

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

FORMULA 1 ROLEX AUSTRALIAN GRAND PRIX 2024

The Australian Grand Prix is an annual motor racing event which is under contract to host Formula One until 2035.[1] One of the oldest surviving motorsport competitions held in Australia, the Grand Prix has moved frequently with 23 different venues having been used since it was first run at Phillip Island in 1928. The race became part of the Formula One World Championship in 1985. Since 1996, it has been held at the Albert Park Circuit in Melbourne, with the exceptions of 2020 and 2021, when the races were cancelled due to the COVID-19 pandemic.[2] Before that, it was held in Adelaide.[3] Source: Wikipedia

Obtain session information

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

```
Out[2]:
```

	session_key	session_name	date_start	date_end	gmt_offset
0	9481	Practice 1	2024-03-22T01:30:00+00:00	2024-03-22T02:30:00+00:00	11:00:00
1	9482	Practice 2	2024-03-22T05:00:00+00:00	2024-03-22T06:00:00+00:00	11:00:00
2	9483	Practice 3	2024-03-23T01:30:00+00:00	2024-03-23T02:30:00+00:00	11:00:00
3	9484	Qualifying	2024-03-23T05:00:00+00:00	2024-03-23T06:00:00+00:00	11:00:00
4	9488	Race	2024-03-24T04:00:00+00:00	2024-03-24T06:00:00+00:00	11:00:00

Free Practice 1

Obtain setup

```
In [3]: practice = libraryDataF1.obtain_information('laps',session_key=9481)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9481)
drivers = libraryDataF1.obtain_information('drivers',session_key=9481)
```

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

```
Out[4]:
```

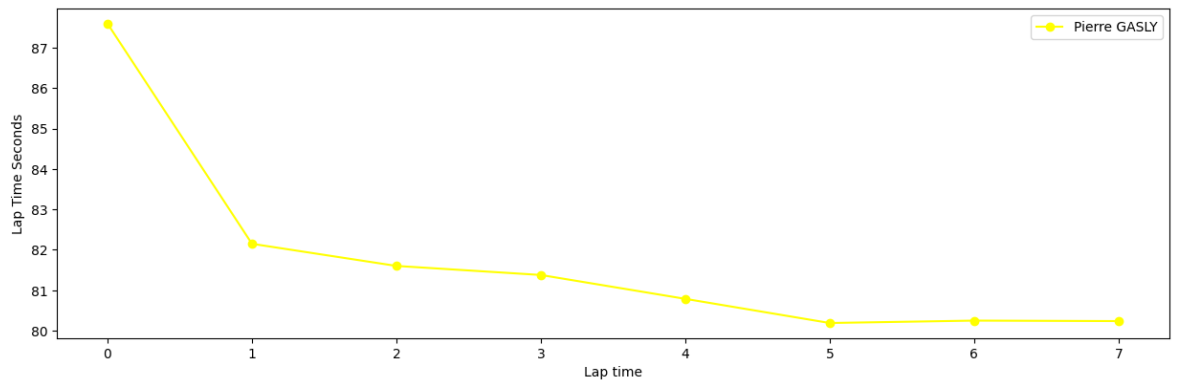
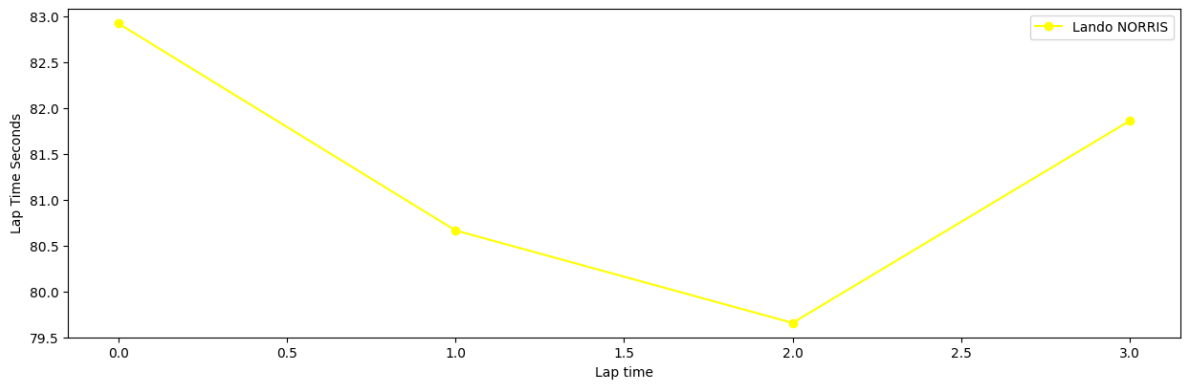
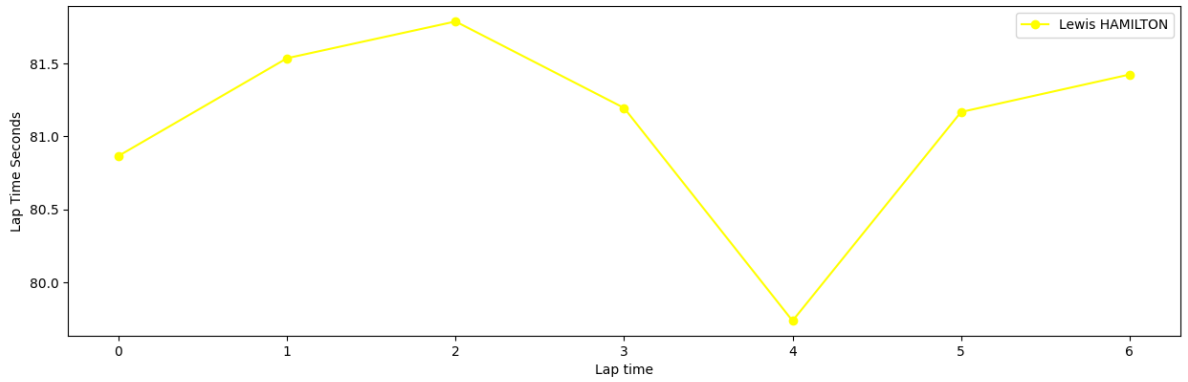
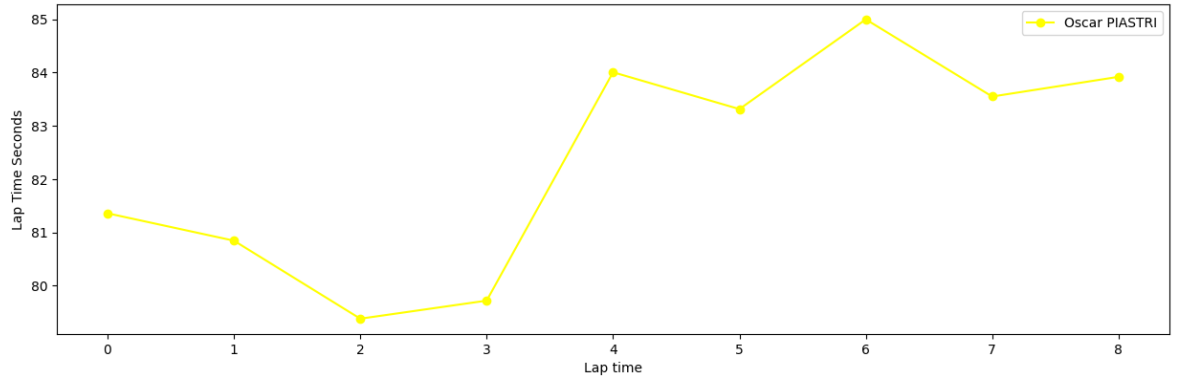
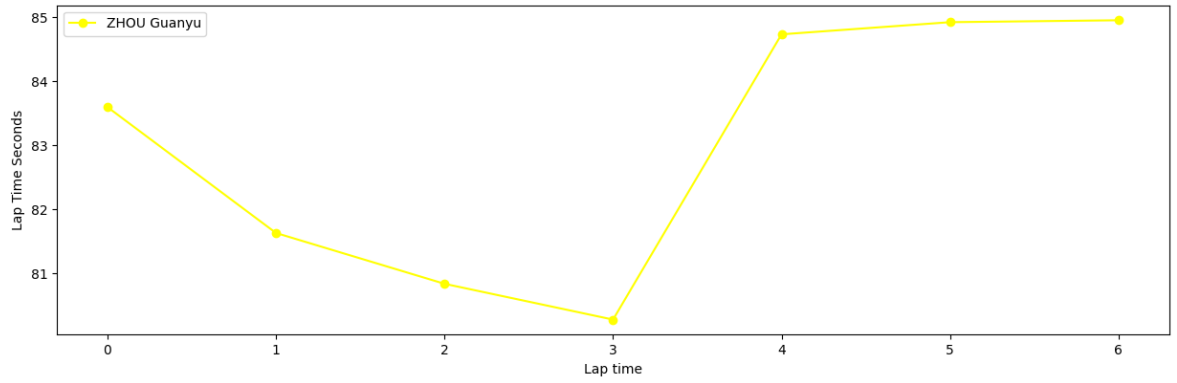
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1231	9481	14	255.0	282.0	171.0	2024-03-22T01:30:00+00:00
1	1231	9481	77	240.0	246.0	156.0	2024-03-22T01:30:00+00:00

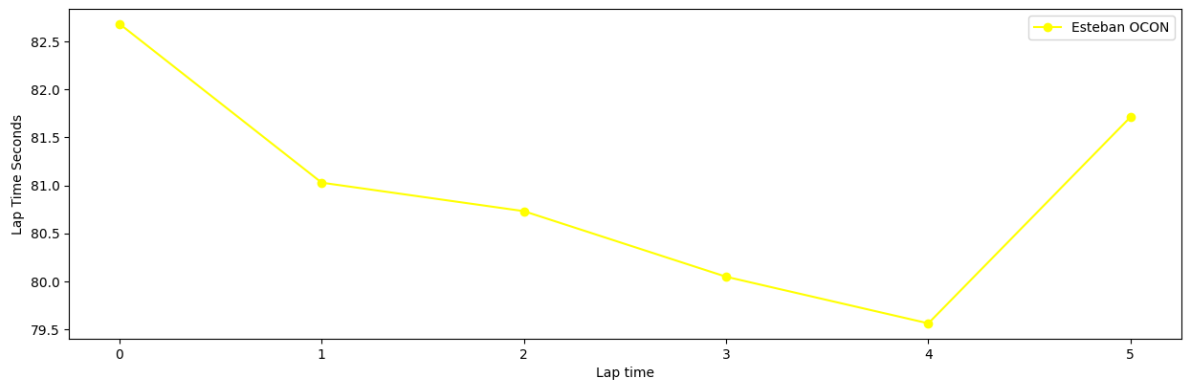
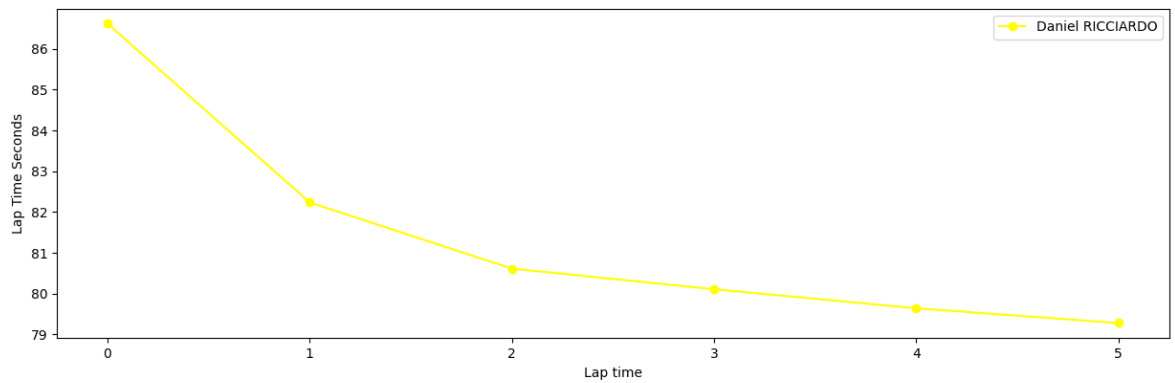
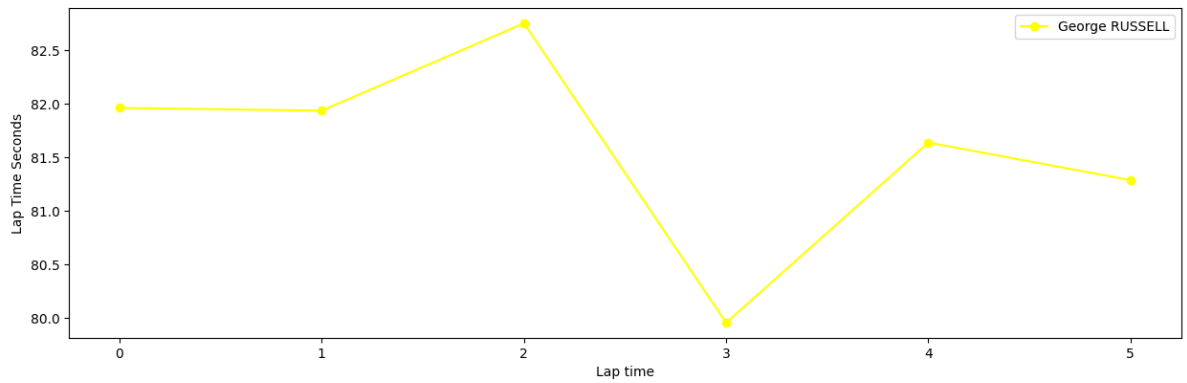
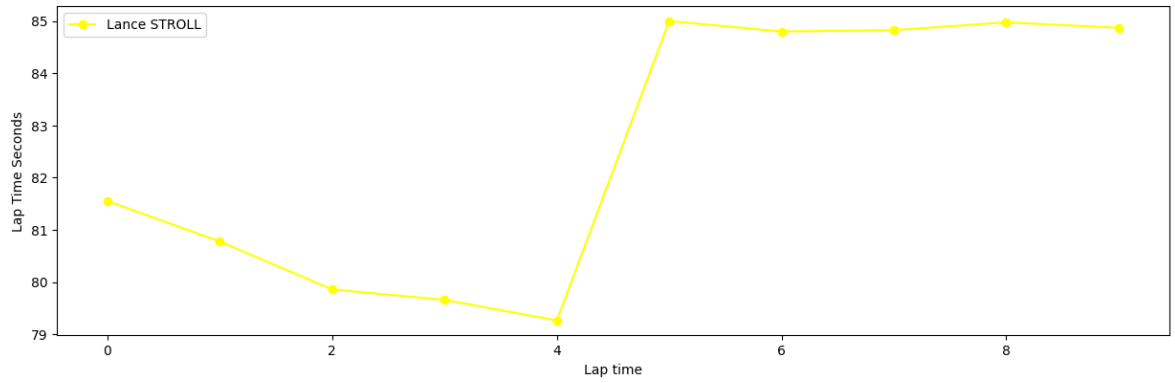
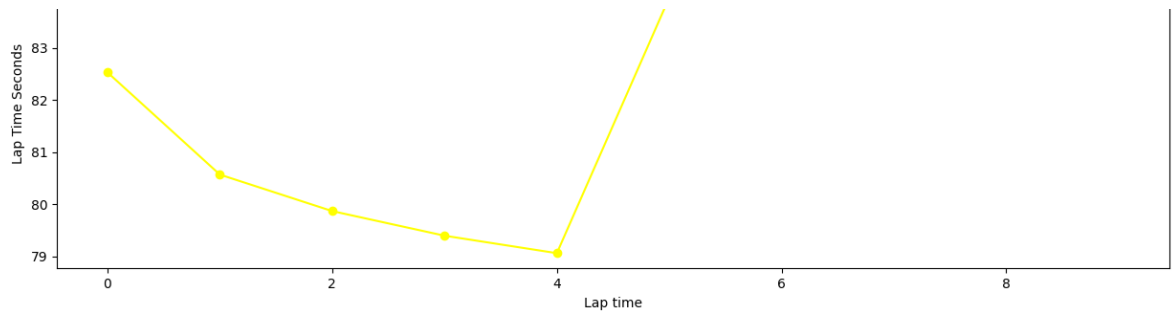
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
2	1231	9481	81	251.0	300.0	176.0	2024-03-22T01:30:
3	1231	9481	63	254.0	288.0	216.0	2024-03-22T01:30:
4	1231	9481	44	258.0	297.0	197.0	2024-03-22T01:30:
...	
430	1231	9481	63	239.0	199.0	261.0	2024-03-22T02:33:
431	1231	9481	16	241.0	270.0	266.0	2024-03-22T02:33:
432	1231	9481	4	236.0	260.0	239.0	2024-03-22T02:33:
433	1231	9481	55	227.0	306.0	268.0	2024-03-22T02:33:
434	1231	9481	44	268.0	246.0	267.0	2024-03-22T02:33:

