-03-07T18:00:25.507000+00:00		19	35.221

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
392	Nico HULKENBERG	HARD	2024-03-07T18:02:01.262000+00:00		20	36.510	
412	Nico HULKENBERG	HARD	2024-03-07T18:03:38.165000+00:00		21	35.202	
431	Nico HULKENBERG	HARD	2024-03-07T18:05:13.633000+00:00		22	35.160	
470	Nico HULKENBERG	CORE	2024-03-07T18:09:44.040000+00:00		23	34.500	

Alpine

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

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
323	Esteban OCON	MEDIUM	2024-03-07T17:56:14.057000+00:00		17	35.103	
341	Esteban OCON	MEDIUM	2024-03-07T17:57:49.870000+00:00		18	34.826	
360	Esteban OCON	MEDIUM	2024-03-07T17:59:24.957000+00:00		19	34.795	
380	Esteban OCON	MEDIUM	2024-03-07T18:00:59.805000+00:00		20	35.118	
400	Esteban OCON	MEDIUM	2024-03-07T18:02:35.219000+00:00		21	34.944	
420	Esteban OCON	MEDIUM	2024-03-07T18:04:10.877000+00:00		22	35.192	
439	Esteban OCON	MEDIUM	2024-03-07T18:05:46.685000+00:00		23	35.214	
458	Esteban OCON	MEDIUM	2024-03-07T18:07:22.292000+00:00		24	35.241	
476	Esteban OCON	MEDIUM	2024-03-07T18:08:57.998000+00:00		25	34.973	

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

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
21	Pierre GASLY	MEDIUM	2024-03-07T17:12:06.737000+00:00		2	35.358	
312	Pierre GASLY	MEDIUM	2024-03-07T17:55:21.338000+00:00		18	35.020	
328	Pierre GASLY	MEDIUM	2024-03-07T17:56:56.870000+00:00		19	34.818	
348	Pierre GASLY	MEDIUM	2024-03-07T17:58:31.566000+00:00		20	35.183	
367	Pierre GASLY	MEDIUM	2024-03-07T18:00:06.744000+00:00		21	36.771	
387	Pierre GASLY	MEDIUM	2024-03-07T18:01:44.165000+00:00		22	35.154	
407	Pierre GASLY	MEDIUM	2024-03-07T18:03:19.690000+00:00		23	35.040	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
427	Pierre GASLY	MEDIUM	2024-03-07T18:04:55.079000+00:00		24	35.014	
446	Pierre GASLY	MEDIUM	2024-03-07T18:06:30.311000+00:00		25	35.181	
465	Pierre GASLY	MEDIUM	2024-03-07T18:08:05.681000+00:00		26	34.793	
484	Pierre GASLY	MEDIUM	2024-03-07T18:09:40.758000+00:00		27	34.802	

Williams

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

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
20	Alexander ALBON	HARD	2024-03-07T17:12:03.062000+00:00		2	34.633	
282	Alexander ALBON	HARD	2024-03-07T17:51:40.768000+00:00		15	35.133	
292	Alexander ALBON	HARD	2024-03-07T17:53:16.078000+00:00		16	35.075	
308	Alexander ALBON	HARD	2024-03-07T17:54:51.228000+00:00		17	34.998	
325	Alexander ALBON	HARD	2024-03-07T17:56:26.253000+00:00		18	35.187	
344	Alexander ALBON	HARD	2024-03-07T17:58:01.522000+00:00		19	34.835	
362	Alexander ALBON	HARD	2024-03-07T17:59:36.148000+00:00		20	37.266	
382	Alexander ALBON	HARD	2024-03-07T18:01:13.813000+00:00		21	34.755	
402	Alexander ALBON	HARD	2024-03-07T18:02:48.652000+00:00		22	34.702	
422	Alexander ALBON	HARD	2024-03-07T18:04:23.214000+00:00		23	34.907	
441	Alexander ALBON	HARD	2024-03-07T18:05:57.773000+00:00		24	34.988	
460	Alexander ALBON	HARD	2024-03-07T18:07:33.130000+00:00		25	34.772	
479	Alexander ALBON	HARD	2024-03-07T18:09:07.314000+00:00		26	34.827	

```
In [82]: libraryDataF1.getinfolongruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
124	Logan SARGEANT	MEDIUM	2024-03-07T17:22:43.726000+00:00		7	37.178	
235	Logan SARGEANT	SOFT	2024-03-07T17:41:59.059000+00:00		13	32.980	
301	Logan SARGEANT	MEDIUM	2024-03-07T17:54:16.843000+00:00		16	35.177	

	full_name	compound		date_start	lap_number	duration_sector_1
318	Logan SARGEANT	MEDIUM	2024-03-07T17:55:52.082000+00:00		17	35.065
335	Logan SARGEANT	MEDIUM	2024-03-07T17:57:27.464000+00:00		18	35.961
378	Logan SARGEANT	MEDIUM	2024-03-07T18:00:52.540000+00:00		20	35.107
398	Logan SARGEANT	MEDIUM	2024-03-07T18:02:28.081000+00:00		21	35.328
418	Logan SARGEANT	MEDIUM	2024-03-07T18:04:03.837000+00:00		22	35.342
437	Logan SARGEANT	MEDIUM	2024-03-07T18:05:39.823000+00:00		23	35.447
456	Logan SARGEANT	MEDIUM	2024-03-07T18:07:15.529000+00:00		24	35.230
475	Logan	MEDIUM	2024-03-07T18:08:50.938000+00:00		25	35.148

Kick Sauber

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

	full_name	compound		date_start	lap_number	duration_sector_1	du
309	ZHOU Guanyu	MEDIUM	2024-03-07T17:55:10.854000+00:00		16	35.115	
326	ZHOU Guanyu	MEDIUM	2024-03-07T17:56:46.198000+00:00		17	34.966	
346	ZHOU Guanyu	MEDIUM	2024-03-07T17:58:21.266000+00:00		18	35.111	
365	ZHOU Guanyu	MEDIUM	2024-03-07T17:59:56.520000+00:00		19	34.983	
384	ZHOU Guanyu	MEDIUM	2024-03-07T18:01:31.002000+00:00		20	34.972	
404	ZHOU Guanyu	MEDIUM	2024-03-07T18:03:05.891000+00:00		21	35.353	
424	ZHOU Guanyu	MEDIUM	2024-03-07T18:04:41.673000+00:00		22	35.176	
443	ZHOU Guanyu	MEDIUM	2024-03-07T18:06:17.129000+00:00		23	35.098	
462	ZHOU Guanyu	MEDIUM	2024-03-07T18:07:52.562000+00:00		24	35.020	
482	ZHOU Guanyu	MEDIUM	2024-03-07T18:09:27.900000+00:00		25	35.045	

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

	full_name	compound		date_start	lap_number	duration_sector_1	du
313	Valtteri BOTTAS	HARD	2024-03-07T17:55:28.805000+00:00		16	35.311	
330	Valtteri BOTTAS	HARD	2024-03-07T17:57:04.731000+00:00		17	36.584	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
350	Valtteri BOTTAS	HARD	2024-03-07T17:58:41.919000+00:00		18	35.162	
370	Valtteri BOTTAS	HARD	2024-03-07T18:00:17.545000+00:00		19	35.328	
390	Valtteri BOTTAS	HARD	2024-03-07T18:01:53.243000+00:00		20	35.170	
409	Valtteri BOTTAS	HARD	2024-03-07T18:03:28.698000+00:00		21	35.998	
429	Valtteri BOTTAS	HARD	2024-03-07T18:05:09.308000+00:00		22	35.480	
449	Valtteri BOTTAS	HARD	2024-03-07T18:06:45.731000+00:00		23	36.147	
467	Valtteri	HARD	2024-03-07T18:08:22.965000+00:00		24	35.688	

Free Practice 3

Obtain setup

```
In [85]: practice = libraryDataF1.obtain_information('laps',session_key=9475)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9475)
drivers = libraryDataF1.obtain_information('drivers',session_key=9475)
```

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

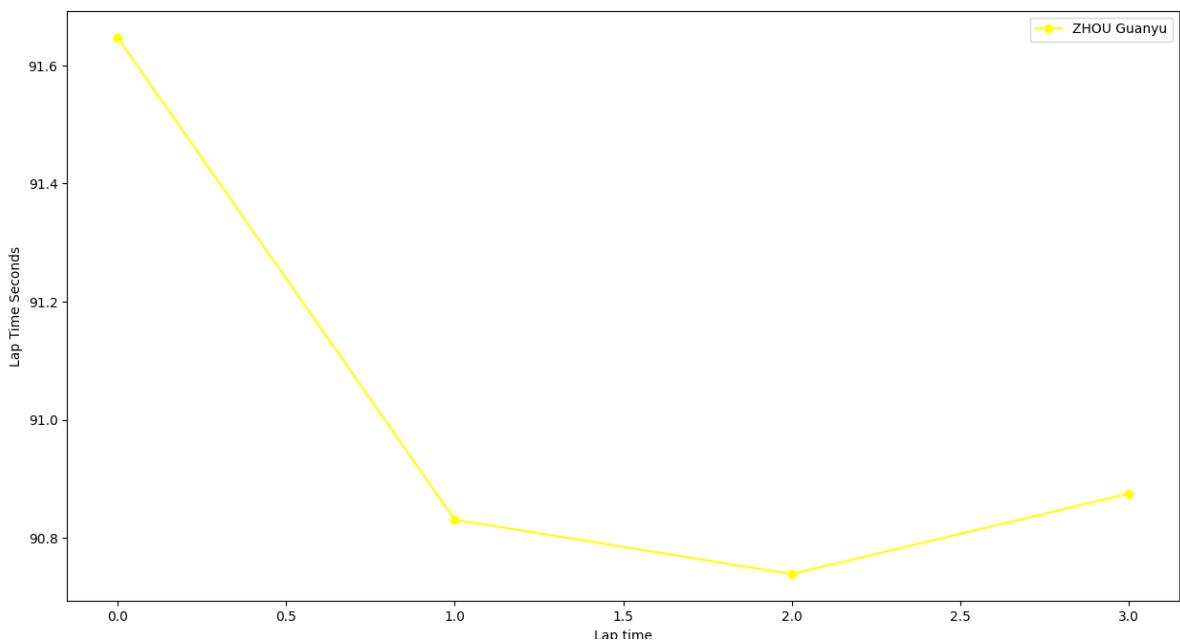
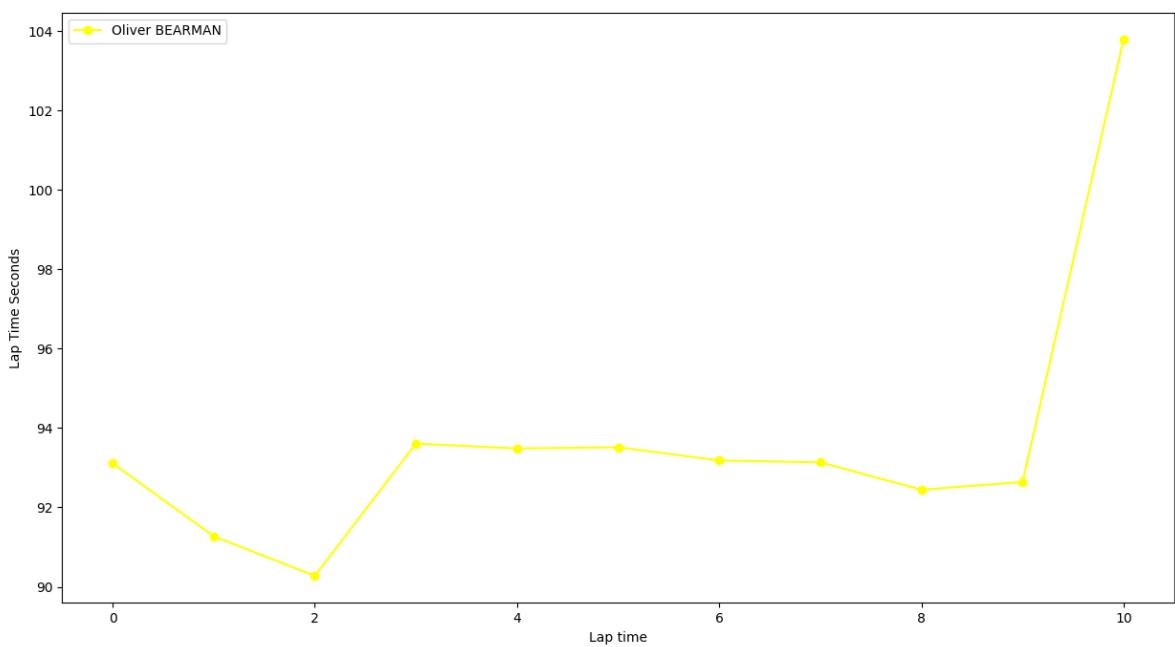
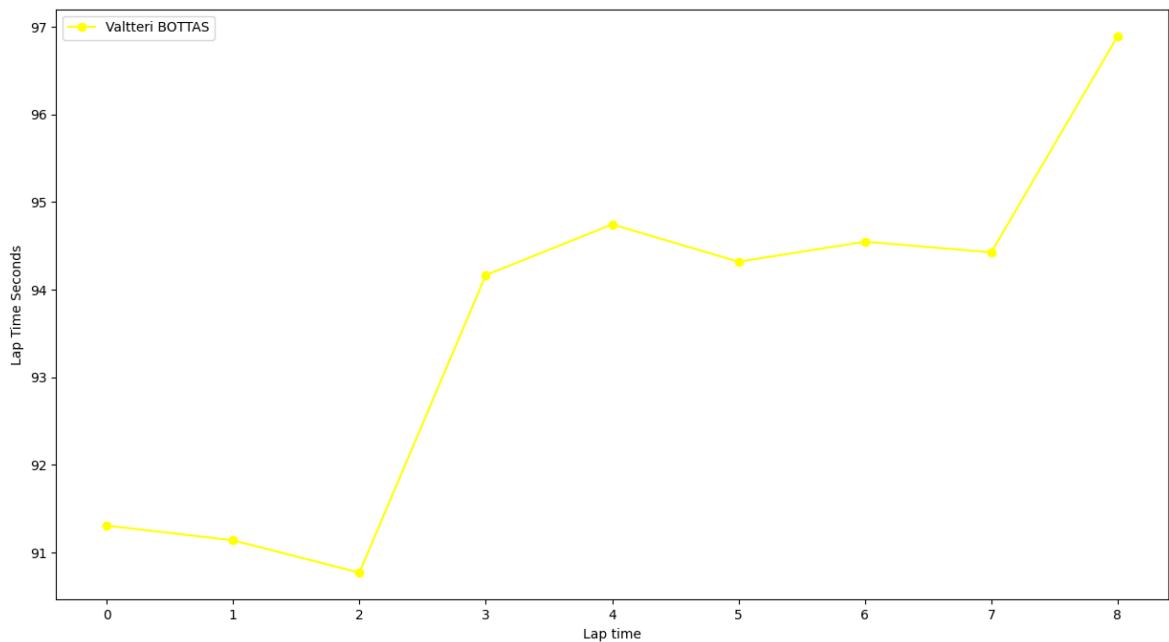
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1230	9475	77	261.0	301.0	306.0	2024-03-08T13:30:
1	1230	9475	38	207.0	283.0	305.0	2024-03-08T13:31:
2	1230	9475	77	285.0	323.0	326.0	2024-03-08T13:31:
3	1230	9475	38	281.0	323.0	327.0	2024-03-08T13:32:
4	1230	9475	77	227.0	253.0	273.0	2024-03-08T13:33:
...
274	1230	9475	22	225.0	178.0	235.0	2024-03-08T14:33:
275	1230	9475	18	283.0	228.0	242.0	2024-03-08T14:33:

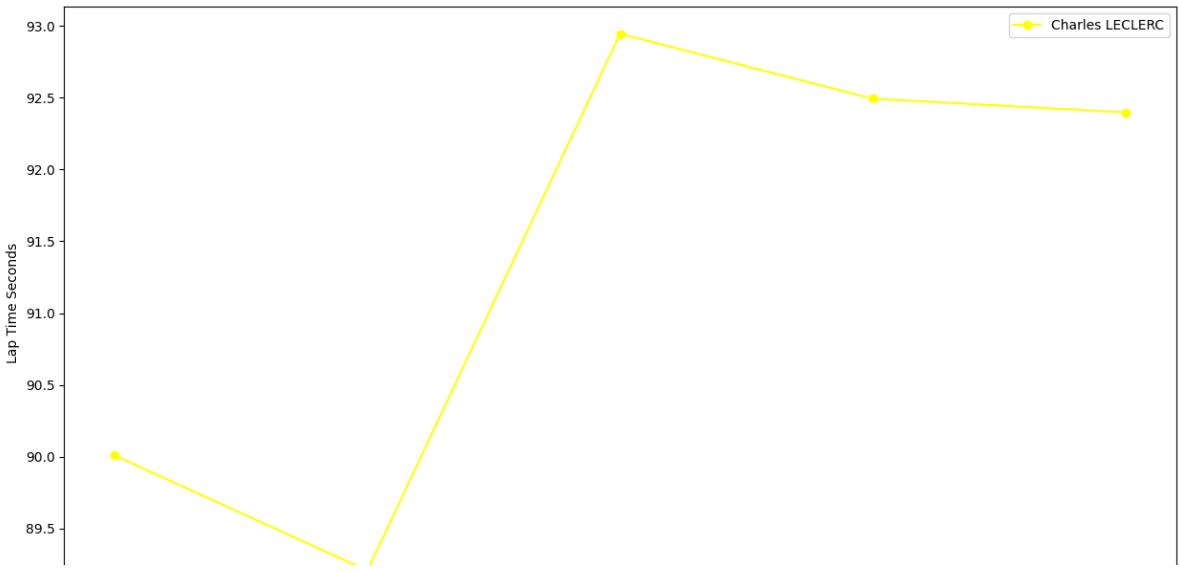
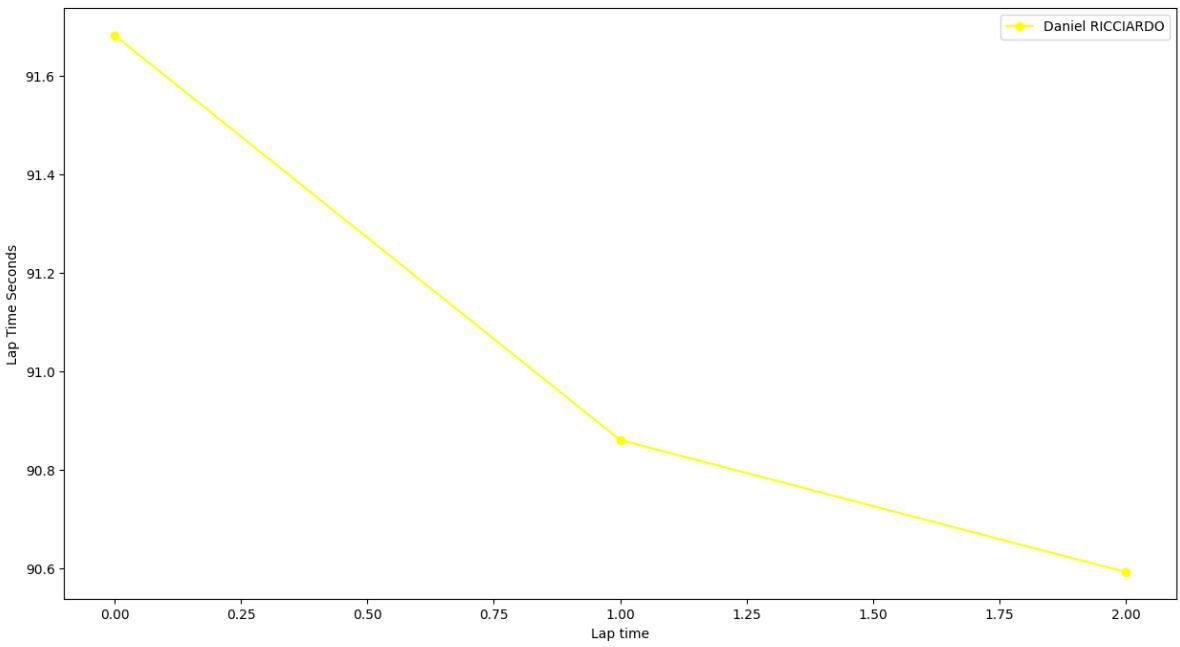
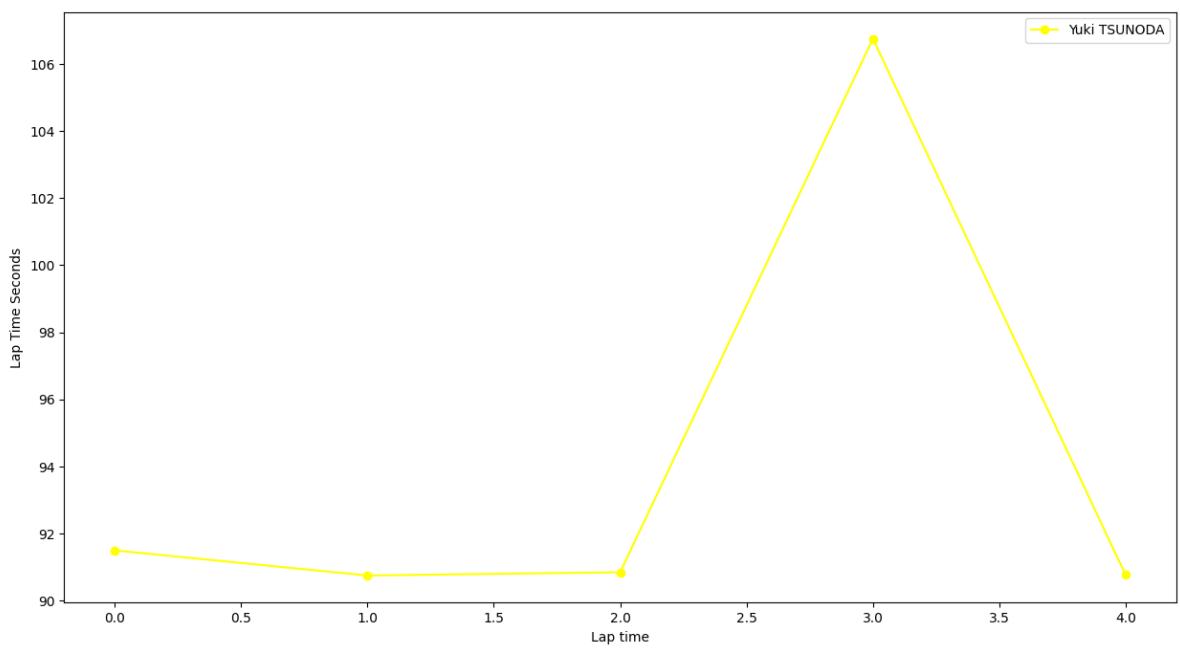
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
276	1230	9475	16	282.0	291.0	285.0	2024-03-08T14:33:
277	1230	9475	38	277.0	302.0	318.0	2024-03-08T14:33:
278	1230	9475	44	139.0	310.0	309.0	2024-03-08T14:33:

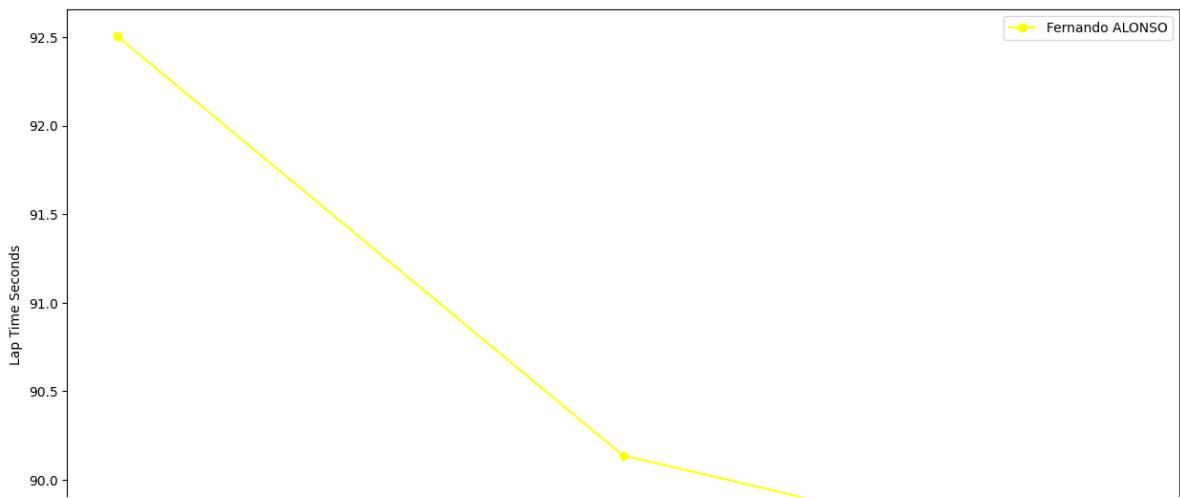
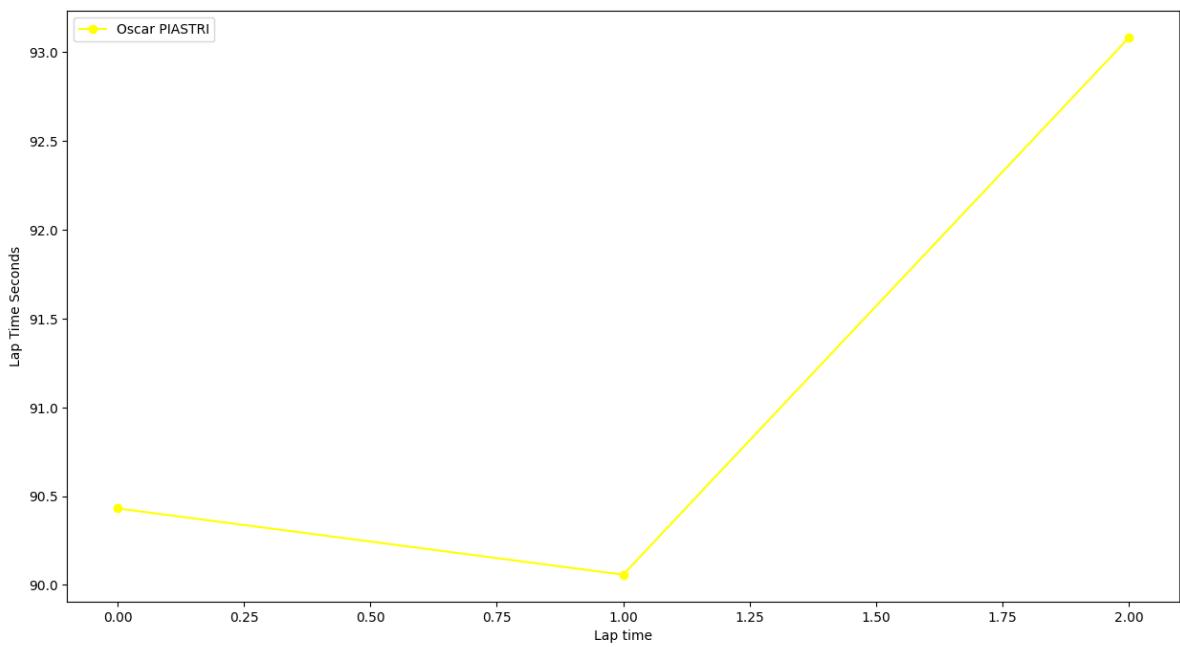
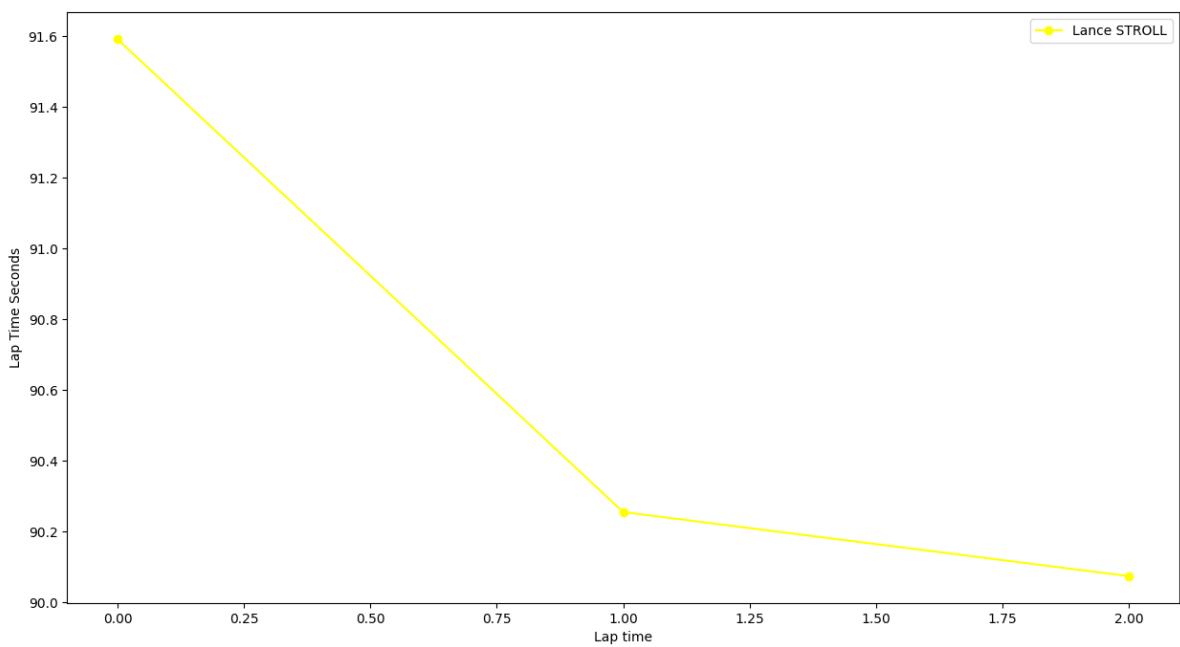
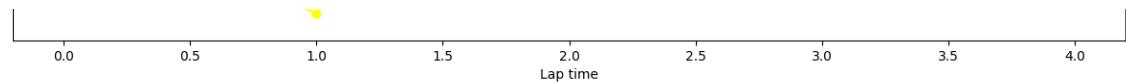
See race pace by means of the charts

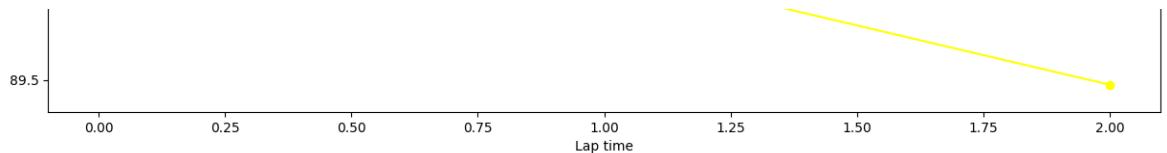
Medium tyres

```
In [87]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",108)
```



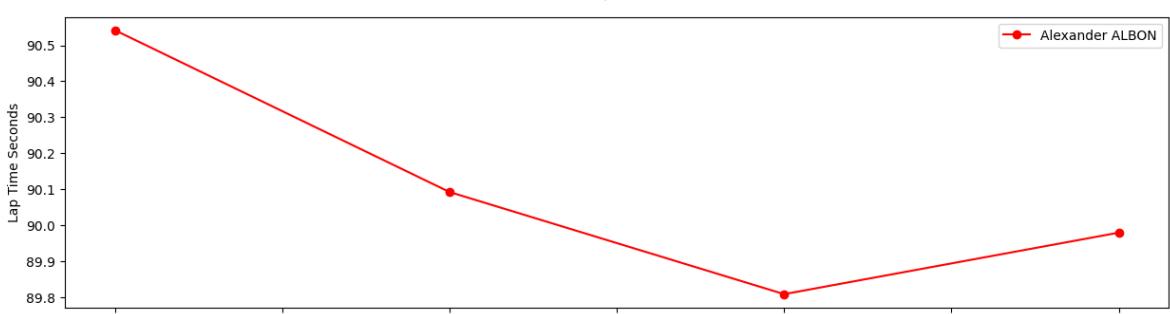
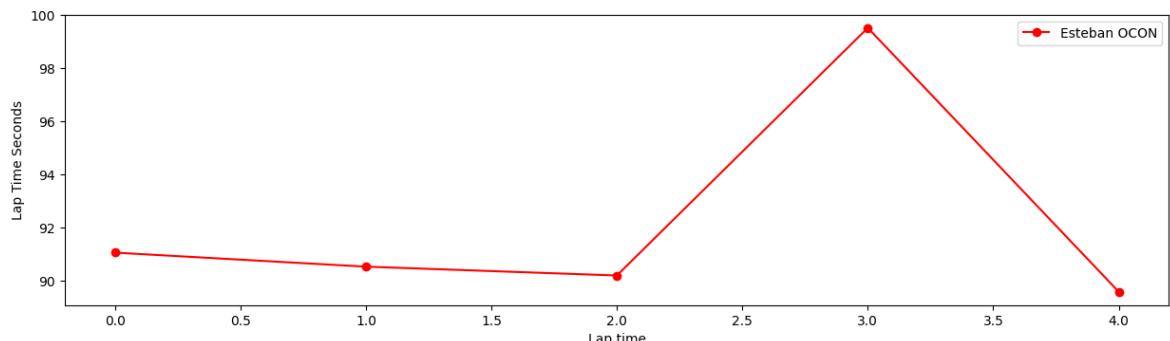
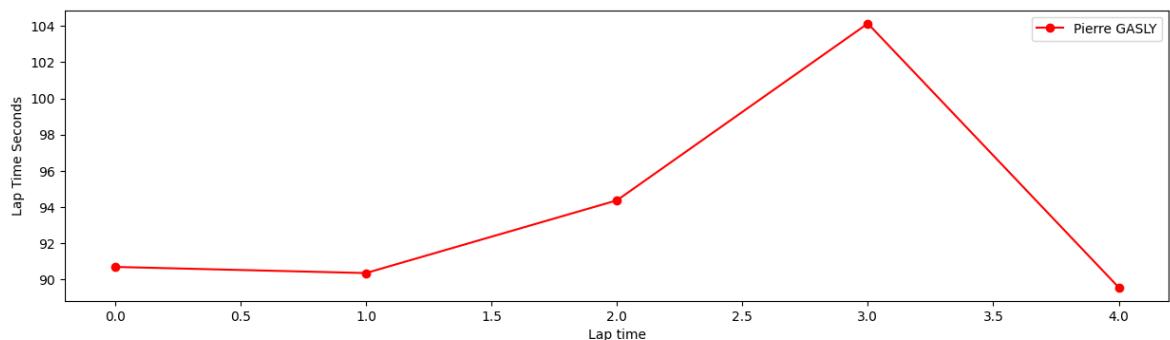
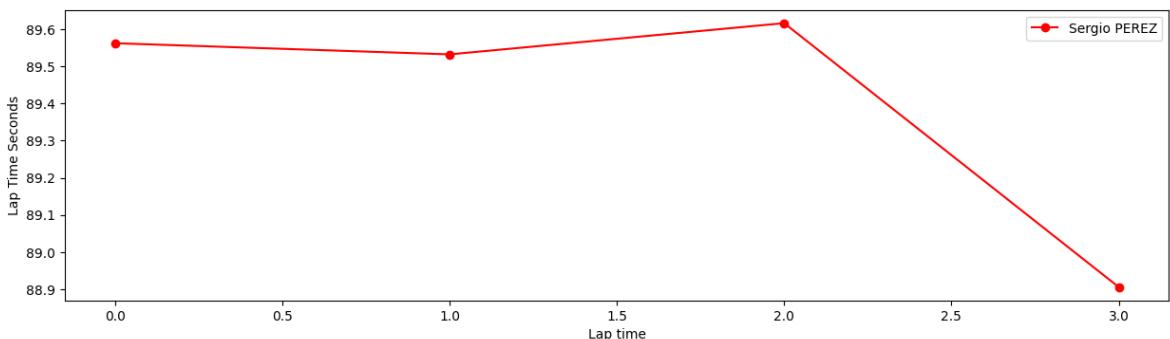
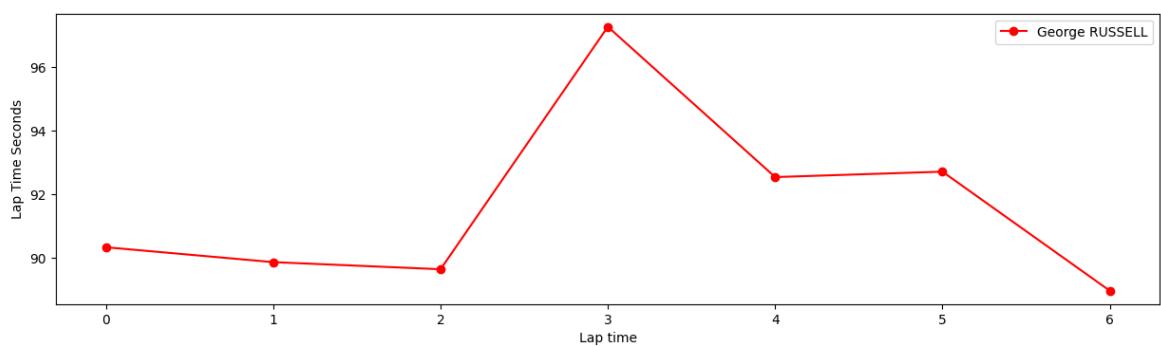
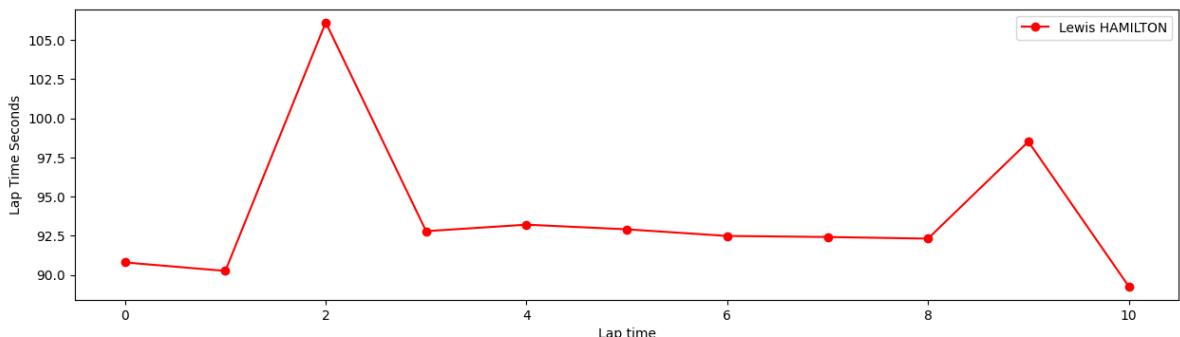


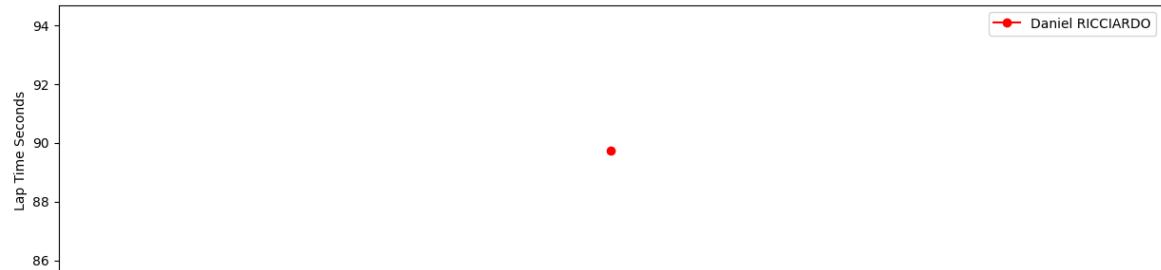
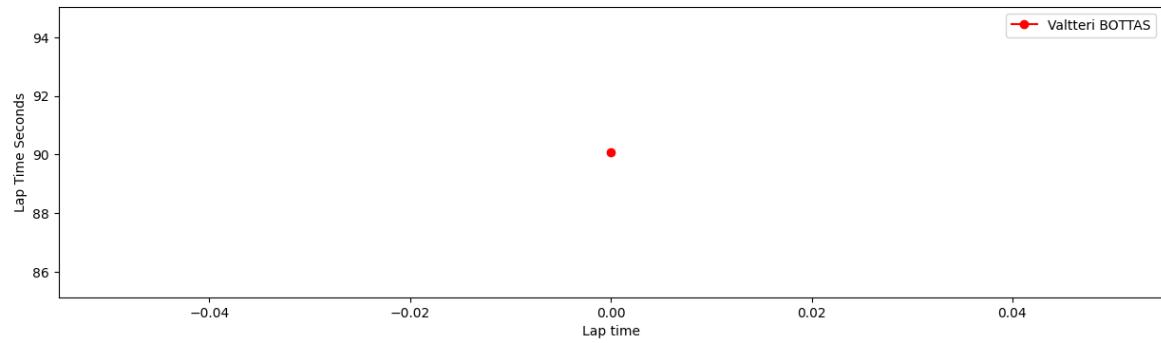
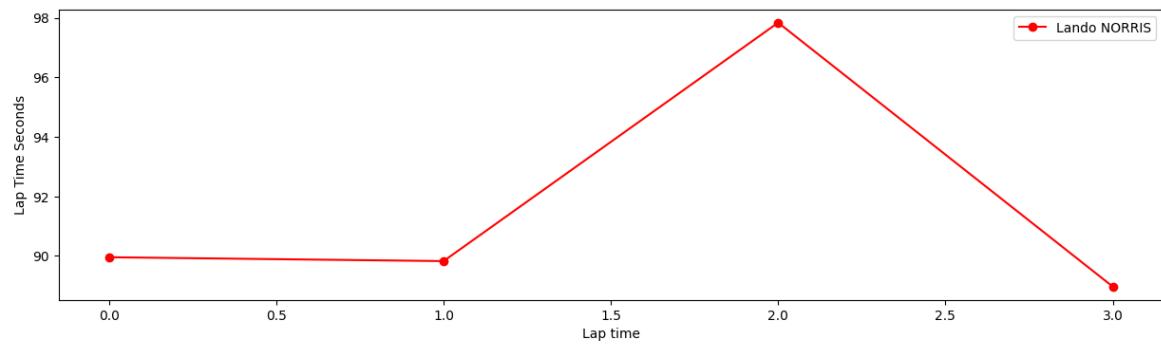
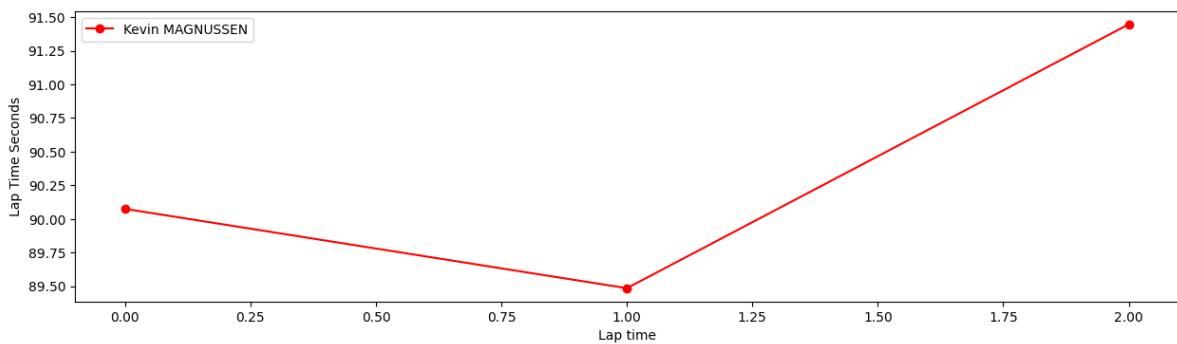
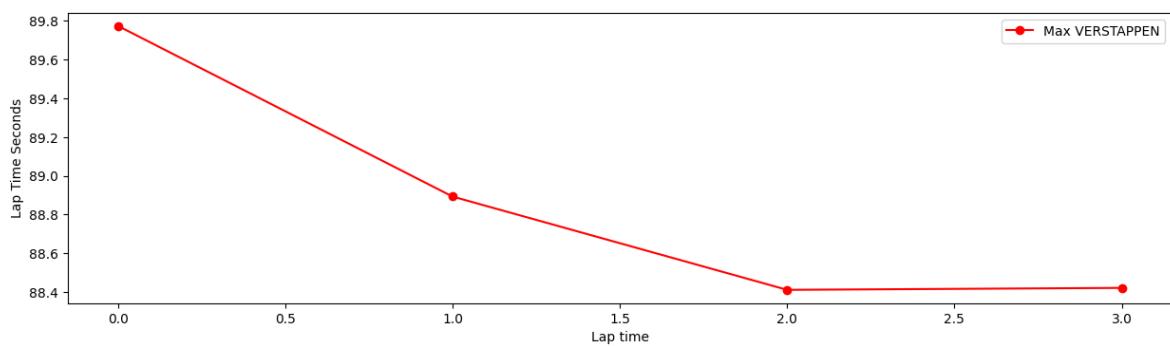
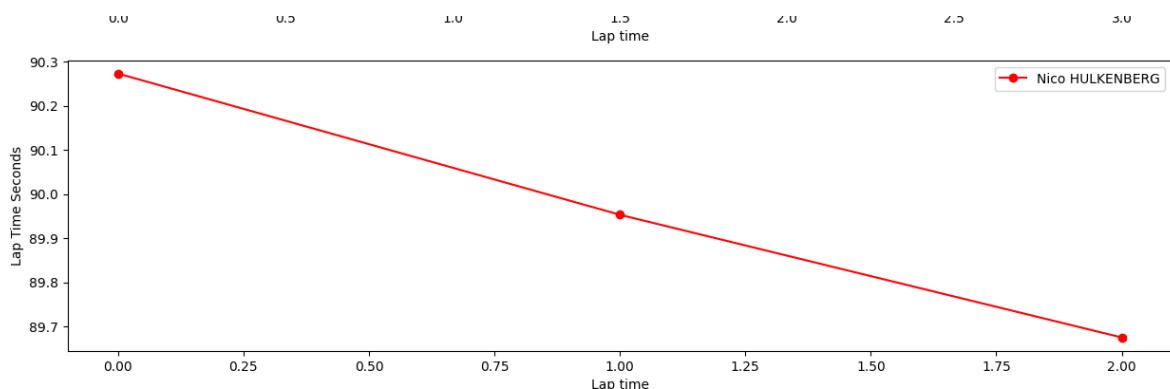


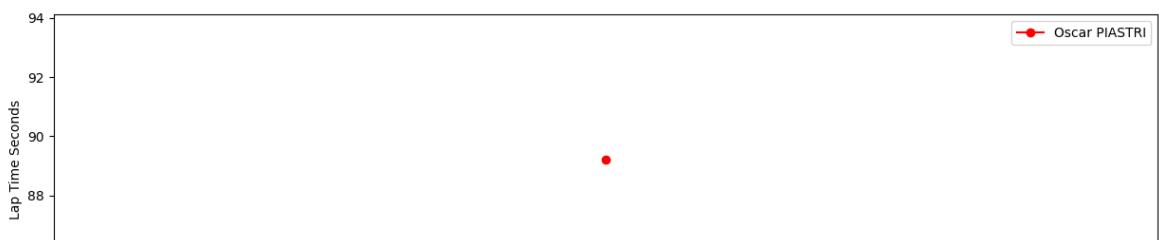
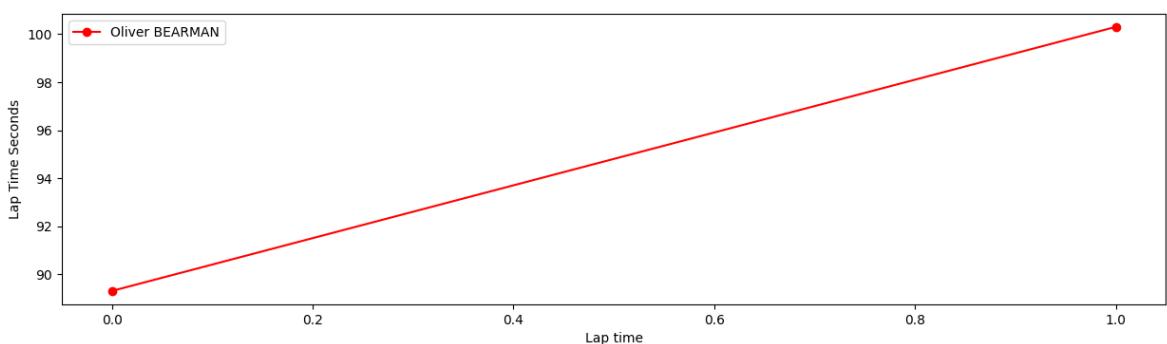
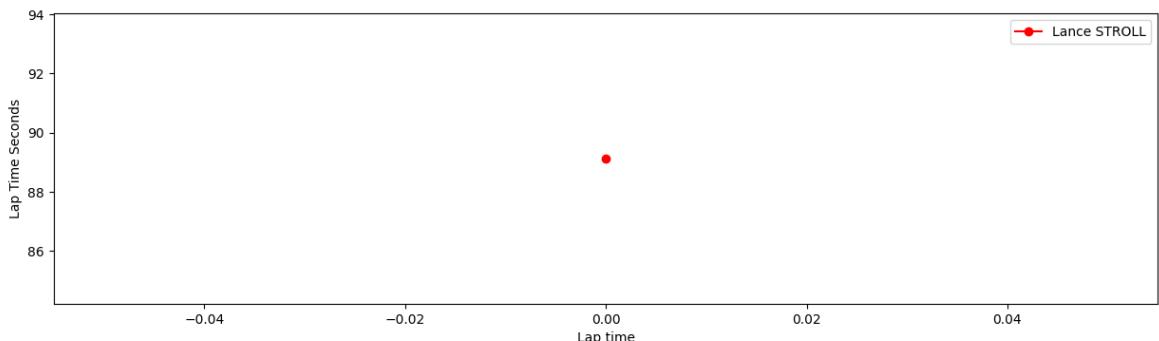
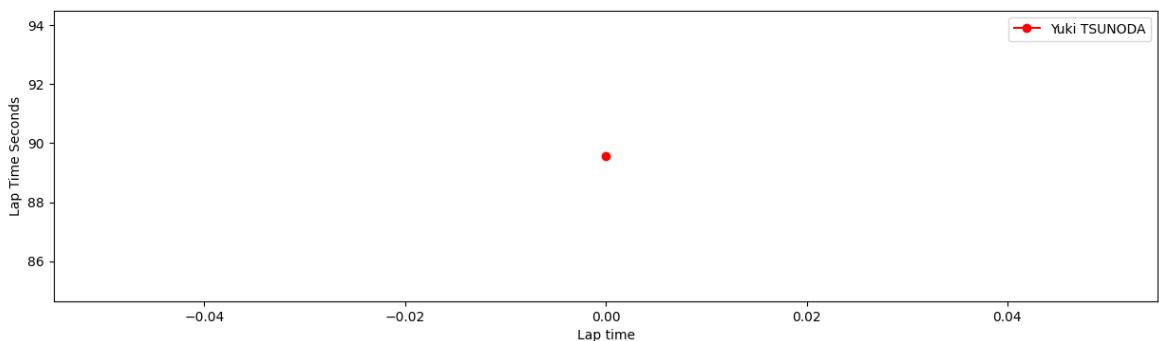
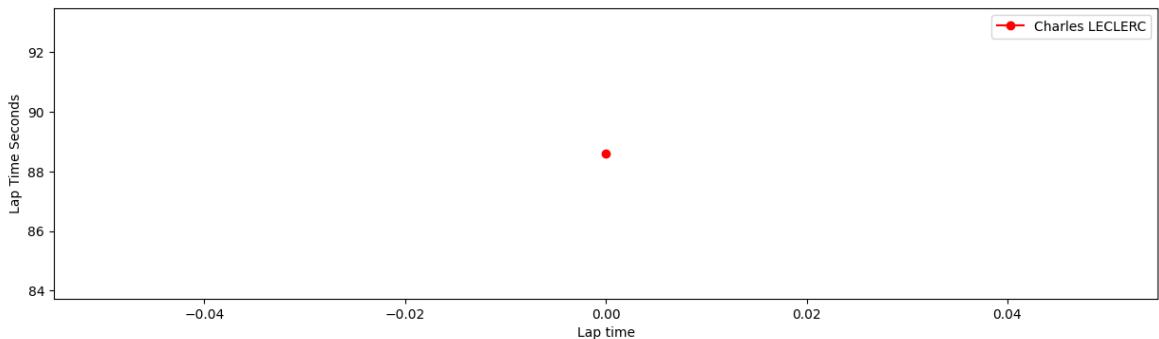
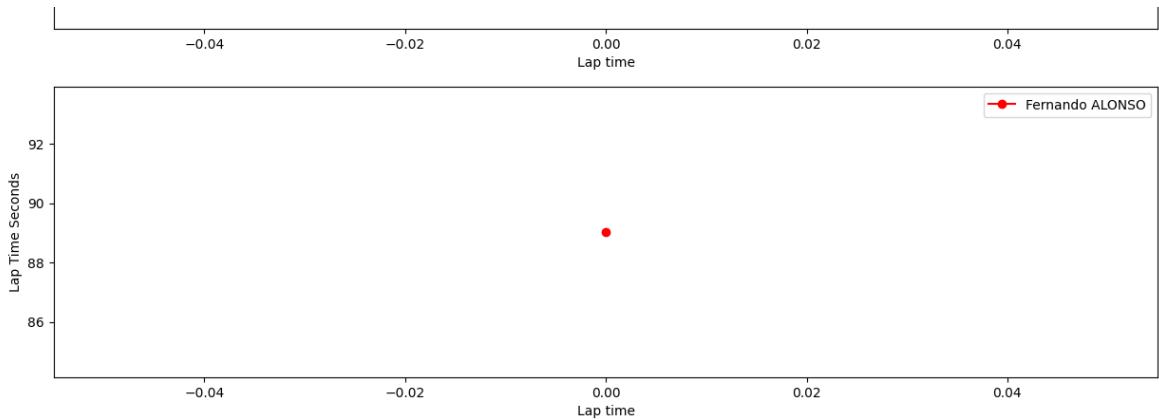


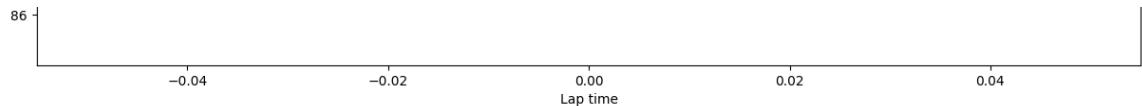
Soft tyres

```
In [88]: libraryDataF1.obtain_data_tyres(jointables2, "SOFT", 108)
```







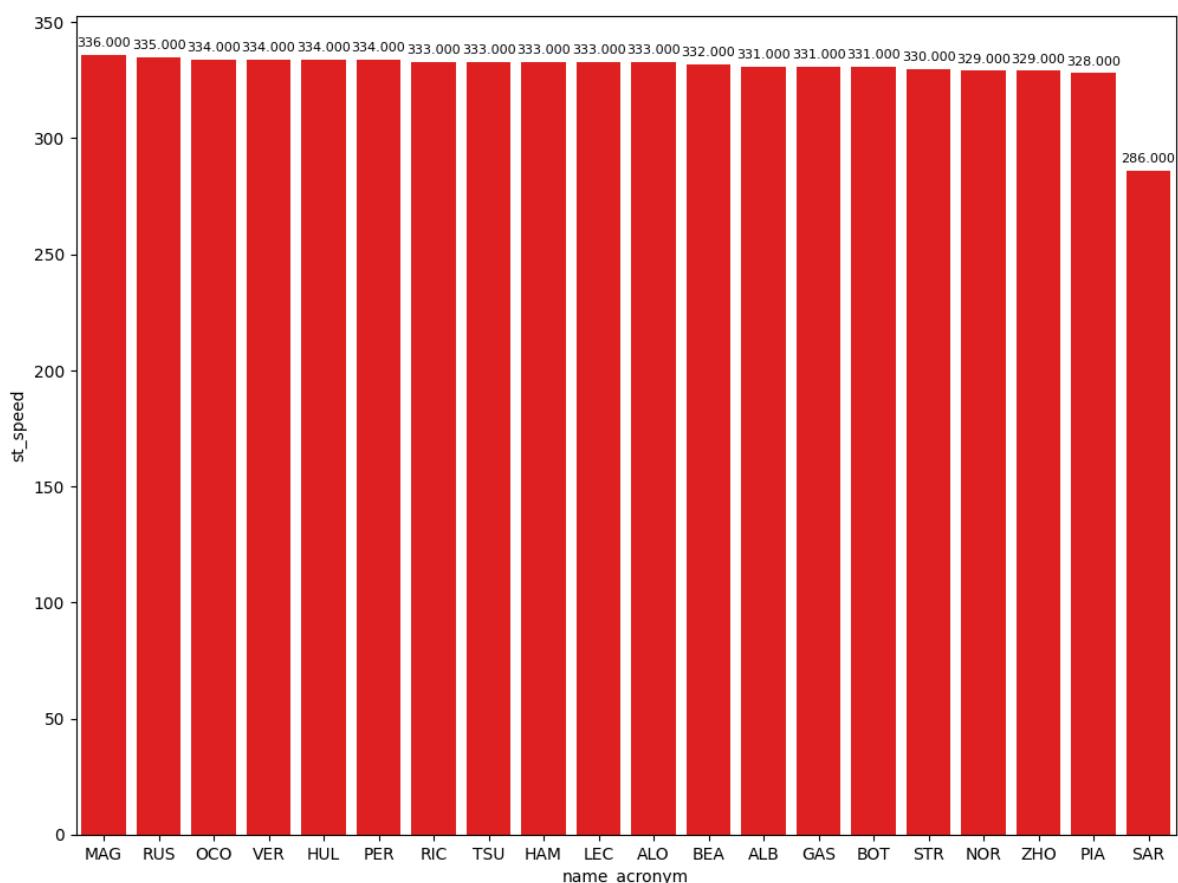


Hard tyres

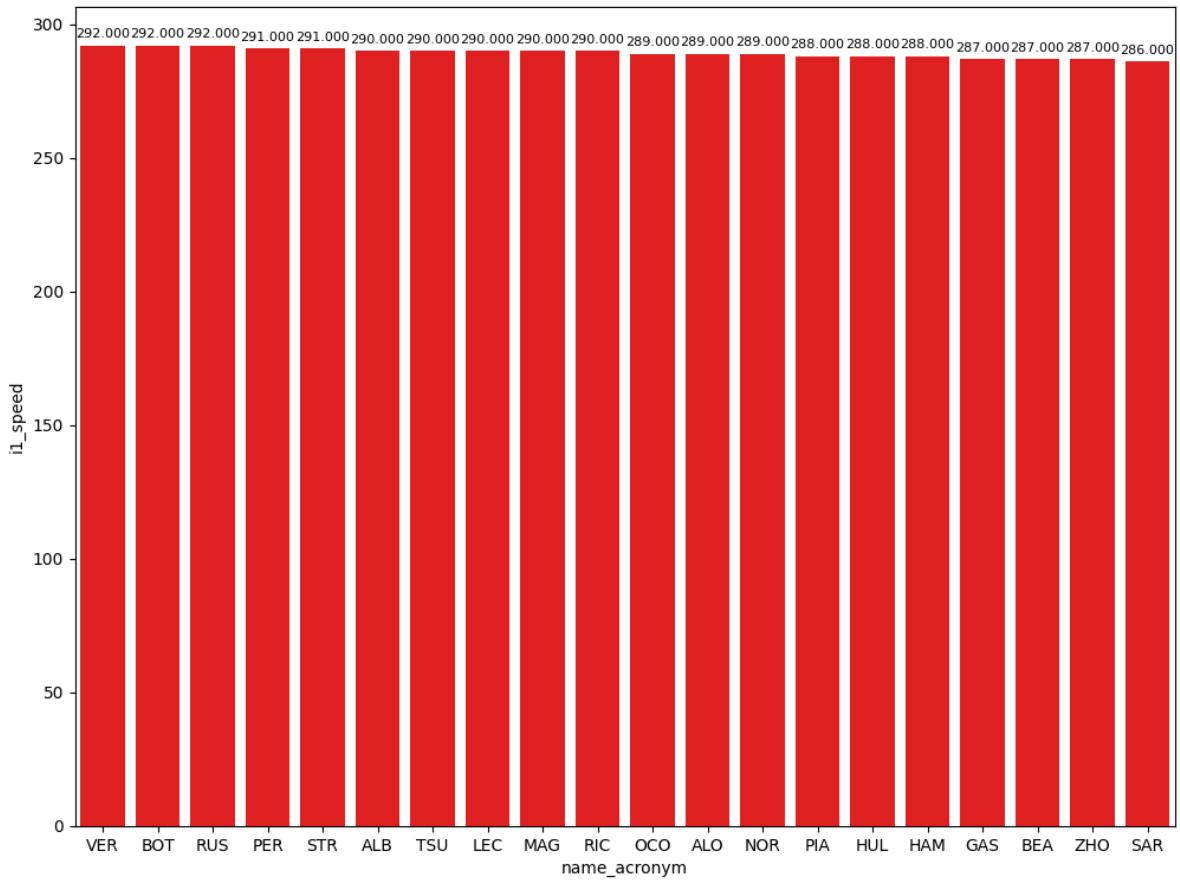
```
In [89]: #libraryDataF1.obtain_data_tyres(jointables2, "HARD", 108)
```

Speed trap

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

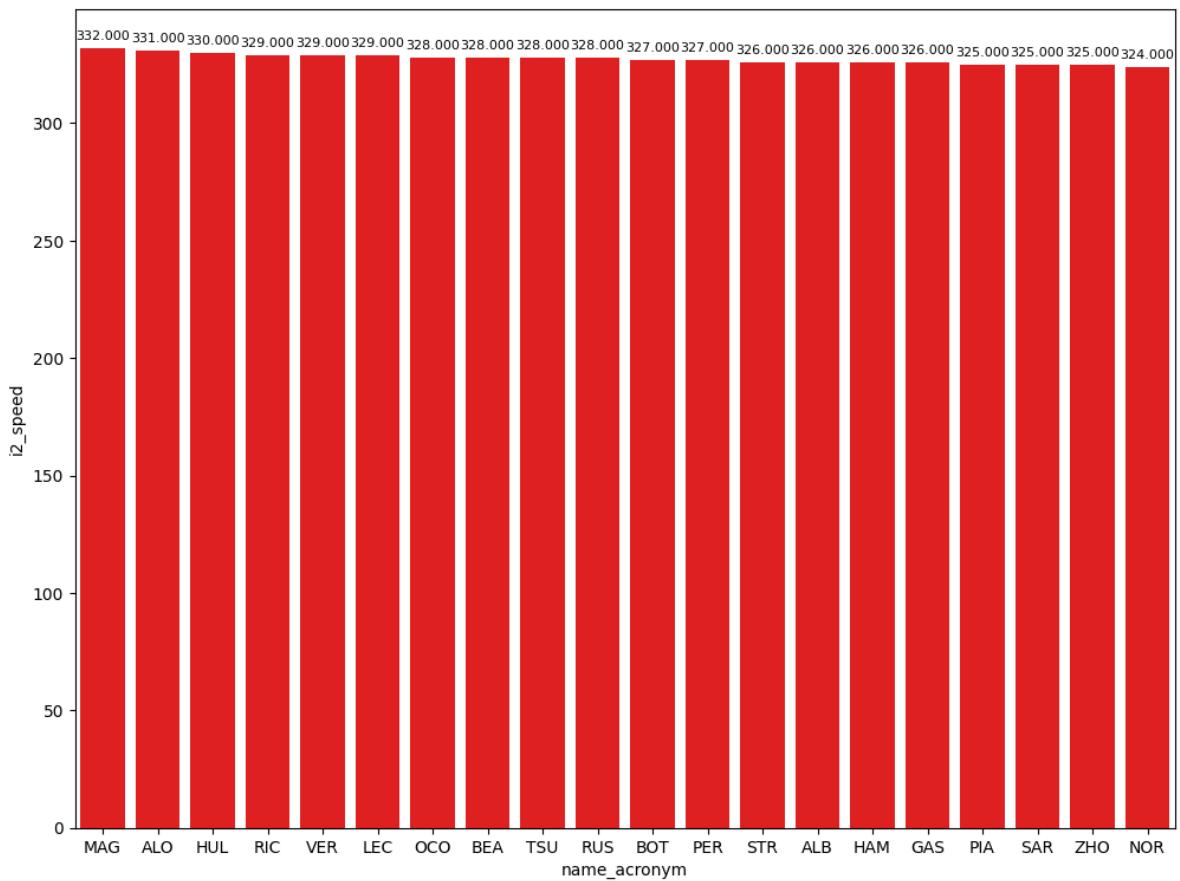


```
In [91]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed'].max()]
libraryDataF1.obtainchart("name_acronym", "i1_speed", top_speed)
```



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()]
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
11		Lance STROLL	HARD	63.091	31.925	42.962	13
91		Charles LECLERC	MEDIUM	32.526	28.249	28.431	8
166		Max VERSTAPPEN	SOFT	32.155	28.021	28.236	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

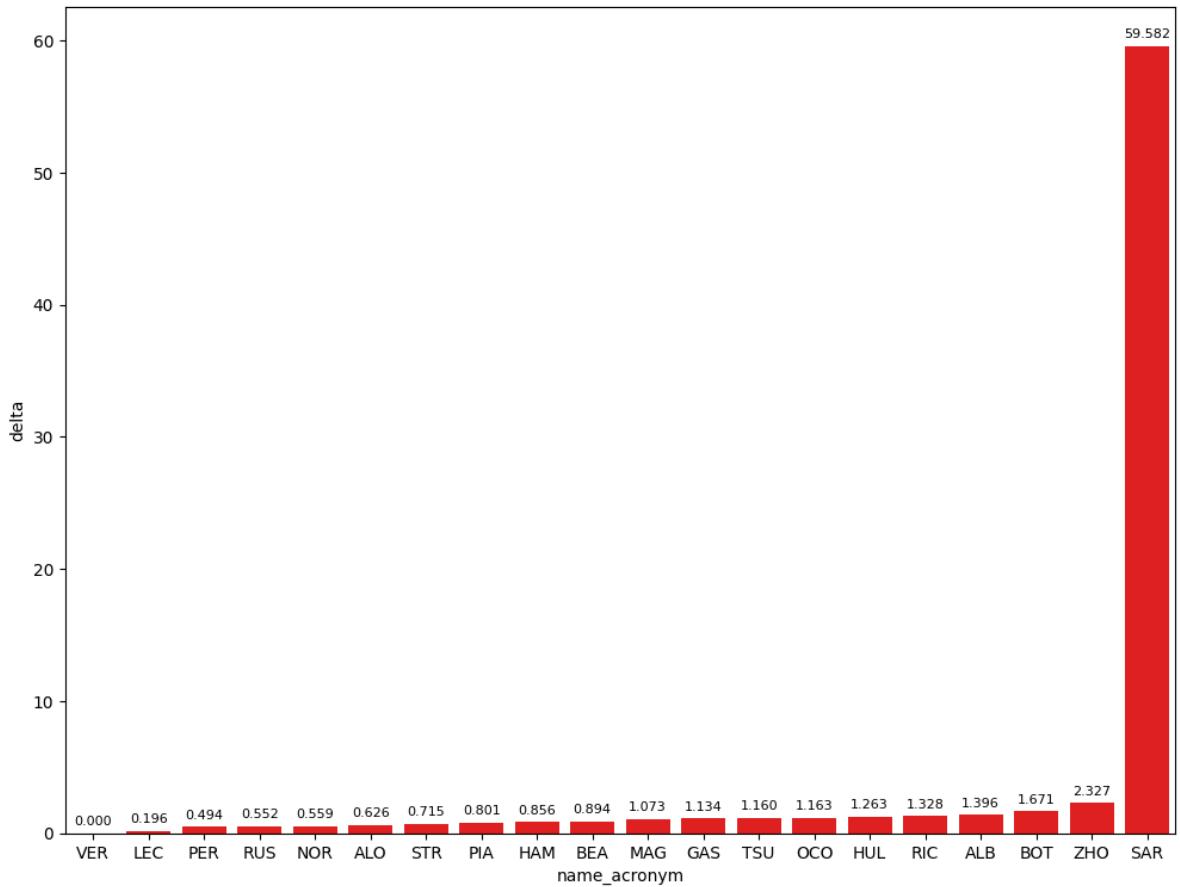
In [94]:

```
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'].min()]
sectorPace[['duration_sector_1','full_name','compound','lap_duration','lap_number']]
```

Out[96]:

	duration_sector_1	full_name	compound	lap_duration	lap_number
237	31.992	Max VERSTAPPEN	SOFT	88.422	11
220	32.141	Charles LECLERC	SOFT	88.608	13
231	32.198	Lando NORRIS	SOFT	88.971	9
233	32.235	Sergio PEREZ	SOFT	88.906	11
222	32.237	Lance STROLL	SOFT	89.127	11
219	32.256	Fernando ALONSO	SOFT	89.038	11
229	32.398	Oscar PIASTRI	SOFT	89.213	9
214	32.454	George RUSSELL	SOFT	88.964	14
223	32.499	Lewis HAMILTON	SOFT	89.268	16
227	32.607	Pierre GASLY	SOFT	89.546	11
235	32.608	Esteban OCON	SOFT	89.575	11
226	32.609	Oliver BEARMAN	SOFT	89.306	19
221	32.619	Yuki TSUNODA	SOFT	89.572	15
213	32.626	Nico HULKENBERG	SOFT	89.675	8

	duration_sector_1	full_name	compound	lap_duration	lap_number
238	32.655	Alexander ALBON	SOFT	89.979	11
148	32.656	Kevin MAGNUSSEN	SOFT	89.485	5
193	32.730	Valtteri BOTTAS	SOFT	NaN	16
215	32.777	Daniel RICCIARDO	SOFT	89.740	12
49	33.127	ZHOU Guanyu	MEDIUM	90.739	6

In [97]:

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

Out[97]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
214	27.996	George RUSSELL	SOFT	88.964	14
237	28.006	Max VERSTAPPEN	SOFT	88.422	11
219	28.020	Fernando ALONSO	SOFT	89.038	11
220	28.090	Charles LECLERC	SOFT	88.608	13
222	28.175	Lance STROLL	SOFT	89.127	11
231	28.209	Lando NORRIS	SOFT	88.971	9
233	28.217	Sergio PEREZ	SOFT	88.906	11
229	28.223	Oscar PIASTRI	SOFT	89.213	9
223	28.241	Lewis HAMILTON	SOFT	89.268	16
226	28.261	Oliver BEARMAN	SOFT	89.306	19
235	28.314	Esteban OCON	SOFT	89.575	11
215	28.332	Daniel RICCIARDO	SOFT	89.740	12
208	28.346	Kevin MAGNUSSEN	SOFT	91.447	9
213	28.359	Nico HULKENBERG	SOFT	89.675	8
227	28.379	Pierre GASLY	SOFT	89.546	11
221	28.386	Yuki TSUNODA	SOFT	89.572	15
186	28.405	Alexander ALBON	SOFT	89.808	8
211	28.461	Valtteri BOTTAS	SOFT	90.083	18
49	28.619	ZHOU Guanyu	MEDIUM	90.739	6
61	28.719	Logan SARGEANT	SOFT	147.994	2

In [98]:

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

Out[98]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
166	28.236	Max VERSTAPPEN	SOFT	88.412	8
220	28.377	Charles LECLERC	SOFT	88.608	13
226	28.436	Oliver BEARMAN	SOFT	89.306	19
156	28.438	Sergio PEREZ	SOFT	89.616	8
148	28.473	Kevin MAGNUSSEN	SOFT	89.485	5

	duration_sector_3	full_name	compound	lap_duration	lap_number
214	28.514	George RUSSELL	SOFT	88.964	14
223	28.528	Lewis HAMILTON	SOFT	89.268	16
227	28.560	Pierre GASLY	SOFT	89.546	11
231	28.564	Lando NORRIS	SOFT	88.971	9
221	28.567	Yuki TSUNODA	SOFT	89.572	15
229	28.592	Oscar PIASTRI	SOFT	89.213	9
215	28.631	Daniel RICCIARDO	SOFT	89.740	12
235	28.653	Esteban OCON	SOFT	89.575	11
186	28.678	Alexander ALBON	SOFT	89.808	8
213	28.690	Nico HULKENBERG	SOFT	89.675	8
222	28.715	Lance STROLL	SOFT	89.127	11
211	28.715	Valtteri BOTTAS	SOFT	90.083	18
173	28.716	Fernando ALONSO	MEDIUM	89.473	8
34	28.896	ZHOU Guanyu	MEDIUM	90.831	4
..	28.896	LEWIS CARPENTER	SOFT	89.473	1

Mean pace with the different compound used on the session

In [99]:

```
race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and lap_number > 10").groupby("compound").mean().reset_index())
race_pace
```

Out[99]:

lap_duration

compound	lap_duration
SOFT	91.496610
MEDIUM	92.505109

Long runs

In [100]:

```
MINIMUM_SECONDS = 84
MAXIMUM_SECONDS = 115
```

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	tyre
16	1230	9475	1		1	1	10	SOFT
17	1230	9475	1	11	1	10	SOFT	
49	1230	9475	2		1	11	14	SOFT
50	1230	9475	2	11	11	14	SOFT	

```
In [102... libraryDataF1.getinfolongruns(jointables2,1,'Red Bull Racing',MINIMUN_SECONDS,MAX)
```

```
Out[102...      full_name  compound          date_start  lap_number  duration_sector_1  
81    Max VERSTAPPEN    SOFT 2024-03-08T13:52:31.983000+00:00      2       32.682  
131   Max VERSTAPPEN    SOFT 2024-03-08T13:58:38.375000+00:00      5       32.340  
166   Max VERSTAPPEN    SOFT 2024-03-08T14:04:36.142000+00:00      8       32.155  
174   Max VERSTAPPEN    SOFT 2024-03-08T14:06:04.561000+00:00      9       39.341  
237   Max VERSTAPPEN    SOFT 2024-03-08T14:29:17.246000+00:00     11       31.992
```

```
In [103... libraryDataF1.getinfolongruns(jointables2,11,'Red Bull Racing',MINIMUN_SECONDS,MAX)
```

```
Out[103...      full_name  compound          date_start  lap_number  duration_sector_1  d...  
56    Sergio PEREZ    SOFT 2024-03-08T13:49:38.605000+00:00      2       32.782  
112   Sergio PEREZ    SOFT 2024-03-08T13:56:28.703000+00:00      5       32.781  
156   Sergio PEREZ    SOFT 2024-03-08T14:03:01.833000+00:00      8       32.736  
233   Sergio PEREZ    SOFT 2024-03-08T14:28:53.677000+00:00     11       32.235
```

Ferrari

```
In [104... libraryDataF1.getinfolongruns(jointables2,16,'Ferrari',MINIMUN_SECONDS,MAX)
```

```
Out[104...      full_name  compound          date_start  lap_number  duration_sector_1  d...  
44    Charles LECLERC  MEDIUM 2024-03-08T13:47:28.540000+00:00      2       32.790  
91    Charles LECLERC  MEDIUM 2024-03-08T13:54:00.548000+00:00      5       32.526  
176   Charles LECLERC  MEDIUM 2024-03-08T14:06:43.655000+00:00      8       34.290  
181   Charles LECLERC  MEDIUM 2024-03-08T14:08:16.563000+00:00      9       33.883  
185   Charles LECLERC  MEDIUM 2024-03-08T14:09:49.068000+00:00     10       33.811  
220   Charles LECLERC  SOFT   2024-03-08T14:27:44.503000+00:00     13       32.141
```

```
In [105... libraryDataF1.getinfolongruns(jointables2,38,'Ferrari',MINIMUN_SECONDS,MAX)
```

```
Out[105...      full_name  compound          date_start  lap_number  duration_sector_1  d...
```

	full_name	compound		date_start	lap_number	duration_sector_1	d
3	Oliver BEARMAN	MEDIUM	2024-03-08T13:32:52.863000+00:00		2		34.789
12	Oliver BEARMAN	MEDIUM	2024-03-08T13:36:28.102000+00:00		4		33.594
20	Oliver BEARMAN	MEDIUM	2024-03-08T13:40:12.111000+00:00		6		33.246
103	Oliver BEARMAN	MEDIUM	2024-03-08T13:55:18.175000+00:00		10		34.585
118	Oliver BEARMAN	MEDIUM	2024-03-08T13:56:51.615000+00:00		11		34.086
129	Oliver BEARMAN	MEDIUM	2024-03-08T13:58:25.145000+00:00		12		34.276
139	Oliver BEARMAN	MEDIUM	2024-03-08T13:59:58.633000+00:00		13		34.048
149	Oliver BEARMAN	MEDIUM	2024-03-08T14:01:32.092000+00:00		14		34.039
157	Oliver BEARMAN	MEDIUM	2024-03-08T14:03:04.930000+00:00		15		33.783
167	Oliver BEARMAN	MEDIUM	2024-03-08T14:04:37.469000+00:00		16		33.869
175	Oliver BEARMAN	MEDIUM	2024-03-08T14:06:10.112000+00:00		17		39.971
226	Oliver BEARMAN	SOFT	2024-03-08T14:28:27.292000+00:00		19		32.609

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	tyre
6	1230	9475	1	44	1	4	SOFT	
13	1230	9475	1	63	1	7	SOFT	
27	1230	9475	2	44	5	7	SOFT	
36	1230	9475	2	63	8	13	SOFT	
37	1230	9475	3	44	8	15	SOFT	
58	1230	9475	3	63	14	18	SOFT	
61	1230	9475	4	44	16	20	SOFT	

In [107...]

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

Out[107...]

	full_name	compound		date_start	lap_number	duration_sector_1	d
10	Lewis HAMILTON	SOFT	2024-03-08T13:35:52.543000+00:00		2		33.254
29	Lewis HAMILTON	SOFT	2024-03-08T13:42:48.101000+00:00		5		33.055

	full_name	compound		date_start	lap_number	duration_sector_1	dt
33	Lewis HAMILTON	SOFT	2024-03-08T13:44:18.281000+00:00		6	39.899	
47	Lewis HAMILTON	SOFT	2024-03-08T13:48:19.260000+00:00		8	34.106	
60	Lewis HAMILTON	SOFT	2024-03-08T13:49:52.071000+00:00		9	34.150	
72	Lewis HAMILTON	SOFT	2024-03-08T13:51:25.916000+00:00		10	34.044	
83	Lewis HAMILTON	SOFT	2024-03-08T13:52:58.096000+00:00		11	34.185	
96	Lewis HAMILTON	SOFT	2024-03-08T13:54:30.713000+00:00		12	33.707	
109	Lewis HAMILTON	SOFT	2024-03-08T13:56:02.961000+00:00		13	33.808	
123	Lewis HAMILTON	SOFT	2024-03-08T13:57:35.314000+00:00		14	35.729	

```
In [108...]: libraryDataF1.getinfolongruns(jointables2, 63, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	dt
25	George RUSSELL	SOFT	2024-03-08T13:41:27.660000+00:00		2	33.026	
42	George RUSSELL	SOFT	2024-03-08T13:47:14.853000+00:00		5	32.773	
171	George RUSSELL	SOFT	2024-03-08T14:05:49.144000+00:00		8	32.717	
178	George RUSSELL	SOFT	2024-03-08T14:07:18.764000+00:00		9	38.367	
184	George RUSSELL	SOFT	2024-03-08T14:08:56.322000+00:00		10	34.026	
187	George RUSSELL	SOFT	2024-03-08T14:10:28.736000+00:00		11	34.451	
214	George RUSSELL	SOFT	2024-03-08T14:27:15.136000+00:00		14	32.454	

McLaren

```
In [109...]: stintInformation.query('driver_number == 81 or driver_number == 4')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1230	9475	1	4	1	2	HARD	
3	1230	9475	1	81	1	2	HARD	
22	1230	9475	2	4	3	8	SOFT	
23	1230	9475	2	81	3	8	MEDIUM	
39	1230	9475	3	4	9	12	SOFT	
40	1230	9475	3	81	9	12	SOFT	

```
In [110... libraryDataF1.getinfolongruns(jointables2, 4, 'McLaren', MINIMUN_SECONDS, MAXI
```

	full_name	compound		date_start	lap_number	duration_sector_1	du
102	Lando NORRIS	SOFT	2024-03-08T13:55:14.155000+00:00		3	32.648	
136	Lando NORRIS	SOFT	2024-03-08T13:59:09.369000+00:00		5	32.569	
158	Lando NORRIS	SOFT	2024-03-08T14:03:17.949000+00:00		7	32.332	
231	Lando NORRIS	SOFT	2024-03-08T14:28:45.310000+00:00		9	32.198	

```
In [111... libraryDataF1.getinfolongruns(jointables2, 81, 'McLaren', MINIMUN_SECONDS, MAXI
```

	full_name	compound		date_start	lap_number	duration_sector_1	du
122	Oscar PIASTRI	MEDIUM	2024-03-08T13:57:11.185000+00:00		3	32.844	
147	Oscar PIASTRI	MEDIUM	2024-03-08T14:00:41.212000+00:00		5	32.543	
161	Oscar PIASTRI	MEDIUM	2024-03-08T14:04:07.332000+00:00		7	32.758	
229	Oscar PIASTRI	SOFT	2024-03-08T14:28:39.481000+00:00		9	32.398	

Aston Martin

```
In [112... stintInformation.query('driver_number == 18 or driver_number == 14')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
1	1230	9475	1	14	1	2	HARD	
2	1230	9475	1	18	1	2	HARD	
20	1230	9475	2	14	3	3	MEDIUM	
21	1230	9475	2	18	3	3	MEDIUM	
24	1230	9475	3	14	4	10	MEDIUM	
25	1230	9475	3	18	4	10	MEDIUM	
52	1230	9475	4	14	11	15	SOFT	
53	1230	9475	4	18	11	15	SOFT	

```
In [113... libraryDataF1.getinfolongruns(jointables2, 14, 'Aston Martin', MINIMUN_SECONDS,
```

	full_name	compound		date_start	lap_number	duration_sector_1	du
135	Fernando ALONSO	MEDIUM	2024-03-08T13:58:48.907000+00:00		4	33.849	
154	Fernando ALONSO	MEDIUM	2024-03-08T14:02:22.149000+00:00		6	32.756	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
173	Fernando ALONSO	MEDIUM	2024-03-08T14:06:04.111000+00:00		8		32.538	
	Fernando							

```
In [114...]: libraryDataF1.getinfolongruns(jointables2, 18, 'Aston Martin', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
117	Lance STROLL	MEDIUM	2024-03-08T13:56:48.892000+00:00		4		33.332	
143	Lance STROLL	MEDIUM	2024-03-08T14:00:29.200000+00:00		6		32.634	
163	Lance STROLL	MEDIUM	2024-03-08T14:04:18.945000+00:00		8		32.479	
222	Lance STROLL	SOFT	2024-03-08T14:28:01.778000+00:00		11		32.237	

RB

```
In [115...]: stintInformation.query('driver_number == 3 or driver_number == 22')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
10	1230	9475	1	3	1	7	MEDIUM	
18	1230	9475	1	22	1	10	MEDIUM	
32	1230	9475	2	3	8	10	MEDIUM	
46	1230	9475	3	3	11	11	MEDIUM	
47	1230	9475	2	22	11	11	MEDIUM	
55	1230	9475	3	22	12	14	MEDIUM	
56	1230	9475	4	3	12	16	SOFT	
59	1230	9475	4	22	15	19	SOFT	

```
In [116...]: libraryDataF1.getinfolongruns(jointables2, 3, 'RB', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
35	Daniel RICCIARDO	MEDIUM	2024-03-08T13:45:05.191000+00:00		2		33.160	
65	Daniel RICCIARDO	MEDIUM	2024-03-08T13:50:31.523000+00:00		5		33.223	
113	Daniel RICCIARDO	MEDIUM	2024-03-08T13:56:34.293000+00:00		8		33.087	
126	Daniel RICCIARDO	MEDIUM	2024-03-08T13:58:04.635000+00:00		9		42.867	
215	Daniel RICCIARDO	SOFT	2024-03-08T14:27:23.551000+00:00		12		32.777	

```
In [117...]: libraryDataF1.getinfolongruns(jointables2, 22, 'RB', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

Out[117...]

	full_name	compound	date_start	lap_number	duration_sector_1	d
32	Yuki TSUNODA	MEDIUM	2024-03-08T13:43:49.624000+00:00	2	33.460	
59	Yuki TSUNODA	MEDIUM	2024-03-08T13:49:45.455000+00:00	5	33.046	
110	Yuki TSUNODA	MEDIUM	2024-03-08T13:56:12.900000+00:00	8	33.168	
124	Yuki TSUNODA	MEDIUM	2024-03-08T13:57:43.787000+00:00	9	39.843	
177	Yuki TSUNODA	MEDIUM	2024-03-08T14:07:18.420000+00:00	12	33.127	
183	Yuki TSUNODA	MEDIUM	2024-03-08T14:08:49.105000+00:00	13	39.172	
221	Yuki TSUNODA	SOFT	2024-03-08T14:27:56.942000+00:00	15	32.619	
239	Yuki TSUNODA	SOFT	2024-03-08T14:29:24.034000+00:00	16	44.720	

Haas

In [118...]

```
libraryDataF1.getinfolongruns(jointables2, 20, 'Haas F1 Team', MINIMUM_SECONDS)
```

Out[118...]

	full_name	compound	date_start	lap_number	duration_sector_1
94	Kevin MAGNUSEN	SOFT	2024-03-08T13:54:17.112000+00:00	2	32.832
148	Kevin MAGNUSEN	SOFT	2024-03-08T14:00:47.940000+00:00	5	32.656
208	Kevin MAGNUSEN	SOFT	2024-03-08T14:26:44.268000+00:00	9	32.719

In [119...]

```
libraryDataF1.getinfolongruns(jointables2, 27, 'Haas F1 Team', MINIMUM_SECONDS)
```

Out[119...]

	full_name	compound	date_start	lap_number	duration_sector_1
73	Nico HULKENBERG	SOFT	2024-03-08T13:51:31.722000+00:00	2	33.006
104	Nico HULKENBERG	SOFT	2024-03-08T13:55:26.334000+00:00	4	32.838
213	Nico HULKENBERG	SOFT	2024-03-08T14:27:04.724000+00:00	8	32.620
228	Nico HULKENBERG	SOFT	2024-03-08T14:28:34.303000+00:00	9	42.006

Alpine

In [120...]

```
libraryDataF1.getinfolongruns(jointables2, 31, 'Alpine', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

Out[120...]

	full_name	compound	date_start	lap_number	duration_sector_1	d
66	Esteban OCON	SOFT	2024-03-08T13:50:36.513000+00:00	2	33.377	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
95	Esteban OCON	SOFT	2024-03-08T13:54:25.659000+00:00		4	33.032	
144	Esteban OCON	SOFT	2024-03-08T14:00:34.796000+00:00		7	33.014	
151	Esteban OCON	SOFT	2024-03-08T14:02:04.849000+00:00		8	43.894	
216	Esteban OCON	SOFT	2024-03-08T14:27:25.058000+00:00		10	37.267	
235	Esteban OCON	SOFT	2024-03-08T14:29:04.482000+00:00		11	32.608	

In [121...]

```
libraryDataF1.getinfolongruns(jointables2, 10, 'Alpine', MINIMUN_SECONDS, MAXI
```

Out[121...]

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
63	Pierre GASLY	SOFT	2024-03-08T13:50:10.808000+00:00		2	33.008	
93	Pierre GASLY	SOFT	2024-03-08T13:54:03.369000+00:00		4	32.754	
172	Pierre GASLY	SOFT	2024-03-08T14:05:53.271000+00:00		7	40.113	
180	Pierre GASLY	SOFT	2024-03-08T14:07:41.766000+00:00		8	32.885	
210	Pierre GASLY	SOFT	2024-03-08T14:26:49.066000+00:00		10	36.498	
227	Pierre GASLY	SOFT	2024-03-08T14:28:33.197000+00:00		11	32.607	

Williams

In [122...]

```
libraryDataF1.getinfolongruns(jointables2, 23, 'Williams', MINIMUN_SECONDS, MAXI
```

Out[122...]

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2
68	Alexander ALBON	SOFT	2024-03-08T13:50:53.406000+00:00		2	33.146	
120	Alexander ALBON	SOFT	2024-03-08T13:56:57.359000+00:00		5	32.743	
186	Alexander ALBON	SOFT	2024-03-08T14:10:18.985000+00:00		8	32.725	
238	Alexander ALBON	SOFT	2024-03-08T14:29:21.661000+00:00		11	32.655	

In [123...]

```
libraryDataF1.getinfolongruns(jointables2, 2, 'Williams', MINIMUN_SECONDS, MAXI
```

Out[123...]

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration
-----------	----------	------------	------------	-------------------	-------------------	----------

Kick Sauber

In [124...]

```
libraryDataF1.getinfolongruns(jointables2, 24, 'Kick Sauber', MINIMUN_SECONDS
```

Out[124...]

		full_name	compound	date_start	lap_number	duration_sector_1	du
23	ZHOU Guanyu	MEDIUM	2024-03-08T13:40:41.846000+00:00		2	33.756	
34	ZHOU Guanyu	MEDIUM	2024-03-08T13:44:32.780000+00:00		4	33.196	
49	ZHOU Guanyu	MEDIUM	2024-03-08T13:48:28.556000+00:00		6	33.127	
79	ZHOU Guanyu	MEDIUM	2024-03-08T13:52:19.553000+00:00		8	33.213	

In [125...]

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

Out[125...]

		full_name	compound	date_start	lap_number	duration_sector_1	du
2	Valtteri BOTTAS	MEDIUM	2024-03-08T13:31:50.421000+00:00		2	33.393	
9	Valtteri BOTTAS	MEDIUM	2024-03-08T13:35:34.113000+00:00		4	33.388	
18	Valtteri BOTTAS	MEDIUM	2024-03-08T13:39:17.572000+00:00		6	33.098	
64	Valtteri BOTTAS	MEDIUM	2024-03-08T13:50:22.969000+00:00		9	34.464	
76	Valtteri BOTTAS	MEDIUM	2024-03-08T13:51:57.232000+00:00		10	34.903	
87	Valtteri BOTTAS	MEDIUM	2024-03-08T13:53:32.050000+00:00		11	34.587	
100	Valtteri BOTTAS	MEDIUM	2024-03-08T13:55:06.276000+00:00		12	34.580	
114	Valtteri BOTTAS	MEDIUM	2024-03-08T13:56:40.730000+00:00		13	34.509	
127	Valtteri BOTTAS	MEDIUM	2024-03-08T13:58:15.167000+00:00		14	34.771	
211	Valtteri BOTTAS	SOFT	2024-03-08T14:26:53.093000+00:00		18	32.907	

Qualifying

Set up

First of all, it is necessary to obtain the data about the qualifying

Race control

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

In [126...]

```
libraryDataF1.obtain_information('race_control',session_key=9476)
```

Out[126...]

	session_key	meeting_key	date	category	flag	lap_number

	session_key	meeting_key		date	category	flag	lap_number
0	9476	1230	2024-03-08T17:00:00+00:00	Flag	GREEN	None	
1	9476	1230	2024-03-08T17:08:34+00:00	Flag	BLACK AND WHITE	None	
2	9476	1230	2024-03-08T17:10:28+00:00	Other	None	None	
3	9476	1230	2024-03-08T17:11:10+00:00	Other	None	None	
4	9476	1230	2024-03-08T17:18:00+00:00	Flag	CHEQUERED	None	
5	9476	1230	2024-03-08T17:18:09+00:00	Other	None	None	
6	9476	1230	2024-03-08T17:19:15+00:00	Other	None	None	
7	9476	1230	2024-03-08T17:20:38+00:00	Other	None	None	
8	9476	1230	2024-03-08T17:20:52+00:00	Other	None	None	
9	9476	1230	2024-03-08T17:21:06+00:00	Other	None	None	
10	9476	1230	2024-03-08T17:25:00+00:00	Flag	GREEN	None	
11	9476	1230	2024-03-08T17:28:31+00:00	Flag	YELLOW	None	
12	9476	1230	2024-03-08T17:29:02+00:00	Flag	RED	None	

	session_key	meeting_key		date	category	flag	lap_number
13	9476	1230	2024-03-08T17:29:03+00:00	Flag	CLEAR	None	
14	9476	1230	2024-03-08T17:29:18+00:00	CarEvent		None	None
15	9476	1230	2024-03-08T17:30:55+00:00	Other		None	None
16	9476	1230	2024-03-08T17:31:28+00:00	Flag	CLEAR	None	
17	9476	1230	2024-03-08T17:31:30+00:00	Drs		None	None
18	9476	1230	2024-03-08T17:34:00+00:00	Flag	GREEN		None
19	9476	1230	2024-03-08T17:44:59+00:00	Flag	CHEQUERED		None
20	9476	1230	2024-03-08T17:45:07+00:00	Other		None	None
21	9476	1230	2024-03-08T17:47:10+00:00	Other		None	None
22	9476	1230	2024-03-08T17:48:04+00:00	Other		None	None
23	9476	1230	2024-03-08T17:48:09+00:00	Other		None	None
24	9476	1230	2024-03-08T17:53:00+00:00	Flag	GREEN		None
25	9476	1230	2024-03-08T18:05:00+00:00	Flag	CHEQUERED		None
26	9476	1230	2024-03-08T18:05:28+00:00	Other		None	None
27	9476	1230	2024-03-08T18:07:07+00:00	Other		None	None
28	9476	1230	2024-03-08T18:07:52+00:00	Other		None	None

	session_key	meeting_key		date	category		flag	lap_number
29	9476	1230	2024-03-08T18:08:30+00:00	Other		None	None	
30	9476	1230	2024-03-08T18:08:41+00:00	Other		None	None	
31	9476	1230	2024-03-08T18:12:40+00:00	Other		None	None	
32	9476	1230	2024-03-08T18:13:05+00:00	Flag		DOUBLE YELLOW	None	

Obtain setup

```
In [127...]: qualyfing = libraryDataF1.obtain_information('laps', session_key=9476)
stintInformation = libraryDataF1.obtain_information('stints', session_key=9476)
drivers = libraryDataF1.obtain_information('drivers', session_key=9476)
```

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 necessary to consult the qualyfing data to obtain the ids.

```
In [128...]: #qualyfing = qualyfing.drop(7)
#qualyfing = qualyfing.drop(137)
```

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

```
Out[129...]: meeting_key  session_key  driver_number  i1_speed  i2_speed  st_speed
274          1230        9476             1      294.0     326.0    330.0  2024-03-08T17:55:
```

In this case, the fastest lap is 89.165 seconds (1.29.165= so that to obtain the competitive laps the fastest lap will be multiplied by 1.07 (95.406 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 > 89.165")
competitiveLaps
```

```
Out[130...]: meeting_key  session_key  driver_number  i1_speed  i2_speed  st_speed
14           1230        9476            20      289.0     329.0    334.0  2024-03-08T17:01:
```

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
15	1230	9476	2	290.0	324.0	332.0	2024-03-08T17:02:
16	1230	9476	27	290.0	331.0	338.0	2024-03-08T17:02:
17	1230	9476	77	291.0	325.0	328.0	2024-03-08T17:02:
20	1230	9476	81	290.0	322.0	324.0	2024-03-08T17:02:
...
302	1230	9476	22	293.0	325.0	330.0	2024-03-08T18:03:
303	1230	9476	11	295.0	326.0	331.0	2024-03-08T18:03:
304	1230	9476	16	291.0	326.0	329.0	2024-03-08T18:03:
306	1230	9476	14	292.0	325.0	329.0	2024-03-08T18:04:
307	1230	9476	18	291.0	324.0	327.0	2024-03-08T18:04:

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
16	1	87.472	0.000	329.0	293.0	326.0	9476	1230
14	16	87.791	0.319	329.0	289.0	325.0	9476	1230
15	11	87.807	0.335	329.0	291.0	324.0	9476	1230
7	14	87.846	0.374	329.0	290.0	324.0	9476	1230
4	81	88.089	0.617	323.0	290.0	320.0	9476	1230
6	4	88.132	0.660	322.0	289.0	318.0	9476	1230

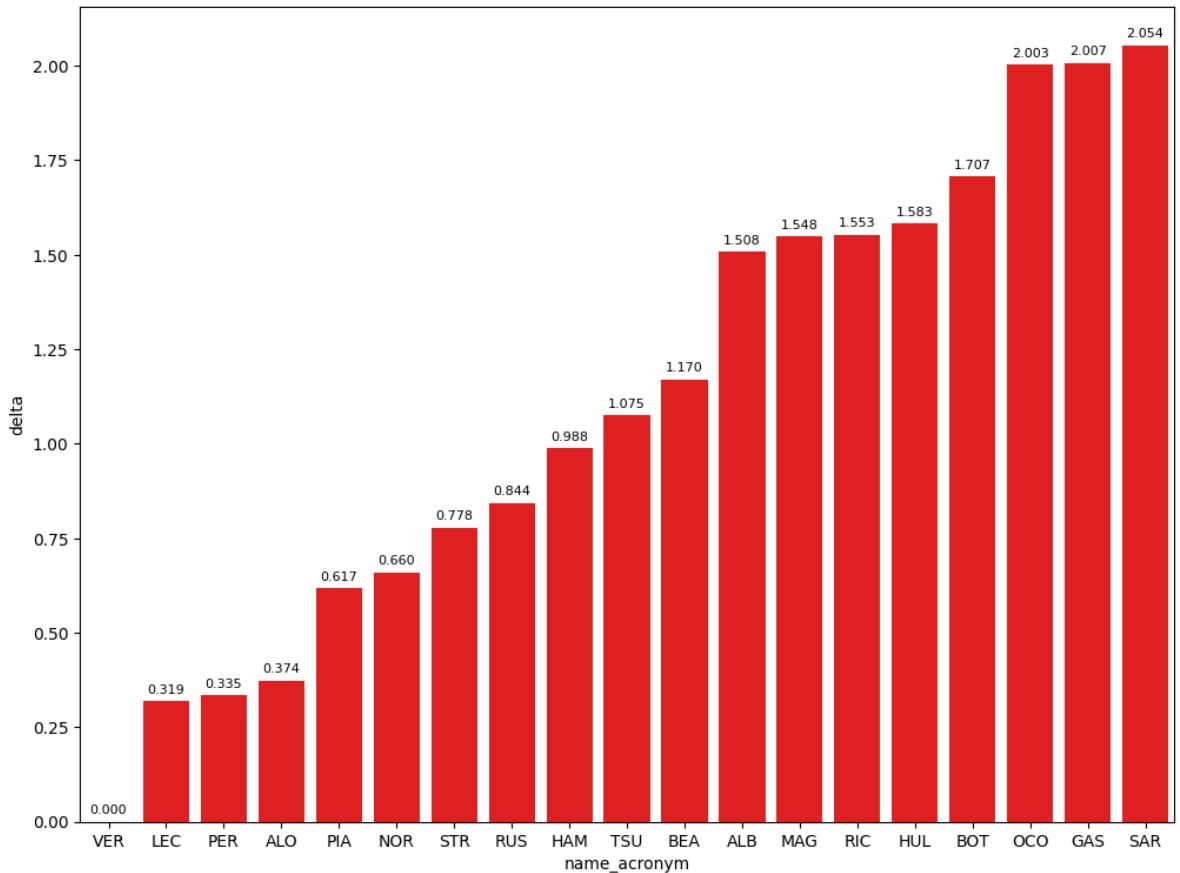
	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
8	18	88.250	0.778	323.0	288.0	322.0	9476	1230
11	63	88.316	0.844	329.0	292.0	324.0	9476	1230
10	44	88.460	0.988	330.0	291.0	324.0	9476	1230
18	22	88.547	1.075	330.0	291.0	324.0	9476	1230
9	38	88.642	1.170	329.0	287.0	323.0	9476	1230
5	23	88.980	1.508	328.0	289.0	323.0	9476	1230
0	20	89.020	1.548	332.0	289.0	329.0	9476	1230
17	3	89.025	1.553	330.0	291.0	326.0	9476	1230
2	27	89.055	1.583	332.0	290.0	328.0	9476	1230
3	77	89.179	1.707	328.0	291.0	325.0	9476	1230
13	31	89.475	2.003	330.0	290.0	322.0	9476	1230
12	10	89.479	2.007	327.0	289.0	320.0	9476	1230

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 best time in Q3 was not the best time of the session.

In [132...]

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

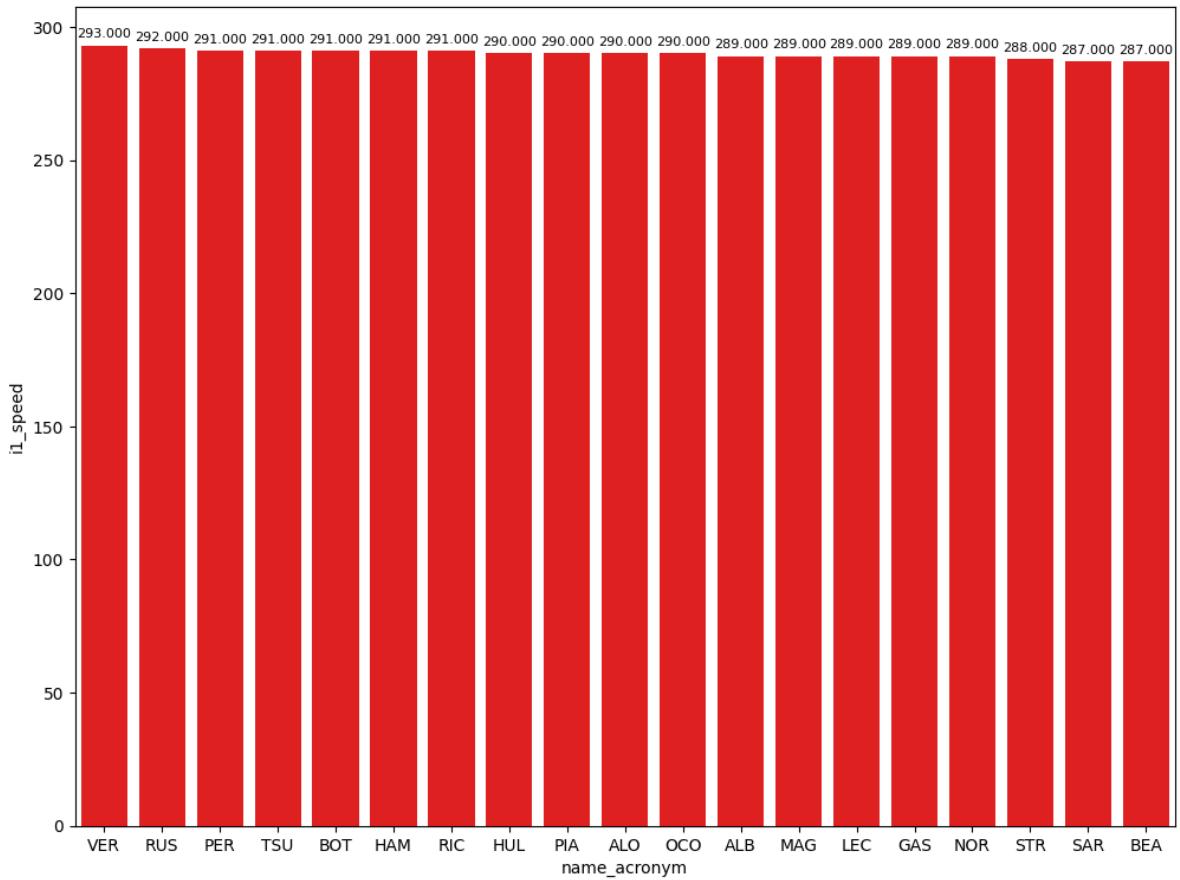


Speed trap

Maximum speed per drivers

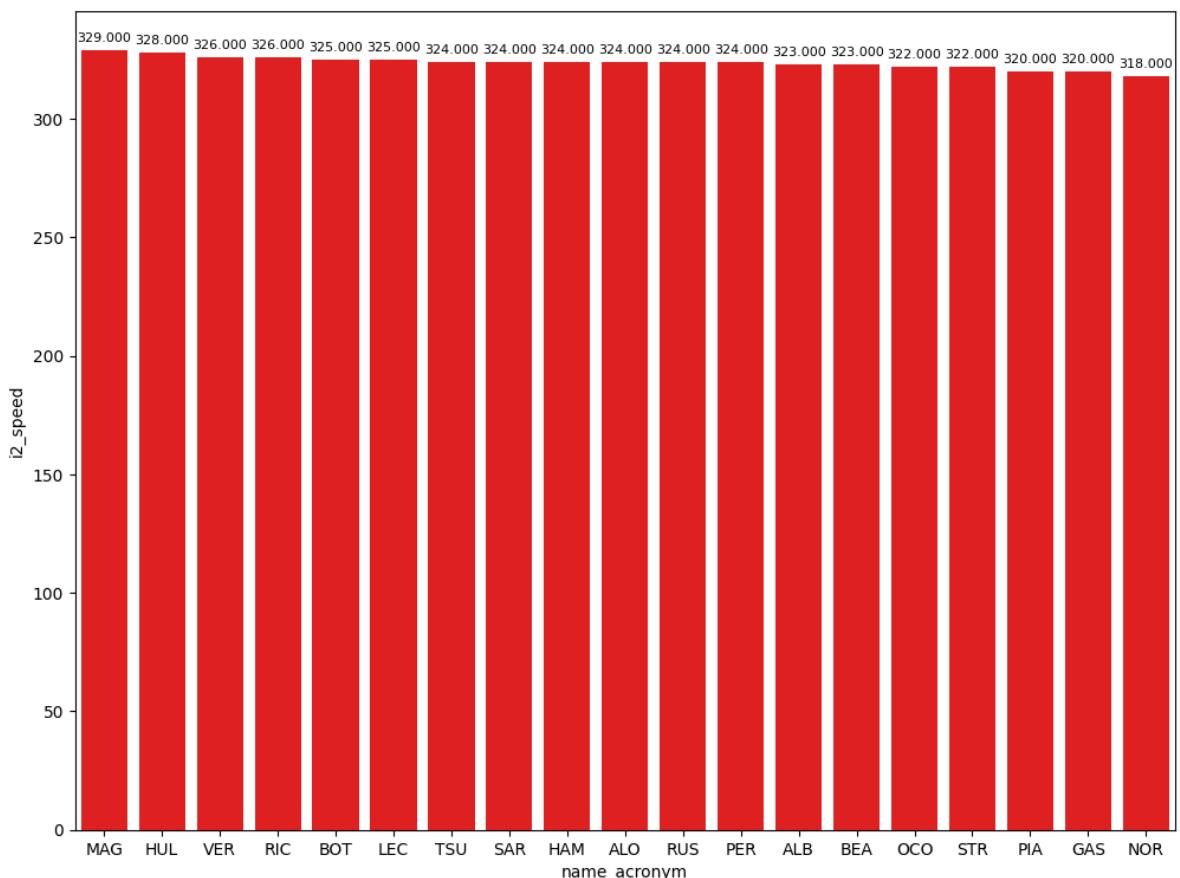
In [133...]