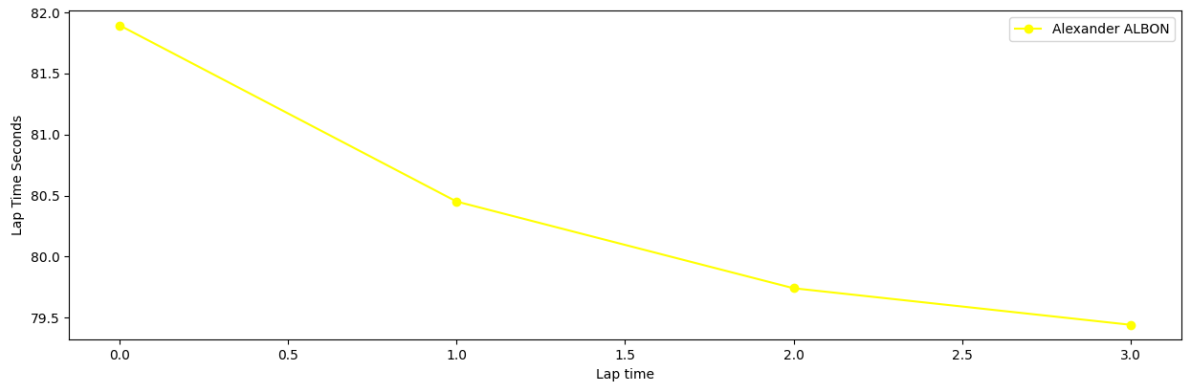
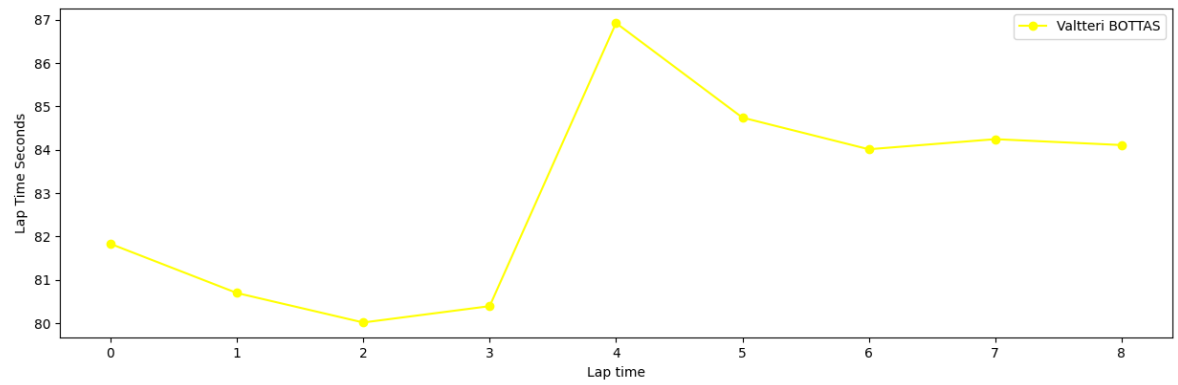
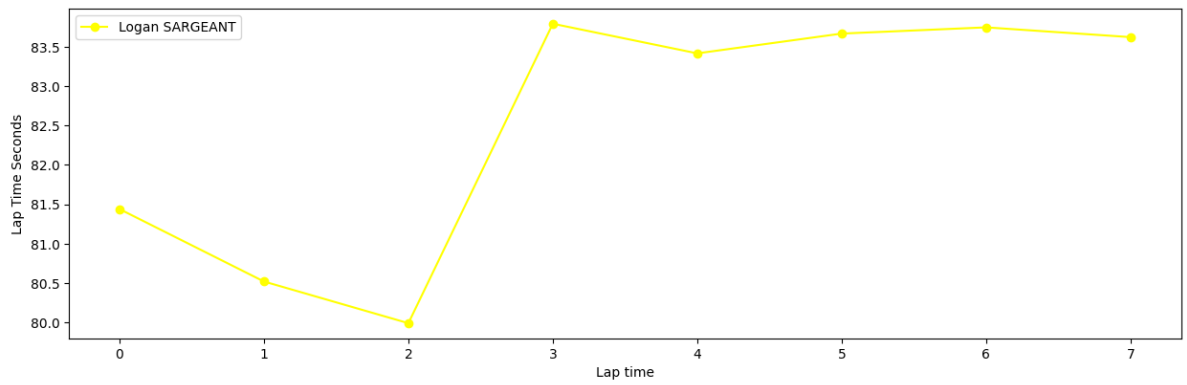
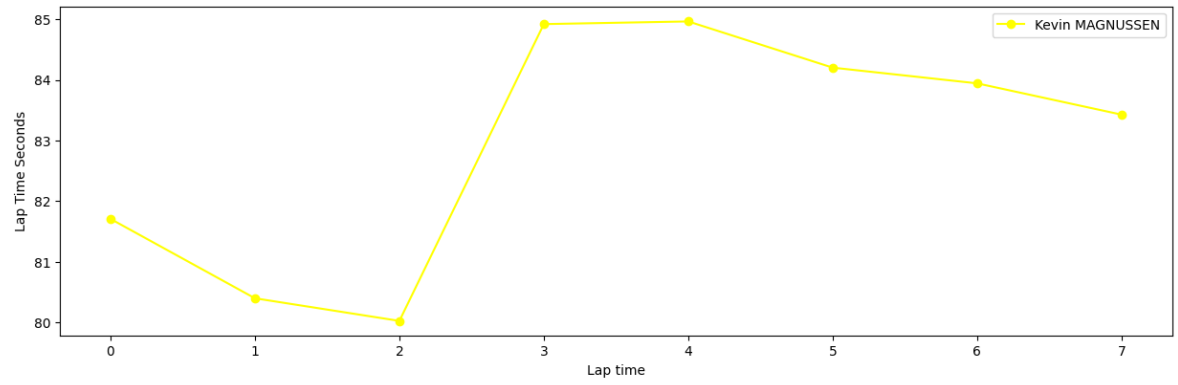
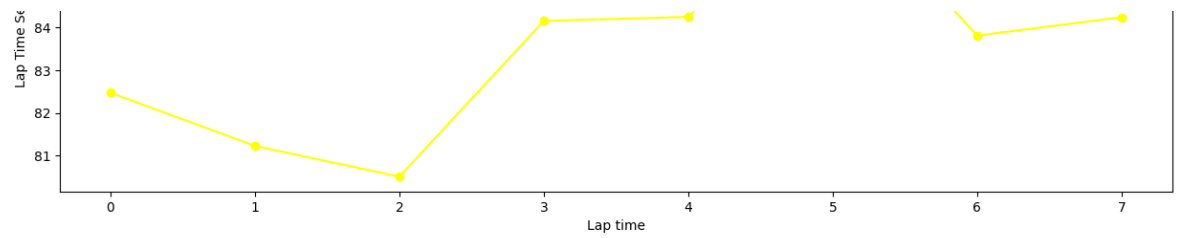
See race pace by means of the charts

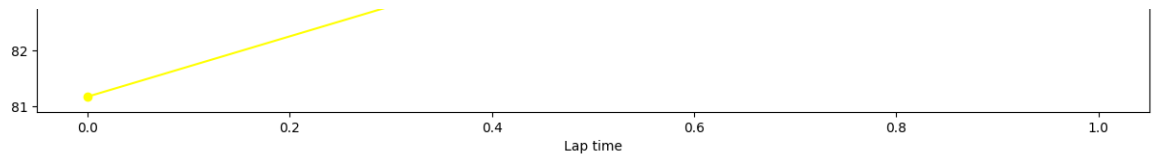
Medium tyres

```
In [5]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",90)
```



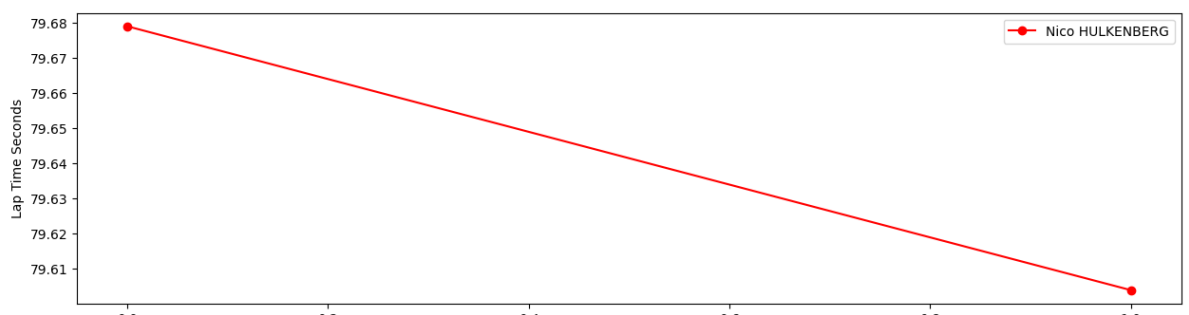
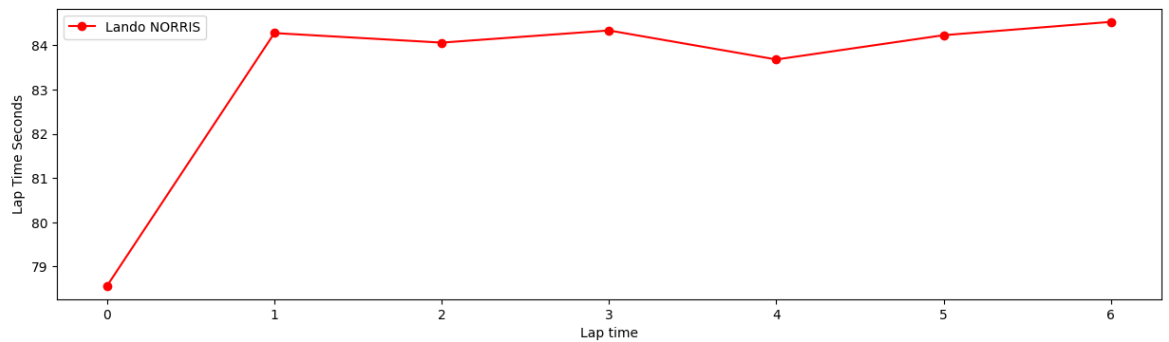
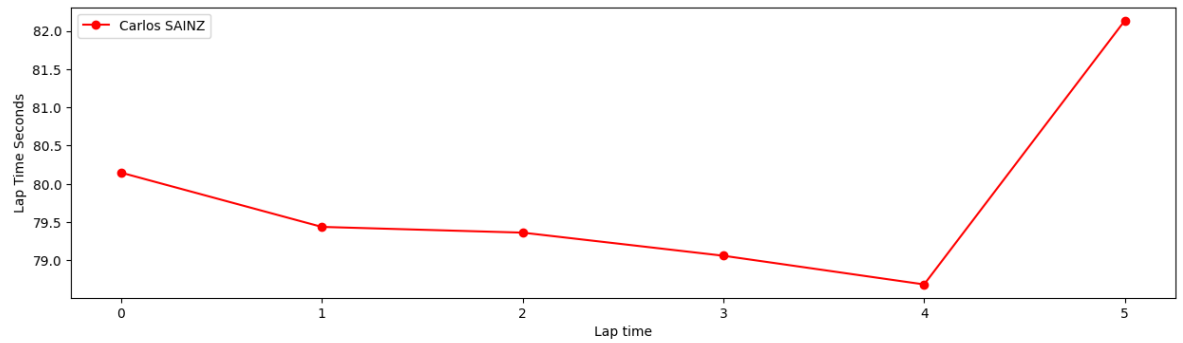
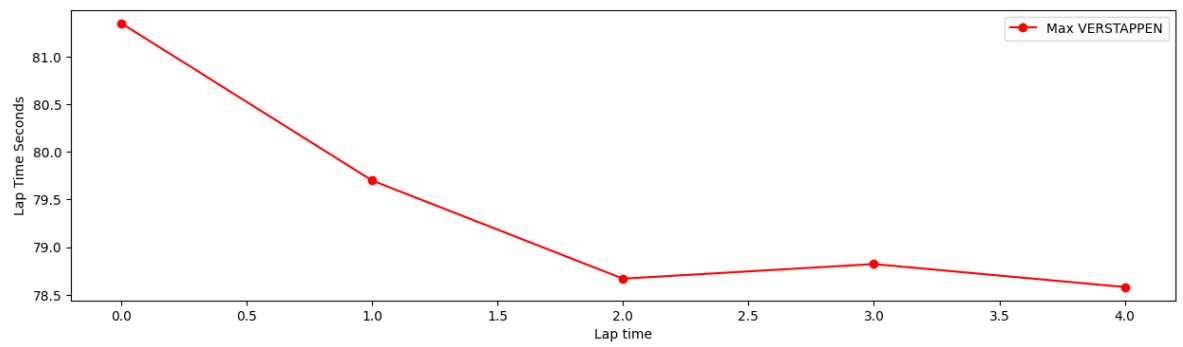
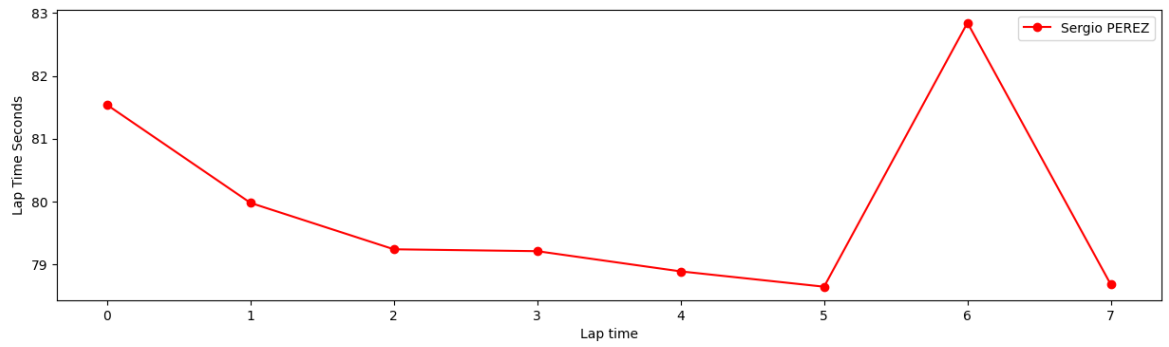
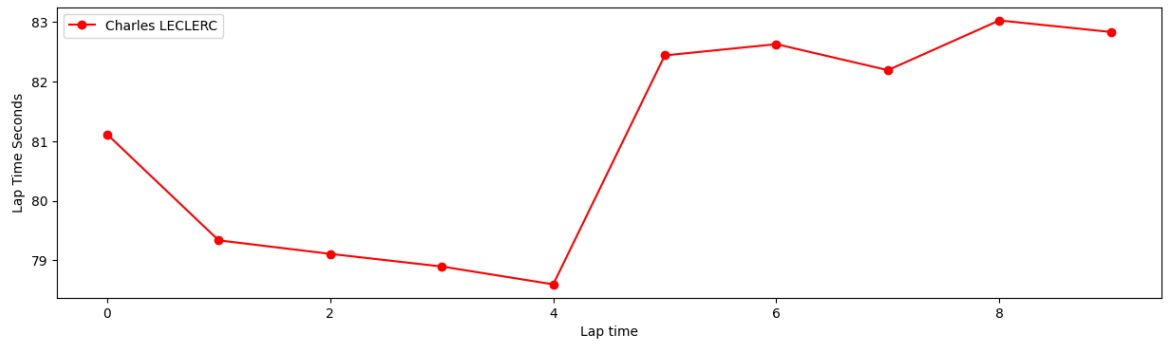