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



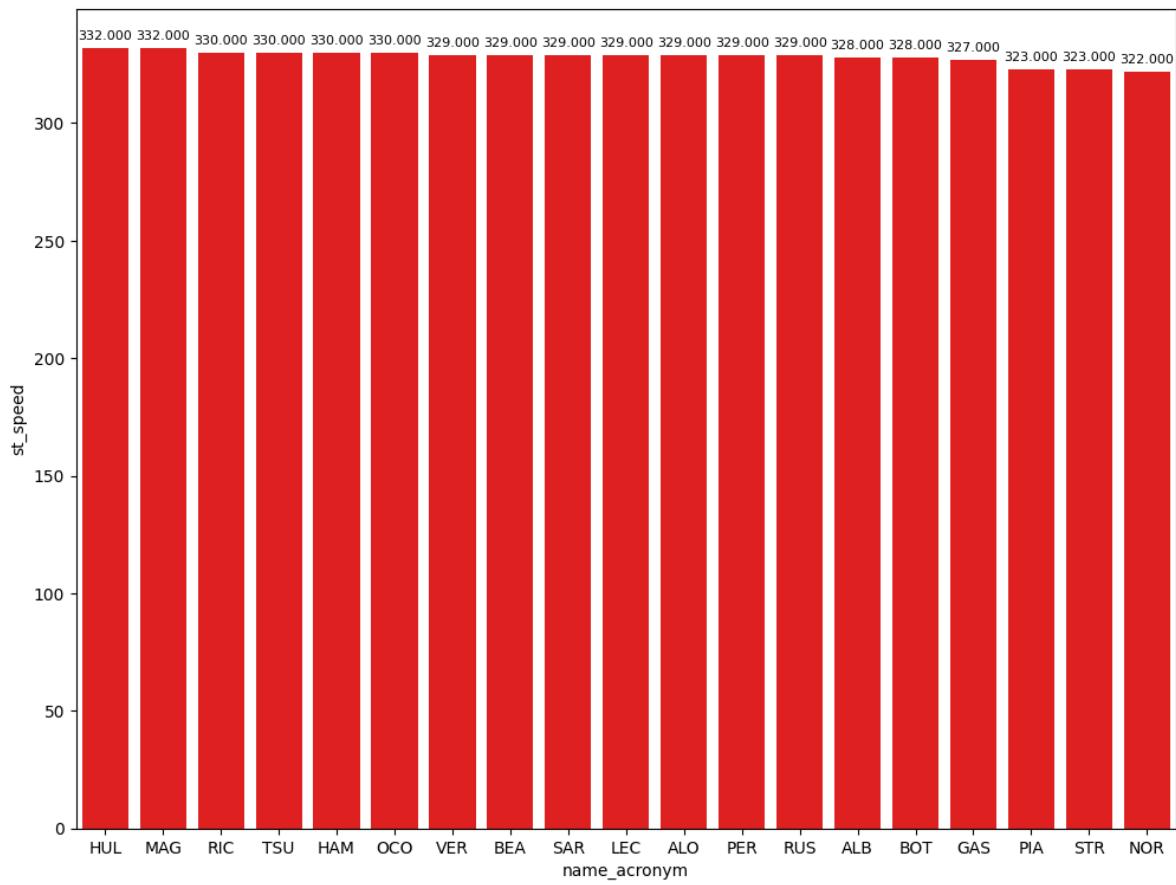
In [134]:

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



In [135...]

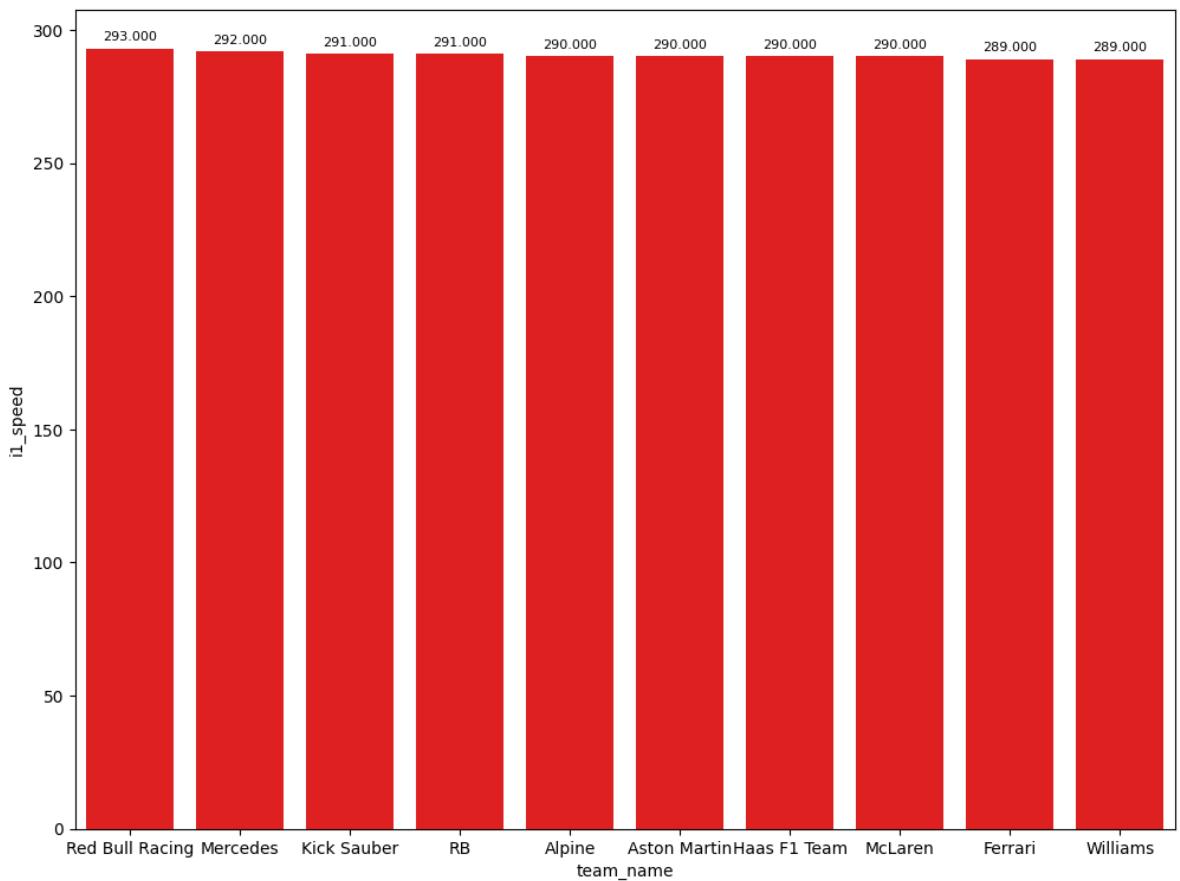
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['st_speed']]  
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



Maximum speed per teams

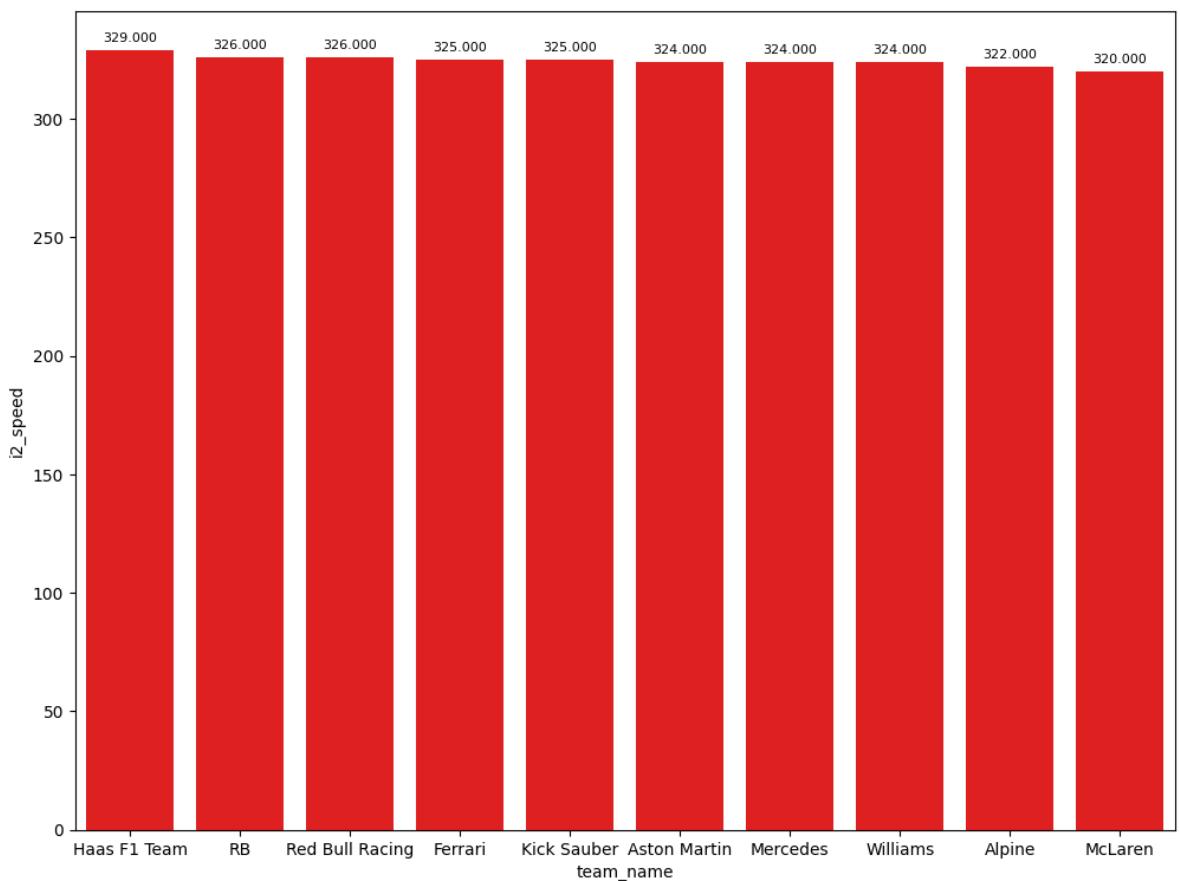
In [136...]

```
top_speed = jointables.loc[jointables.groupby(['team_name'])['i1_speed']]  
libraryDataF1.obtainchart("team_name","i1_speed",top_speed)
```

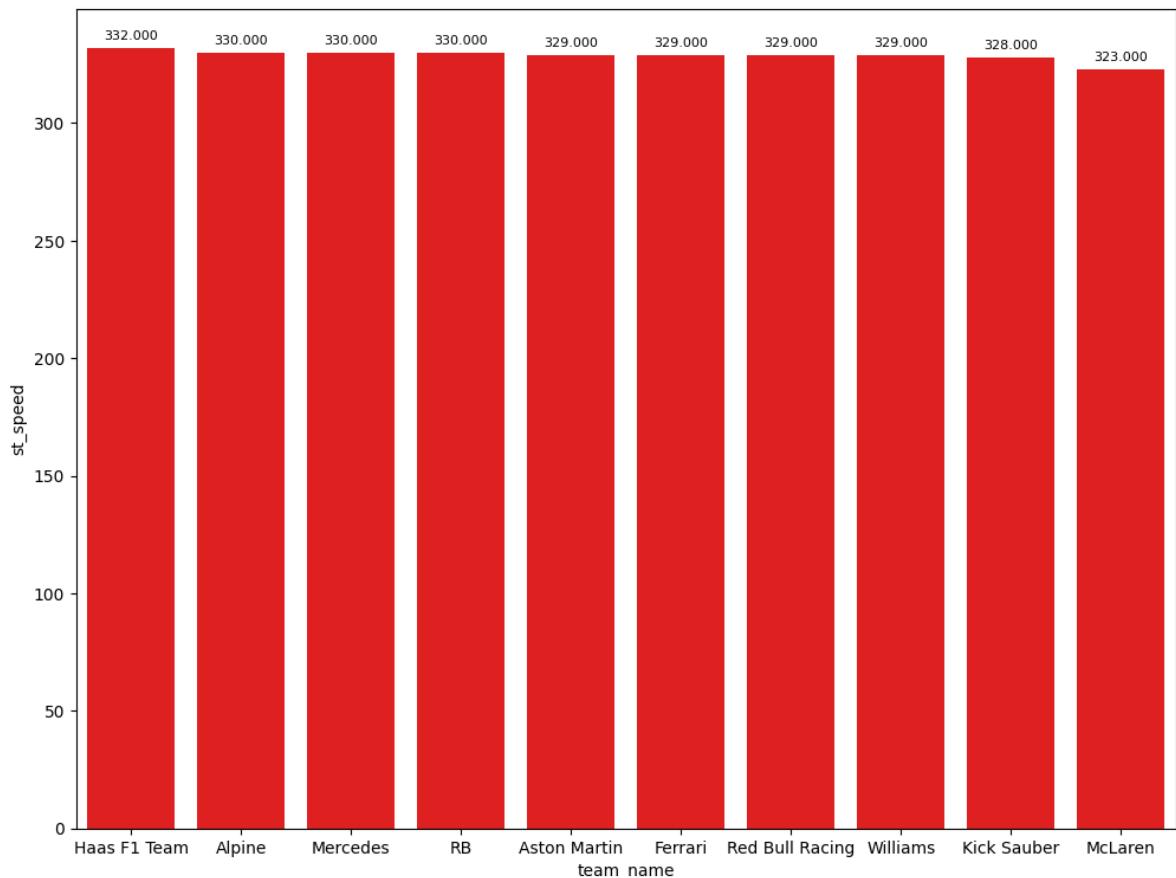


In [137]:

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



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



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

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
0	1230	9476	20	289.0	329.0	334.0	2024-03-08T17
1	1230	9476	20	292.0	331.0	334.0	2024-03-08T17
2	1230	9476	20	291.0	330.0	333.0	2024-03-08T17
3	1230	9476	20	291.0	329.0	332.0	2024-03-08T17
4	1230	9476	2	290.0	324.0	332.0	2024-03-08T17
...
90	1230	9476	22	293.0	327.0	331.0	2024-03-08T17
91	1230	9476	22	293.0	325.0	331.0	2024-03-08T17
92	1230	9476	22	293.0	327.0	332.0	2024-03-08T17
93	1230	9476	22	292.0	324.0	330.0	2024-03-08T17

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
94	1230	9476	22	293.0	325.0	330.0	2024-03-08T18

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

In [140...]

```
maximumDateQ1 = "date_start <'2024-03-08T17:25:00+00:00'"
maximumDateQ2 = "date_start <'2024-03-08T17:53:00+00:00' and date_start >'"
```

Qualifying 1

In this session, I did not see any surprise with the favourites qualifying to Q2. As we can in testing, we knew that Alpine was the worst team and that was contrasted in qualifying finishing P19 and P20. Other team that finished out of Q1 was Kick Sauber finishing Zhou P17 and Bottas P16. Differences between sectors will be shown in the following section.

In [141...]

```
q1Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly, maximumDateQ1)
```

Out[141...]

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
80	1230	9476	1	294.0	327.0	333.0	2024-03-08T17
38	1230	9476	18	293.0	322.0	328.0	2024-03-08T17
68	1230	9476	16	290.0	327.0	330.0	2024-03-08T17
74	1230	9476	11	293.0	324.0	329.0	2024-03-08T17
33	1230	9476	14	292.0	325.0	329.0	2024-03-08T17
56	1230	9476	63	292.0	324.0	329.0	2024-03-08T17
14	1230	9476	81	292.0	324.0	325.0	2024-03-08T17
26	1230	9476	4	290.0	322.0	325.0	2024-03-08T17
43	1230	9476	38	290.0	325.0	330.0	2024-03-08T17
90	1230	9476	22	293.0	327.0	331.0	2024-03-08T17
48	1230	9476	44	291.0	327.0	332.0	2024-03-08T17
9	1230	9476	27	291.0	330.0	332.0	2024-03-08T17
86	1230	9476	3	292.0	328.0	332.0	2024-03-08T17
1	1230	9476	20	292.0	331.0	334.0	2024-03-08T17

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
22	1230	9476	23	292.0	323.0	328.0	2024-03-08T17
12	1230	9476	77	291.0	326.0	328.0	2024-03-08T17
65	1230	9476	31	292.0	322.0	330.0	2024-03-08T17
62	1230	9476	10	289.0	322.0	327.0	2024-03-08T17
6	1230	9476	2	287.0	325.0	330.0	2024-03-08T17

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 do a comparaison 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	
22	1230	9476	23	292.0	323.0	328.0	2024-03-08T17

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: 32.284 Sector 2: 28.293 Sector 3: 28.53

In [144...]

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

Out[144...]

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
12	1230	9476	77	291.0	326.0	328.0	2024-03-08T17
65	1230	9476	31	292.0	322.0	330.0	2024-03-08T17
62	1230	9476	10	289.0	322.0	327.0	2024-03-08T17
6	1230	9476	2	287.0	325.0	330.0	2024-03-08T17

4 rows × 28 columns

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

In the first sector we can see that none of the eliminated drivers were close 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 77 0.072 0.195 0.048 -0.171  
1 31 0.368 0.371 -0.043 0.040  
2 10 0.372 0.234 0.076 0.062  
3 2 0.419 0.407 0.090 -0.078
```

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. In general, the unique driver that was at risk if Albon had improved his first sector it would have been Magnussen because his first was worse than the Thailand driver.

```
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 -0.936 -0.331 -0.302 -0.303  
1 18 -0.857 -0.237 -0.371 -0.249  
2 16 -0.789 -0.184 -0.245 -0.360  
3 11 -0.469 -0.203 0.023 -0.289  
4 14 -0.401 -0.192 -0.309 0.100  
5 63 -0.358 0.102 -0.272 -0.188  
6 81 -0.352 -0.147 -0.193 -0.012  
7 4 -0.302 -0.082 -0.142 -0.078  
8 38 -0.123 0.155 -0.025 -0.253  
9 22 -0.119 0.130 -0.120 -0.129  
10 44 -0.113 0.237 -0.205 -0.145  
11 27 -0.052 0.246 -0.195 -0.103  
12 3 -0.042 0.179 -0.158 -0.063  
13 20 -0.038 0.210 -0.087 -0.161
```

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()).sort_index()
```

```
Out[147... duration_sector_1
```

name_acronym	duration_sector_1
VER	31.953
STR	32.047
PER	32.081
ALO	32.092
LEC	32.100
PIA	32.137
NOR	32.202
ALB	32.284
RUS	32.386
TSU	32.414
BEA	32.439
RIC	32.463
BOT	32.479
MAG	32.494
GAS	32.518
HAM	32.521
HUL	32.530
OCO	32.655
SAR	32.691

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

```
Out[148... duration_sector_2
```

name_acronym	duration_sector_2
STR	27.922
ALO	27.984
VER	27.991
RUS	28.021
LEC	28.048
HAM	28.088
HUL	28.098
PIA	28.100
RIC	28.135
NOR	28.151
TSU	28.173

```
duration_sector_2
```

```
name_acronym
```

MAG	28.206
OCO	28.250
BEA	28.268
ALB	28.293
PER	28.316
BOT	28.341

```
In [149...]
```

```
pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_3'].min()).sort_values(ascending=True)
```

```
Out[149...]
```

```
duration_sector_3
```

```
name_acronym
```

LEC	28.170
VER	28.227
PER	28.241
BEA	28.277
STR	28.281
RUS	28.342
BOT	28.359
MAG	28.369
HAM	28.385
TSU	28.401
HUL	28.427
SAR	28.452
NOR	28.452
RIC	28.467
PIA	28.518
ALB	28.530
OCO	28.570
GAS	28.592
ALO	28.630

Qualifying 2

In this session, we had the surprise of the Stroll's elimination finishing P12 and the incredible lap that afford to promote Hulkenberg to P6. Also, both RB were knocked-out finishing Tsunoda 9 thousands behind Piastri

```
In [150...]
```

```
q2Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly, maximumDateQ2)
```

Out[150...]

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
82	1230	9476	1	295.0	327.0	331.0	2024-03-08T17
70	1230	9476	16	290.0	325.0	330.0	2024-03-08T17
34	1230	9476	14	291.0	327.0	331.0	2024-03-08T17
18	1230	9476	81	290.0	321.0	325.0	2024-03-08T17
59	1230	9476	63	293.0	325.0	331.0	2024-03-08T17
76	1230	9476	11	292.0	325.0	331.0	2024-03-08T17
28	1230	9476	4	290.0	318.0	322.0	2024-03-08T17
92	1230	9476	22	293.0	327.0	332.0	2024-03-08T17
39	1230	9476	18	290.0	324.0	328.0	2024-03-08T17
52	1230	9476	44	293.0	327.0	332.0	2024-03-08T17
46	1230	9476	38	291.0	327.0	331.0	2024-03-08T17
24	1230	9476	23	290.0	328.0	330.0	2024-03-08T17
3	1230	9476	20	291.0	329.0	332.0	2024-03-08T17
87	1230	9476	3	291.0	327.0	331.0	2024-03-08T17

14 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: Lewis HAMILTON Sector 1: 32.499 Sector 2: 27.927 Sector 3: 28.18

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

In the first sector we can see that Bearman and Albon were faster than Hamilton, being Bearman chances to make it through Q3. But the rookie was not able to improve in the

second and third sector to pass to Q3

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	38	0.036	-0.244	0.188	0.092	
1	23	0.374	-0.015	0.198	0.191	
2	20	0.414	0.015	0.234	0.165	
3	3	0.419	0.096	0.265	0.058	

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. Mercedes suffered a lot in the first sector being 3 tenths slower than Stroll in this sector. One thing I would like to stand out is the third sector of Stroll who, if he had improved his sector he would have been able to finish, at least, in P6.

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	-0.573	-0.607	0.108	-0.074	
1	16	-0.494	-0.390	-0.059	-0.045	
2	14	-0.484	-0.535	-0.068	0.119	
3	81	-0.263	-0.438	0.080	0.095	
4	63	-0.158	-0.029	-0.104	-0.025	
5	11	-0.139	-0.290	0.157	-0.006	
6	4	-0.127	-0.431	0.112	0.192	
7	22	-0.042	-0.231	0.130	0.059	
8	18	-0.028	-0.416	0.007	0.381	

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_values(ascending=False))
```

Out[154...]

name_acronym	duration_sector_1
VER	31.892

duration_sector_1

name_acronym

ALO	31.964
PIA	32.061
NOR	32.068
STR	32.083
LEC	32.109
PER	32.209
BEA	32.255
TSU	32.268
RUS	32.470
ALB	32.484
HAM	32.499

In [155... pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_2'].min()).sort_index()

Out[155... **duration_sector_2**

name_acronym

RUS	27.823
ALO	27.859
LEC	27.868
HAM	27.927
STR	27.934
PIA	28.007
VER	28.035
NOR	28.039
TSU	28.057
PER	28.084
BEA	28.115
ALB	28.125
MAG	28.161
RIC	28.192

In [156... pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_3'].min()).sort_index()

Out[156... **duration_sector_3**

name_acronym

VER	28.106
LEC	28.135
RUS	28.155

duration_sector_3

name_acronym

PER	28.174
HAM	28.180
RIC	28.238
TSU	28.239
BEA	28.272
PIA	28.275
ALO	28.299
MAG	28.345
ALB	28.371

Qualyfing 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	
83	1230	9476	1	294.0	326.0	330.0	2024-03-08T17
72	1230	9476	16	291.0	326.0	329.0	2024-03-08T18
77	1230	9476	11	294.0	326.0	332.0	2024-03-08T17
36	1230	9476	14	292.0	325.0	329.0	2024-03-08T18
20	1230	9476	81	292.0	322.0	324.0	2024-03-08T18
31	1230	9476	4	293.0	322.0	325.0	2024-03-08T18
60	1230	9476	63	295.0	327.0	331.0	2024-03-08T17
54	1230	9476	44	295.0	329.0	331.0	2024-03-08T18
94	1230	9476	22	293.0	325.0	330.0	2024-03-08T18
41	1230	9476	18	291.0	324.0	327.0	2024-03-08T18

10 rows × 28 columns

Comparaison 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 comparaison 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: 31.763 Sector 2: 27.8 Sector 3: 27.909

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

Verstappen did not have any problem to defend his pole. Until the third sector, the driver that was closer Verstappen was Fernando but the problem that Aston Martin has with the straights impeding to take the P2.

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	16	0.319	0.170	0.042	0.107	
1	11	0.335	0.181	0.066	0.088	
2	14	0.374	0.077	0.023	0.274	
3	81	0.617	0.231	0.088	0.298	
4	4	0.660	0.117	0.222	0.321	
5	63	0.844	0.530	0.084	0.230	
6	44	0.988	0.656	0.079	0.253	
7	22	1.075	0.417	0.310	0.348	
8	18	1.100	0.180	0.212	0.708	

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_values(ascending=False))
```

Out[160...]

name_acronym	duration_sector_1
VER	31.763
ALO	31.840
NOR	31.880
LEC	31.933
STR	31.943
PER	31.944

```
duration_sector_1  
name_acronym  
PIA      31.994  
TSU      32.180
```

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

```
Out[161... duration_sector_2  
name_acronym  
VER      27.800  
ALO      27.823  
LEC      27.842  
PER      27.866  
HAM      27.879  
RUS      27.884  
PIA      27.888  
STR      28.012  
NOR      28.022  
TSU      28.110
```

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

```
Out[162... duration_sector_1  
name_acronym  
VER      31.763  
ALO      31.840  
NOR      31.880  
LEC      31.933  
STR      31.943  
PER      31.944  
PIA      31.994  
TSU      32.180  
RUS      32.293  
HAM      32.419
```

Best sector per driver of the session (in general)

```
In [163... pd.DataFrame(mergeQualy.groupby("name_acronym")['duration_sector_1'].min())
```

```
Out[163... duration_sector_1  
name_acronym
```

duration_sector_1

name_acronym	
VER	31.763
ALO	31.840
PER	31.878
NOR	31.880
LEC	31.933
STR	31.943
PIA	31.994
TSU	32.180
BEA	32.255
ALB	32.284
RUS	32.293
HAM	32.341
RIC	32.463
BOT	32.479
MAG	32.494
GAS	32.518
HUL	32.530

In [164]:

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

Out[164]:

duration_sector_2

name_acronym	
VER	27.800
ALO	27.823
RUS	27.823
LEC	27.842
PER	27.866
HAM	27.879
PIA	27.888
STR	27.922
NOR	28.022
TSU	28.057
BEA	28.061
HUL	28.098
RIC	28.117
ALB	28.125
MAG	28.161
OCO	28.250

```

duration_sector_2

name_acronym
BOT      28.292

In [165... pd.DataFrame(mergeQualy.groupby("name_acronym")['duration_sector_3'].min())

Out[165... duration_sector_3

name_acronym
VER      27.909
PER      27.997
LEC      28.016
RUS      28.139
HAM      28.162
ALO      28.183
PIA      28.207
NOR      28.230
RIC      28.238
TSU      28.239
BEA      28.272
STR      28.281
MAG      28.345
BOT      28.359
ALB      28.371
HUL      28.399
SAR      28.452
OCO      28.542
GAS      28.592

```

Race

Obtain setup

```

In [166... race = libraryDataF1.obtain_information('laps', session_key=9480)
stintInformation = libraryDataF1.obtain_information('stints', session_key=9480)
drivers = libraryDataF1.obtain_information('drivers', session_key=9480)

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_nur'])

```

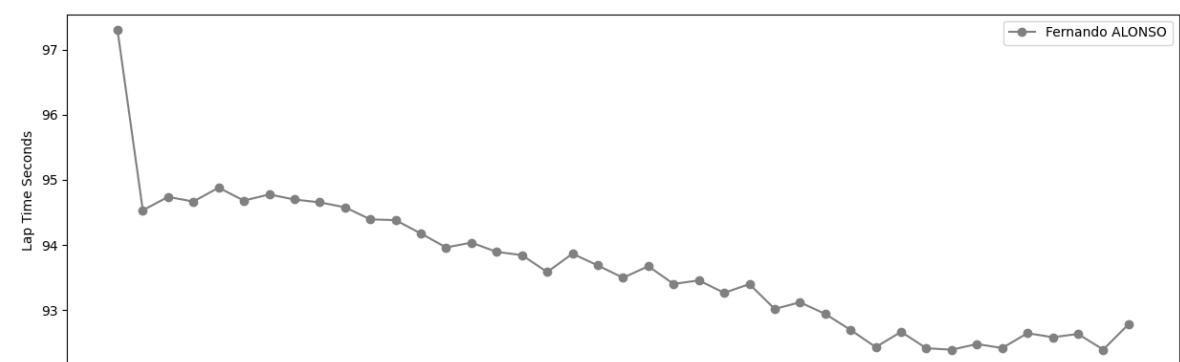
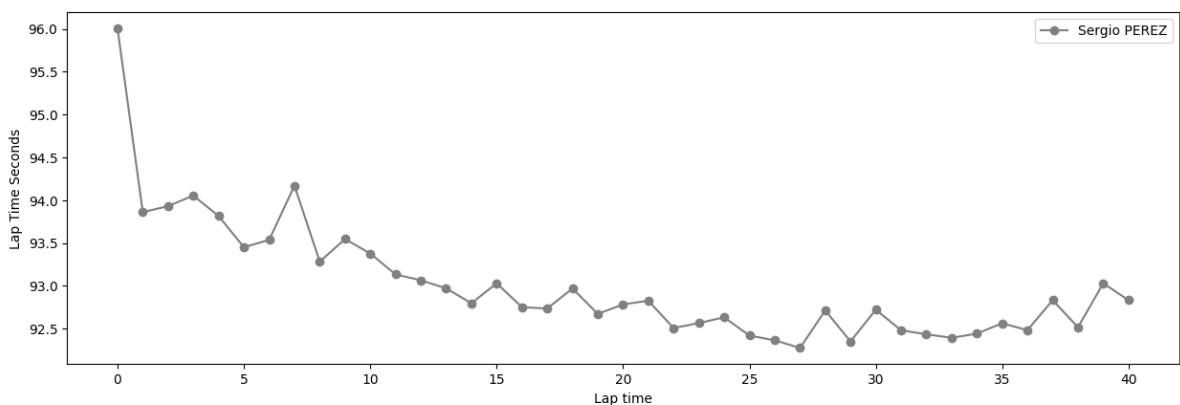
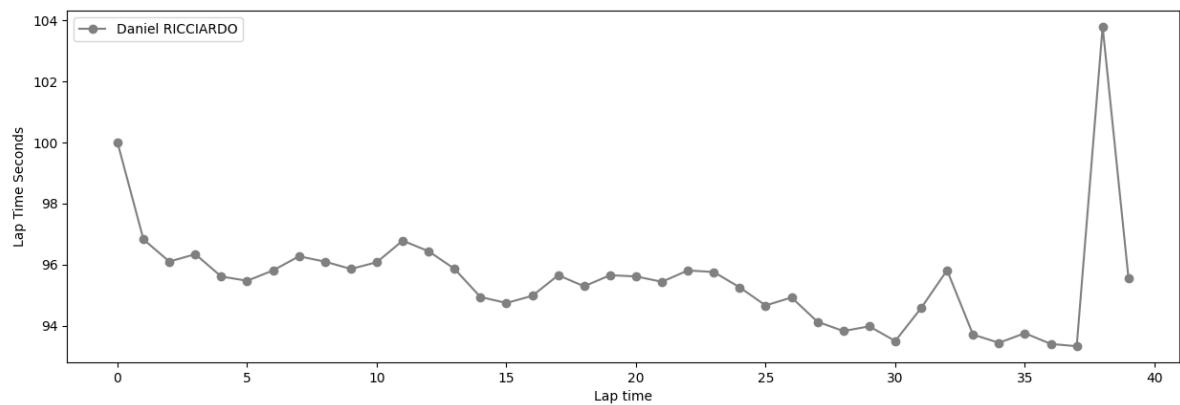
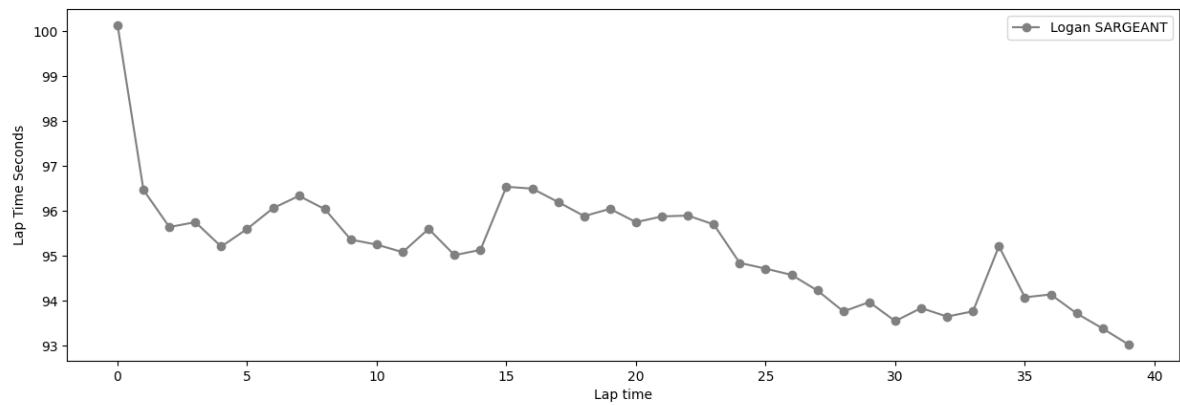
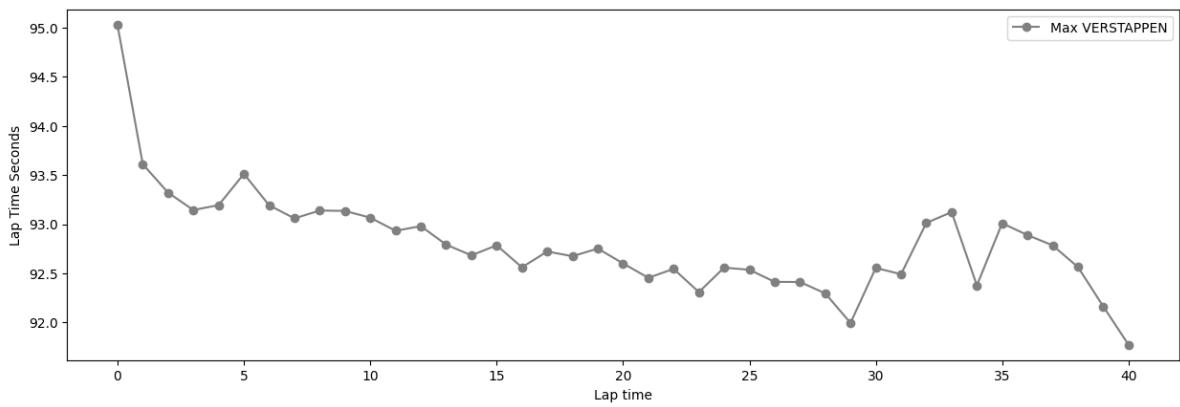
Obtain data tyres

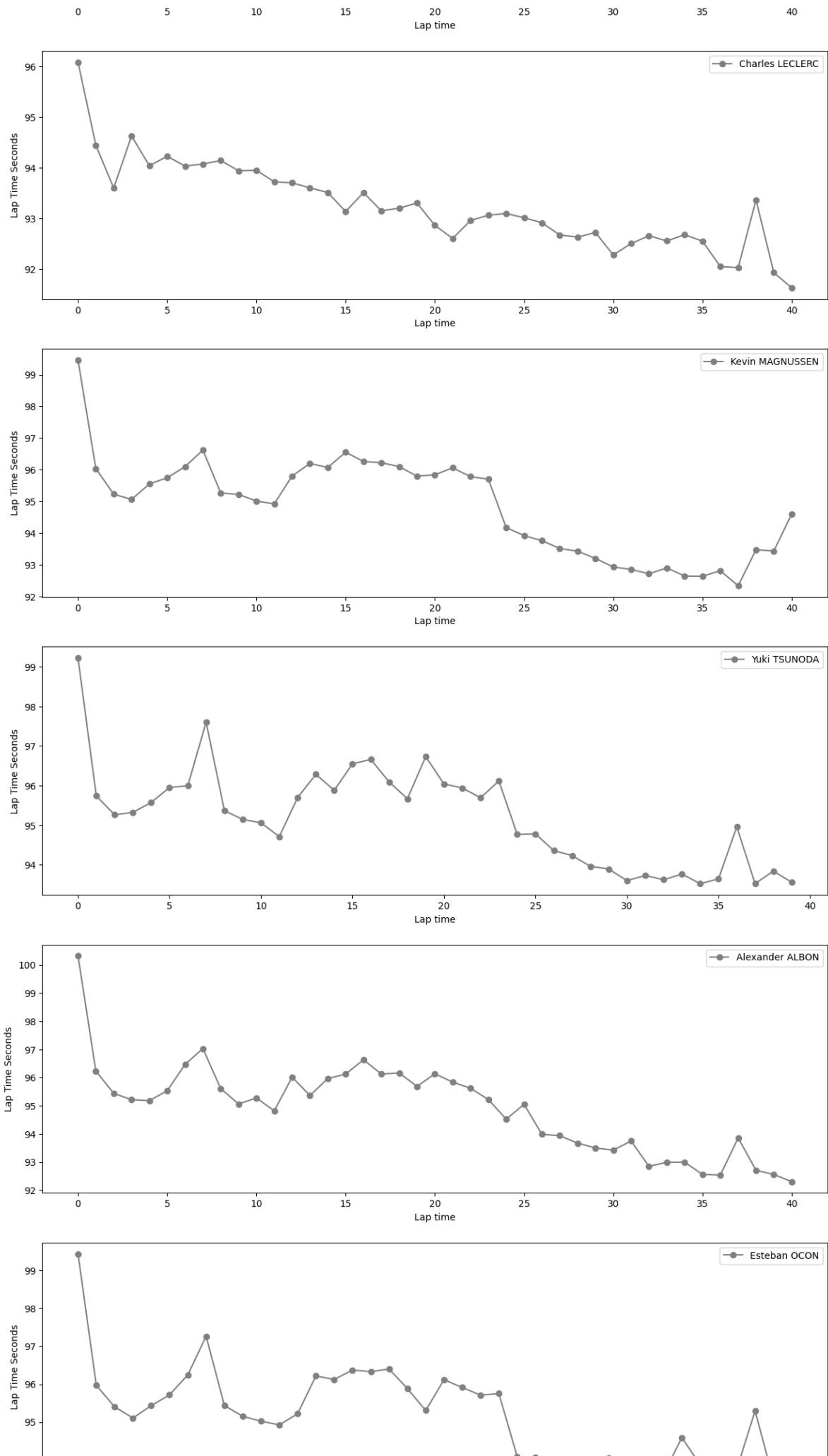
Hard tyres

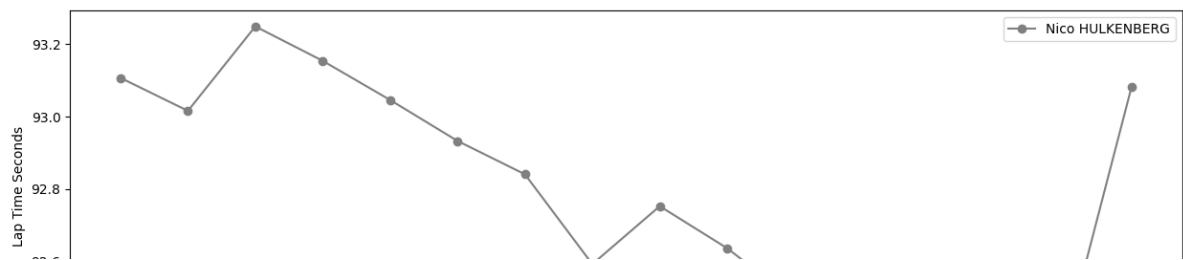
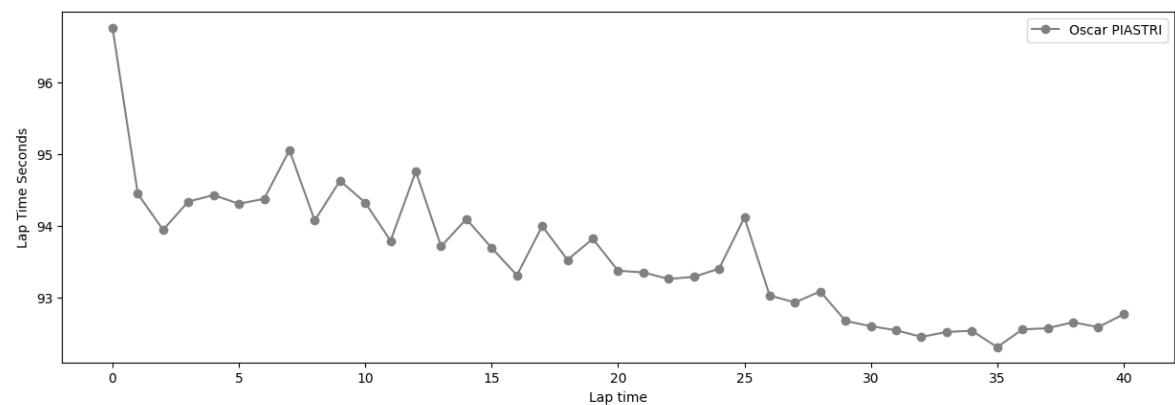
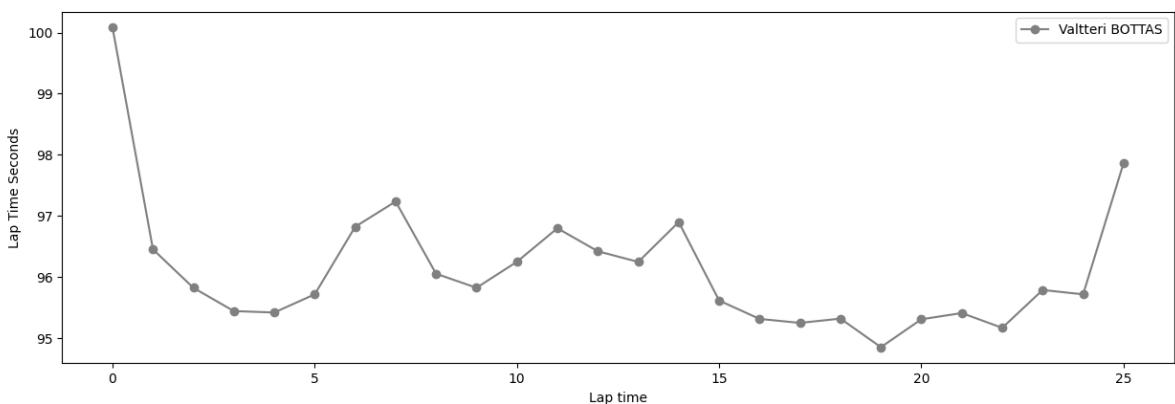
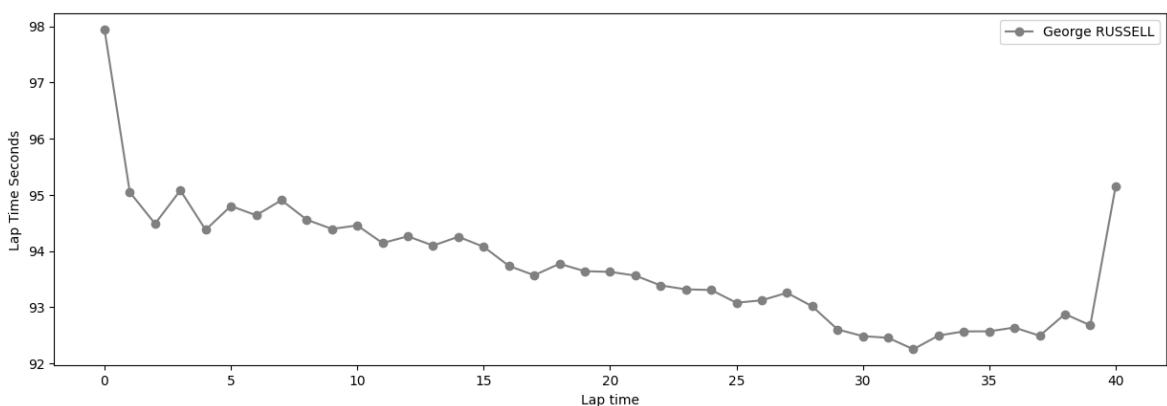
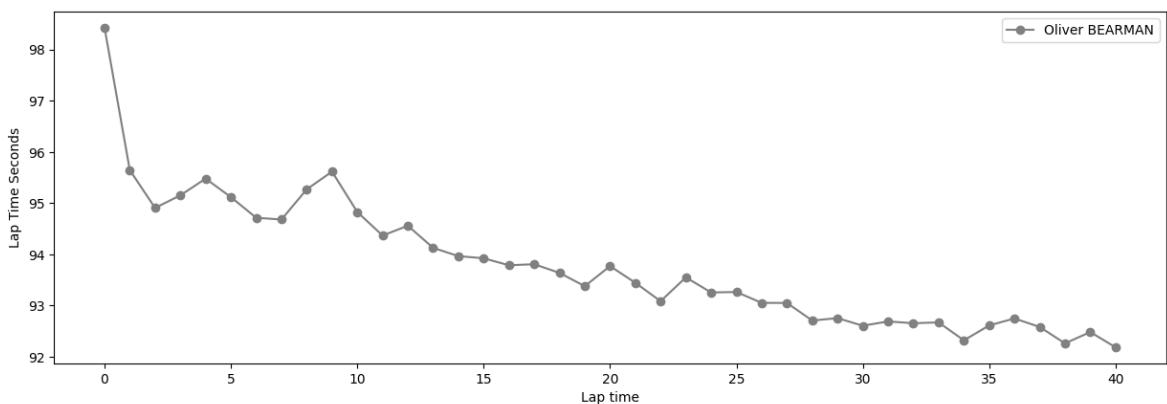
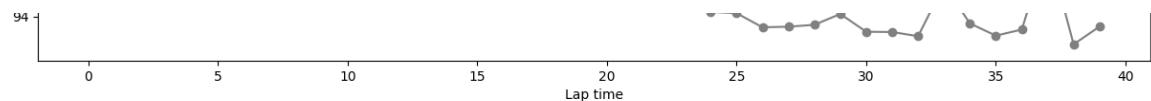
Unlike Bahrain, the abrasion of the circuit was better than the previous circuit. Hence, one stop was the ideal strategy for this race and Pirelli decided to bring their mid-range tyres (C2,C3,C4)

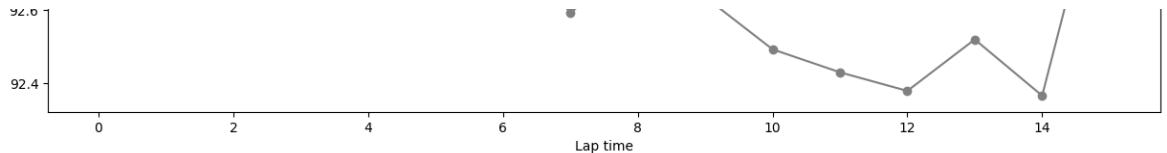
In [169...]

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







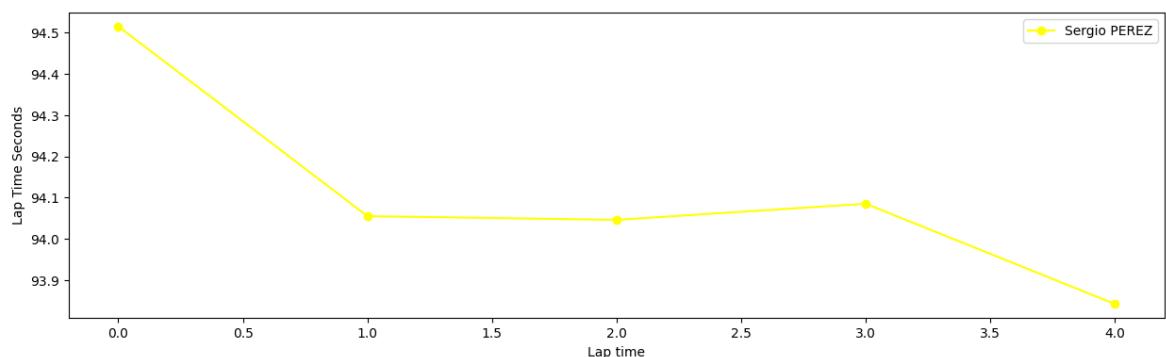
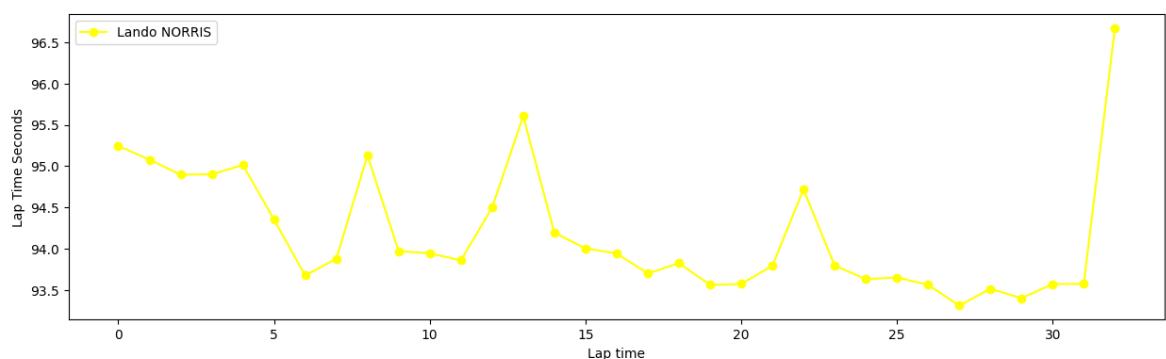
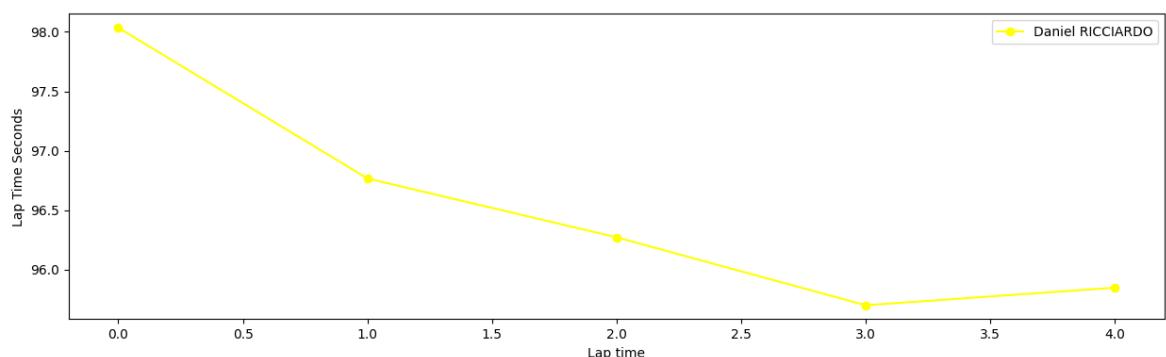
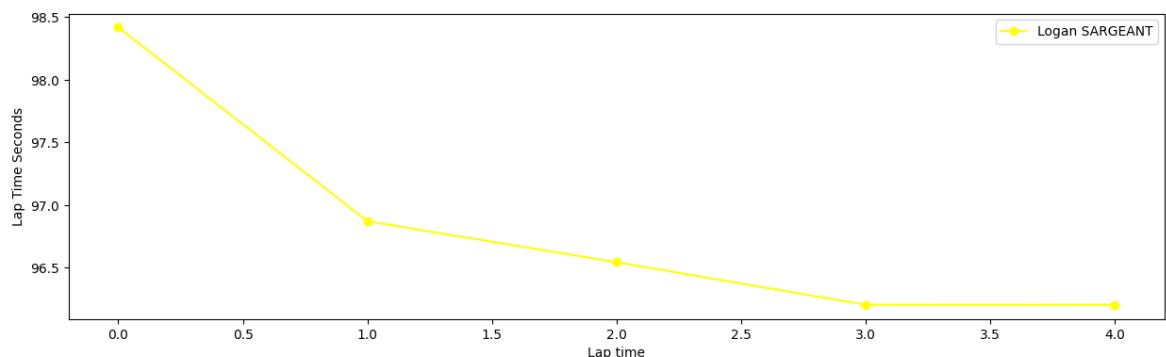
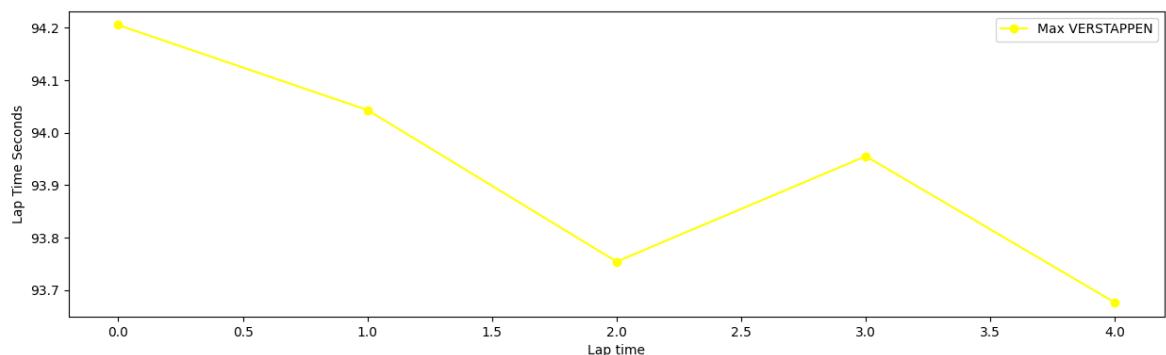


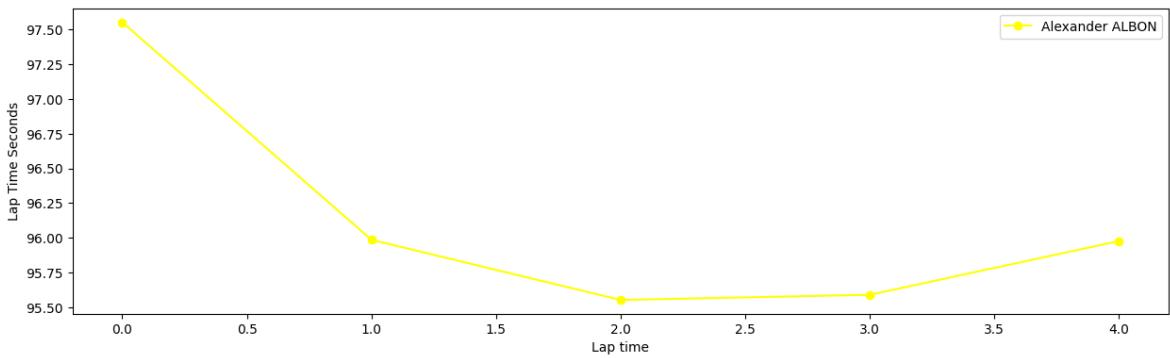
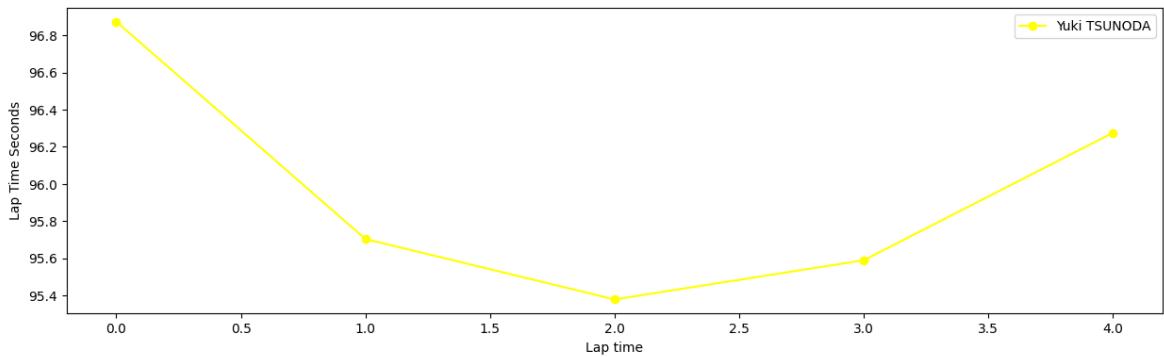
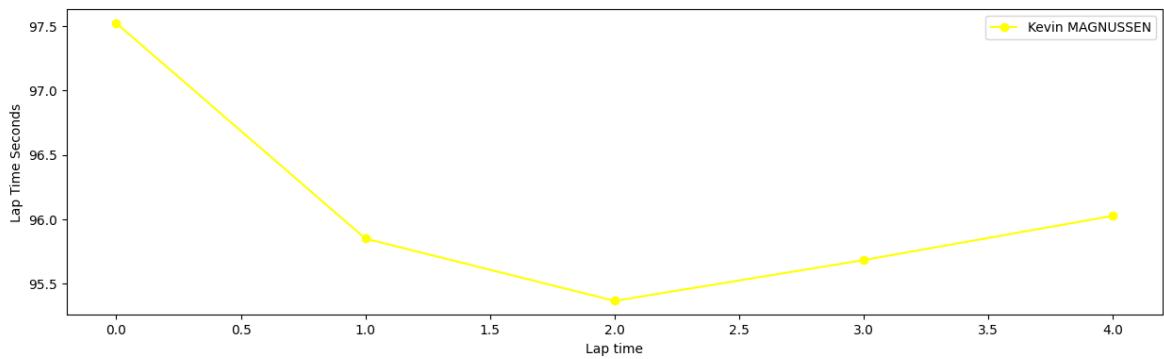
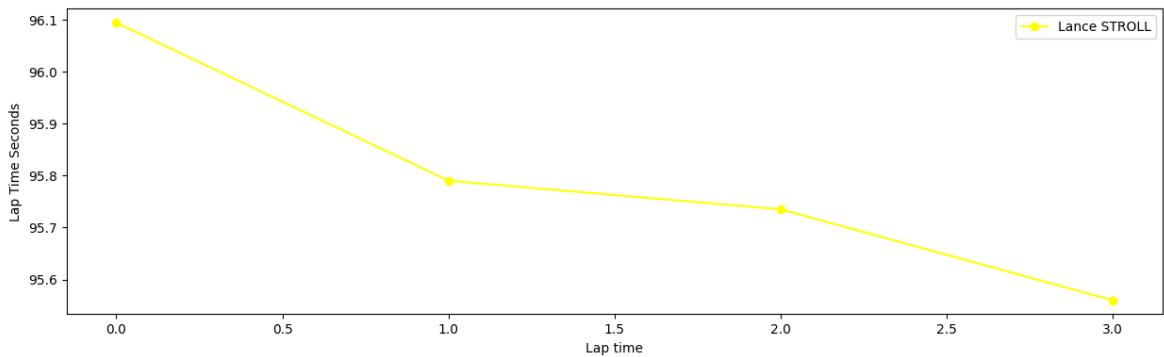
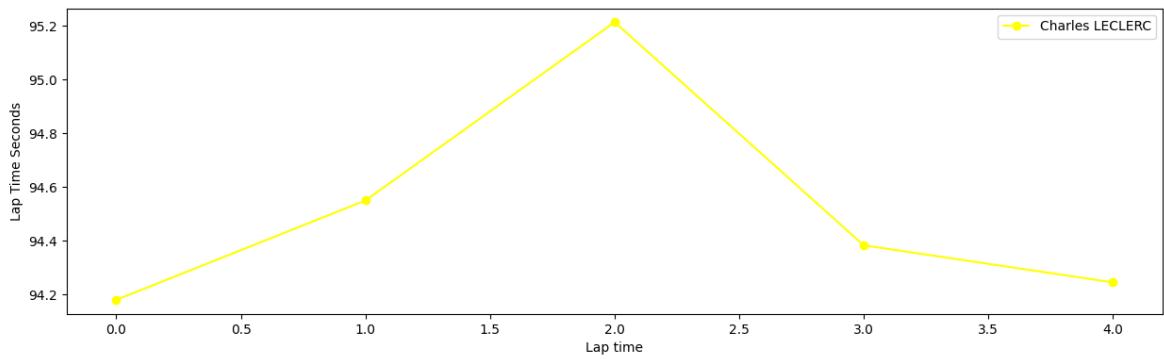
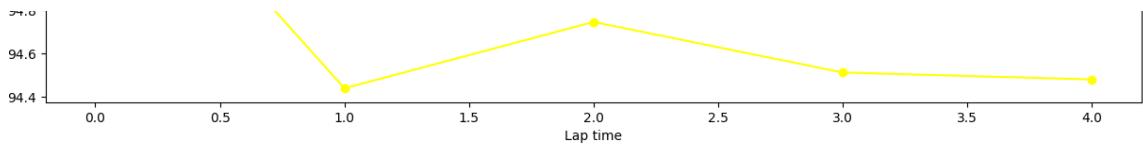
Medium tyres

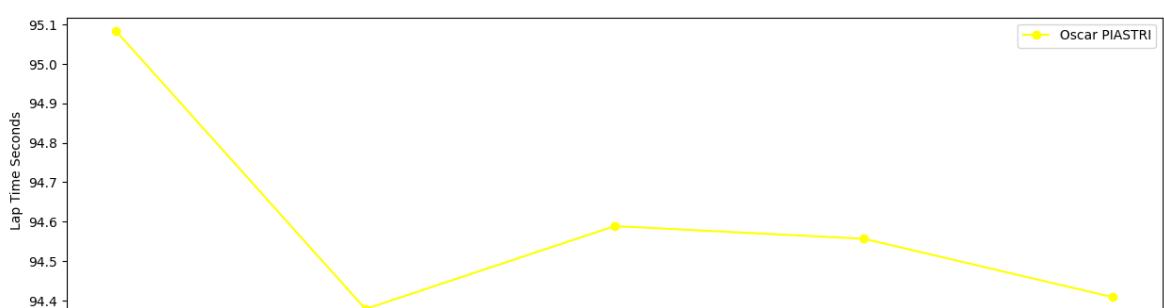
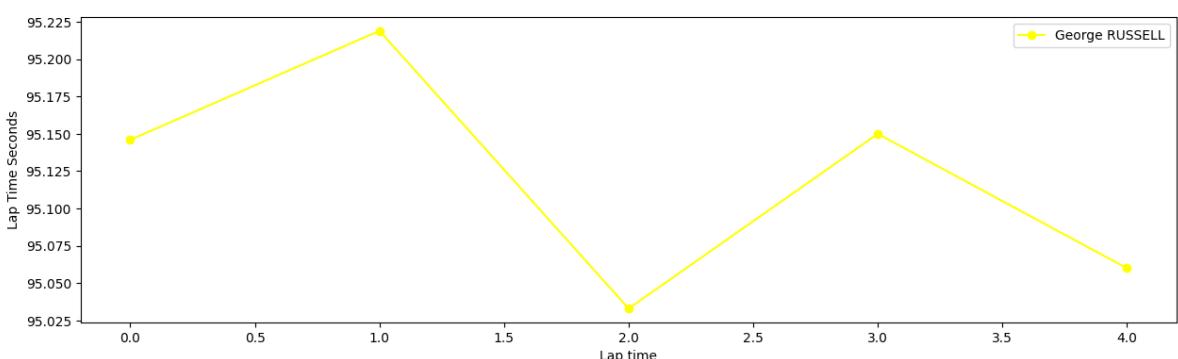
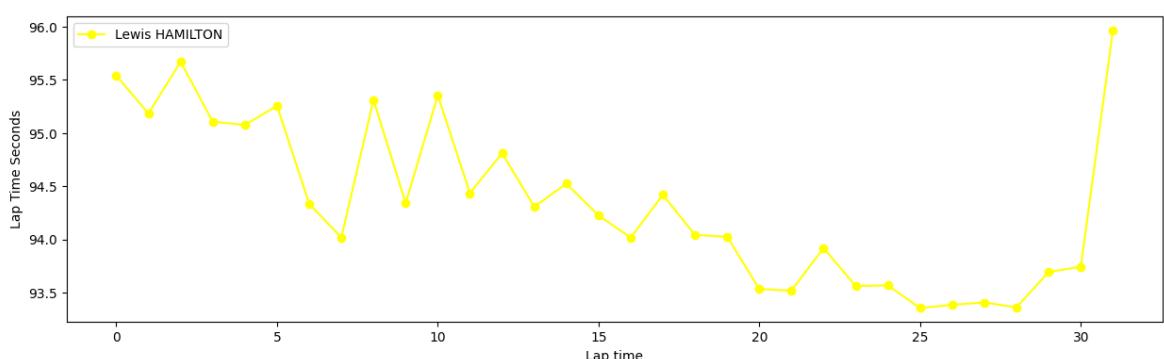
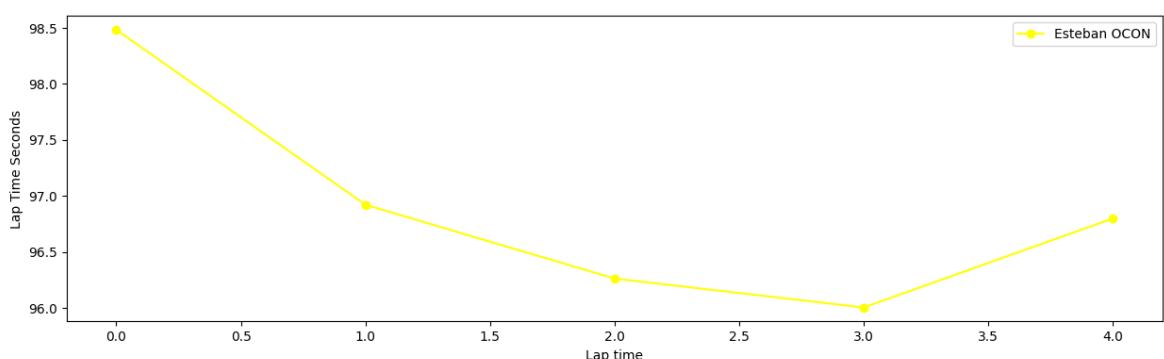
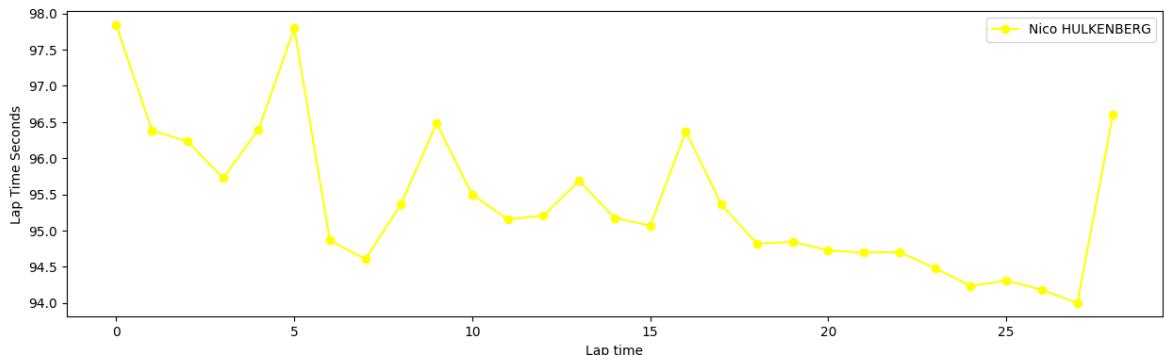
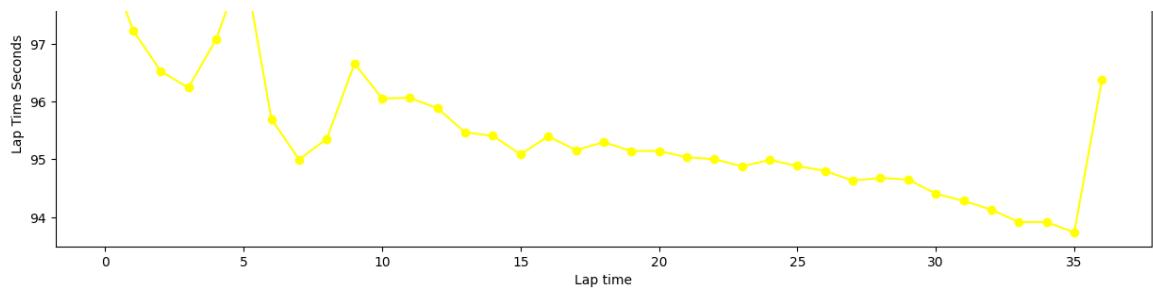
C3 was the tyre used from this session. Due to the safety car, the most of the drivers decided to stop. In case of the drivers that had a different strategy, starting with the hard tyre, was 30 laps with a good pace.