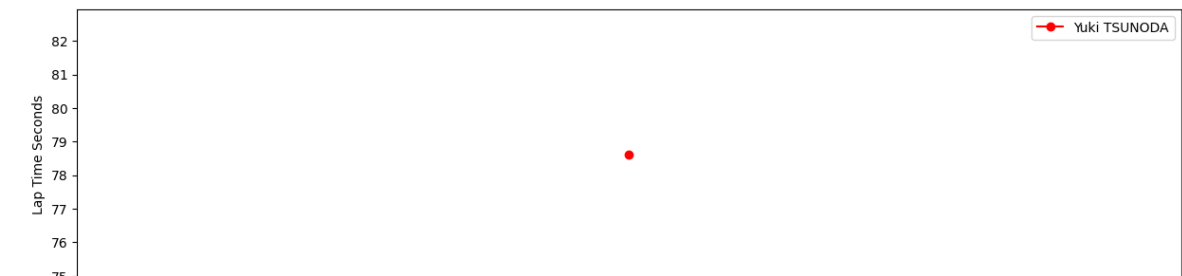
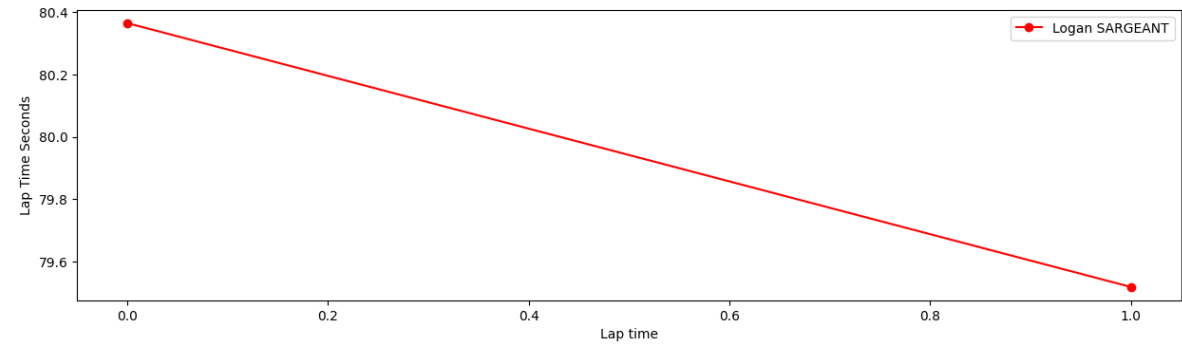
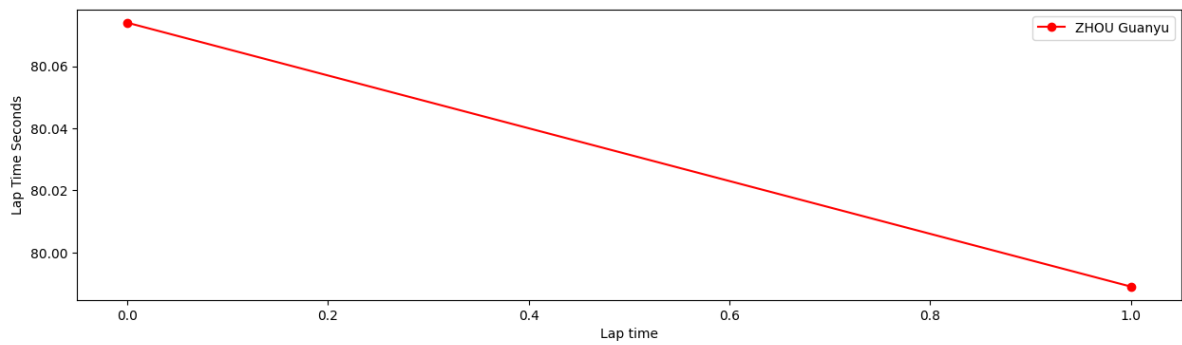
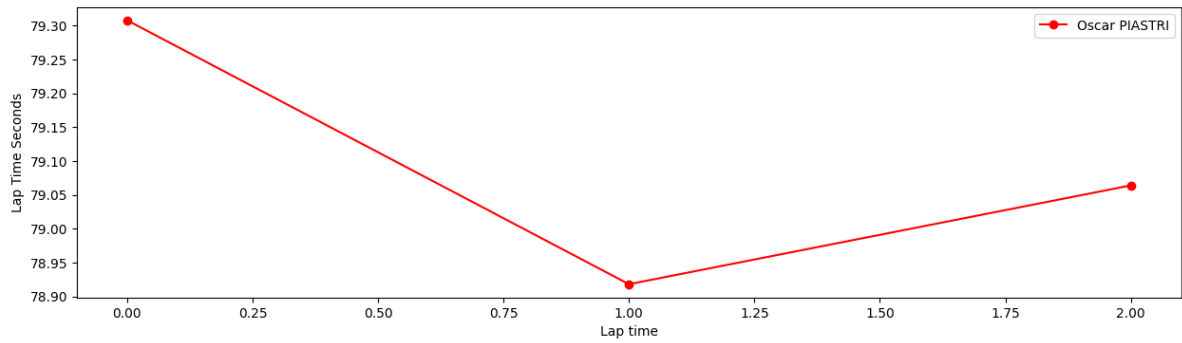
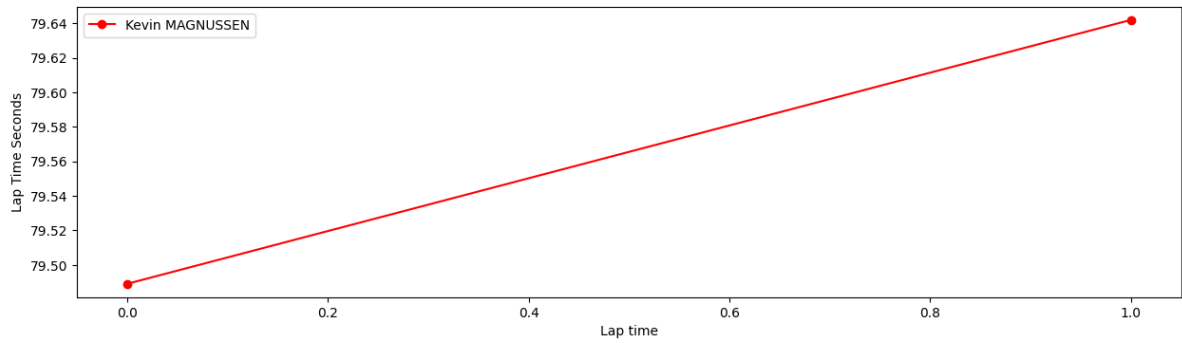
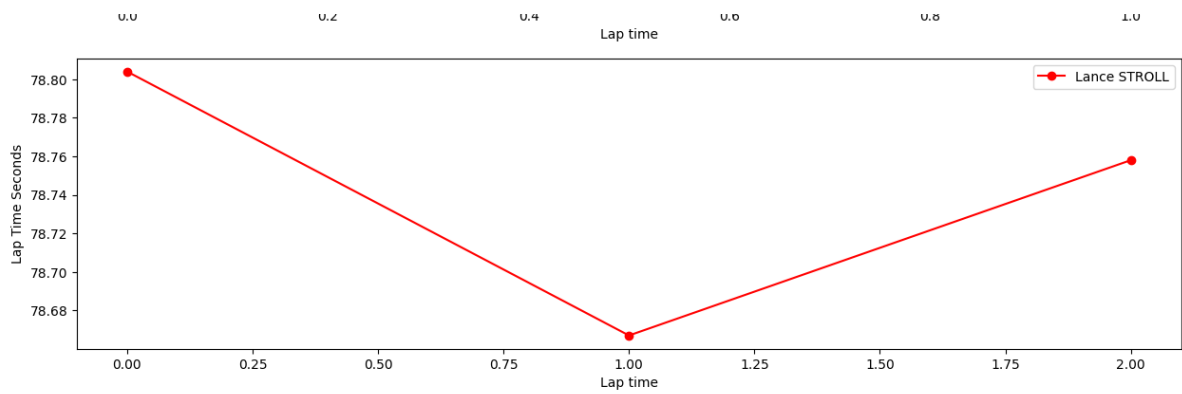


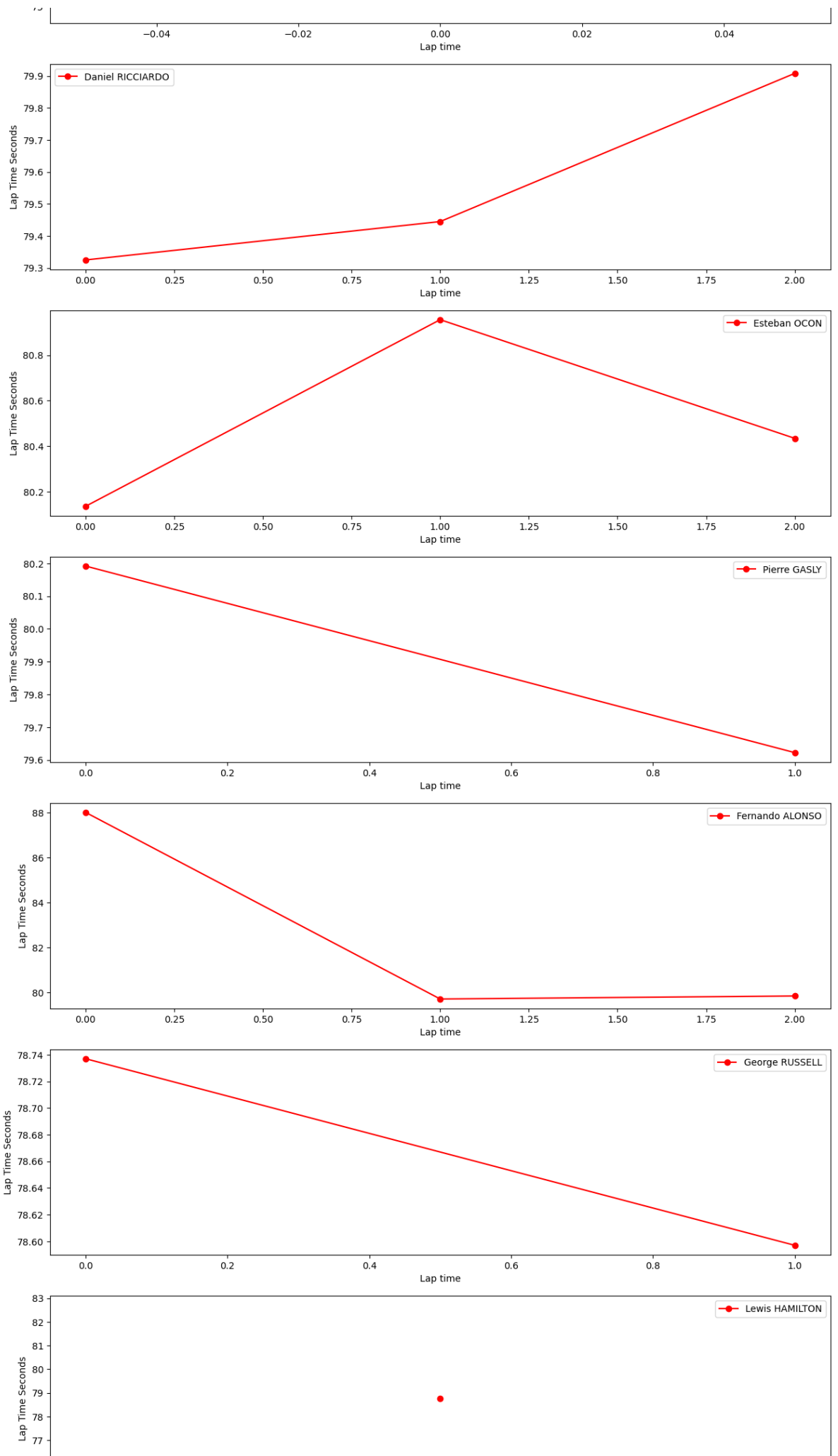


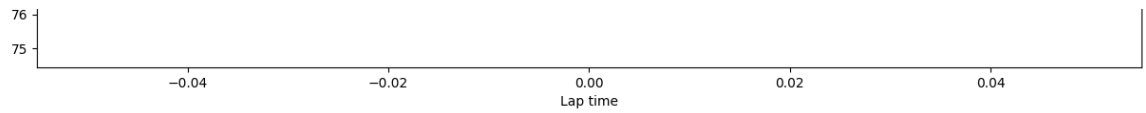
Soft tyres

```
In [6]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",90)
```







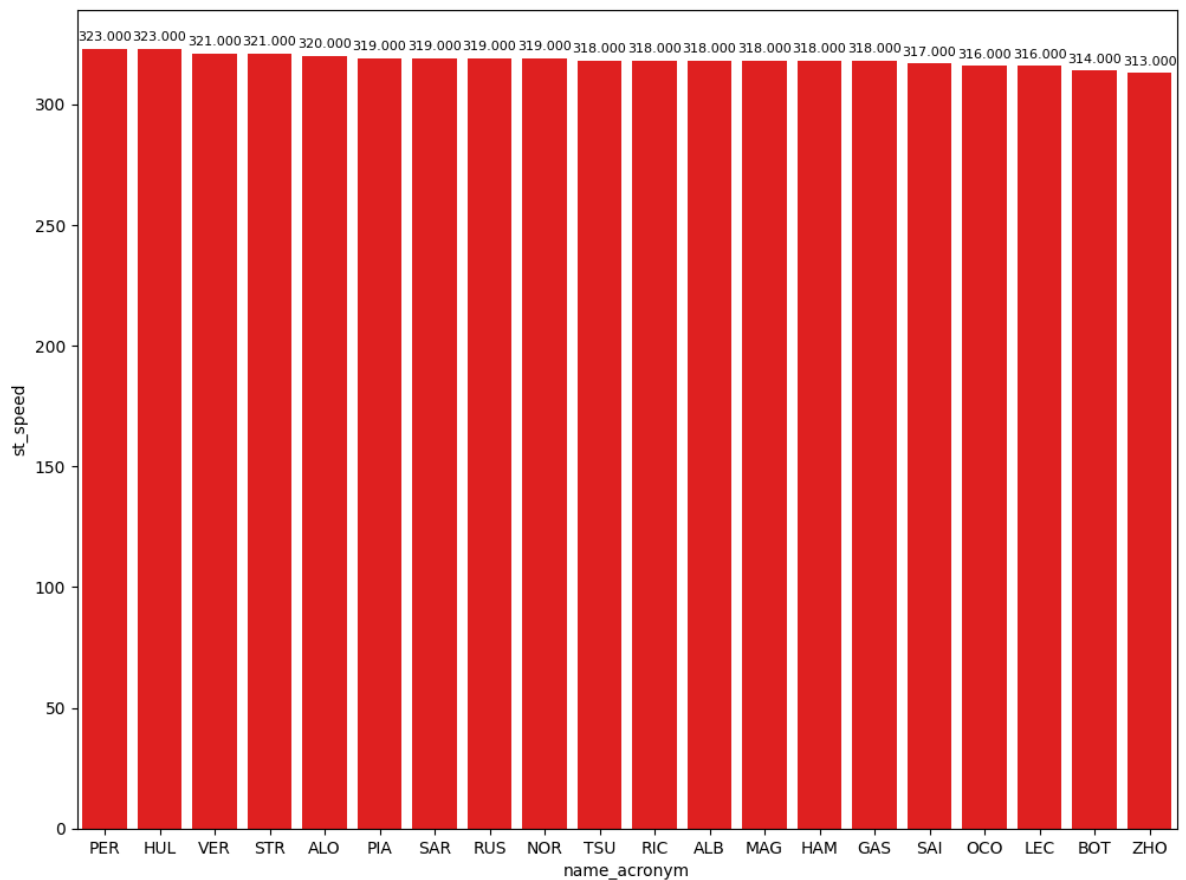


Hard tyres

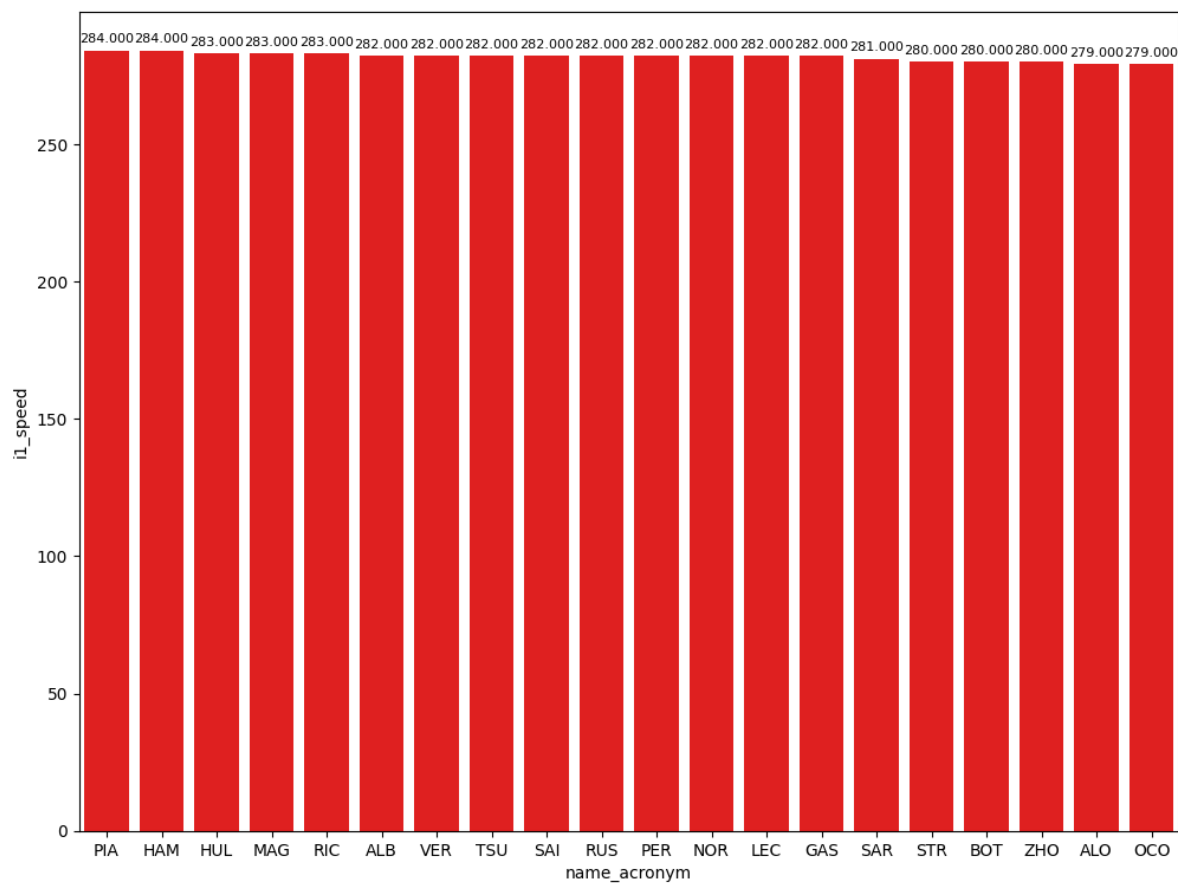
In [7]: `#libraryDataF1.obtain_data_tyres(jointables2,"HARD",90)`

Speed trap

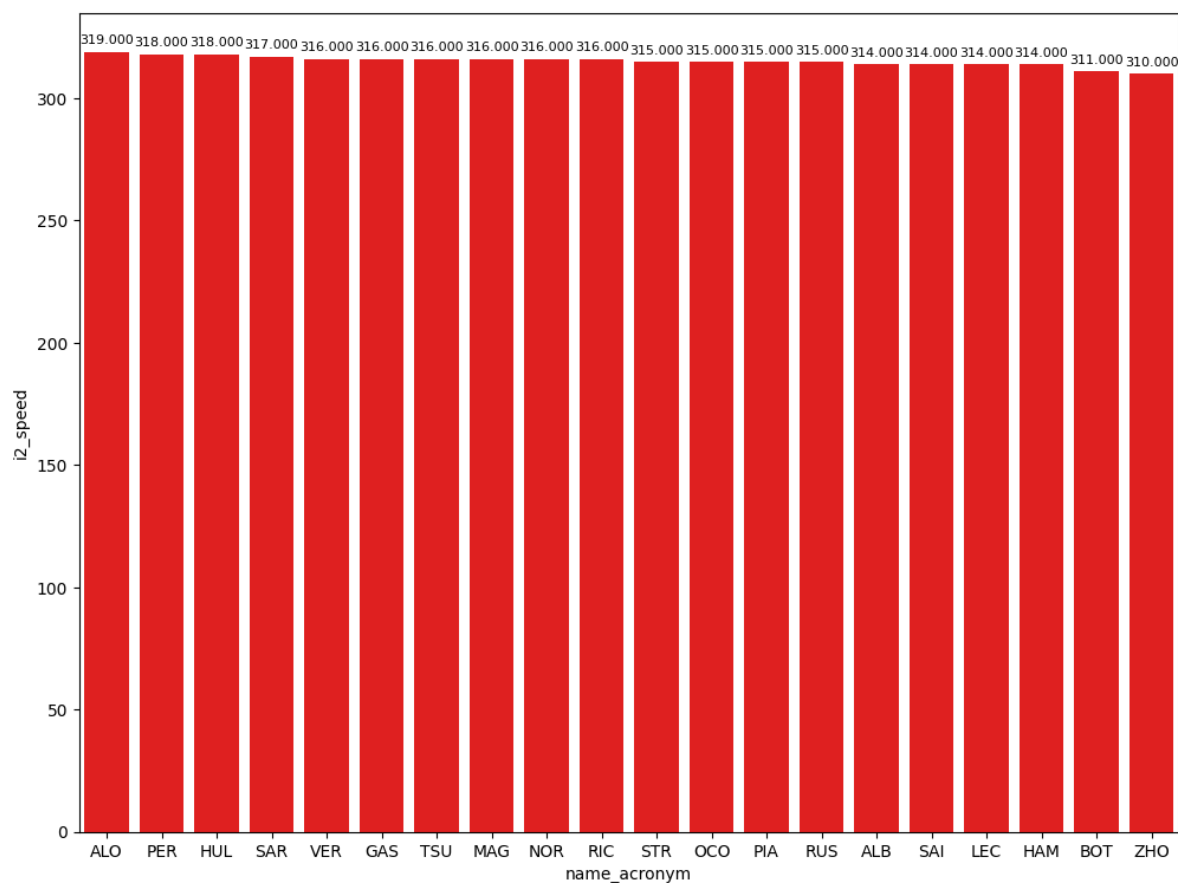
In [8]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed'].max()
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)`



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

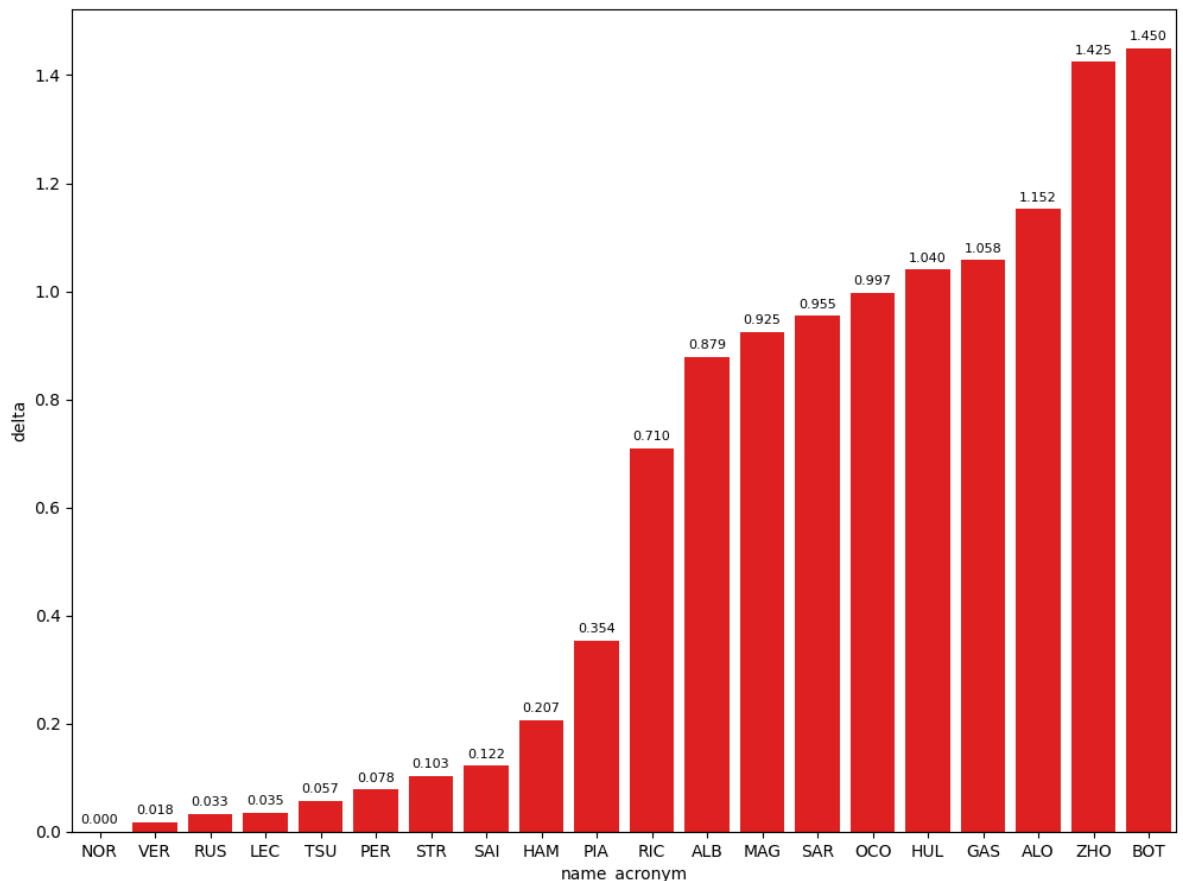
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
161	Yuki TSUNODA	MEDIUM	27.432	17.945	33.683	79.06
195	Lando NORRIS	SOFT	27.116	17.930	33.518	78.56

Deltas

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

```
In [12]: practiceCleaned = jointables2.query("lap_duration > 1")  
drivers_list = list(practiceCleaned['driver_number'].unique())  
newdataset = pd.DataFrame()  
for driver in drivers_list:  
    newdataset = libraryDataF1.obtain_fastest_lap(driver, practiceCleaned, newdataset)  
  
arr = libraryDataF1.obtain_deltas(newdataset)  
newdataset.insert(3, 'delta', arr)
```

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



Track dominance

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

```
In [14]: sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_1', 'full_name', 'compound', 'lap_duration', 'lap_number']]
```

```
Out[14]:
```

	duration_sector_1	full_name	compound	lap_duration	lap_number
195	27.116	Lando NORRIS	SOFT	78.564	12
252	27.124	Yuki TSUNODA	SOFT	78.621	17
229	27.163	Charles LECLERC	SOFT	78.898	10
320	27.166	Max VERSTAPPEN	SOFT	114.219	14
264	27.167	George RUSSELL	SOFT	95.675	13
261	27.203	Lance STROLL	SOFT	78.758	17
247	27.246	Oscar PIASTRI	SOFT	78.918	14
324	27.259	Sergio PEREZ	SOFT	82.846	18
262	27.278	Kevin MAGNUSSEN	SOFT	79.642	12
312	27.308	Carlos SAINZ	SOFT	79.061	14
271	27.315	Valtteri BOTTAS	SOFT	790.299	13
283	27.320	Alexander ALBON	SOFT	NaN	11
266	27.326	Daniel RICCIARDO	SOFT	79.325	16
336	27.340	Lewis HAMILTON	SOFT	110.119	15
246	27.349	Logan SARGEANT	SOFT	80.365	11
204	27.455	Nico HULKENBERG	SOFT	79.679	9
225	27.549	ZHOU Guanyu	SOFT	80.074	12
410	27.659	Pierre GASLY	SOFT	131.114	24
148	27.667	Esteban OCON	MEDIUM	79.561	11
163	27.670	Fernando ALONSO	MEDIUM	86.536	8

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

```
Out[15]:
```

	duration_sector_2	full_name	compound	lap_duration	lap_number
232	17.701	Lance STROLL	SOFT	78.667	15
247	17.751	Oscar PIASTRI	SOFT	78.918	14
320	17.757	Max VERSTAPPEN	SOFT	114.219	14
323	17.773	George RUSSELL	SOFT	78.737	16
324	17.800	Sergio PEREZ	SOFT	82.846	18
373	17.852	Pierre GASLY	SOFT	79.622	22
277	17.863	Charles LECLERC	SOFT	78.599	13

	duration_sector_2	full_name	compound	lap_duration	lap_number
378	17.868	Fernando ALONSO	SOFT	79.850	15
155	17.885	Daniel RICCIARDO	MEDIUM	79.274	11
252	17.910	Yuki TSUNODA	SOFT	78.621	17
356	17.913	Lewis HAMILTON	SOFT	78.771	16
195	17.930	Lando NORRIS	SOFT	78.564	12
246	17.940	Logan SARGEANT	SOFT	80.365	11
312	17.946	Carlos SAINZ	SOFT	79.061	14
122	17.975	Kevin MAGNUSSEN	MEDIUM	80.025	6
148	17.982	Esteban OCON	MEDIUM	79.561	11
242	18.000	Nico HULKENBERG	SOFT	79.604	12
193	18.099	Alexander ALBON	MEDIUM	79.443	8
225	18.120	ZHOU Guanvu	SOFT	80.074	12