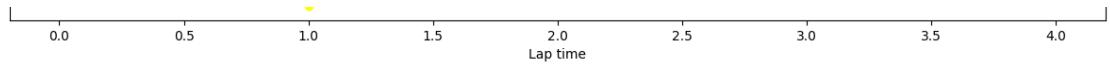
In [170]:

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







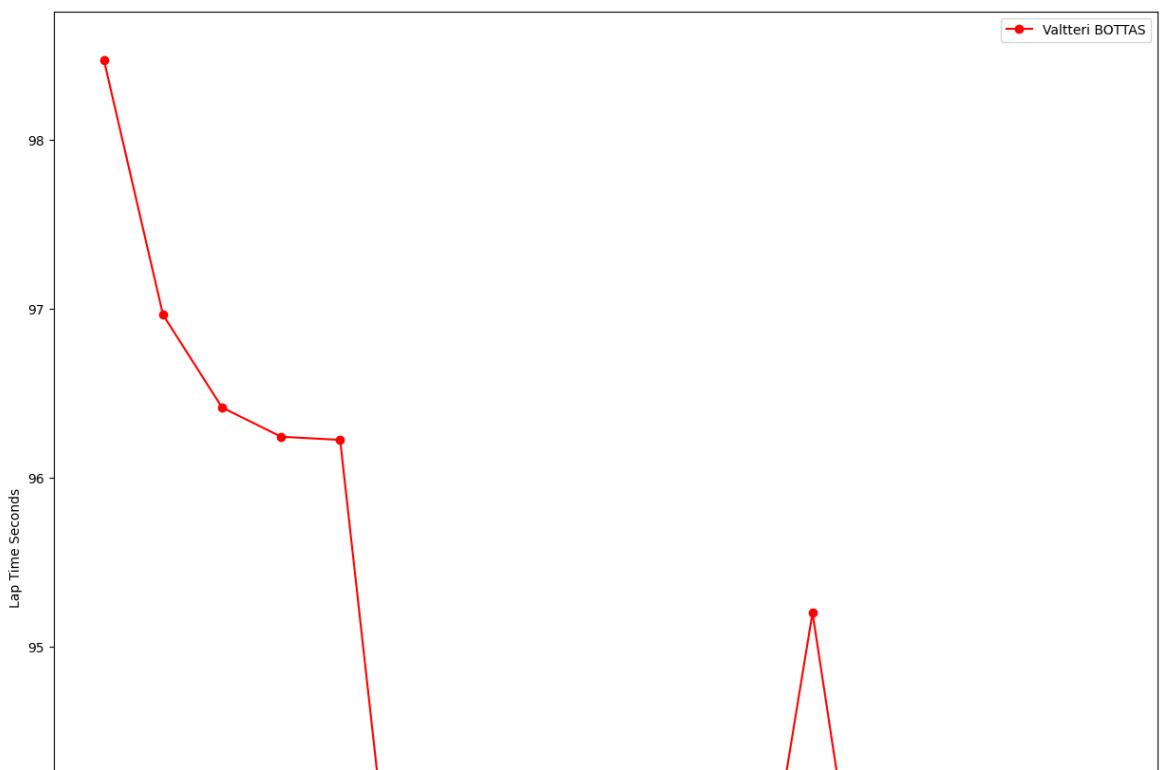
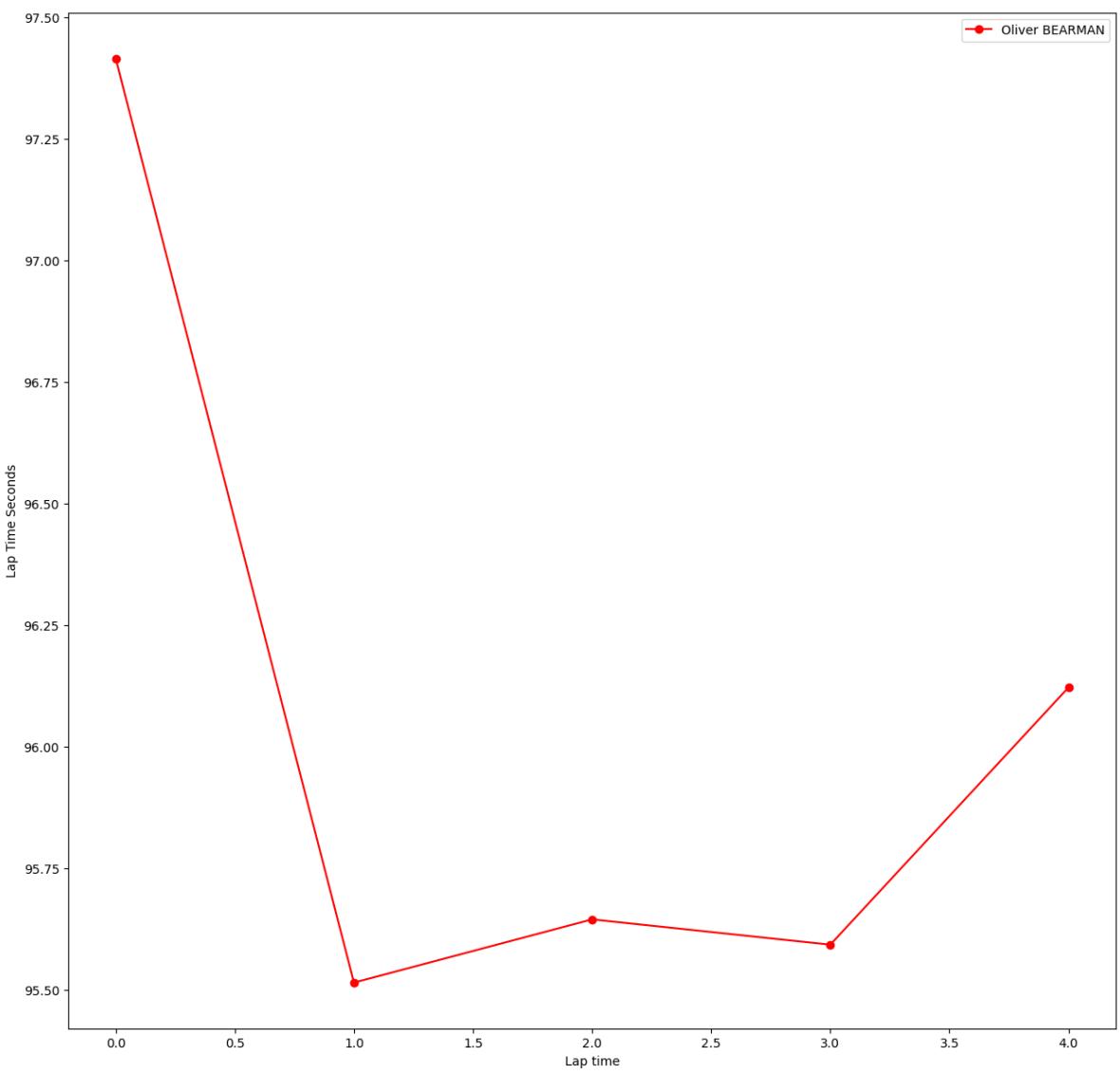


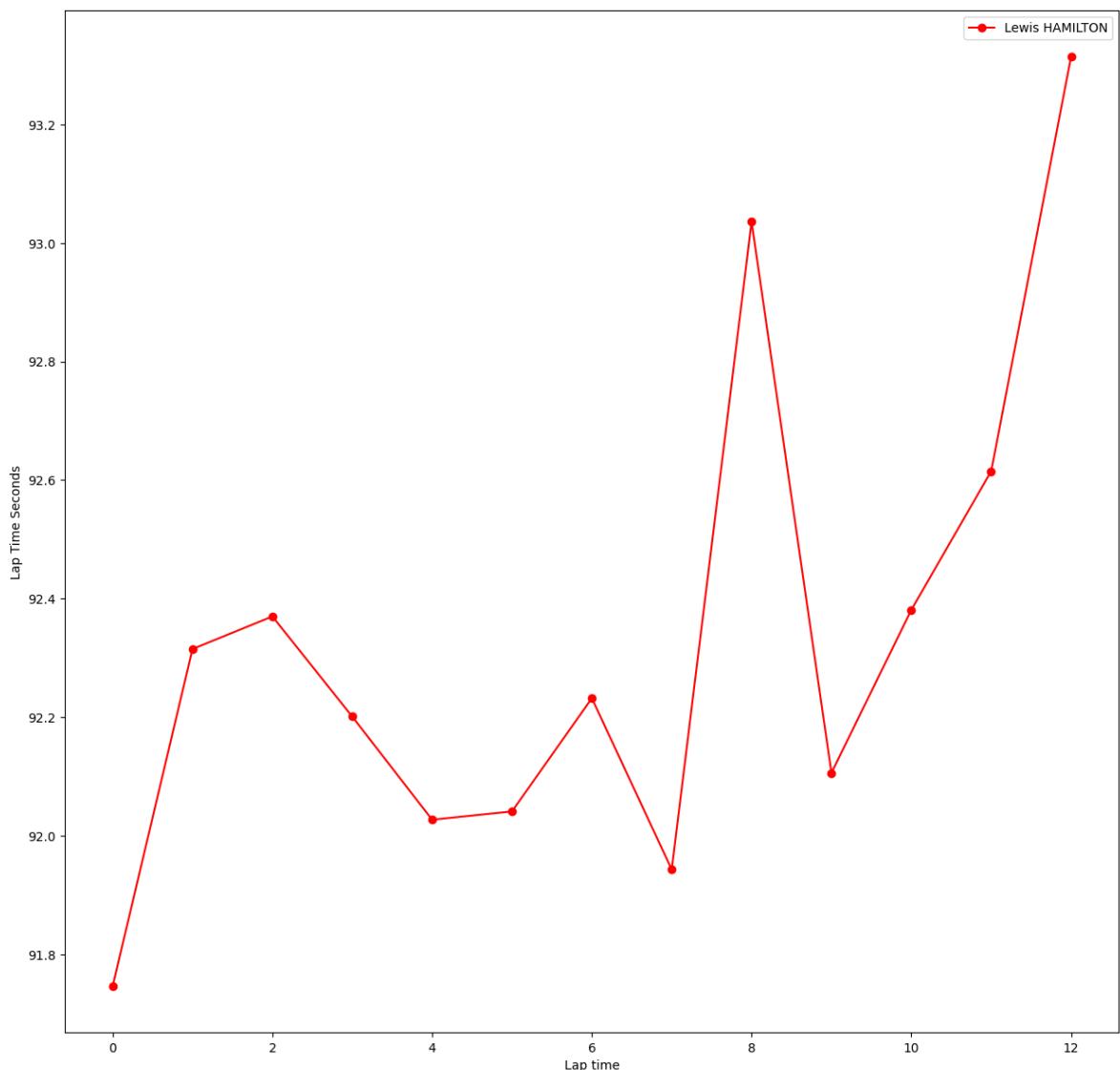
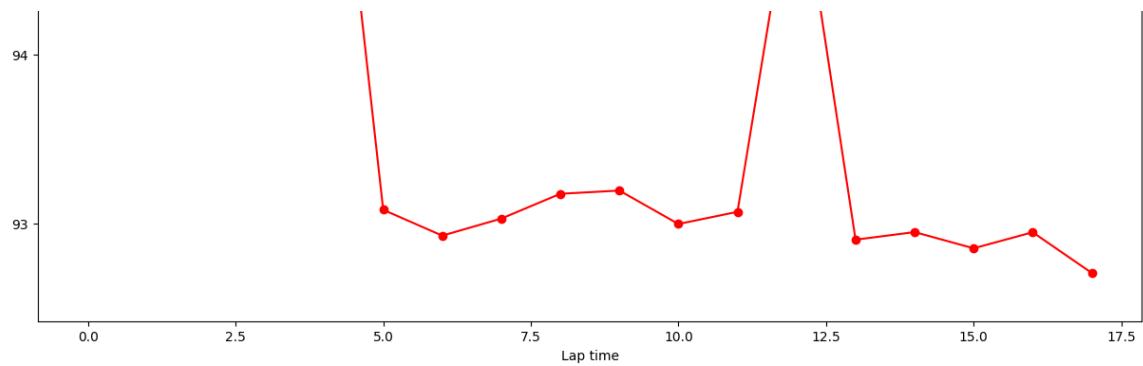
Soft tyres

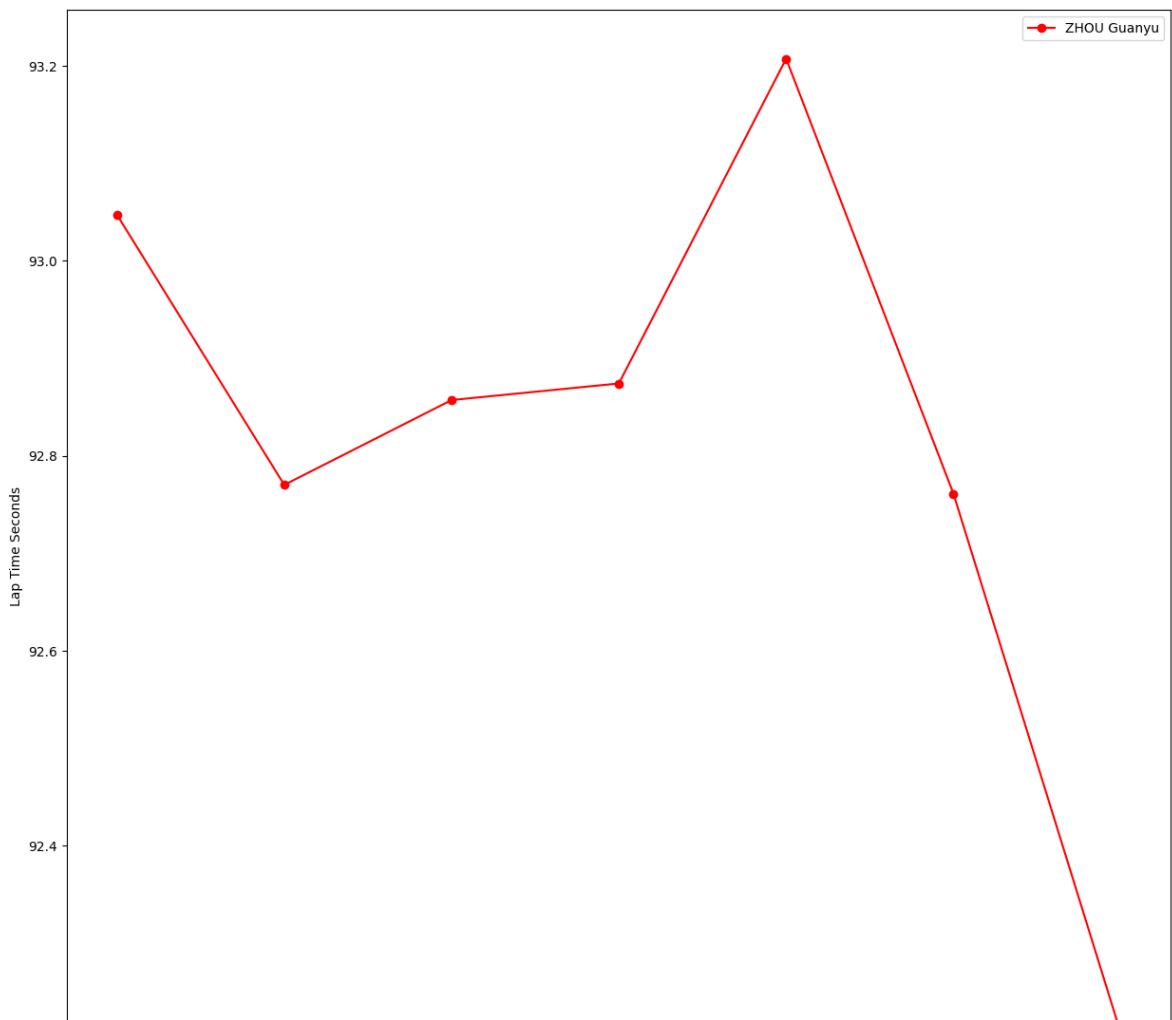
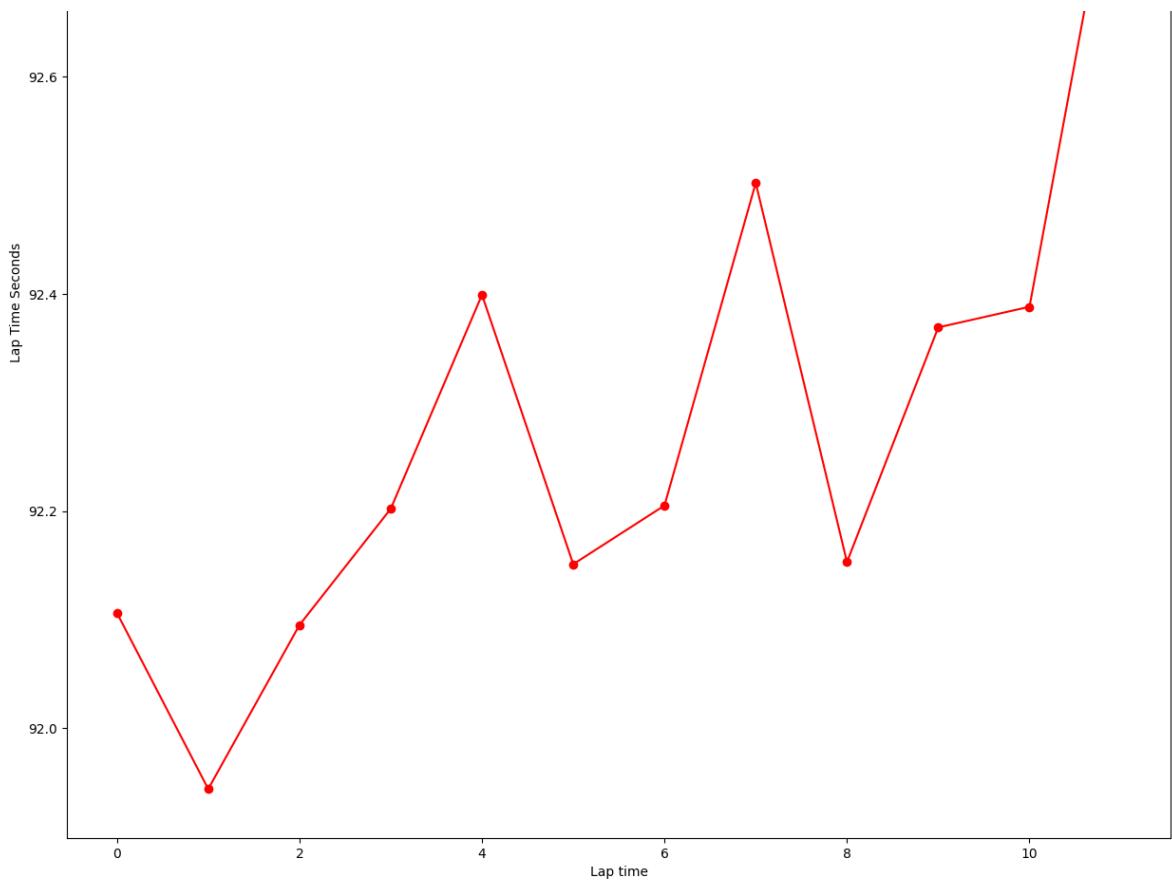
Only ,at beginning, Ollie Bearman used this strategy and due to safety car he stopped to change his tyres. In case of Norris and Hamilton that used a different strategy than the optimal, his pace with the soft was good but not enough to catch Ollie Bearman.

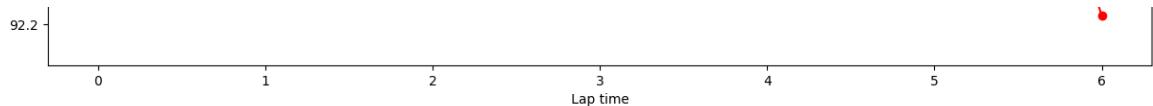
In [171...]

```
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 lap > 0"))
race_pace
```

Out[172...]

lap_duration

compound	lap_duration
SOFT	93.328127
HARD	94.236979
MEDIUM	95.054641

Race pace

General explanation Explanation per teams

In [173...]

```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and lap > 0"))
race_pace
```

Out[173...]

lap_duration

team_name	lap_duration
Red Bull Racing	93.021507
Mercedes	93.682692
McLaren	93.693812
Ferrari	93.749191
Aston Martin	94.009000
Haas F1 Team	94.762517
Kick Sauber	95.168416
Alpine	95.418543
RB	95.475843
Williams	95.485433

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 lap > 0"))
race_pace
```

```
Out[174...           duration_sector_1
```

team_name	duration_sector_1
Red Bull Racing	34.258884
McLaren	34.541058
Ferrari	34.635044
Aston Martin	34.757429
Mercedes	34.810731
Haas F1 Team	35.182083
Kick Sauber	35.282649
Alpine	35.660400
Williams	35.706267
RB	35.742957

Sector 2

General explanation

```
In [175...           race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and la
race_pace
```

```
Out[175...           duration_sector_2
```

team_name	duration_sector_2
Red Bull Racing	29.287725
Mercedes	29.288135
McLaren	29.434319
Aston Martin	29.484750
Ferrari	29.497279
Haas F1 Team	29.723100
Alpine	29.857429
Kick Sauber	29.876506
Williams	29.883500
RB	29.914071

Sector 3

General explanation

```
In [176...           race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False and la
race_pace
```

```
Out[176...           duration_sector_3
```

team_name	duration_sector_3
Red Bull Racing	29.474899

duration_sector_3

team_name	duration_sector_3
Mercedes	29.583827
Ferrari	29.616868
McLaren	29.718435
Aston Martin	29.766821
RB	29.818814
Haas F1 Team	29.857333
Williams	29.895667

In [177]:

jointables

Out[177]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed		
0	1230	9480	1	284.0	294	298.0		
1	1230	9480	2	283.0	285	308.0		
2	1230	9480	3	285.0	309	320.0		
3	1230	9480	4	283.0	300	300.0		
4	1230	9480	10	221.0	213	224.0		
...
877	1230	9480	27	287.0	300	307.0	2024-03-09T18:24:	
878	1230	9480	38	NaN	313	313.0	2024-03-09T18:23:	
879	1230	9480	44	291.0	314	320.0	2024-03-09T18:23:	
880	1230	9480	63	292.0	313	289.0	2024-03-09T18:23:	
881	1230	9480	81	NaN	307	311.0	2024-03-09T18:23:	

882 rows × 20 columns

Comparaison beetween drivers

General explanation

Red Bull Racing

```
In [178... race.query("driver_number== 1 and lap_duration <=110 and lap_duration > 94")  
Out[178... 94.42399999999999
```

```
In [179... race.query("driver_number== 11 and lap_duration <=110 and lap_duration > 94")  
Out[179... 94.41828571428572
```

Ferrari

```
In [180... race.query("driver_number== 16 and lap_duration <=110 and lap_duration > 94")  
Out[180... 94.47930769230769
```

```
In [181... race.query("driver_number== 38 and lap_duration <=110 and lap_duration > 94")  
Out[181... 95.43073684210525
```

McLaren

```
In [182... race.query("driver_number== 4 and lap_duration <=110 and lap_duration > 94")  
Out[182... 94.94730769230767
```

```
In [183... race.query("driver_number== 81 and lap_duration <=110 and lap_duration > 94")  
Out[183... 94.59738888888889
```

Mercedes

```
In [184... race.query("driver_number== 44 and lap_duration <=110 and lap_duration > 94")  
Out[184... 95.42968181818183
```

```
In [185... race.query("driver_number== 63 and lap_duration <=110 and lap_duration > 94")  
Out[185... 94.83145454545455
```

Aston Martin

```
In [186... race.query("driver_number== 14 and lap_duration <=110 and lap_duration > 94")  
Out[186... 94.75526315789473
```

```
In [187... race.query("driver_number== 18 and lap_duration <=110 and lap_duration > 94")
Out[187... 95.79475000000001
```

Haas F1 Team

```
In [188... race.query("driver_number== 20 and lap_duration <=110 and lap_duration > 94")
Out[188... 95.86619354838707
```

```
In [189... race.query("driver_number== 27 and lap_duration <=110 and lap_duration > 94")
Out[189... 95.45642857142856
```

RB

```
In [190... race.query("driver_number== 3 and lap_duration <=110 and lap_duration > 94")
Out[190... 96.0695135135135
```

```
In [191... race.query("driver_number== 22 and lap_duration <=110 and lap_duration > 94")
Out[191... 95.801
```

Williams

```
In [192... race.query("driver_number== 2 and lap_duration <=110 and lap_duration > 94")
Out[192... 95.8088888888889
```

```
In [193... race.query("driver_number== 23 and lap_duration <=110 and lap_duration > 94")
Out[193... 95.91354838709678
```

Alpine

```
In [194... race.query("driver_number== 10 and lap_duration <=110 and lap_duration > 94")
Out[194... nan
```

```
In [195... race.query("driver_number== 31 and lap_duration <=110 and lap_duration > 94")
Out[195... 95.85264705882352
```

Kick Sauber

```
In [196... race.query("driver_number== 24 and lap_duration <=110 and lap_duration > 94")
Out[196... 95.57597058823528
```

```
In [197... race.query("driver_number== 77 and lap_duration <=110 and lap_duration > 90")
Out[197... 96.20987500000001
```

Race pace

```
In [198... MINIMUM_SECONDS = 90
MAXIMUM_SECONDS = 108
```

Red Bull Racing

```
In [199... stintInformation.query('driver_number == 1 or driver_number == 11')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
2	1230	9480		1	1	1	7	MEDIUM
5	1230	9480		1	11	1	7	MEDIUM
25	1230	9480		2	1	8	51	HARD
26	1230	9480		2	11	8	51	HARD

```
In [200... libraryDataF1.getinfolongruns(jointables,1,'Red Bull Racing',MINIMUM_SECONDS)
```

	full_name	compound	date_start	lap_number	duration_sector_1
20	Max VERSTAPPEN	MEDIUM	2024-03-09T17:05:34.885000+00:00	2	34.720
39	Max VERSTAPPEN	MEDIUM	2024-03-09T17:07:09.250000+00:00	3	34.530
58	Max VERSTAPPEN	MEDIUM	2024-03-09T17:08:43.306000+00:00	4	34.416
77	Max VERSTAPPEN	MEDIUM	2024-03-09T17:10:17.093000+00:00	5	34.457
96	Max VERSTAPPEN	MEDIUM	2024-03-09T17:11:50.933000+00:00	6	34.355
155	Max VERSTAPPEN	HARD	2024-03-09T17:21:17.723000+00:00	10	35.648
173	Max VERSTAPPEN	HARD	2024-03-09T17:22:52.628000+00:00	11	34.555
191	Max VERSTAPPEN	HARD	2024-03-09T17:24:26.243000+00:00	12	34.391
209	Max VERSTAPPEN	HARD	2024-03-09T17:25:59.611000+00:00	13	34.096
227	Max VERSTAPPEN	HARD	2024-03-09T17:27:32.604000+00:00	14	34.303
245	Max VERSTAPPEN	HARD	2024-03-09T17:29:05.883000+00:00	15	34.320
263	Max VERSTAPPEN	HARD	2024-03-09T17:30:39.352000+00:00	16	34.239

	full_name	compound		date_start	lap_number	duration_sector_1
281	Max VERSTAPPEN	HARD		2024-03-09T17:32:12.586000+00:00	17	34.134
299	Max VERSTAPPEN	HARD		2024-03-09T17:33:45.720000+00:00	18	34.172
317	Max VERSTAPPEN	HARD		2024-03-09T17:35:18.779000+00:00	19	34.172
335	Max VERSTAPPEN	HARD		2024-03-09T17:36:51.962000+00:00	20	34.155
353	Max VERSTAPPEN	HARD		2024-03-09T17:38:25.080000+00:00	21	34.129
371	Max VERSTAPPEN	HARD		2024-03-09T17:39:57.953000+00:00	22	34.195
389	Max VERSTAPPEN	HARD		2024-03-09T17:41:30.860000+00:00	23	34.024
407	Max VERSTAPPEN	HARD		2024-03-09T17:43:03.691000+00:00	24	33.956
425	Max VERSTAPPEN	HARD		2024-03-09T17:44:36.388000+00:00	25	34.120
443	Max VERSTAPPEN	HARD		2024-03-09T17:46:09.126000+00:00	26	33.949
461	Max VERSTAPPEN	HARD		2024-03-09T17:47:41.703000+00:00	27	34.033
479	Max VERSTAPPEN	HARD		2024-03-09T17:49:14.533000+00:00	28	33.962
497	Max VERSTAPPEN	HARD		2024-03-09T17:50:47.178000+00:00	29	33.939
515	Max VERSTAPPEN	HARD		2024-03-09T17:52:19.969000+00:00	30	33.902
533	Max VERSTAPPEN	HARD		2024-03-09T17:53:52.569000+00:00	31	33.899
551	Max VERSTAPPEN	HARD		2024-03-09T17:55:25.006000+00:00	32	33.990
569	Max VERSTAPPEN	HARD		2024-03-09T17:56:57.539000+00:00	33	33.856
587	Max VERSTAPPEN	HARD		2024-03-09T17:58:29.760000+00:00	34	33.918
604	Max VERSTAPPEN	HARD		2024-03-09T18:00:02.320000+00:00	35	34.000
622	Max VERSTAPPEN	HARD		2024-03-09T18:01:34.943000+00:00	36	33.965
639	Max VERSTAPPEN	HARD		2024-03-09T18:03:07.299000+00:00	37	33.887
656	Max VERSTAPPEN	HARD		2024-03-09T18:04:39.763000+00:00	38	33.875
673	Max VERSTAPPEN	HARD		2024-03-09T18:06:12.089000+00:00	39	33.743
691	Max VERSTAPPEN	HARD		2024-03-09T18:07:43.927000+00:00	40	34.039
709	Max VERSTAPPEN	HARD		2024-03-09T18:09:16.583000+00:00	41	34.119

	full_name	compound		date_start	lap_number	duration_sector_1
727	Max VERSTAPPEN	HARD	2024-03-09T18:10:49.102000+00:00		42	34.337
744	Max VERSTAPPEN	HARD	2024-03-09T18:12:22.031000+00:00		43	34.553
762	Max VERSTAPPEN	HARD	2024-03-09T18:13:55.226000+00:00		44	33.996
780	Max VERSTAPPEN	HARD	2024-03-09T18:15:27.522000+00:00		45	34.348
798	Max VERSTAPPEN	HARD	2024-03-09T18:17:00.590000+00:00		46	34.168
816	Max VERSTAPPEN	HARD	2024-03-09T18:18:33.540000+00:00		47	34.402
834	Max VERSTAPPEN	HARD	2024-03-09T18:20:06.253000+00:00		48	34.127

Max

In [201]:

```
libraryDataF1.getinfolongruns(jointables,11,'Red Bull Racing',MINIMUM_SECONDS=1)
```

Out[201]:

	full_name	compound		date_start	lap_number	duration_sector_1	duration_lap
24	Sergio PEREZ	MEDIUM	2024-03-09T17:05:36.711000+00:00		2	35.070	35.070
43	Sergio PEREZ	MEDIUM	2024-03-09T17:07:11.256000+00:00		3	34.799	34.799
62	Sergio PEREZ	MEDIUM	2024-03-09T17:08:45.305000+00:00		4	34.751	34.751
81	Sergio PEREZ	MEDIUM	2024-03-09T17:10:19.312000+00:00		5	34.625	34.625
100	Sergio PEREZ	MEDIUM	2024-03-09T17:11:53.330000+00:00		6	34.574	34.574
159	Sergio PEREZ	HARD	2024-03-09T17:21:18.137000+00:00		10	36.360	36.360
177	Sergio PEREZ	HARD	2024-03-09T17:22:54.126000+00:00		11	35.019	35.019
195	Sergio PEREZ	HARD	2024-03-09T17:24:28.016000+00:00		12	35.000	35.000
213	Sergio PEREZ	HARD	2024-03-09T17:26:01.897000+00:00		13	34.785	34.785
231	Sergio PEREZ	HARD	2024-03-09T17:27:35.851000+00:00		14	34.633	34.633
249	Sergio PEREZ	HARD	2024-03-09T17:29:09.856000+00:00		15	34.515	34.515
267	Sergio PEREZ	HARD	2024-03-09T17:30:43.184000+00:00		16	34.719	34.719
285	Sergio PEREZ	HARD	2024-03-09T17:32:16.740000+00:00		17	34.882	34.882
303	Sergio PEREZ	HARD	2024-03-09T17:33:50.928000+00:00		18	34.340	34.340
321	Sergio PEREZ	HARD	2024-03-09T17:35:24.176000+00:00		19	34.462	34.462

	full_name	compound		date_start	lap_number	duration_sector_1	dt
339	Sergio PEREZ	HARD	2024-03-09T17:36:57.752000+00:00		20	34.399	
357	Sergio PEREZ	HARD	2024-03-09T17:38:31.208000+00:00		21	34.191	
375	Sergio PEREZ	HARD	2024-03-09T17:40:04.273000+00:00		22	34.206	
393	Sergio PEREZ	HARD	2024-03-09T17:41:37.343000+00:00		23	34.259	
411	Sergio PEREZ	HARD	2024-03-09T17:43:10.256000+00:00		24	34.002	
429	Sergio PEREZ	HARD	2024-03-09T17:44:43.125000+00:00		25	34.219	
447	Sergio PEREZ	HARD	2024-03-09T17:46:16.141000+00:00		26	33.951	
465	Sergio PEREZ	HARD	2024-03-09T17:47:48.953000+00:00		27	34.045	
483	Sergio PEREZ	HARD	2024-03-09T17:49:21.629000+00:00		28	34.129	
501	Sergio PEREZ	HARD	2024-03-09T17:50:54.646000+00:00		29	34.061	
519	Sergio PEREZ	HARD	2024-03-09T17:52:27.241000+00:00		30	34.063	
537	Sergio PEREZ	HARD	2024-03-09T17:54:00.092000+00:00		31	33.992	
555	Sergio PEREZ	HARD	2024-03-09T17:55:32.872000+00:00		32	33.975	
573	Sergio PEREZ	HARD	2024-03-09T17:57:05.385000+00:00		33	33.985	
591	Sergio PEREZ	HARD	2024-03-09T17:58:37.911000+00:00		34	34.056	
608	Sergio PEREZ	HARD	2024-03-09T18:00:10.583000+00:00		35	34.000	
626	Sergio PEREZ	HARD	2024-03-09T18:01:42.962000+00:00		36	33.948	
643	Sergio PEREZ	HARD	2024-03-09T18:03:15.341000+00:00		37	33.781	
659	Sergio PEREZ	HARD	2024-03-09T18:04:47.567000+00:00		38	34.097	
677	Sergio PEREZ	HARD	2024-03-09T18:06:20.362000+00:00		39	33.952	
695	Sergio PEREZ	HARD	2024-03-09T18:07:52.634000+00:00		40	34.179	
713	Sergio PEREZ	HARD	2024-03-09T18:09:25.437000+00:00		41	34.098	
731	Sergio PEREZ	HARD	2024-03-09T18:10:57.847000+00:00		42	33.903	
748	Sergio PEREZ	HARD	2024-03-09T18:12:30.322000+00:00		43	33.987	
766	Sergio PEREZ	HARD	2024-03-09T18:14:02.625000+00:00		44	33.983	

	full_name	compound		date_start	lap_number	duration_sector_1	du
784	Sergio PEREZ	HARD		2024-03-09T18:15:35.165000+00:00	45	34.187	
802	Sergio PEREZ	HARD		2024-03-09T18:17:07.726000+00:00	46	34.002	
820	Sergio PEREZ	HARD		2024-03-09T18:18:40.207000+00:00	47	34.183	
838	Sergio PEREZ	HARD		2024-03-09T18:20:13.116000+00:00	48	33.997	
856	Sergio	HARD		2024-03-09T18:21:45.564000+00:00	49	34.482	

Ferrari

```
In [202]: stintInformation.query('driver number == 16 or driver number == 55')
```

Out[202...]	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
7	1230	9480	1	16	1	7	MEDIUM	
28	1230	9480	2	16	8	51	HARD	

```
In [203]: libraryDataF1.getinfolongruns(jointables, 16, 'Ferrari', MINIMUM_SECONDS, MAXI
```

Out[203...]	full_name	compound		date_start	lap_number	duration_sector_1	du
26	Charles LECLERC	MEDIUM	2024-03-09T17:05:36.112000+00:00		2	34.757	
45	Charles LECLERC	MEDIUM	2024-03-09T17:07:10.280000+00:00		3	34.851	
64	Charles LECLERC	MEDIUM	2024-03-09T17:08:44.924000+00:00		4	35.927	
83	Charles LECLERC	MEDIUM	2024-03-09T17:10:20.146000+00:00		5	34.902	
102	Charles LECLERC	MEDIUM	2024-03-09T17:11:54.577000+00:00		6	34.737	
161	Charles LECLERC	HARD	2024-03-09T17:21:18.576000+00:00		10	36.458	
179	Charles LECLERC	HARD	2024-03-09T17:22:54.603000+00:00		11	35.345	
197	Charles LECLERC	HARD	2024-03-09T17:24:29.101000+00:00		12	34.732	
215	Charles LECLERC	HARD	2024-03-09T17:26:02.823000+00:00		13	35.443	
233	Charles LECLERC	HARD	2024-03-09T17:27:37.378000+00:00		14	35.106	
251	Charles LECLERC	HARD	2024-03-09T17:29:11.446000+00:00		15	34.869	
269	Charles LECLERC	HARD	2024-03-09T17:30:45.591000+00:00		16	34.623	
287	Charles LECLERC	HARD	2024-03-09T17:32:19.686000+00:00		17	34.602	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
305	Charles LECLERC	HARD	2024-03-09T17:33:53.797000+00:00		18	34.703	
323	Charles LECLERC	HARD	2024-03-09T17:35:27.808000+00:00		19	34.700	
341	Charles LECLERC	HARD	2024-03-09T17:37:01.878000+00:00		20	34.734	
359	Charles LECLERC	HARD	2024-03-09T17:38:35.833000+00:00		21	34.562	
377	Charles LECLERC	HARD	2024-03-09T17:40:09.542000+00:00		22	34.505	
395	Charles LECLERC	HARD	2024-03-09T17:41:43.168000+00:00		23	34.525	
413	Charles LECLERC	HARD	2024-03-09T17:43:16.744000+00:00		24	34.499	
431	Charles LECLERC	HARD	2024-03-09T17:44:50.353000+00:00		25	34.411	
449	Charles LECLERC	HARD	2024-03-09T17:46:23.530000+00:00		26	34.950	
467	Charles LECLERC	HARD	2024-03-09T17:47:57.020000+00:00		27	34.087	
485	Charles LECLERC	HARD	2024-03-09T17:49:29.995000+00:00		28	33.992	
503	Charles LECLERC	HARD	2024-03-09T17:51:03.239000+00:00		29	34.229	
521	Charles LECLERC	HARD	2024-03-09T17:52:36.640000+00:00		30	34.034	
539	Charles LECLERC	HARD	2024-03-09T17:54:09.513000+00:00		31	33.852	
557	Charles LECLERC	HARD	2024-03-09T17:55:42.135000+00:00		32	33.998	
575	Charles LECLERC	HARD	2024-03-09T17:57:14.983000+00:00		33	34.074	
593	Charles LECLERC	HARD	2024-03-09T17:58:48.169000+00:00		34	34.015	
610	Charles LECLERC	HARD	2024-03-09T18:00:21.261000+00:00		35	34.047	
628	Charles LECLERC	HARD	2024-03-09T18:01:54.176000+00:00		36	33.953	
645	Charles LECLERC	HARD	2024-03-09T18:03:27.122000+00:00		37	33.871	
661	Charles LECLERC	HARD	2024-03-09T18:04:59.904000+00:00		38	34.030	
679	Charles LECLERC	HARD	2024-03-09T18:06:32.456000+00:00		39	33.983	
697	Charles LECLERC	HARD	2024-03-09T18:08:05.205000+00:00		40	33.896	
715	Charles LECLERC	HARD	2024-03-09T18:09:37.451000+00:00		41	33.936	
733	Charles LECLERC	HARD	2024-03-09T18:11:09.901000+00:00		42	34.077	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration
750	Charles LECLERC	HARD	2024-03-09T18:12:42.641000+00:00		43			34.020
768	Charles LECLERC	HARD	2024-03-09T18:14:15.113000+00:00		44			33.979
786	Charles LECLERC	HARD	2024-03-09T18:15:47.881000+00:00		45			33.883
804	Charles LECLERC	HARD	2024-03-09T18:17:20.433000+00:00		46			33.737
822	Charles LECLERC	HARD	2024-03-09T18:18:52.486000+00:00		47			33.634
840	Charles LECLERC	HARD	2024-03-09T18:20:24.484000+00:00		48			33.936

In [204...]

```
libraryDataF1.getinfolongruns(jointables, 55, 'Ferrari', MINIMUN_SECONDS, MAXIMUM_SECONDS)
```

Out[204...]