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

Out[16]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
358	33.320	Carlos SAINZ	SOFT	78.686	16
277	33.384	Charles LECLERC	SOFT	78.599	13
254	33.393	Sergio PEREZ	SOFT	78.642	15
356	33.430	Lewis HAMILTON	SOFT	78.771	16
195	33.518	Lando NORRIS	SOFT	78.564	12
120	33.551	Max VERSTAPPEN	SOFT	78.670	7
391	33.571	George RUSSELL	SOFT	78.597	19
252	33.587	Yuki TSUNODA	SOFT	78.621	17
232	33.617	Lance STROLL	SOFT	78.667	15
275	33.808	Oscar PIASTRI	SOFT	79.064	16
193	33.849	Alexander ALBON	MEDIUM	79.443	8
148	33.912	Esteban OCON	MEDIUM	79.561	11
242	33.936	Nico HULKENBERG	SOFT	79.604	12
155	33.961	Daniel RICCIARDO	MEDIUM	79.274	11
270	34.006	ZHOU Guanyu	SOFT	79.989	15
218	34.026	Kevin MAGNUSSEN	SOFT	79.489	9
274	34.051	Logan SARGEANT	SOFT	79.519	13
373	34.098	Pierre GASLY	SOFT	79.622	22
168	34.105	Valtteri BOTTAS	MEDIUM	80.014	8
339	34.123	Fernando ALONSO	SOFT	79.716	13

Mean pace with the different compound used on the session

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

Out[17]:

	lap_duration
compound	
SOFT	80.353846
MEDIUM	82.227321

Long runs

```
In [18]: MINIMUM_SECONDS = 76
MAXIMUM_SECONDS = 93
```

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	1231	9481	1	1	1	4	SOFT	
10	1231	9481	1	11	1	8	SOFT	
24	1231	9481	2	1	5	9	SOFT	
32	1231	9481	2	11	9	11	SOFT	
37	1231	9481	3	1	10	13	SOFT	
46	1231	9481	3	11	12	17	SOFT	
53	1231	9481	4	1	14	15	SOFT	
64	1231	9481	5	1	16	16	SOFT	
71	1231	9481	6	1	17	20	SOFT	
73	1231	9481	4	11	18	24	SOFT	

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

Out[20]:

	full_name	compound	date_start	lap_number	duration_sector_1
45	Max VERSTAPPEN	SOFT	2024-03-22T01:35:27.505000+00:00	2	28.462
96	Max VERSTAPPEN	SOFT	2024-03-22T01:40:53.989000+00:00	5	27.886
120	Max VERSTAPPEN	SOFT	2024-03-22T01:44:10.730000+00:00	7	27.358
211	Max VERSTAPPEN	SOFT	2024-03-22T02:00:20.406000+00:00	10	27.305
390	Max VERSTAPPEN	SOFT	2024-03-22T02:29:25.170000+00:00	17	27.228

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
26	Sergio PEREZ	SOFT	2024-03-22T01:33:26.149000+00:00	2	28.560	28.560
62	Sergio PEREZ	SOFT	2024-03-22T01:37:02.350000+00:00	4	27.995	27.995
95	Sergio PEREZ	SOFT	2024-03-22T01:40:46.602000+00:00	6	27.619	27.619
188	Sergio PEREZ	SOFT	2024-03-22T01:55:13.099000+00:00	9	27.596	27.596
214	Sergio PEREZ	SOFT	2024-03-22T02:00:43.119000+00:00	12	27.441	27.441
254	Sergio PEREZ	SOFT	2024-03-22T02:06:05.549000+00:00	15	27.406	27.406
324	Sergio PEREZ	SOFT	2024-03-22T02:24:08.719000+00:00	18	27.259	27.259
393	Sergio PEREZ	SOFT	2024-03-22T02:29:40.487000+00:00	21	27.347	27.347

Ferrari

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
23	Charles LECLERC	SOFT	2024-03-22T01:33:07.890000+00:00	2	28.251	28.251
78	Charles LECLERC	SOFT	2024-03-22T01:38:54.772000+00:00	5	27.482	27.482
108	Charles LECLERC	SOFT	2024-03-22T01:42:25.658000+00:00	7	27.427	27.427
229	Charles LECLERC	SOFT	2024-03-22T02:02:55.601000+00:00	10	27.163	27.163
277	Charles LECLERC	SOFT	2024-03-22T02:08:44.537000+00:00	13	27.352	27.352
326	Charles LECLERC	SOFT	2024-03-22T02:24:13.758000+00:00	16	28.627	28.627
342	Charles LECLERC	SOFT	2024-03-22T02:25:36.264000+00:00	17	28.610	28.610
359	Charles LECLERC	SOFT	2024-03-22T02:26:58.907000+00:00	18	28.581	28.581
377	Charles LECLERC	SOFT	2024-03-22T02:28:21.108000+00:00	19	29.141	29.141
394	Charles LECLERC	SOFT	2024-03-22T02:29:44.084000+00:00	20	28.926	28.926

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

Out[23]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
94	Carlos SAINZ	SOFT	2024-03-22T01:40:40.312000+00:00	3	28.005	
138	Carlos SAINZ	SOFT	2024-03-22T01:46:23.922000+00:00	6	27.767	
227	Carlos SAINZ	SOFT	2024-03-22T02:02:37.739000+00:00	9	27.375	
312	Carlos SAINZ	SOFT	2024-03-22T02:23:02.736000+00:00	14	27.308	
358	Carlos SAINZ	SOFT	2024-03-22T02:26:52.963000+00:00	16	27.397	
396	Carlos SAINZ	SOFT	2024-03-22T02:29:54.360000+00:00	18	28.740	

Mercedes

```
In [24]: stintInformation.query('driver_number == 63 or driver_number == 44')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
5	1231	9481	1	44	1	6	MEDIUM	
8	1231	9481	1	63	1	7	MEDIUM	
27	1231	9481	2	44	7	12	MEDIUM	
29	1231	9481	2	63	8	12	MEDIUM	
49	1231	9481	3	44	13	13	SOFT	
51	1231	9481	3	63	13	15	SOFT	
55	1231	9481	4	44	14	21	SOFT	
66	1231	9481	4	63	16	22	SOFT	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
17	Lewis HAMILTON	MEDIUM	2024-03-22T01:32:16.662000+00:00	2	28.209	
30	Lewis HAMILTON	MEDIUM	2024-03-22T01:33:37.380000+00:00	3	28.294	
41	Lewis HAMILTON	MEDIUM	2024-03-22T01:34:59.101000+00:00	4	28.599	
55	Lewis HAMILTON	MEDIUM	2024-03-22T01:36:20.952000+00:00	5	28.164	
177	Lewis HAMILTON	MEDIUM	2024-03-22T01:52:59.454000+00:00	8	27.667	
184	Lewis HAMILTON	MEDIUM	2024-03-22T01:54:18.966000+00:00	9	28.076	
191	Lewis HAMILTON	MEDIUM	2024-03-22T01:55:40.916000+00:00	10	28.366	
356	Lewis HAMILTON	SOFT	2024-03-22T02:26:39.827000+00:00	16	27.428	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
14	George RUSSELL	MEDIUM	2024-03-22T01:31:50.874000+00:00	2	29.454	
25	George RUSSELL	MEDIUM	2024-03-22T01:33:21.093000+00:00	3	28.535	
39	George RUSSELL	MEDIUM	2024-03-22T01:34:43.046000+00:00	4	28.399	
53	George RUSSELL	MEDIUM	2024-03-22T01:36:04.790000+00:00	5	28.557	
169	George RUSSELL	MEDIUM	2024-03-22T01:51:34.040000+00:00	8	27.739	
176	George RUSSELL	MEDIUM	2024-03-22T01:52:53.996000+00:00	9	27.907	
183	George RUSSELL	MEDIUM	2024-03-22T01:54:15.583000+00:00	10	28.103	
323	George RUSSELL	SOFT	2024-03-22T02:24:03.405000+00:00	16	27.244	
391	George RUSSELL	SOFT	2024-03-22T02:29:32.065000+00:00	19	27.191	

McLaren

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
9	1231	9481	1	4	1	8	MEDIUM	
14	1231	9481	1	81	1	8	MEDIUM	
31	1231	9481	2	4	9	11	MEDIUM	
35	1231	9481	2	81	9	11	MEDIUM	
43	1231	9481	3	4	12	14	SOFT	
48	1231	9481	3	81	12	18	SOFT	
57	1231	9481	4	4	15	15	SOFT	
69	1231	9481	5	4	16	24	SOFT	
78	1231	9481	4	81	19	26	MEDIUM	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
19	Lando NORRIS	MEDIUM	2024-03-22T01:32:30.228000+00:00	2	28.972	
48	Lando NORRIS	MEDIUM	2024-03-22T01:35:42.406000+00:00	4	27.886	

	full_name	compound	date_start	lap_number	duration_sector_1	di
82	Lando NORRIS	MEDIUM	2024-03-22T01:39:07.608000+00:00	6	27.695	
170	Lando NORRIS	MEDIUM	2024-03-22T01:51:41.202000+00:00	9	27.578	
195	Lando NORRIS	SOFT	2024-03-22T01:56:42.642000+00:00	12	27.116	
311	Lando NORRIS	SOFT	2024-03-22T02:22:55.655000+00:00	16	29.045	
328	Lando NORRIS	SOFT	2024-03-22T02:24:19.960000+00:00	17	28.970	
344	Lando NORRIS	SOFT	2024-03-22T02:25:43.966000+00:00	18	29.222	
360	Lando NORRIS	SOFT	2024-03-22T02:27:08.310000+00:00	19	28.910	
379	Lando NORRIS	SOFT	2024-03-22T02:28:32.047000+00:00	20	28.935	

In [29]: `libraryDataF1.getinfo(longruns(jointables2,81,'McLaren',MINIMUM_SECONDS,MAX_SECONDS))`

Out[29]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
16	Oscar PIASTRI	MEDIUM	2024-03-22T01:32:09.891000+00:00	2	28.596	
46	Oscar PIASTRI	MEDIUM	2024-03-22T01:35:32.676000+00:00	4	28.040	
76	Oscar PIASTRI	MEDIUM	2024-03-22T01:38:44.844000+00:00	6	27.620	
115	Oscar PIASTRI	MEDIUM	2024-03-22T01:43:36.597000+00:00	9	27.856	
224	Oscar PIASTRI	SOFT	2024-03-22T02:02:06.349000+00:00	12	27.372	
247	Oscar PIASTRI	SOFT	2024-03-22T02:05:15.250000+00:00	14	27.246	
275	Oscar PIASTRI	SOFT	2024-03-22T02:08:36.994000+00:00	16	27.439	
315	Oscar PIASTRI	MEDIUM	2024-03-22T02:23:15.344000+00:00	19	29.148	
333	Oscar PIASTRI	MEDIUM	2024-03-22T02:24:41.247000+00:00	20	28.785	
348	Oscar PIASTRI	MEDIUM	2024-03-22T02:26:02.708000+00:00	21	28.985	
364	Oscar PIASTRI	MEDIUM	2024-03-22T02:27:27.599000+00:00	22	29.017	
382	Oscar PIASTRI	MEDIUM	2024-03-22T02:28:51.131000+00:00	23	29.074	

Aston Martin

In [30]: `stintInformation.query('driver_number == 18 or driver_number == 14')`

Out[30]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	2	1231	9481	1	14	1	3	MEDIUM
	7	1231	9481	1	18	1	7	MEDIUM
	22	1231	9481	2	14	4	5	MEDIUM
	26	1231	9481	3	14	6	11	MEDIUM
	28	1231	9481	2	18	8	12	MEDIUM
	47	1231	9481	4	14	12	17	SOFT
	52	1231	9481	3	18	13	19	SOFT
	79	1231	9481	4	18	20	27	MEDIUM

In [31]:

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

Out[31]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
146	Fernando ALONSO	MEDIUM	2024-03-22T01:47:53.242000+00:00	6	28.475	
163	Fernando ALONSO	MEDIUM	2024-03-22T01:50:50.626000+00:00	8	27.670	
321	Fernando ALONSO	SOFT	2024-03-22T02:23:53.186000+00:00	12	28.563	
339	Fernando ALONSO	SOFT	2024-03-22T02:25:21.087000+00:00	13	27.675	
378	Fernando ALONSO	SOFT	2024-03-22T02:28:30.269000+00:00	15	27.673	

In [32]:

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

Out[32]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
24	Lance STROLL	MEDIUM	2024-03-22T01:33:13.960000+00:00	2	28.350	