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration
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Mercedes

In [205...]

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

Out[205...]

meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
13	1230	9480	1	63	1	7	MEDIUM
17	1230	9480	1	44	1	36	MEDIUM
32	1230	9480	2	63	8	51	HARD
36	1230	9480	2	44	37	51	SOFT

In [206...]

```
libraryDataF1.getinfolongruns(jointables, 44, 'Mercedes', MINIMUN_SECONDS, MAXIMUM_SECONDS)
```

Out[206...]

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration
35	Lewis HAMILTON	MEDIUM	2024-03-09T17:05:40.365000+00:00		2			36.082
54	Lewis HAMILTON	MEDIUM	2024-03-09T17:07:15.871000+00:00		3			35.620
73	Lewis HAMILTON	MEDIUM	2024-03-09T17:08:51.131000+00:00		4			35.622
92	Lewis HAMILTON	MEDIUM	2024-03-09T17:10:26.789000+00:00		5			35.365
111	Lewis HAMILTON	MEDIUM	2024-03-09T17:12:01.878000+00:00		6			35.389
169	Lewis HAMILTON	MEDIUM	2024-03-09T17:21:17.869000+00:00		10			36.023
187	Lewis HAMILTON	MEDIUM	2024-03-09T17:22:53.208000+00:00		11			35.119
205	Lewis HAMILTON	MEDIUM	2024-03-09T17:24:27.573000+00:00		12			34.807

	full_name	compound	date_start	lap_number	duration_sector_1	d
223	Lewis HAMILTON	MEDIUM	2024-03-09T17:26:01.536000+00:00	13	36.142	
241	Lewis HAMILTON	MEDIUM	2024-03-09T17:27:36.795000+00:00	14	34.994	
259	Lewis HAMILTON	MEDIUM	2024-03-09T17:29:11.203000+00:00	15	36.045	
277	Lewis HAMILTON	MEDIUM	2024-03-09T17:30:46.608000+00:00	16	35.036	
295	Lewis HAMILTON	MEDIUM	2024-03-09T17:32:20.976000+00:00	17	35.564	
313	Lewis HAMILTON	MEDIUM	2024-03-09T17:33:55.803000+00:00	18	34.882	
331	Lewis HAMILTON	MEDIUM	2024-03-09T17:35:30.089000+00:00	19	35.163	
349	Lewis HAMILTON	MEDIUM	2024-03-09T17:37:04.568000+00:00	20	34.860	
367	Lewis HAMILTON	MEDIUM	2024-03-09T17:38:38.824000+00:00	21	34.763	
385	Lewis HAMILTON	MEDIUM	2024-03-09T17:40:12.965000+00:00	22	35.066	
403	Lewis HAMILTON	MEDIUM	2024-03-09T17:41:47.285000+00:00	23	34.829	
421	Lewis HAMILTON	MEDIUM	2024-03-09T17:43:21.340000+00:00	24	34.845	
439	Lewis HAMILTON	MEDIUM	2024-03-09T17:44:55.401000+00:00	25	34.498	
457	Lewis HAMILTON	MEDIUM	2024-03-09T17:46:28.840000+00:00	26	34.498	
475	Lewis HAMILTON	MEDIUM	2024-03-09T17:48:02.349000+00:00	27	34.772	
493	Lewis HAMILTON	MEDIUM	2024-03-09T17:49:36.294000+00:00	28	34.565	
511	Lewis HAMILTON	MEDIUM	2024-03-09T17:51:09.847000+00:00	29	34.579	
529	Lewis HAMILTON	MEDIUM	2024-03-09T17:52:43.414000+00:00	30	34.562	
547	Lewis HAMILTON	MEDIUM	2024-03-09T17:54:16.743000+00:00	31	34.454	
565	Lewis HAMILTON	MEDIUM	2024-03-09T17:55:50.109000+00:00	32	34.534	
583	Lewis HAMILTON	MEDIUM	2024-03-09T17:57:23.549000+00:00	33	34.510	
600	Lewis HAMILTON	MEDIUM	2024-03-09T17:58:56.894000+00:00	34	34.622	
618	Lewis HAMILTON	MEDIUM	2024-03-09T18:00:30.553000+00:00	35	34.844	
636	Lewis HAMILTON	MEDIUM	2024-03-09T18:02:04.320000+00:00	36	34.588	
669	Lewis HAMILTON	SOFT	2024-03-09T18:05:29.923000+00:00	38	33.995	

	full_name	compound	date_start	lap_number	duration_sector_1	duration_lap
687	Lewis HAMILTON	SOFT	2024-03-09T18:07:01.794000+00:00	39	34.456	34.456
705	Lewis HAMILTON	SOFT	2024-03-09T18:08:33.896000+00:00	40	34.188	34.188
723	Lewis HAMILTON	SOFT	2024-03-09T18:10:06.212000+00:00	41	34.196	34.196
740	Lewis HAMILTON	SOFT	2024-03-09T18:11:38.514000+00:00	42	34.075	34.075
758	Lewis HAMILTON	SOFT	2024-03-09T18:13:10.452000+00:00	43	34.125	34.125
776	Lewis HAMILTON	SOFT	2024-03-09T18:14:42.559000+00:00	44	34.288	34.288
794	Lewis HAMILTON	SOFT	2024-03-09T18:16:14.819000+00:00	45	34.153	34.153
812	Lewis HAMILTON	SOFT	2024-03-09T18:17:46.699000+00:00	46	34.709	34.709
830	Lewis HAMILTON	SOFT	2024-03-09T18:19:19.782000+00:00	47	34.081	34.081
848	Lewis HAMILTON	SOFT	2024-03-09T18:20:51.963000+00:00	48	34.186	34.186
866	Lewis HAMILTON	SOFT	2024-03-09T18:22:24.242000+00:00	49	34.257	34.257

In [207]: libraryDataF1.getinfolongruns(jointables, 63, 'Mercedes', MINIMUM_SECONDS, MAXIMUM_SECONDS)

	full_name	compound	date_start	lap_number	duration_sector_1	duration_lap
36	George RUSSELL	MEDIUM	2024-03-09T17:05:39.868000+00:00	2	35.762	35.762
55	George RUSSELL	MEDIUM	2024-03-09T17:07:15.135000+00:00	3	35.737	35.737
74	George RUSSELL	MEDIUM	2024-03-09T17:08:50.307000+00:00	4	35.522	35.522
93	George RUSSELL	MEDIUM	2024-03-09T17:10:25.283000+00:00	5	35.467	35.467
112	George RUSSELL	MEDIUM	2024-03-09T17:12:00.536000+00:00	6	35.505	35.505
170	George RUSSELL	HARD	2024-03-09T17:21:19.460000+00:00	10	37.722	37.722
188	George RUSSELL	HARD	2024-03-09T17:22:57.445000+00:00	11	35.820	35.820
206	George RUSSELL	HARD	2024-03-09T17:24:32.404000+00:00	12	35.327	35.327
224	George RUSSELL	HARD	2024-03-09T17:26:06.980000+00:00	13	35.530	35.530
242	George RUSSELL	HARD	2024-03-09T17:27:42.080000+00:00	14	35.046	35.046
260	George RUSSELL	HARD	2024-03-09T17:29:16.295000+00:00	15	35.346	35.346
278	George RUSSELL	HARD	2024-03-09T17:30:51.312000+00:00	16	35.196	35.196

	full_name	compound		date_start	lap_number	duration_sector_1	dt
296	George RUSSELL	HARD	2024-03-09T17:32:25.779000+00:00		17	35.144	
314	George RUSSELL	HARD	2024-03-09T17:34:00.730000+00:00		18	35.218	
332	George RUSSELL	HARD	2024-03-09T17:35:35.254000+00:00		19	35.139	
350	George RUSSELL	HARD	2024-03-09T17:37:09.609000+00:00		20	35.093	
368	George RUSSELL	HARD	2024-03-09T17:38:44.124000+00:00		21	34.966	
386	George RUSSELL	HARD	2024-03-09T17:40:18.339000+00:00		22	34.970	
404	George RUSSELL	HARD	2024-03-09T17:41:52.545000+00:00		23	34.763	
422	George RUSSELL	HARD	2024-03-09T17:43:26.658000+00:00		24	35.064	
440	George RUSSELL	HARD	2024-03-09T17:45:00.887000+00:00		25	35.002	
458	George RUSSELL	HARD	2024-03-09T17:46:34.983000+00:00		26	34.921	
476	George RUSSELL	HARD	2024-03-09T17:48:08.723000+00:00		27	34.788	
494	George RUSSELL	HARD	2024-03-09T17:49:42.305000+00:00		28	34.708	
512	George RUSSELL	HARD	2024-03-09T17:51:16.116000+00:00		29	34.730	
530	George RUSSELL	HARD	2024-03-09T17:52:49.700000+00:00		30	34.659	
548	George RUSSELL	HARD	2024-03-09T17:54:23.386000+00:00		31	34.639	
566	George RUSSELL	HARD	2024-03-09T17:55:56.840000+00:00		32	34.602	
584	George RUSSELL	HARD	2024-03-09T17:57:30.281000+00:00		33	34.610	
601	George RUSSELL	HARD	2024-03-09T17:59:03.657000+00:00		34	34.543	
619	George RUSSELL	HARD	2024-03-09T18:00:36.849000+00:00		35	34.496	
637	George RUSSELL	HARD	2024-03-09T18:02:10.117000+00:00		36	34.449	
653	George RUSSELL	HARD	2024-03-09T18:03:43.149000+00:00		37	34.474	
670	George RUSSELL	HARD	2024-03-09T18:05:16.283000+00:00		38	34.454	
688	George RUSSELL	HARD	2024-03-09T18:06:49.393000+00:00		39	34.309	
706	George RUSSELL	HARD	2024-03-09T18:08:22.080000+00:00		40	34.210	
724	George RUSSELL	HARD	2024-03-09T18:09:54.580000+00:00		41	34.172	

	full_name	compound		date_start	lap_number	duration_sector_1	du
741	George RUSSELL	HARD	2024-03-09T18:11:27.087000+00:00		42	34.061	
759	George RUSSELL	HARD	2024-03-09T18:12:59.192000+00:00		43	34.162	
777	George RUSSELL	HARD	2024-03-09T18:14:31.658000+00:00		44	34.256	
795	George RUSSELL	HARD	2024-03-09T18:16:04.251000+00:00		45	34.325	
813	George RUSSELL	HARD	2024-03-09T18:17:36.838000+00:00		46	34.342	
831	George RUSSELL	HARD	2024-03-09T18:19:09.461000+00:00		47	34.327	
849	George RUSSELL	HARD	2024-03-09T18:20:42.011000+00:00		48	34.605	
867	George RUSSELL	HARD	2024-03-09T18:22:14.822000+00:00		49	34.431	

Aston Martin

```
In [208]: stintInformation.query('driver_number == 14 or driver_number == 18')

Out[208]:
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
1	1230	9480	1	18	1	6	MEDIUM	
6	1230	9480	1	14	1	7	MEDIUM	
27	1230	9480	2	14	8	51	HARD	

```
In [209]: libraryDataF1.getinfolongruns(jointables, 14, 'Aston Martin', MINIMUM_SECONDS)
```



```
Out[209]:
```

full_name	compound	date_start	lap_number	duration_sector_1	di
Aston Martin	Qualifying	2019-07-13T12:00:00Z	1	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	2	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	3	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	4	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	5	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	6	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	7	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	8	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	9	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	10	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	11	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	12	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	13	00:00:00.000	0
Aston Martin	Qualifying	2019-07-13T12:00:00Z	14	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	1	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	2	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	3	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	4	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	5	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	6	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	7	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	8	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	9	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	10	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	11	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	12	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	13	00:00:00.000	0
Aston Martin	Race	2019-07-13T12:00:00Z	14	00:00:00.000	0

	full_name	compound		date_start	lap_number	duration_sector_1	dt
250	Fernando ALONSO	HARD	2024-03-09T17:29:15.157000+00:00		15	34.902	
268	Fernando ALONSO	HARD	2024-03-09T17:30:49.753000+00:00		16	34.934	
286	Fernando ALONSO	HARD	2024-03-09T17:32:24.531000+00:00		17	34.943	
304	Fernando ALONSO	HARD	2024-03-09T17:33:59.313000+00:00		18	34.896	
322	Fernando ALONSO	HARD	2024-03-09T17:35:33.920000+00:00		19	34.983	
340	Fernando ALONSO	HARD	2024-03-09T17:37:08.599000+00:00		20	34.883	
358	Fernando ALONSO	HARD	2024-03-09T17:38:43.090000+00:00		21	34.729	
376	Fernando ALONSO	HARD	2024-03-09T17:40:17.314000+00:00		22	34.739	
394	Fernando ALONSO	HARD	2024-03-09T17:41:51.394000+00:00		23	34.657	
412	Fernando ALONSO	HARD	2024-03-09T17:43:25.385000+00:00		24	34.677	
430	Fernando ALONSO	HARD	2024-03-09T17:44:59.441000+00:00		25	34.616	
448	Fernando ALONSO	HARD	2024-03-09T17:46:33.385000+00:00		26	34.594	
466	Fernando ALONSO	HARD	2024-03-09T17:48:07.183000+00:00		27	34.426	
484	Fernando ALONSO	HARD	2024-03-09T17:49:40.801000+00:00		28	34.576	
502	Fernando ALONSO	HARD	2024-03-09T17:51:14.663000+00:00		29	34.537	
520	Fernando ALONSO	HARD	2024-03-09T17:52:48.237000+00:00		30	34.451	
538	Fernando ALONSO	HARD	2024-03-09T17:54:21.795000+00:00		31	34.486	
556	Fernando ALONSO	HARD	2024-03-09T17:55:55.460000+00:00		32	34.473	
574	Fernando ALONSO	HARD	2024-03-09T17:57:28.803000+00:00		33	34.434	
592	Fernando ALONSO	HARD	2024-03-09T17:59:02.316000+00:00		34	34.380	
609	Fernando ALONSO	HARD	2024-03-09T18:00:35.519000+00:00		35	34.323	
627	Fernando ALONSO	HARD	2024-03-09T18:02:09.082000+00:00		36	34.245	
644	Fernando ALONSO	HARD	2024-03-09T18:03:41.967000+00:00		37	34.240	
660	Fernando ALONSO	HARD	2024-03-09T18:05:15.217000+00:00		38	34.158	
678	Fernando ALONSO	HARD	2024-03-09T18:06:47.952000+00:00		39	34.055	

In [210]:

```
libraryDataF1.getinfologruns(jointables, 18, 'Aston Martin', MINIMUM SECONDS
```

Out[210...]

	full_name	compound		date_start	lap_number	duration_sector_1	du
27	Lance STROLL	MEDIUM		2024-03-09T17:05:41.933000+00:00	2		35.771
46	Lance STROLL	MEDIUM		2024-03-09T17:07:18.074000+00:00	3		35.453
65	Lance STROLL	MEDIUM		2024-03-09T17:08:53.791000+00:00	4		35.301
84	Lance STROLL	MEDIUM		2024-03-09T17:10:29.589000+00:00	5		35.293

McLaren

In [211...]

```
stintInformation.query('driver number == 4 or driver number == 81')
```

Out[211...]

meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
15	1230	9480	1	81	1	7	MEDIUM
18	1230	9480	1	4	1	37	MEDIUM
33	1230	9480	2	81	8	51	HARD
37	1230	9480	2	4	38	51	SOFT

In [212]:

```
libraryDataF1.getinfofolongruns(jointables, 4, 'McLaren', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

Out[212]

full name	compound	date	start	lap	number	duration	sector 1	di
-----------	----------	------	-------	-----	--------	----------	----------	----

	full_name	compound		date_start	lap_number	duration_sector_1	dt
23	Lando NORRIS	MEDIUM	2024-03-09T17:05:39.455000+00:00		2	35.355	
42	Lando NORRIS	MEDIUM	2024-03-09T17:07:14.651000+00:00		3	35.158	
61	Lando NORRIS	MEDIUM	2024-03-09T17:08:49.750000+00:00		4	35.054	
80	Lando NORRIS	MEDIUM	2024-03-09T17:10:24.642000+00:00		5	35.043	
99	Lando NORRIS	MEDIUM	2024-03-09T17:11:59.573000+00:00		6	35.133	
158	Lando NORRIS	MEDIUM	2024-03-09T17:21:17.536000+00:00		10	34.882	
176	Lando NORRIS	MEDIUM	2024-03-09T17:22:51.733000+00:00		11	34.198	
194	Lando NORRIS	MEDIUM	2024-03-09T17:24:25.525000+00:00		12	34.258	
212	Lando NORRIS	MEDIUM	2024-03-09T17:25:59.337000+00:00		13	35.575	
230	Lando NORRIS	MEDIUM	2024-03-09T17:27:34.446000+00:00		14	34.497	
248	Lando NORRIS	MEDIUM	2024-03-09T17:29:08.333000+00:00		15	34.389	
266	Lando NORRIS	MEDIUM	2024-03-09T17:30:42.302000+00:00		16	34.387	
284	Lando NORRIS	MEDIUM	2024-03-09T17:32:16.147000+00:00		17	34.635	
302	Lando NORRIS	MEDIUM	2024-03-09T17:33:50.596000+00:00		18	35.599	
320	Lando NORRIS	MEDIUM	2024-03-09T17:35:26.268000+00:00		19	34.537	
338	Lando NORRIS	MEDIUM	2024-03-09T17:37:00.485000+00:00		20	34.492	
356	Lando NORRIS	MEDIUM	2024-03-09T17:38:34.519000+00:00		21	34.384	
374	Lando NORRIS	MEDIUM	2024-03-09T17:40:08.478000+00:00		22	34.268	
392	Lando NORRIS	MEDIUM	2024-03-09T17:41:42.106000+00:00		23	34.331	
410	Lando NORRIS	MEDIUM	2024-03-09T17:43:15.990000+00:00		24	34.228	
428	Lando NORRIS	MEDIUM	2024-03-09T17:44:49.503000+00:00		25	34.207	
446	Lando NORRIS	MEDIUM	2024-03-09T17:46:23.101000+00:00		26	34.364	
464	Lando NORRIS	MEDIUM	2024-03-09T17:47:56.895000+00:00		27	35.204	
482	Lando NORRIS	MEDIUM	2024-03-09T17:49:31.547000+00:00		28	34.295	
500	Lando NORRIS	MEDIUM	2024-03-09T17:51:05.296000+00:00		29	34.288	

	full_name	compound	date_start	lap_number	duration_sector_1	duration_lap
518	Lando NORRIS	MEDIUM	2024-03-09T17:52:39.083000+00:00	30	34.252	
536	Lando NORRIS	MEDIUM	2024-03-09T17:54:12.646000+00:00	31	34.267	
554	Lando NORRIS	MEDIUM	2024-03-09T17:55:46.247000+00:00	32	34.073	
572	Lando NORRIS	MEDIUM	2024-03-09T17:57:19.527000+00:00	33	34.174	
590	Lando NORRIS	MEDIUM	2024-03-09T17:58:53.100000+00:00	34	34.242	
607	Lando NORRIS	MEDIUM	2024-03-09T18:00:26.458000+00:00	35	34.212	
625	Lando NORRIS	MEDIUM	2024-03-09T18:02:00.093000+00:00	36	34.258	
642	Lando NORRIS	MEDIUM	2024-03-09T18:03:33.592000+00:00	37	34.295	
676	Lando NORRIS	SOFT	2024-03-09T18:07:01.105000+00:00	39	33.720	
694	Lando NORRIS	SOFT	2024-03-09T18:08:33.340000+00:00	40	33.625	
712	Lando NORRIS	SOFT	2024-03-09T18:10:05.196000+00:00	41	33.575	
730	Lando NORRIS	SOFT	2024-03-09T18:11:37.188000+00:00	42	33.716	
747	Lando NORRIS	SOFT	2024-03-09T18:13:09.425000+00:00	43	33.785	
765	Lando NORRIS	SOFT	2024-03-09T18:14:41.921000+00:00	44	33.605	
783	Lando NORRIS	SOFT	2024-03-09T18:16:13.996000+00:00	45	33.639	
801	Lando NORRIS	SOFT	2024-03-09T18:17:46.285000+00:00	46	33.904	
819	Lando NORRIS	SOFT	2024-03-09T18:19:18.713000+00:00	47	33.589	
837	Lando NORRIS	SOFT	2024-03-09T18:20:50.849000+00:00	48	33.734	

Lando

In [213...]

```
libraryDataF1.getinfolongruns(jointables,81,'McLaren',MINIMUM_SECONDS,MAXIMUM_SECONDS)
```

Out[213...]

	full_name	compound	date_start	lap_number	duration_sector_1	duration_lap
38	Oscar PIASTRI	MEDIUM	2024-03-09T17:05:38.133000+00:00	2	34.965	
57	Oscar PIASTRI	MEDIUM	2024-03-09T17:07:13.200000+00:00	3	34.586	
76	Oscar PIASTRI	MEDIUM	2024-03-09T17:08:47.691000+00:00	4	34.810	
95	Oscar PIASTRI	MEDIUM	2024-03-09T17:10:22.205000+00:00	5	34.773	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
114	Oscar PIASTRI	MEDIUM	2024-03-09T17:11:56.771000+00:00		6	34.705	
172	Oscar PIASTRI	HARD	2024-03-09T17:21:18.871000+00:00		10	36.736	
190	Oscar PIASTRI	HARD	2024-03-09T17:22:55.487000+00:00		11	35.264	
208	Oscar PIASTRI	HARD	2024-03-09T17:24:29.862000+00:00		12	34.817	
226	Oscar PIASTRI	HARD	2024-03-09T17:26:03.859000+00:00		13	35.103	
244	Oscar PIASTRI	HARD	2024-03-09T17:27:38.123000+00:00		14	34.969	
262	Oscar PIASTRI	HARD	2024-03-09T17:29:12.571000+00:00		15	35.174	
280	Oscar PIASTRI	HARD	2024-03-09T17:30:46.904000+00:00		16	35.147	
298	Oscar PIASTRI	HARD	2024-03-09T17:32:21.292000+00:00		17	35.865	
316	Oscar PIASTRI	HARD	2024-03-09T17:33:56.391000+00:00		18	34.898	
334	Oscar PIASTRI	HARD	2024-03-09T17:35:30.490000+00:00		19	35.267	
352	Oscar PIASTRI	HARD	2024-03-09T17:37:05.157000+00:00		20	34.990	
370	Oscar PIASTRI	HARD	2024-03-09T17:38:39.456000+00:00		21	34.684	
388	Oscar PIASTRI	HARD	2024-03-09T17:40:13.223000+00:00		22	35.259	
406	Oscar PIASTRI	HARD	2024-03-09T17:41:47.900000+00:00		23	34.722	
424	Oscar PIASTRI	HARD	2024-03-09T17:43:21.691000+00:00		24	35.019	
442	Oscar PIASTRI	HARD	2024-03-09T17:44:55.729000+00:00		25	34.773	
460	Oscar PIASTRI	HARD	2024-03-09T17:46:29.446000+00:00		26	34.612	
478	Oscar PIASTRI	HARD	2024-03-09T17:48:02.778000+00:00		27	34.846	
496	Oscar PIASTRI	HARD	2024-03-09T17:49:36.704000+00:00		28	34.617	
514	Oscar PIASTRI	HARD	2024-03-09T17:51:10.290000+00:00		29	34.792	
532	Oscar PIASTRI	HARD	2024-03-09T17:52:44.202000+00:00		30	34.651	
550	Oscar PIASTRI	HARD	2024-03-09T17:54:17.436000+00:00		31	34.555	
568	Oscar PIASTRI	HARD	2024-03-09T17:55:50.865000+00:00		32	34.729	
586	Oscar PIASTRI	HARD	2024-03-09T17:57:24.149000+00:00		33	34.649	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
603	Oscar PIASTRI	HARD	2024-03-09T17:58:57.390000+00:00		34	34.725	
621	Oscar PIASTRI	HARD	2024-03-09T18:00:30.828000+00:00		35	35.331	
638	Oscar PIASTRI	HARD	2024-03-09T18:02:04.949000+00:00		36	34.596	
655	Oscar PIASTRI	HARD	2024-03-09T18:03:37.835000+00:00		37	33.990	
672	Oscar PIASTRI	HARD	2024-03-09T18:05:10.907000+00:00		38	34.210	
690	Oscar PIASTRI	HARD	2024-03-09T18:06:43.913000+00:00		39	34.000	
708	Oscar PIASTRI	HARD	2024-03-09T18:08:16.692000+00:00		40	33.984	
726	Oscar PIASTRI	HARD	2024-03-09T18:09:49.213000+00:00		41	34.014	
743	Oscar PIASTRI	HARD	2024-03-09T18:11:21.766000+00:00		42	33.936	
761	Oscar PIASTRI	HARD	2024-03-09T18:12:54.186000+00:00		43	33.951	
779	Oscar PIASTRI	HARD	2024-03-09T18:14:26.810000+00:00		44	33.957	
797	Oscar PIASTRI	HARD	2024-03-09T18:15:59.311000+00:00		45	33.816	
815	Oscar PIASTRI	HARD	2024-03-09T18:17:31.640000+00:00		46	34.112	
833	Oscar PIASTRI	HARD	2024-03-09T18:19:04.224000+00:00		47	34.006	
851	Oscar PIASTRI	HARD	2024-03-09T18:20:36.816000+00:00		48	34.010	
860	Oscar	MEDIUM	2024-03-09T18:22:00.001000+00:00		49	34.050	

RB

In [214...]: `stintInformation.query('driver_number == 3 or driver_number == 22')`

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
4	1230	9480	1	3	1	7	MEDIUM	
9	1230	9480	1	22	1	7	MEDIUM	
22	1230	9480	2	3	8	50	HARD	
23	1230	9480	2	22	8	50	HARD	

In [215...]: `libraryDataF1.getinfolongruns(jointables, 3, 'RB', MINIMUM_SECONDS, MAXIMUM_SECONDS)`

	full_name	compound		date_start	lap_number	duration_sector_1
22	Daniel RICCIARDO	MEDIUM	2024-03-09T17:05:43.944000+00:00		2	37.420

	full_name	compound	date_start	lap_number	duration_sector_1
41	Daniel RICCIARDO	MEDIUM	2024-03-09T17:07:21.833000+00:00	3	36.440
60	Daniel RICCIARDO	MEDIUM	2024-03-09T17:08:58.600000+00:00	4	35.734
79	Daniel RICCIARDO	MEDIUM	2024-03-09T17:10:34.862000+00:00	5	35.461
98	Daniel RICCIARDO	MEDIUM	2024-03-09T17:12:10.560000+00:00	6	35.463
157	Daniel RICCIARDO	HARD	2024-03-09T17:21:22.640000+00:00	10	38.260
175	Daniel RICCIARDO	HARD	2024-03-09T17:23:02.549000+00:00	11	36.633
193	Daniel RICCIARDO	HARD	2024-03-09T17:24:39.330000+00:00	12	35.792
211	Daniel RICCIARDO	HARD	2024-03-09T17:26:15.528000+00:00	13	35.538
229	Daniel RICCIARDO	HARD	2024-03-09T17:27:51.811000+00:00	14	35.562
247	Daniel RICCIARDO	HARD	2024-03-09T17:29:27.419000+00:00	15	35.330
265	Daniel RICCIARDO	HARD	2024-03-09T17:31:02.917000+00:00	16	35.480
283	Daniel RICCIARDO	HARD	2024-03-09T17:32:38.761000+00:00	17	35.974
301	Daniel RICCIARDO	HARD	2024-03-09T17:34:15.001000+00:00	18	35.958
319	Daniel RICCIARDO	HARD	2024-03-09T17:35:51.112000+00:00	19	35.819
337	Daniel RICCIARDO	HARD	2024-03-09T17:37:27.001000+00:00	20	35.843
355	Daniel RICCIARDO	HARD	2024-03-09T17:39:03.093000+00:00	21	36.830
373	Daniel RICCIARDO	HARD	2024-03-09T17:40:39.810000+00:00	22	36.561
391	Daniel RICCIARDO	HARD	2024-03-09T17:42:16.193000+00:00	23	35.877
409	Daniel RICCIARDO	HARD	2024-03-09T17:43:52.140000+00:00	24	35.091
427	Daniel RICCIARDO	HARD	2024-03-09T17:45:26.884000+00:00	25	35.044
445	Daniel RICCIARDO	HARD	2024-03-09T17:47:01.790000+00:00	26	35.025
463	Daniel RICCIARDO	HARD	2024-03-09T17:48:36.671000+00:00	27	35.583
481	Daniel RICCIARDO	HARD	2024-03-09T17:50:12.348000+00:00	28	35.502
499	Daniel RICCIARDO	HARD	2024-03-09T17:51:47.601000+00:00	29	35.595
517	Daniel RICCIARDO	HARD	2024-03-09T17:53:23.346000+00:00	30	35.466

	full_name	compound	date_start	lap_number	duration_sector_1
535	Daniel RICCIARDO	HARD	2024-03-09T17:54:58.921000+00:00	31	35.565
553	Daniel RICCIARDO	HARD	2024-03-09T17:56:34.358000+00:00	32	35.768
571	Daniel RICCIARDO	HARD	2024-03-09T17:58:10.170000+00:00	33	36.095
589	Daniel RICCIARDO	HARD	2024-03-09T17:59:45.891000+00:00	34	35.588
606	Daniel RICCIARDO	HARD	2024-03-09T18:01:21.106000+00:00	35	35.174
624	Daniel RICCIARDO	HARD	2024-03-09T18:02:55.772000+00:00	36	35.342
641	Daniel RICCIARDO	HARD	2024-03-09T18:04:30.747000+00:00	37	34.931
658	Daniel RICCIARDO	HARD	2024-03-09T18:06:04.827000+00:00	38	34.776
675	Daniel RICCIARDO	HARD	2024-03-09T18:07:38.670000+00:00	39	34.822
693	Daniel RICCIARDO	HARD	2024-03-09T18:09:12.565000+00:00	40	34.721
711	Daniel RICCIARDO	HARD	2024-03-09T18:10:46.245000+00:00	41	35.343
729	Daniel RICCIARDO	HARD	2024-03-09T18:12:20.814000+00:00	42	35.691
746	Daniel RICCIARDO	HARD	2024-03-09T18:13:56.524000+00:00	43	34.779
764	Daniel RICCIARDO	HARD	2024-03-09T18:15:30.247000+00:00	44	34.624
782	Daniel RICCIARDO	HARD	2024-03-09T18:17:03.634000+00:00	45	34.885
800	Daniel RICCIARDO	HARD	2024-03-09T18:18:37.380000+00:00	46	34.552
818	Daniel RICCIARDO	HARD	2024-03-09T18:20:10.830000+00:00	47	34.562
...	Daniel	MEDIUM	2024-03-09T18:21.11100000+00:00	48	34.100

In [216...]

libraryDataF1.getinfolongruns(jointables, 22, 'RB', MINIMUM_SECONDS, MAXIMUM_SI

Out[216...]

	full_name	compound	date_start	lap_number	duration_sector_1	d
29	Yuki TSUNODA	MEDIUM	2024-03-09T17:05:42.090000+00:00	2	36.610	
48	Yuki TSUNODA	MEDIUM	2024-03-09T17:07:18.870000+00:00	3	35.593	
67	Yuki TSUNODA	MEDIUM	2024-03-09T17:08:54.576000+00:00	4	35.570	
86	Yuki TSUNODA	MEDIUM	2024-03-09T17:10:29.998000+00:00	5	35.908	
105	Yuki TSUNODA	MEDIUM	2024-03-09T17:12:05.581000+00:00	6	36.227	

	full_name	compound		date_start	lap_number	duration_sector_1	d
163	Yuki TSUNODA	HARD		2024-03-09T17:21:20.168000+00:00	10	38.387	
181	Yuki TSUNODA	HARD		2024-03-09T17:22:59.494000+00:00	11	36.072	
199	Yuki TSUNODA	HARD		2024-03-09T17:24:35.140000+00:00	12	35.637	
217	Yuki TSUNODA	HARD		2024-03-09T17:26:10.351000+00:00	13	35.622	
235	Yuki TSUNODA	HARD		2024-03-09T17:27:45.685000+00:00	14	35.709	
253	Yuki TSUNODA	HARD		2024-03-09T17:29:21.355000+00:00	15	35.754	
271	Yuki TSUNODA	HARD		2024-03-09T17:30:57.321000+00:00	16	36.156	
289	Yuki TSUNODA	HARD		2024-03-09T17:32:33.304000+00:00	17	37.518	
307	Yuki TSUNODA	HARD		2024-03-09T17:34:10.921000+00:00	18	35.599	
325	Yuki TSUNODA	HARD		2024-03-09T17:35:46.180000+00:00	19	35.486	
343	Yuki TSUNODA	HARD		2024-03-09T17:37:21.344000+00:00	20	35.498	
361	Yuki TSUNODA	HARD		2024-03-09T17:38:56.456000+00:00	21	35.457	
379	Yuki TSUNODA	HARD		2024-03-09T17:40:31.162000+00:00	22	35.785	
397	Yuki TSUNODA	HARD		2024-03-09T17:42:06.814000+00:00	23	36.367	
415	Yuki TSUNODA	HARD		2024-03-09T17:43:43.181000+00:00	24	36.214	
433	Yuki TSUNODA	HARD		2024-03-09T17:45:19.079000+00:00	25	36.806	
451	Yuki TSUNODA	HARD		2024-03-09T17:46:55.497000+00:00	26	36.840	
469	Yuki TSUNODA	HARD		2024-03-09T17:48:32.215000+00:00	27	36.464	
487	Yuki TSUNODA	HARD		2024-03-09T17:50:08.331000+00:00	28	36.328	
505	Yuki TSUNODA	HARD		2024-03-09T17:51:44.100000+00:00	29	37.282	
523	Yuki TSUNODA	HARD		2024-03-09T17:53:20.759000+00:00	30	36.222	
541	Yuki TSUNODA	HARD		2024-03-09T17:54:56.777000+00:00	31	36.193	
559	Yuki TSUNODA	HARD		2024-03-09T17:56:32.675000+00:00	32	36.159	
577	Yuki TSUNODA	HARD		2024-03-09T17:58:08.345000+00:00	33	36.774	
595	Yuki TSUNODA	HARD		2024-03-09T17:59:44.525000+00:00	34	35.626	

	full_name	compound		date_start	lap_number	duration_sector_1	d
612	Yuki TSUNODA	HARD	2024-03-09T18:01:19.238000+00:00		35		35.490
630	Yuki TSUNODA	HARD	2024-03-09T18:02:54.082000+00:00		36		35.130
647	Yuki TSUNODA	HARD	2024-03-09T18:04:28.424000+00:00		37		34.974
663	Yuki TSUNODA	HARD	2024-03-09T18:06:02.618000+00:00		38		34.743
681	Yuki TSUNODA	HARD	2024-03-09T18:07:36.662000+00:00		39		34.876
699	Yuki TSUNODA	HARD	2024-03-09T18:09:10.557000+00:00		40		34.619
717	Yuki TSUNODA	HARD	2024-03-09T18:10:44.132000+00:00		41		34.725
735	Yuki TSUNODA	HARD	2024-03-09T18:12:17.866000+00:00		42		34.630
752	Yuki TSUNODA	HARD	2024-03-09T18:13:51.420000+00:00		43		34.621
770	Yuki TSUNODA	HARD	2024-03-09T18:15:25.222000+00:00		44		34.541
788	Yuki TSUNODA	HARD	2024-03-09T18:16:58.816000+00:00		45		34.656
806	Yuki TSUNODA	HARD	2024-03-09T18:18:32.442000+00:00		46		35.343
824	Yuki TSUNODA	HARD	2024-03-09T18:20:07.333000+00:00		47		34.567
842	Yuki	HARD	2024-03-09T18:21:40.954000+00:00		48		34.678

Haas F1 Team

In [217...]

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

Out[217...]