38	Lance STROLL	MEDIUM	2024-03-22T01:34:35.426000+00:00	3	27.892	
70	Lance STROLL	MEDIUM	2024-03-22T01:37:49.076000+00:00	5	27.590	
136	Lance STROLL	MEDIUM	2024-03-22T01:46:14.067000+00:00	8	27.490	
154	Lance STROLL	MEDIUM	2024-03-22T01:49:35.614000+00:00	10	27.315	
207	Lance STROLL	SOFT	2024-03-22T01:59:40.274000+00:00	13	27.304	
232	Lance STROLL	SOFT	2024-03-22T02:03:15.006000+00:00	15	27.349	
261	Lance STROLL	SOFT	2024-03-22T02:06:55.844000+00:00	17	27.203	
316	Lance STROLL	MEDIUM	2024-03-22T02:23:18.402000+00:00	20	29.473	

	full_name	compound	date_start	lap_number	duration_sector_1	di
334	Lance STROLL	MEDIUM	2024-03-22T02:24:43.335000+00:00	21	29.455	
350	Lance STROLL	MEDIUM	2024-03-22T02:26:08.221000+00:00	22	29.488	
365	Lance STROLL	MEDIUM	2024-03-22T02:27:33.028000+00:00	23	29.615	

RB

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
18	1231	9481	1	3	1	13	MEDIUM	
19	1231	9481	1	22	1	14	MEDIUM	
54	1231	9481	2	3	14	15	SOFT	
60	1231	9481	2	22	15	19	SOFT	
65	1231	9481	3	3	16	18	SOFT	
75	1231	9481	4	3	19	26	SOFT	
80	1231	9481	3	22	20	27	MEDIUM	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
35	Daniel RICCIARDO	MEDIUM	2024-03-22T01:34:11.066000+00:00	2	29.583	
47	Daniel RICCIARDO	MEDIUM	2024-03-22T01:35:37.220000+00:00	3	28.547	
80	Daniel RICCIARDO	MEDIUM	2024-03-22T01:39:02.835000+00:00	5	28.054	
109	Daniel RICCIARDO	MEDIUM	2024-03-22T01:42:30.659000+00:00	7	27.755	
134	Daniel RICCIARDO	MEDIUM	2024-03-22T01:46:05.307000+00:00	9	27.615	
155	Daniel RICCIARDO	MEDIUM	2024-03-22T01:49:41.412000+00:00	11	27.428	
266	Daniel RICCIARDO	SOFT	2024-03-22T02:07:19.403000+00:00	16	27.326	
310	Daniel RICCIARDO	SOFT	2024-03-22T02:22:55.363000+00:00	19	27.480	
376	Daniel RICCIARDO	SOFT	2024-03-22T02:28:18.881000+00:00	22	27.589	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
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	full_name	compound	date_start	lap_number	duration_sector_1	d
22	Yuki TSUNODA	MEDIUM	2024-03-22T01:32:57.555000+00:00	2	28.980	
54	Yuki TSUNODA	MEDIUM	2024-03-22T01:36:17.209000+00:00	4	28.043	
87	Yuki TSUNODA	MEDIUM	2024-03-22T01:39:51.847000+00:00	6	27.741	
130	Yuki TSUNODA	MEDIUM	2024-03-22T01:45:22.260000+00:00	9	27.609	
161	Yuki TSUNODA	MEDIUM	2024-03-22T01:50:41.879000+00:00	12	27.432	
252	Yuki TSUNODA	SOFT	2024-03-22T02:05:47.456000+00:00	17	27.124	
314	Yuki TSUNODA	MEDIUM	2024-03-22T02:23:11.668000+00:00	20	29.140	
331	Yuki TSUNODA	MEDIUM	2024-03-22T02:24:34.965000+00:00	21	29.293	
347	Yuki TSUNODA	MEDIUM	2024-03-22T02:25:59.283000+00:00	22	29.104	
363	Yuki TSUNODA	MEDIUM	2024-03-22T02:27:23.410000+00:00	23	29.193	

Haas

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

Out[36]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
67	Kevin MAGNUSSEN	MEDIUM	2024-03-22T01:37:33.722000+00:00	2	28.253	
97	Kevin MAGNUSSEN	MEDIUM	2024-03-22T01:40:58.807000+00:00	4	27.804	
122	Kevin MAGNUSSEN	MEDIUM	2024-03-22T01:44:18.342000+00:00	6	27.739	
218	Kevin MAGNUSSEN	SOFT	2024-03-22T02:01:24.329000+00:00	9	27.444	
262	Kevin MAGNUSSEN	SOFT	2024-03-22T02:07:01.610000+00:00	12	27.278	
319	Kevin MAGNUSSEN	MEDIUM	2024-03-22T02:23:29.556000+00:00	15	29.398	
338	Kevin MAGNUSSEN	MEDIUM	2024-03-22T02:24:54.362000+00:00	16	29.398	
354	Kevin MAGNUSSEN	MEDIUM	2024-03-22T02:26:19.338000+00:00	17	28.976	
370	Kevin MAGNUSSEN	MEDIUM	2024-03-22T02:27:43.519000+00:00	18	29.173	
388	Kevin MAGNUSSEN	MEDIUM	2024-03-22T02:29:07.434000+00:00	19	29.172	

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

Out[37]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
65	Nico HULKENBERG	MEDIUM	2024-03-22T01:37:26.601000+00:00	2	28.666	
77	Nico HULKENBERG	MEDIUM	2024-03-22T01:38:48.988000+00:00	3	28.136	
119	Nico HULKENBERG	MEDIUM	2024-03-22T01:43:58.298000+00:00	6	27.566	
204	Nico HULKENBERG	SOFT	2024-03-22T01:58:51.976000+00:00	9	27.456	
242	Nico HULKENBERG	SOFT	2024-03-22T02:04:18.419000+00:00	12	27.666	
317	Nico HULKENBERG	MEDIUM	2024-03-22T02:23:20.428000+00:00	15	29.206	
335	Nico HULKENBERG	MEDIUM	2024-03-22T02:24:44.422000+00:00	16	29.196	
351	Nico HULKENBERG	MEDIUM	2024-03-22T02:26:08.793000+00:00	17	29.614	
366	Nico HULKENBERG	MEDIUM	2024-03-22T02:27:36.235000+00:00	18	29.236	
385	Nico HULKENBERG	MEDIUM	2024-03-22T02:29:00.080000+00:00	19	29.306	

Alpine

In [38]:

libraryDataF1.getinfo(longruns(jointables2,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[38]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
42	Esteban OCON	MEDIUM	2024-03-22T01:35:14.332000+00:00	3	28.887	
71	Esteban OCON	MEDIUM	2024-03-22T01:38:15.612000+00:00	5	28.184	
100	Esteban OCON	MEDIUM	2024-03-22T01:41:33.725000+00:00	7	28.120	
124	Esteban OCON	MEDIUM	2024-03-22T01:44:48.709000+00:00	9	27.850	
148	Esteban OCON	MEDIUM	2024-03-22T01:48:05.879000+00:00	11	27.667	
153	Esteban OCON	MEDIUM	2024-03-22T01:49:25.523000+00:00	12	28.294	
307	Esteban OCON	SOFT	2024-03-22T02:22:38.338000+00:00	19	27.946	
345	Esteban OCON	SOFT	2024-03-22T02:25:50.447000+00:00	21	27.799	
383	Esteban OCON	SOFT	2024-03-22T02:28:55.951000+00:00	23	27.895	

In [39]:

libraryDataF1.getinfo(longruns(jointables2,10,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[39]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
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	full_name	compound	date_start	lap_number	duration_sector_1	dt
20	Pierre GASLY	MEDIUM	2024-03-22T01:32:31.581000+00:00	2	30.788	
34	Pierre GASLY	MEDIUM	2024-03-22T01:33:59.107000+00:00	3	28.488	
64	Pierre GASLY	MEDIUM	2024-03-22T01:37:11.128000+00:00	5	28.524	
182	Pierre GASLY	MEDIUM	2024-03-22T01:54:08.898000+00:00	8	28.227	
197	Pierre GASLY	MEDIUM	2024-03-22T01:57:11.652000+00:00	10	28.166	
209	Pierre GASLY	MEDIUM	2024-03-22T02:00:07.488000+00:00	12	27.902	
230	Pierre GASLY	MEDIUM	2024-03-22T02:03:02.765000+00:00	14	27.795	
255	Pierre GASLY	MEDIUM	2024-03-22T02:06:11.085000+00:00	16	27.839	
309	Pierre GASLY	SOFT	2024-03-22T02:22:50.642000+00:00	19	27.744	
	Diarra					

Williams

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

	full_name	compound	date_start	lap_number	duration_sector_1	dt
140	Alexander ALBON	MEDIUM	2024-03-22T01:46:41.377000+00:00	2	28.456	
158	Alexander ALBON	MEDIUM	2024-03-22T01:49:55.199000+00:00	4	27.845	
179	Alexander ALBON	MEDIUM	2024-03-22T01:53:12.337000+00:00	6	27.563	
193	Alexander ALBON	MEDIUM	2024-03-22T01:56:29.822000+00:00	8	27.495	

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

	full_name	compound	date_start	lap_number	duration_sector_1	dt
98	Logan SARGEANT	MEDIUM	2024-03-22T01:41:03.279000+00:00	2	32.057	
110	Logan SARGEANT	MEDIUM	2024-03-22T01:42:35.388000+00:00	3	28.151	
133	Logan SARGEANT	MEDIUM	2024-03-22T01:45:51.149000+00:00	5	27.870	
151	Logan SARGEANT	MEDIUM	2024-03-22T01:49:03.028000+00:00	7	27.660	
246	Logan SARGEANT	SOFT	2024-03-22T02:05:09.640000+00:00	11	27.349	
274	Logan SARGEANT	SOFT	2024-03-22T02:08:31.081000+00:00	13	27.401	

	full_name	compound	date_start	lap_number	duration_sector_1
313	Logan SARGEANT	MEDIUM	2024-03-22T02:23:07.601000+00:00	16	29.119
330	Logan SARGEANT	MEDIUM	2024-03-22T02:24:31.415000+00:00	17	28.927
346	Logan SARGEANT	MEDIUM	2024-03-22T02:25:54.937000+00:00	18	28.826
362	Logan SARGEANT	MEDIUM	2024-03-22T02:27:18.517000+00:00	19	29.031
	Logan				

Kick Sauber

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

	full_name	compound	date_start	lap_number	duration_sector_1	di
15	ZHOU Guanyu	MEDIUM	2024-03-22T01:32:03.366000+00:00	2	29.116	
43	ZHOU Guanyu	MEDIUM	2024-03-22T01:35:19.209000+00:00	4	28.327	
75	ZHOU Guanyu	MEDIUM	2024-03-22T01:38:38.965000+00:00	6	28.037	
101	ZHOU Guanyu	MEDIUM	2024-03-22T01:41:51.294000+00:00	8	27.732	
225	ZHOU Guanyu	SOFT	2024-03-22T02:02:14.964000+00:00	12	27.549	
270	ZHOU Guanyu	SOFT	2024-03-22T02:07:50.035000+00:00	15	27.758	
352	ZHOU Guanyu	MEDIUM	2024-03-22T02:26:12.585000+00:00	19	29.484	
367	ZHOU Guanyu	MEDIUM	2024-03-22T02:27:37.238000+00:00	20	29.576	
386	ZHOU Guanyu	MEDIUM	2024-03-22T02:29:02.155000+00:00	21	29.494	

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

	full_name	compound	date_start	lap_number	duration_sector_1	di
127	Valtteri BOTTAS	MEDIUM	2024-03-22T01:45:12.757000+00:00	4	28.727	
149	Valtteri BOTTAS	MEDIUM	2024-03-22T01:48:21.722000+00:00	6	28.104	
168	Valtteri BOTTAS	MEDIUM	2024-03-22T01:51:27.657000+00:00	8	27.703	
186	Valtteri BOTTAS	MEDIUM	2024-03-22T01:54:44.892000+00:00	10	27.688	
318	Valtteri BOTTAS	MEDIUM	2024-03-22T02:23:25.410000+00:00	15	29.293	
337	Valtteri BOTTAS	MEDIUM	2024-03-22T02:24:52.368000+00:00	16	29.336	

	full_name	compound	date_start	lap_number	duration_sector_1	di
353	Valtteri BOTTAS	MEDIUM	2024-03-22T02:26:17.103000+00:00	17	29.202	
368	Valtteri BOTTAS	MEDIUM	2024-03-22T02:27:41.096000+00:00	18	29.225	
...	Valtteri	MEDIUM	2024-03-22T02:28:05.100000+00:00	19	29.200	

Free Practice 2

Obtain setup

In [44]:

```
practice = libraryDataF1.obtain_information('laps',session_key=9482)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9482)
drivers = libraryDataF1.obtain_information('drivers',session_key=9482)
```

In [45]:

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

Out[45]:

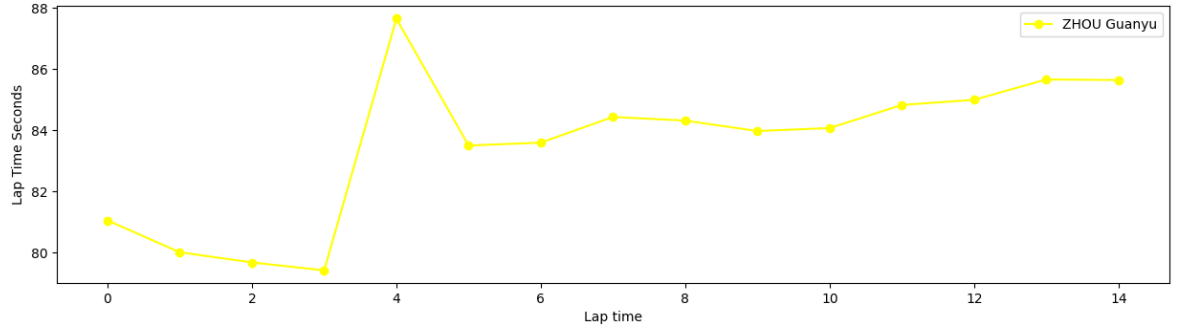
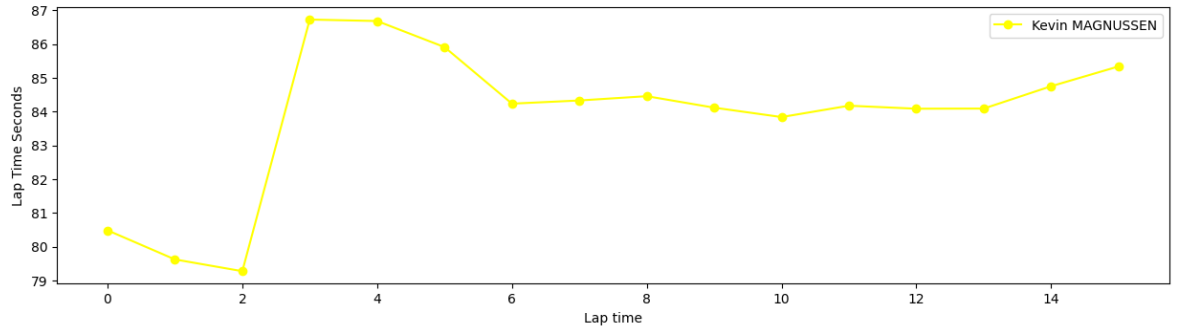
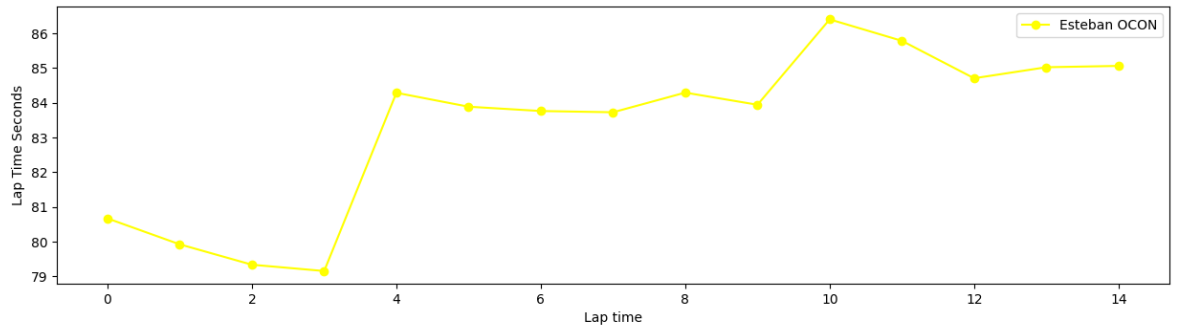
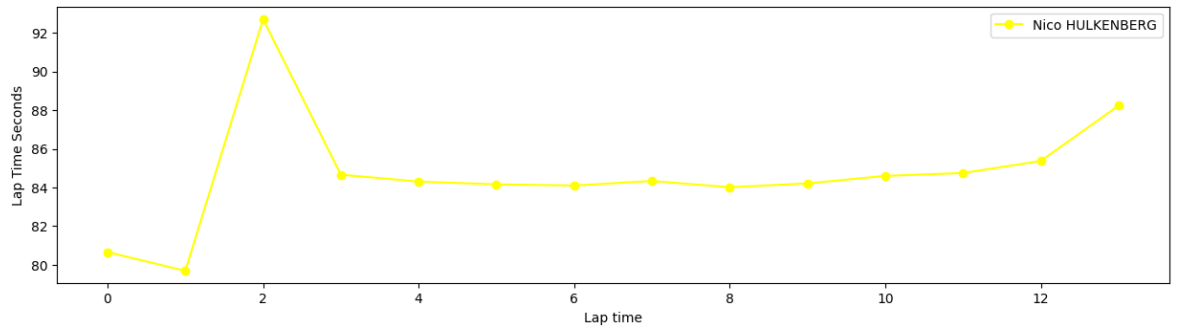
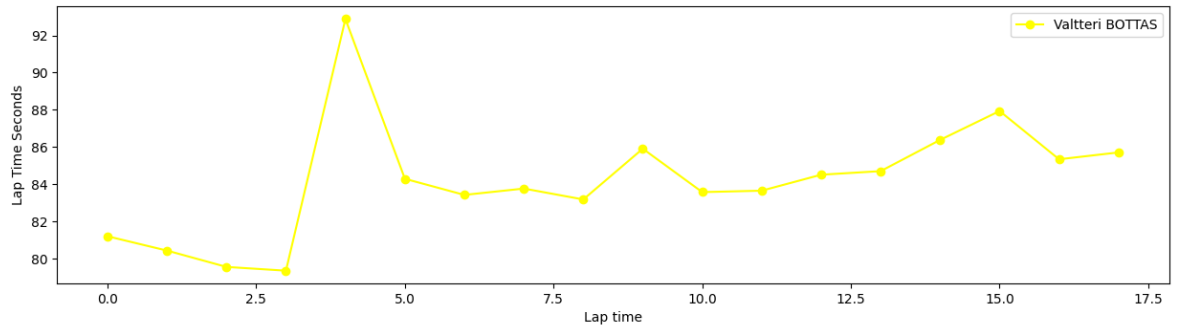
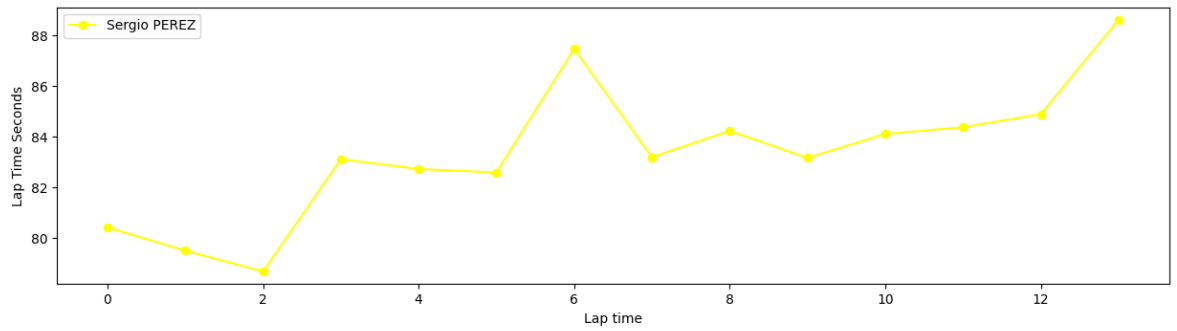
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1231	9482	77	254.0	287	205.0	2024-03-22T05:00:00.000000+00:00
1	1231	9482	11	252.0	310	203.0	2024-03-22T05:00:00.000000+00:00
2	1231	9482	27	254.0	277	170.0	2024-03-22T05:00:00.000000+00:00
3	1231	9482	31	265.0	297	135.0	2024-03-22T05:00:00.000000+00:00
4	1231	9482	24	253.0	293	134.0	2024-03-22T05:00:00.000000+00:00
...
527	1231	9482	44	192.0	281	250.0	2024-03-22T06:03:00.000000+00:00
528	1231	9482	1	242.0	202	253.0	2024-03-22T06:03:00.000000+00:00
529	1231	9482	63	267.0	275	237.0	2024-03-22T06:03:00.000000+00:00
530	1231	9482	31	268.0	294	255.0	2024-03-22T06:03:00.000000+00:00