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
8	1230	9480	1	20	1	7	MEDIUM	
16	1230	9480	1	27	1	34	MEDIUM	
29	1230	9480	2	20	8	51	HARD	
34	1230	9480	2	27	34	51	HARD	

In [218...]

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

Out[218...]

	full_name	compound		date_start	lap_number	duration_sector_1	
28	Kevin MAGNUSEN	MEDIUM	2024-03-09T17:05:42.717000+00:00		2		37.419
47	Kevin MAGNUSEN	MEDIUM	2024-03-09T17:07:20.224000+00:00		3		35.815
66	Kevin MAGNUSEN	MEDIUM	2024-03-09T17:08:55.973000+00:00		4		35.537

		full_name	compound	date_start	lap_number	duration_sector_1
85		Kevin MAGNUSEN	MEDIUM	2024-03-09T17:10:31.345000+00:00	5	35.781
104		Kevin MAGNUSEN	MEDIUM	2024-03-09T17:12:07.080000+00:00	6	35.769
162		Kevin MAGNUSEN	HARD	2024-03-09T17:21:20.485000+00:00	10	38.527
180		Kevin MAGNUSEN	HARD	2024-03-09T17:22:59.914000+00:00	11	36.096
198		Kevin MAGNUSEN	HARD	2024-03-09T17:24:35.978000+00:00	12	35.570
216		Kevin MAGNUSEN	HARD	2024-03-09T17:26:11.310000+00:00	13	35.513
234		Kevin MAGNUSEN	HARD	2024-03-09T17:27:46.259000+00:00	14	35.596
252		Kevin MAGNUSEN	HARD	2024-03-09T17:29:21.927000+00:00	15	35.796
270		Kevin MAGNUSEN	HARD	2024-03-09T17:30:57.548000+00:00	16	36.392
288		Kevin MAGNUSEN	HARD	2024-03-09T17:32:33.772000+00:00	17	36.447
306		Kevin MAGNUSEN	HARD	2024-03-09T17:34:10.201000+00:00	18	35.237
324		Kevin MAGNUSEN	HARD	2024-03-09T17:35:45.622000+00:00	19	35.318
342		Kevin MAGNUSEN	HARD	2024-03-09T17:37:20.797000+00:00	20	35.225
360		Kevin MAGNUSEN	HARD	2024-03-09T17:38:55.854000+00:00	21	35.229
378		Kevin MAGNUSEN	HARD	2024-03-09T17:40:30.725000+00:00	22	35.779
396		Kevin MAGNUSEN	HARD	2024-03-09T17:42:06.479000+00:00	23	36.375
414		Kevin MAGNUSEN	HARD	2024-03-09T17:43:42.745000+00:00	24	36.264
432		Kevin MAGNUSEN	HARD	2024-03-09T17:45:18.761000+00:00	25	36.561
450		Kevin MAGNUSEN	HARD	2024-03-09T17:46:55.373000+00:00	26	36.579
468		Kevin MAGNUSEN	HARD	2024-03-09T17:48:31.608000+00:00	27	36.586
486		Kevin MAGNUSEN	HARD	2024-03-09T17:50:07.897000+00:00	28	36.373
504		Kevin MAGNUSEN	HARD	2024-03-09T17:51:44.089000+00:00	29	36.062
522		Kevin MAGNUSEN	HARD	2024-03-09T17:53:19.743000+00:00	30	36.329
540		Kevin MAGNUSEN	HARD	2024-03-09T17:54:55.643000+00:00	31	36.500
558		Kevin MAGNUSEN	HARD	2024-03-09T17:56:31.663000+00:00	32	36.336

	full_name	compound		date_start	lap_number	duration_sector_1
576	Kevin MAGNUSEN	HARD		2024-03-09T17:58:07.455000+00:00	33	36.290
594	Kevin MAGNUSEN	HARD		2024-03-09T17:59:43.181000+00:00	34	34.753
611	Kevin MAGNUSEN	HARD		2024-03-09T18:01:17.313000+00:00	35	34.681
629	Kevin MAGNUSEN	HARD		2024-03-09T18:02:51.262000+00:00	36	34.509
646	Kevin MAGNUSEN	HARD		2024-03-09T18:04:24.983000+00:00	37	34.443
662	Kevin MAGNUSEN	HARD		2024-03-09T18:05:58.453000+00:00	38	34.416
680	Kevin MAGNUSEN	HARD		2024-03-09T18:07:31.995000+00:00	39	34.225
698	Kevin MAGNUSEN	HARD		2024-03-09T18:09:05.100000+00:00	40	34.213
716	Kevin MAGNUSEN	HARD		2024-03-09T18:10:38.099000+00:00	41	34.044
734	Kevin MAGNUSEN	HARD		2024-03-09T18:12:10.962000+00:00	42	33.954
751	Kevin MAGNUSEN	HARD		2024-03-09T18:13:43.659000+00:00	43	34.118
769	Kevin MAGNUSEN	HARD		2024-03-09T18:15:16.595000+00:00	44	33.941
787	Kevin MAGNUSEN	HARD		2024-03-09T18:16:49.257000+00:00	45	33.856
805	Kevin MAGNUSEN	HARD		2024-03-09T18:18:21.813000+00:00	46	33.970
823	Kevin MAGNUSEN	HARD		2024-03-09T18:19:54.684000+00:00	47	33.881
841	Kevin MAGNUSEN	HARD		2024-03-09T18:21:26.983000+00:00	48	34.893
850	Kevin	HARD		2024-03-09T18:22:00.501000+00:00	49	34.223

In [219...]

```
libraryDataF1.getinfolongruns(jointables, 27, 'Haas F1 Team', MINIMUM_SECONDS)
```

Out[219...]

	full_name	compound		date_start	lap_number	duration_sector_1
32	Nico HULKENBERG	MEDIUM		2024-03-09T17:05:43.291000+00:00	2	37.556
51	Nico HULKENBERG	MEDIUM		2024-03-09T17:07:20.999000+00:00	3	36.146
70	Nico HULKENBERG	MEDIUM		2024-03-09T17:08:57.498000+00:00	4	35.786
89	Nico HULKENBERG	MEDIUM		2024-03-09T17:10:33.704000+00:00	5	35.486
108	Nico HULKENBERG	MEDIUM		2024-03-09T17:12:09.516000+00:00	6	35.706
166	Nico HULKENBERG	MEDIUM		2024-03-09T17:21:19.204000+00:00	10	37.446

		full_name	compound	date_start	lap_number	duration_sector_1
184		Nico HULKENBERG	MEDIUM	2024-03-09T17:22:56.856000+00:00	11	35.558
202		Nico HULKENBERG	MEDIUM	2024-03-09T17:24:31.696000+00:00	12	35.112
220		Nico HULKENBERG	MEDIUM	2024-03-09T17:26:06.339000+00:00	13	35.321
238		Nico HULKENBERG	MEDIUM	2024-03-09T17:27:41.780000+00:00	14	36.334
256		Nico HULKENBERG	MEDIUM	2024-03-09T17:29:18.176000+00:00	15	35.314
274		Nico HULKENBERG	MEDIUM	2024-03-09T17:30:53.657000+00:00	16	35.134
292		Nico HULKENBERG	MEDIUM	2024-03-09T17:32:28.821000+00:00	17	35.144
310		Nico HULKENBERG	MEDIUM	2024-03-09T17:34:04.093000+00:00	18	35.228
328		Nico HULKENBERG	MEDIUM	2024-03-09T17:35:39.744000+00:00	19	35.076
346		Nico HULKENBERG	MEDIUM	2024-03-09T17:37:14.876000+00:00	20	35.019
364		Nico HULKENBERG	MEDIUM	2024-03-09T17:38:50.005000+00:00	21	36.161
382		Nico HULKENBERG	MEDIUM	2024-03-09T17:40:26.269000+00:00	22	35.191
400		Nico HULKENBERG	MEDIUM	2024-03-09T17:42:01.812000+00:00	23	34.990
418		Nico HULKENBERG	MEDIUM	2024-03-09T17:43:36.531000+00:00	24	34.948
436		Nico HULKENBERG	MEDIUM	2024-03-09T17:45:11.355000+00:00	25	34.831
454		Nico HULKENBERG	MEDIUM	2024-03-09T17:46:46.122000+00:00	26	34.909
472		Nico HULKENBERG	MEDIUM	2024-03-09T17:48:20.808000+00:00	27	34.881
490		Nico HULKENBERG	MEDIUM	2024-03-09T17:49:55.445000+00:00	28	34.779
508		Nico HULKENBERG	MEDIUM	2024-03-09T17:51:30.076000+00:00	29	34.681
526		Nico HULKENBERG	MEDIUM	2024-03-09T17:53:04.188000+00:00	30	34.691
544		Nico HULKENBERG	MEDIUM	2024-03-09T17:54:38.480000+00:00	31	34.648
562		Nico HULKENBERG	MEDIUM	2024-03-09T17:56:12.761000+00:00	32	34.550
580		Nico HULKENBERG	MEDIUM	2024-03-09T17:57:46.770000+00:00	33	34.574
615		Nico HULKENBERG	HARD	2024-03-09T18:01:15.168000+00:00	35	34.261
633		Nico HULKENBERG	HARD	2024-03-09T18:02:48.227000+00:00	36	34.214

	full_name	compound		date_start	lap_number	duration_sector_1
650	Nico HULKENBERG	HARD	2024-03-09T18:04:21.297000+00:00		37	34.451
666	Nico HULKENBERG	HARD	2024-03-09T18:05:54.459000+00:00		38	34.298
684	Nico HULKENBERG	HARD	2024-03-09T18:07:27.690000+00:00		39	34.246
702	Nico HULKENBERG	HARD	2024-03-09T18:09:00.760000+00:00		40	34.275
720	Nico HULKENBERG	HARD	2024-03-09T18:10:33.642000+00:00		41	34.206
737	Nico HULKENBERG	HARD	2024-03-09T18:12:06.509000+00:00		42	34.093
755	Nico HULKENBERG	HARD	2024-03-09T18:13:39.165000+00:00		43	34.046
773	Nico HULKENBERG	HARD	2024-03-09T18:15:11.843000+00:00		44	34.039
791	Nico HULKENBERG	HARD	2024-03-09T18:16:44.563000+00:00		45	34.018
809	Nico HULKENBERG	HARD	2024-03-09T18:18:16.961000+00:00		46	33.921
827	Nico HULKENBERG	HARD	2024-03-09T18:19:49.428000+00:00		47	33.912
845	Nico HULKENBERG	HARD	2024-03-09T18:21:21.884000+00:00		48	34.149
863	Nico	HARD	2024-03-09T18:22:54.346000+00:00		49	34.024

Kick Sauber

In [220...]

```
stintInformation.query('driver_number == 24 or driver_number == 77')
```

Out[220...]

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
14	1230	9480	1	77	1	7	SOFT	
19	1230	9480	1	24	1	41	MEDIUM	
20	1230	9480	2	77	8	35	HARD	
35	1230	9480	3	77	36	50	SOFT	
38	1230	9480	2	24	42	50	SOFT	

In [221...]

```
libraryDataF1.getinfolongruns(jointables, 24, 'Kick Sauber', MINIMUM_SECONDS, 1)
```

Out[221...]

	full_name	compound		date_start	lap_number	duration_sector_1	dt
31	ZHOU Guanyu	MEDIUM	2024-03-09T17:05:45.375000+00:00		2	37.329	
50	ZHOU Guanyu	MEDIUM	2024-03-09T17:07:23.826000+00:00		3	36.300	
69	ZHOU Guanyu	MEDIUM	2024-03-09T17:09:01.132000+00:00		4	36.001	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
88	ZHOU Guanyu	MEDIUM	2024-03-09T17:10:37.509000+00:00		5	35.861	
107	ZHOU Guanyu	MEDIUM	2024-03-09T17:12:13.894000+00:00		6	35.967	
165	ZHOU Guanyu	MEDIUM	2024-03-09T17:21:19.721000+00:00		10	37.871	
183	ZHOU Guanyu	MEDIUM	2024-03-09T17:22:58.111000+00:00		11	35.805	
201	ZHOU Guanyu	MEDIUM	2024-03-09T17:24:33.781000+00:00		12	35.228	
219	ZHOU Guanyu	MEDIUM	2024-03-09T17:26:08.773000+00:00		13	35.518	
237	ZHOU Guanyu	MEDIUM	2024-03-09T17:27:44.095000+00:00		14	36.466	
255	ZHOU Guanyu	MEDIUM	2024-03-09T17:29:20.800000+00:00		15	35.646	
273	ZHOU Guanyu	MEDIUM	2024-03-09T17:30:56.871000+00:00		16	35.904	
291	ZHOU Guanyu	MEDIUM	2024-03-09T17:32:32.892000+00:00		17	35.909	
309	ZHOU Guanyu	MEDIUM	2024-03-09T17:34:08.832000+00:00		18	35.430	
327	ZHOU Guanyu	MEDIUM	2024-03-09T17:35:44.165000+00:00		19	35.361	
345	ZHOU Guanyu	MEDIUM	2024-03-09T17:37:19.625000+00:00		20	35.247	
363	ZHOU Guanyu	MEDIUM	2024-03-09T17:38:54.778000+00:00		21	35.370	
381	ZHOU Guanyu	MEDIUM	2024-03-09T17:40:30.177000+00:00		22	35.125	
399	ZHOU Guanyu	MEDIUM	2024-03-09T17:42:05.290000+00:00		23	35.253	
417	ZHOU Guanyu	MEDIUM	2024-03-09T17:43:40.623000+00:00		24	35.242	
435	ZHOU Guanyu	MEDIUM	2024-03-09T17:45:15.642000+00:00		25	35.278	
453	ZHOU Guanyu	MEDIUM	2024-03-09T17:46:50.854000+00:00		26	35.260	
471	ZHOU Guanyu	MEDIUM	2024-03-09T17:48:25.841000+00:00		27	35.170	
489	ZHOU Guanyu	MEDIUM	2024-03-09T17:50:00.854000+00:00		28	35.104	
507	ZHOU Guanyu	MEDIUM	2024-03-09T17:51:35.776000+00:00		29	35.142	
525	ZHOU Guanyu	MEDIUM	2024-03-09T17:53:10.841000+00:00		30	35.153	
543	ZHOU Guanyu	MEDIUM	2024-03-09T17:54:45.575000+00:00		31	34.983	
561	ZHOU Guanyu	MEDIUM	2024-03-09T17:56:20.471000+00:00		32	34.972	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
579	ZHOU Guanyu	MEDIUM	2024-03-09T17:57:55.131000+00:00		33	35.023	
597	ZHOU Guanyu	MEDIUM	2024-03-09T17:59:29.847000+00:00		34	34.981	
614	ZHOU Guanyu	MEDIUM	2024-03-09T18:01:04.433000+00:00		35	34.813	
632	ZHOU Guanyu	MEDIUM	2024-03-09T18:02:38.809000+00:00		36	34.747	
649	ZHOU Guanyu	MEDIUM	2024-03-09T18:04:13.109000+00:00		37	34.806	
665	ZHOU Guanyu	MEDIUM	2024-03-09T18:05:47.284000+00:00		38	34.602	
683	ZHOU Guanyu	MEDIUM	2024-03-09T18:07:21.141000+00:00		39	34.674	
701	ZHOU Guanyu	MEDIUM	2024-03-09T18:08:55.091000+00:00		40	34.604	
719	ZHOU Guanyu	MEDIUM	2024-03-09T18:10:28.785000+00:00		41	34.611	
754	ZHOU Guanyu	SOFT	2024-03-09T18:14:22.626000+00:00		43	34.276	
772	ZHOU Guanyu	SOFT	2024-03-09T18:15:55.589000+00:00		44	34.167	
790	ZHOU Guanyu	SOFT	2024-03-09T18:17:28.469000+00:00		45	34.219	
808	ZHOU Guanyu	SOFT	2024-03-09T18:19:01.266000+00:00		46	34.126	
826	ZHOU Guanyu	SOFT	2024-03-09T18:20:34.144000+00:00		47	34.497	

In [222...]

```
libraryDataF1.getinfolongruns(jointables,77,'Kick Sauber',MINIMUM_SECONDS,1)
```

Out[222...]

	full_name	compound		date_start	lap_number	duration_sector_1	dt
37	Valtteri BOTTAS	SOFT	2024-03-09T17:05:44.260000+00:00		2	37.493	
56	Valtteri BOTTAS	SOFT	2024-03-09T17:07:22.879000+00:00		3	36.222	
75	Valtteri BOTTAS	SOFT	2024-03-09T17:08:59.748000+00:00		4	35.910	
94	Valtteri BOTTAS	SOFT	2024-03-09T17:10:36.132000+00:00		5	35.837	
113	Valtteri BOTTAS	SOFT	2024-03-09T17:12:12.360000+00:00		6	35.387	
171	Valtteri BOTTAS	HARD	2024-03-09T17:21:21.418000+00:00		10	38.709	
189	Valtteri BOTTAS	HARD	2024-03-09T17:23:01.429000+00:00		11	36.431	
207	Valtteri BOTTAS	HARD	2024-03-09T17:24:37.916000+00:00		12	35.578	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
225	Valtteri BOTTAS	HARD	2024-03-09T17:26:13.791000+00:00		13	35.489	
243	Valtteri BOTTAS	HARD	2024-03-09T17:27:49.209000+00:00		14	35.414	
261	Valtteri BOTTAS	HARD	2024-03-09T17:29:24.647000+00:00		15	35.380	
279	Valtteri BOTTAS	HARD	2024-03-09T17:31:00.749000+00:00		16	35.638	
297	Valtteri BOTTAS	HARD	2024-03-09T17:32:37.141000+00:00		17	36.446	
315	Valtteri BOTTAS	HARD	2024-03-09T17:34:14.373000+00:00		18	35.531	
333	Valtteri BOTTAS	HARD	2024-03-09T17:35:50.439000+00:00		19	35.387	
351	Valtteri BOTTAS	HARD	2024-03-09T17:37:26.300000+00:00		20	35.663	
369	Valtteri BOTTAS	HARD	2024-03-09T17:39:02.499000+00:00		21	36.614	
387	Valtteri BOTTAS	HARD	2024-03-09T17:40:39.376000+00:00		22	36.244	
405	Valtteri BOTTAS	HARD	2024-03-09T17:42:15.859000+00:00		23	35.641	
423	Valtteri BOTTAS	HARD	2024-03-09T17:43:52.137000+00:00		24	36.506	
441	Valtteri BOTTAS	HARD	2024-03-09T17:45:28.894000+00:00		25	35.557	
459	Valtteri BOTTAS	HARD	2024-03-09T17:47:04.555000+00:00		26	35.298	
477	Valtteri BOTTAS	HARD	2024-03-09T17:48:39.855000+00:00		27	35.279	
495	Valtteri BOTTAS	HARD	2024-03-09T17:50:15.157000+00:00		28	35.381	
513	Valtteri BOTTAS	HARD	2024-03-09T17:51:50.402000+00:00		29	35.074	
531	Valtteri BOTTAS	HARD	2024-03-09T17:53:25.236000+00:00		30	35.378	
549	Valtteri BOTTAS	HARD	2024-03-09T17:55:00.659000+00:00		31	35.237	
567	Valtteri BOTTAS	HARD	2024-03-09T17:56:36.096000+00:00		32	35.252	
585	Valtteri BOTTAS	HARD	2024-03-09T17:58:11.199000+00:00		33	35.706	
602	Valtteri BOTTAS	HARD	2024-03-09T17:59:47+00:00		34	35.876	
620	Valtteri BOTTAS	HARD	2024-03-09T18:01:22.711000+00:00		35	35.391	
654	Valtteri BOTTAS	SOFT	2024-03-09T18:04:54.811000+00:00		37	34.261	
671	Valtteri BOTTAS	SOFT	2024-03-09T18:06:27.923000+00:00		38	34.133	

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
689	Valtteri BOTTAS	SOFT	2024-03-09T18:08:00.807000+00:00	39	34.203		
707	Valtteri BOTTAS	SOFT	2024-03-09T18:09:33.930000+00:00	40	34.335		
725	Valtteri BOTTAS	SOFT	2024-03-09T18:11:07.001000+00:00	41	34.358		
742	Valtteri BOTTAS	SOFT	2024-03-09T18:12:40.223000+00:00	42	34.237		
760	Valtteri BOTTAS	SOFT	2024-03-09T18:14:13.191000+00:00	43	34.160		
778	Valtteri BOTTAS	SOFT	2024-03-09T18:15:46.315000+00:00	44	34.198		
796	Valtteri BOTTAS	SOFT	2024-03-09T18:17:21.565000+00:00	45	34.239		
814	Valtteri BOTTAS	SOFT	2024-03-09T18:18:54.394000+00:00	46	34.251		
832	Valtteri BOTTAS	SOFT	2024-03-09T18:20:27.320000+00:00	47	34.198		
	Valtteri BOTTAS	SOFT	2024-03-09T18:21:59.350000+00:00	48	34.200		

Williams

In [223...]

```
stintInformation.query('driver_number == 23 or driver_number == 2')
```

Out[223...]

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
3	1230	9480	1	2	1	7	MEDIUM	
10	1230	9480	1	23	1	7	MEDIUM	
21	1230	9480	2	2	8	50	HARD	
30	1230	9480	2	23	8	51	HARD	

In [224...]

```
libraryDataF1.getinfolongruns(jointables, 23, 'Williams', MINIMUM_SECONDS, MAXIMUM_SECONDS)
```

Out[224...]

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
30	Alexander ALBON	MEDIUM	2024-03-09T17:05:43.110000+00:00	2	37.270		
49	Alexander ALBON	MEDIUM	2024-03-09T17:07:20.685000+00:00	3	35.739		
68	Alexander ALBON	MEDIUM	2024-03-09T17:08:56.605000+00:00	4	35.715		
87	Alexander ALBON	MEDIUM	2024-03-09T17:10:32.229000+00:00	5	35.622		
106	Alexander ALBON	MEDIUM	2024-03-09T17:12:07.859000+00:00	6	35.791		
164	Alexander ALBON	HARD	2024-03-09T17:21:20.738000+00:00	10	39.036		
182	Alexander ALBON	HARD	2024-03-09T17:23:01.096000+00:00	11	36.040		

	full_name	compound		date_start	lap_number	duration_sector_1	dt
200	Alexander ALBON	HARD	2024-03-09T17:24:37.335000+00:00		12	35.514	
218	Alexander ALBON	HARD	2024-03-09T17:26:12.809000+00:00		13	35.449	
236	Alexander ALBON	HARD	2024-03-09T17:27:47.973000+00:00		14	35.471	
254	Alexander ALBON	HARD	2024-03-09T17:29:23.199000+00:00		15	35.647	
272	Alexander ALBON	HARD	2024-03-09T17:30:58.734000+00:00		16	36.164	
290	Alexander ALBON	HARD	2024-03-09T17:32:35.169000+00:00		17	36.439	
308	Alexander ALBON	HARD	2024-03-09T17:34:12.245000+00:00		18	35.803	
326	Alexander ALBON	HARD	2024-03-09T17:35:47.864000+00:00		19	35.426	
344	Alexander ALBON	HARD	2024-03-09T17:37:22.827000+00:00		20	35.644	
362	Alexander ALBON	HARD	2024-03-09T17:38:58.123000+00:00		21	35.308	
380	Alexander ALBON	HARD	2024-03-09T17:40:33.090000+00:00		22	36.002	
398	Alexander ALBON	HARD	2024-03-09T17:42:08.935000+00:00		23	35.496	
416	Alexander ALBON	HARD	2024-03-09T17:43:44.400000+00:00		24	35.696	
434	Alexander ALBON	HARD	2024-03-09T17:45:20.339000+00:00		25	36.148	
452	Alexander ALBON	HARD	2024-03-09T17:46:56.496000+00:00		26	36.635	
470	Alexander ALBON	HARD	2024-03-09T17:48:33.095000+00:00		27	36.103	
488	Alexander ALBON	HARD	2024-03-09T17:50:09.442000+00:00		28	35.985	
506	Alexander ALBON	HARD	2024-03-09T17:51:45.360000+00:00		29	36.139	
524	Alexander ALBON	HARD	2024-03-09T17:53:21.086000+00:00		30	36.098	
542	Alexander ALBON	HARD	2024-03-09T17:54:57.185000+00:00		31	36.024	
560	Alexander ALBON	HARD	2024-03-09T17:56:32.952000+00:00		32	36.014	
578	Alexander ALBON	HARD	2024-03-09T17:58:08.640000+00:00		33	35.946	
596	Alexander ALBON	HARD	2024-03-09T17:59:43.785000+00:00		34	35.596	
613	Alexander ALBON	HARD	2024-03-09T18:01:18.360000+00:00		35	35.697	
631	Alexander ALBON	HARD	2024-03-09T18:02:53.469000+00:00		36	34.779	

	full_name	compound		date_start	lap_number	duration_sector_1	dt
648	Alexander ALBON	HARD	2024-03-09T18:04:27.443000+00:00		37	34.692	
664	Alexander ALBON	HARD	2024-03-09T18:06:01.426000+00:00		38	34.538	
682	Alexander ALBON	HARD	2024-03-09T18:07:35.080000+00:00		39	34.722	
700	Alexander ALBON	HARD	2024-03-09T18:09:08.671000+00:00		40	34.576	
718	Alexander ALBON	HARD	2024-03-09T18:10:41.961000+00:00		41	34.761	
736	Alexander ALBON	HARD	2024-03-09T18:12:15.794000+00:00		42	34.546	
753	Alexander ALBON	HARD	2024-03-09T18:13:48.547000+00:00		43	34.116	
771	Alexander ALBON	HARD	2024-03-09T18:15:21.463000+00:00		44	34.316	
789	Alexander ALBON	HARD	2024-03-09T18:16:54.612000+00:00		45	34.171	
807	Alexander ALBON	HARD	2024-03-09T18:18:27.111000+00:00		46	34.109	
825	Alexander ALBON	HARD	2024-03-09T18:19:59.725000+00:00		47	35.331	
843	Alexander ALBON	HARD	2024-03-09T18:21:33.577000+00:00		48	34.315	

Alexander ALBON

In [225...]

```
libraryDataF1.getinfolongruns(jointables,2,'Williams',MINIMUN_SECONDS,MAXI
```

Out[225...]

	full_name	compound		date_start	lap_number	duration_sector_1	
21	Logan SARGEANT	MEDIUM	2024-03-09T17:05:44.873000+00:00		2	37.303	
40	Logan SARGEANT	MEDIUM	2024-03-09T17:07:23.293000+00:00		3	36.326	
59	Logan SARGEANT	MEDIUM	2024-03-09T17:09:00.292000+00:00		4	36.153	
78	Logan SARGEANT	MEDIUM	2024-03-09T17:10:36.739000+00:00		5	35.938	
97	Logan SARGEANT	MEDIUM	2024-03-09T17:12:13.089000+00:00		6	35.749	
156	Logan SARGEANT	HARD	2024-03-09T17:21:22.105000+00:00		10	38.458	
174	Logan SARGEANT	HARD	2024-03-09T17:23:02.142000+00:00		11	36.344	
192	Logan SARGEANT	HARD	2024-03-09T17:24:38.540000+00:00		12	35.639	
210	Logan SARGEANT	HARD	2024-03-09T17:26:14.291000+00:00		13	35.743	
228	Logan SARGEANT	HARD	2024-03-09T17:27:50.131000+00:00		14	35.526	

	full_name	compound		date_start	lap_number	duration_sector_1
246	Logan SARGEANT	HARD	2024-03-09T17:29:25.245000+00:00		15	35.548
264	Logan SARGEANT	HARD	2024-03-09T17:31:00.906000+00:00		16	35.952
282	Logan SARGEANT	HARD	2024-03-09T17:32:36.790000+00:00		17	36.065
300	Logan SARGEANT	HARD	2024-03-09T17:34:13.143000+00:00		18	35.719
318	Logan SARGEANT	HARD	2024-03-09T17:35:49.159000+00:00		19	35.415
336	Logan SARGEANT	HARD	2024-03-09T17:37:24.666000+00:00		20	35.308
354	Logan SARGEANT	HARD	2024-03-09T17:38:59.836000+00:00		21	35.159
372	Logan SARGEANT	HARD	2024-03-09T17:40:34.867000+00:00		22	35.472
390	Logan SARGEANT	HARD	2024-03-09T17:42:10.519000+00:00		23	35.340
408	Logan SARGEANT	HARD	2024-03-09T17:43:45.480000+00:00		24	35.392
426	Logan SARGEANT	HARD	2024-03-09T17:45:20.721000+00:00		25	36.231
444	Logan SARGEANT	HARD	2024-03-09T17:46:57.293000+00:00		26	36.255
462	Logan SARGEANT	HARD	2024-03-09T17:48:33.729000+00:00		27	35.934
480	Logan SARGEANT	HARD	2024-03-09T17:50:09.903000+00:00		28	35.701
498	Logan SARGEANT	HARD	2024-03-09T17:51:45.870000+00:00		29	36.095
516	Logan SARGEANT	HARD	2024-03-09T17:53:21.943000+00:00		30	35.725
534	Logan SARGEANT	HARD	2024-03-09T17:54:57.623000+00:00		31	35.994
552	Logan SARGEANT	HARD	2024-03-09T17:56:33.483000+00:00		32	35.934
570	Logan SARGEANT	HARD	2024-03-09T17:58:09.380000+00:00		33	36.155
588	Logan SARGEANT	HARD	2024-03-09T17:59:45.133000+00:00		34	35.442
605	Logan SARGEANT	HARD	2024-03-09T18:01:19.879000+00:00		35	35.301
623	Logan SARGEANT	HARD	2024-03-09T18:02:54.579000+00:00		36	35.216
640	Logan SARGEANT	HARD	2024-03-09T18:04:29.224000+00:00		37	34.960
657	Logan SARGEANT	HARD	2024-03-09T18:06:03.421000+00:00		38	34.749
674	Logan SARGEANT	HARD	2024-03-09T18:07:37.161000+00:00		39	34.958

	full_name	compound	date_start	lap_number	duration_sector_1
692	Logan SARGEANT	HARD	2024-03-09T18:09:11.155000+00:00	40	34.661
710	Logan SARGEANT	HARD	2024-03-09T18:10:44.659000+00:00	41	35.051
728	Logan SARGEANT	HARD	2024-03-09T18:12:18.467000+00:00	42	34.875
745	Logan SARGEANT	HARD	2024-03-09T18:13:52.217000+00:00	43	34.869
763	Logan SARGEANT	HARD	2024-03-09T18:15:25.960000+00:00	44	34.746
781	Logan SARGEANT	HARD	2024-03-09T18:17:01.324000+00:00	45	34.812
799	Logan SARGEANT	HARD	2024-03-09T18:18:35.217000+00:00	46	35.016
817	Logan SARGEANT	HARD	2024-03-09T18:20:09.383000+00:00	47	34.616

Logan

Alpine

```
In [226]: stintInformation.query('driver_number == 10 or driver_number == 31')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1230	9480	1	10	1	2	MEDIUM	
11	1230	9480	1	31	1	7	MEDIUM	
24	1230	9480	2	31	8	50	HARD	

```
In [227]: libraryDataF1.getinfolongruns(jointables, 31, 'Alpine', MINIMUN_SECONDS, MAXIMUN_SECONDS)
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3
33	Esteban OCON	MEDIUM	2024-03-09T17:05:43.944000+00:00	2	37.709		
52	Esteban OCON	MEDIUM	2024-03-09T17:07:22.282000+00:00	3	36.320		
71	Esteban OCON	MEDIUM	2024-03-09T17:08:59.213000+00:00	4	35.875		
90	Esteban OCON	MEDIUM	2024-03-09T17:10:35.520000+00:00	5	35.727		
109	Esteban OCON	MEDIUM	2024-03-09T17:12:11.492000+00:00	6	35.505		
167	Esteban OCON	HARD	2024-03-09T17:21:21.140000+00:00	10	38.307		
185	Esteban OCON	HARD	2024-03-09T17:23:00.461000+00:00	11	36.156		
203	Esteban OCON	HARD	2024-03-09T17:24:36.474000+00:00	12	35.633		
221	Esteban OCON	HARD	2024-03-09T17:26:11.991000+00:00	13	35.506		

	full_name	compound		date_start	lap_number	duration_sector_1	dt
239	Esteban OCON	HARD	2024-03-09T17:27:47.127000+00:00		14	35.525	
257	Esteban OCON	HARD	2024-03-09T17:29:22.543000+00:00		15	35.792	
275	Esteban OCON	HARD	2024-03-09T17:30:58.221000+00:00		16	36.319	
293	Esteban OCON	HARD	2024-03-09T17:32:34.498000+00:00		17	36.819	
311	Esteban OCON	HARD	2024-03-09T17:34:11.763000+00:00		18	35.655	
329	Esteban OCON	HARD	2024-03-09T17:35:47.195000+00:00		19	35.530	
347	Esteban OCON	HARD	2024-03-09T17:37:22.221000+00:00		20	35.440	
365	Esteban OCON	HARD	2024-03-09T17:38:57.375000+00:00		21	35.383	
383	Esteban OCON	HARD	2024-03-09T17:40:32.341000+00:00		22	35.490	
401	Esteban OCON	HARD	2024-03-09T17:42:07.486000+00:00		23	36.275	
419	Esteban OCON	HARD	2024-03-09T17:43:43.680000+00:00		24	36.070	
437	Esteban OCON	HARD	2024-03-09T17:45:19.844000+00:00		25	36.401	
455	Esteban OCON	HARD	2024-03-09T17:46:56.187000+00:00		26	36.625	
473	Esteban OCON	HARD	2024-03-09T17:48:32.556000+00:00		27	36.410	
491	Esteban OCON	HARD	2024-03-09T17:50:08.954000+00:00		28	36.049	
509	Esteban OCON	HARD	2024-03-09T17:51:44.758000+00:00		29	35.624	
527	Esteban OCON	HARD	2024-03-09T17:53:20.188000+00:00		30	36.326	
545	Esteban OCON	HARD	2024-03-09T17:54:56.259000+00:00		31	36.310	
563	Esteban OCON	HARD	2024-03-09T17:56:32.111000+00:00		32	36.228	
581	Esteban OCON	HARD	2024-03-09T17:58:07.943000+00:00		33	36.304	
598	Esteban OCON	HARD	2024-03-09T17:59:43.620000+00:00		34	35.063	
616	Esteban OCON	HARD	2024-03-09T18:01:17.690000+00:00		35	35.081	
634	Esteban OCON	HARD	2024-03-09T18:02:51.711000+00:00		36	34.881	
651	Esteban OCON	HARD	2024-03-09T18:04:25.601000+00:00		37	34.845	
667	Esteban OCON	HARD	2024-03-09T18:05:59.301000+00:00		38	34.643	

	full_name	compound		date_start	lap_number	duration_sector_1	duration_sector_2	duration
685	Esteban OCON	HARD	2024-03-09T18:07:33.267000+00:00		39			34.721
703	Esteban OCON	HARD	2024-03-09T18:09:07.217000+00:00		40			34.600
721	Esteban OCON	HARD	2024-03-09T18:10:40.980000+00:00		41			34.532
738	Esteban OCON	HARD	2024-03-09T18:12:14.633000+00:00		42			34.532
756	Esteban OCON	HARD	2024-03-09T18:13:48.253000+00:00		43			35.359
774	Esteban OCON	HARD	2024-03-09T18:15:22.920000+00:00		44			34.803
792	Esteban OCON	HARD	2024-03-09T18:16:56.725000+00:00		45			34.713
810	Esteban OCON	HARD	2024-03-09T18:18:30.444000+00:00		46			34.502
828	Esteban OCON	HARD	2024-03-09T18:20:04.205000+00:00		47			34.722
846	Esteban OCON	HARD	2024-03-09T18:21:39.423000+00:00		48			34.570

In [228...]

```
libraryDataF1.getinfolongruns(jointables,10,'Alpine',MINIMUN_SECONDS,MAXIMU
```

Out[228...]

full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration
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Pits

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

In [229...]

```
pit = libraryDataF1.obtain_information('pit',session_key=9472)
```

In [230...]

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

Out[230...]

team_name	pit_duration
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team_name	pit_duration
Ferrari	24.050
Red Bull Racing	24.550
Mercedes	24.625
Aston Martin	24.675
RB	24.675
McLaren	24.775
Alpine	26.280

pit_duration
team_name
Williams 27.040