531	1231	9482	55	263.0	199	260.0	2024-03-22T06:03:00.000000+00:00

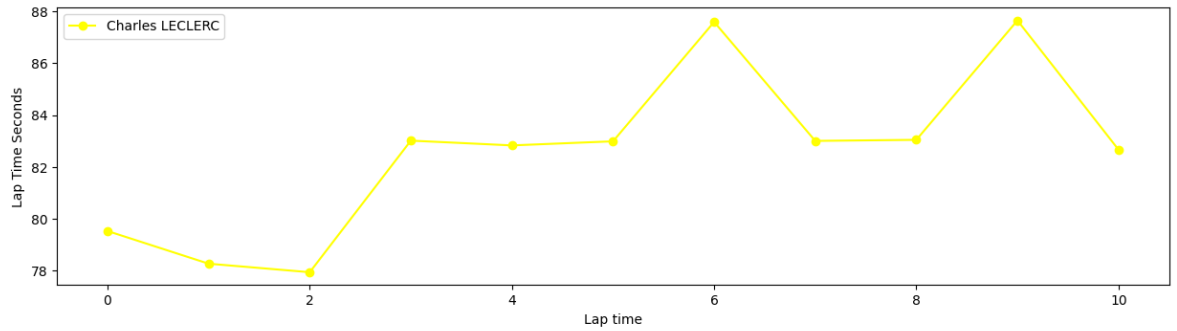
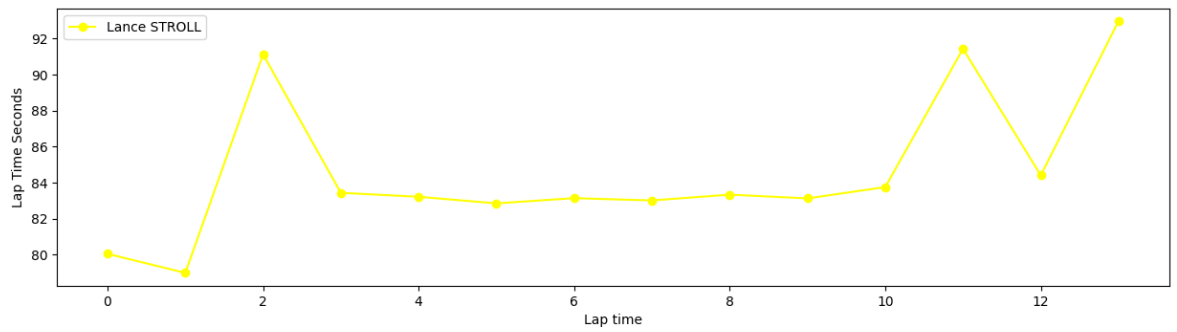
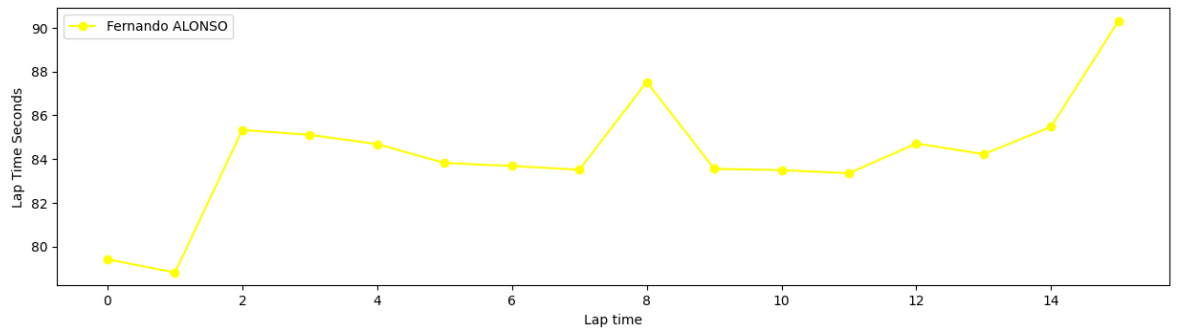
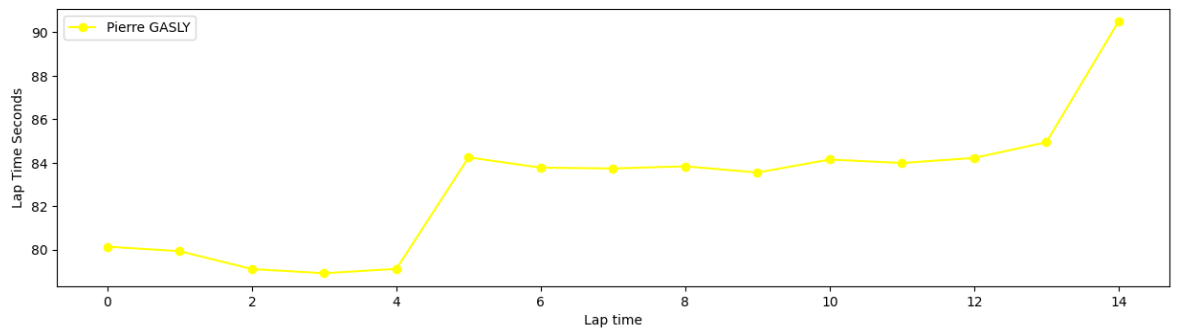
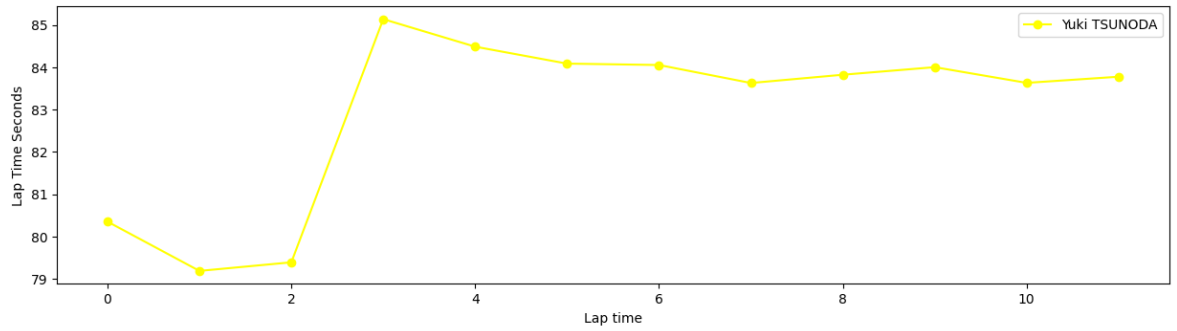
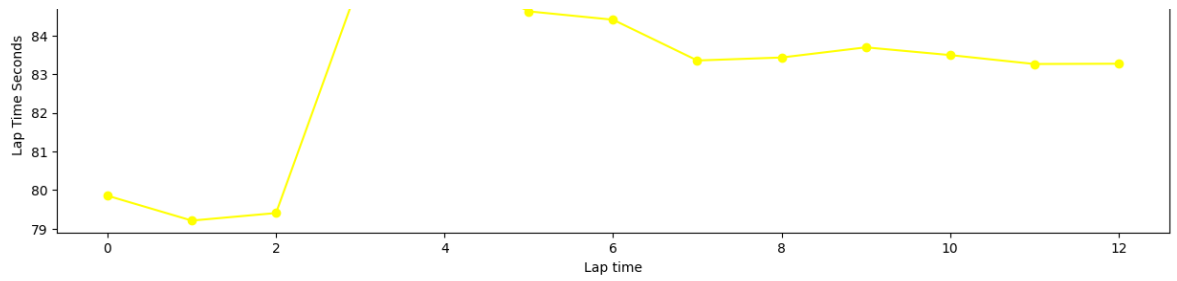
532 rows × 20 columns

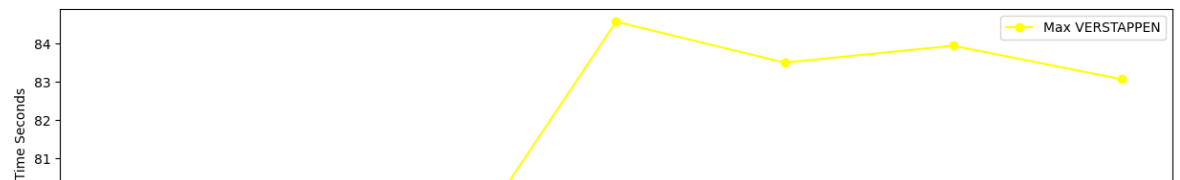
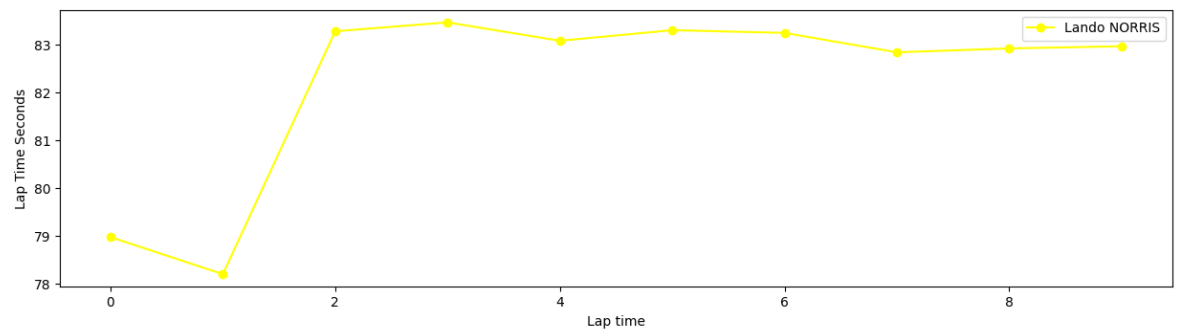
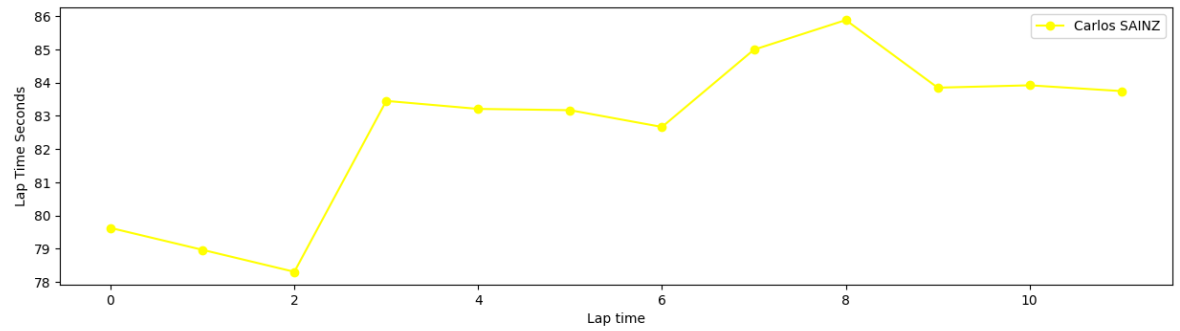
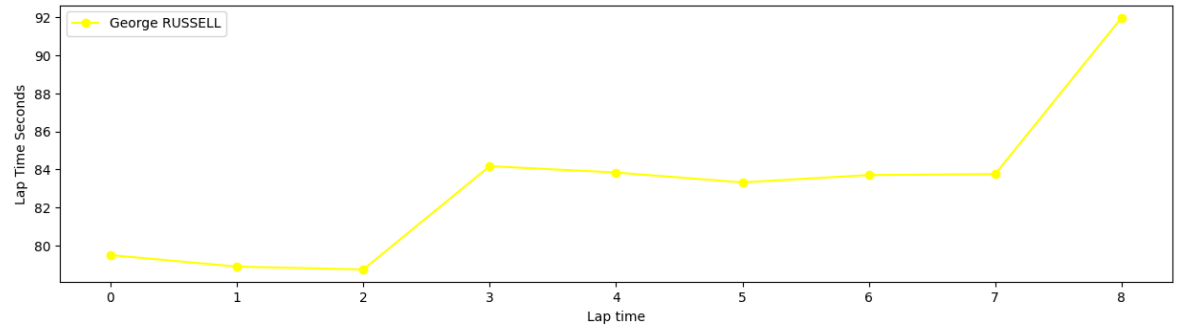
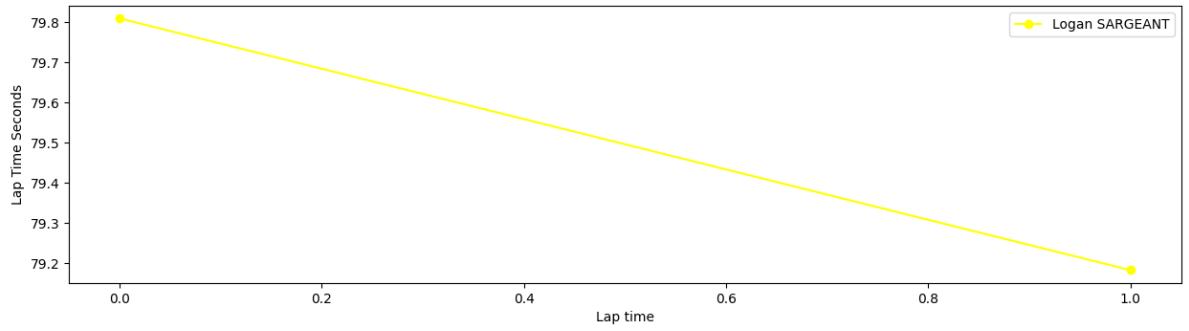
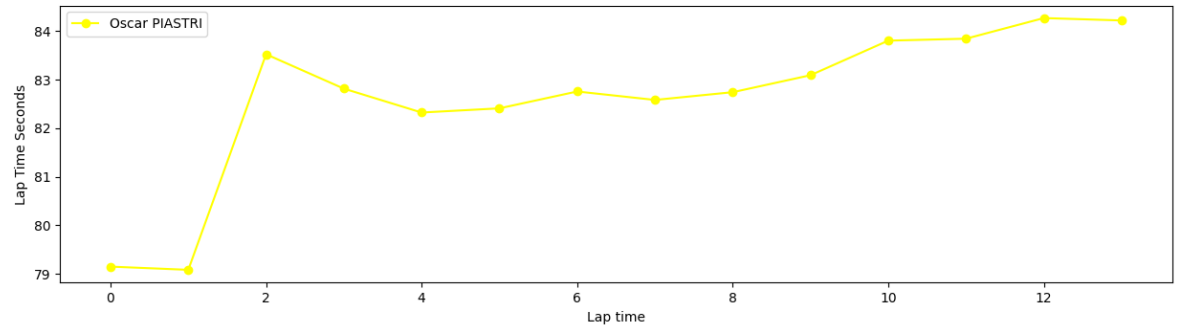
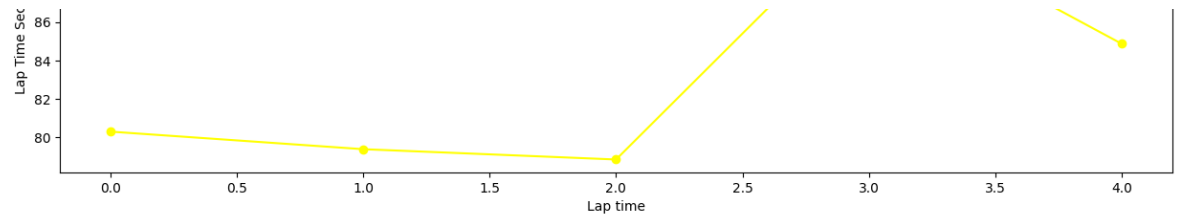
See race pace by means of the charts

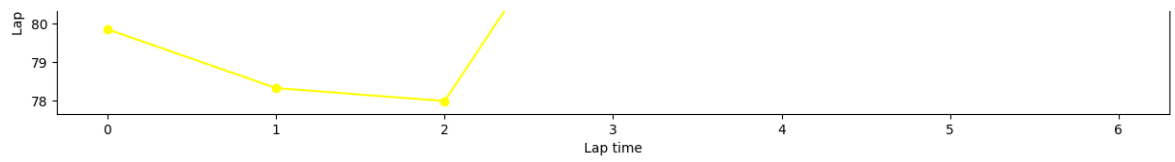
Medium tyres

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



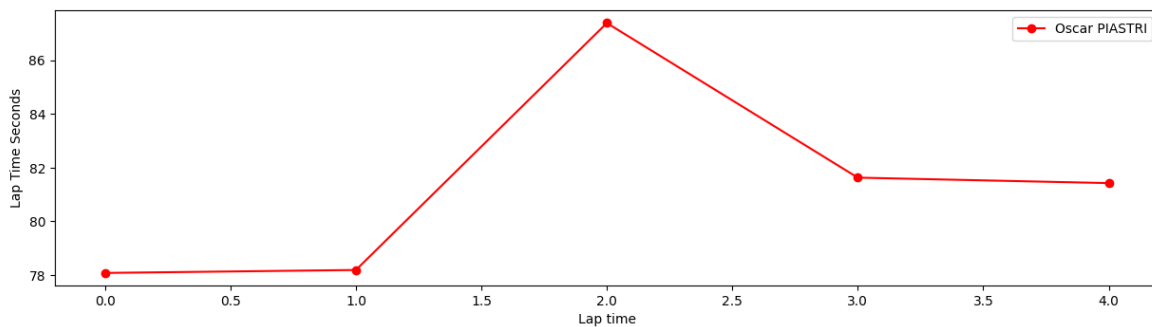
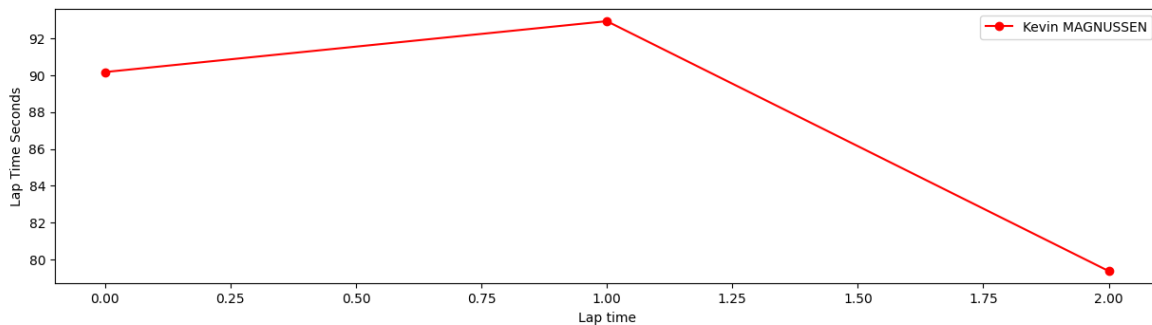
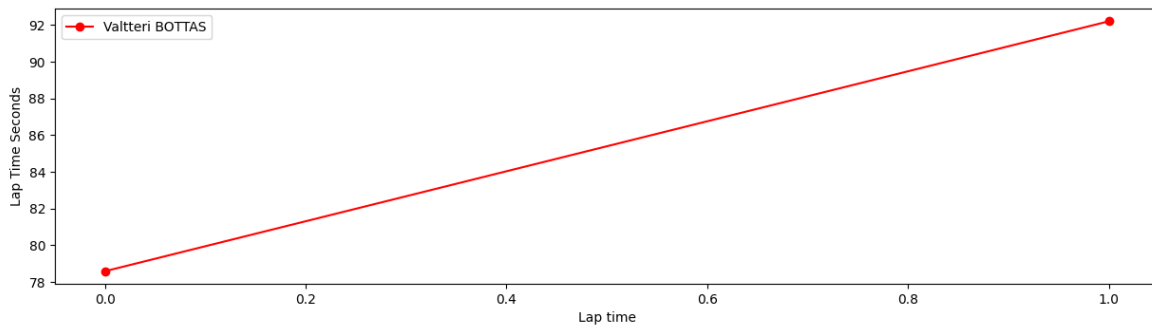
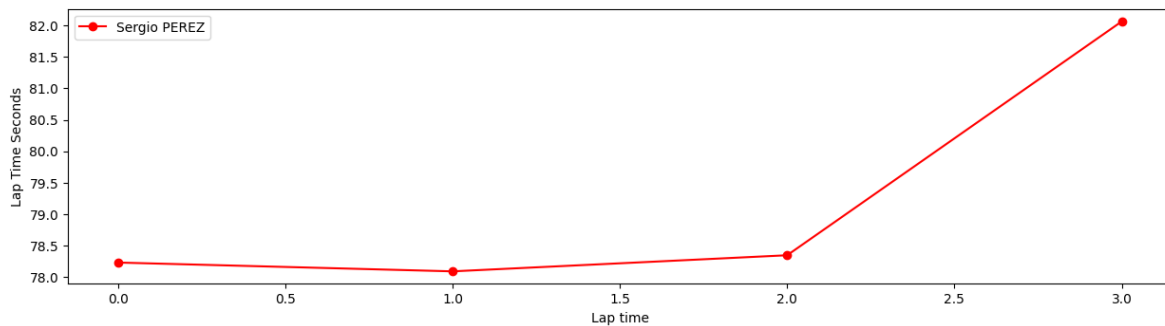
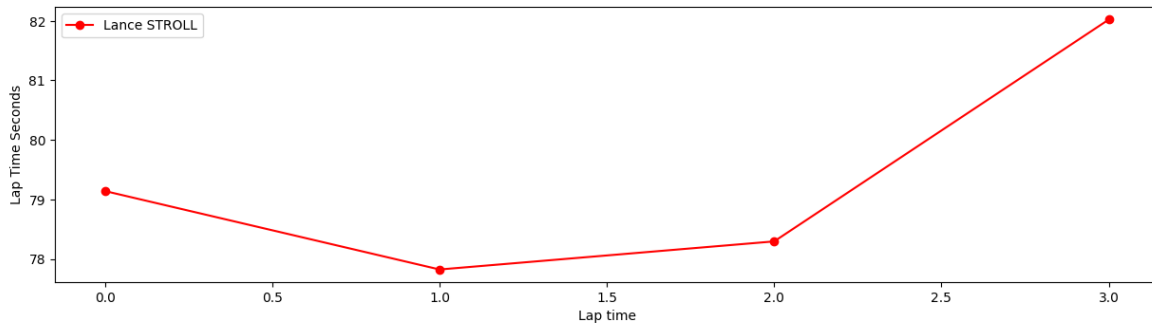
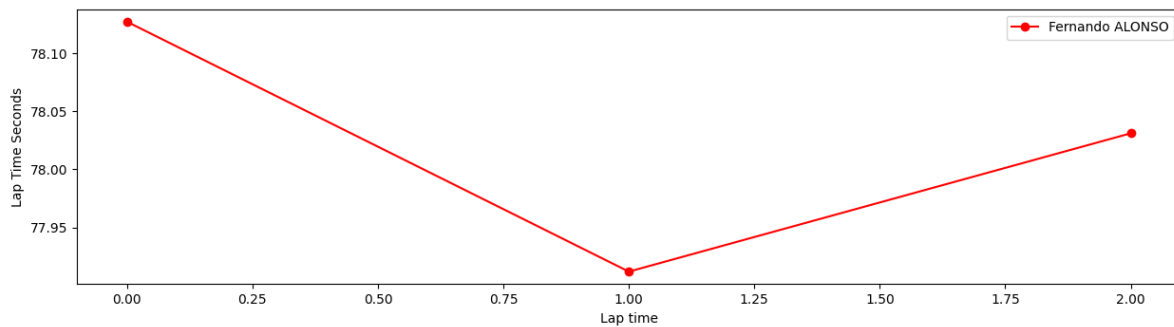


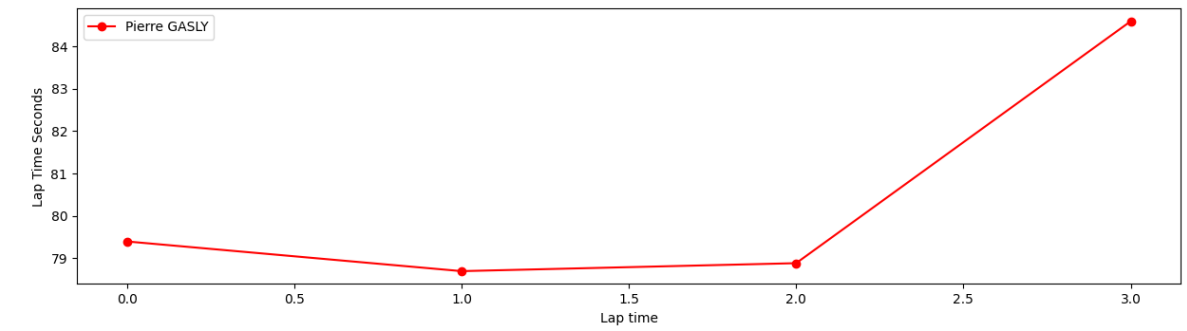
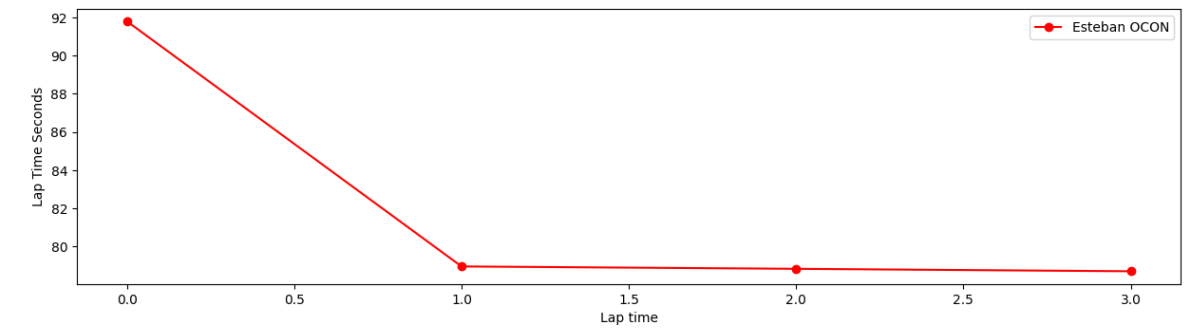
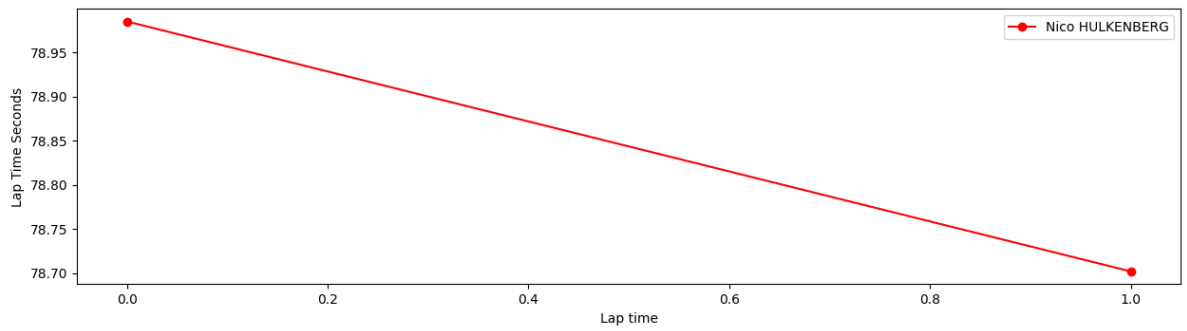
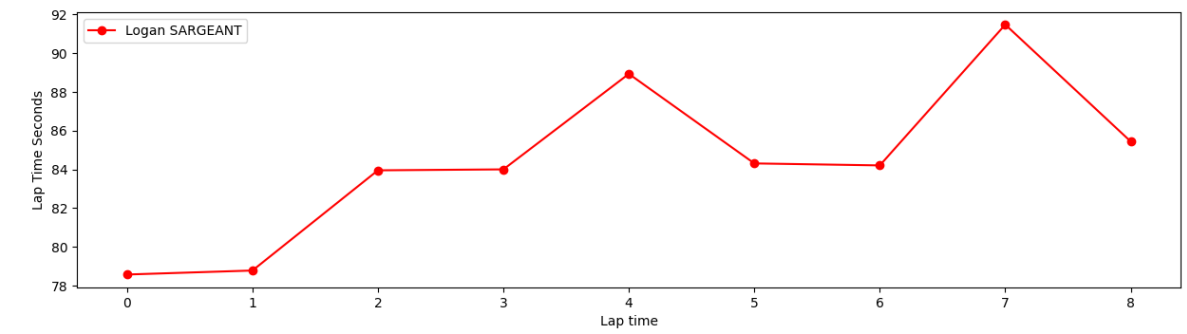
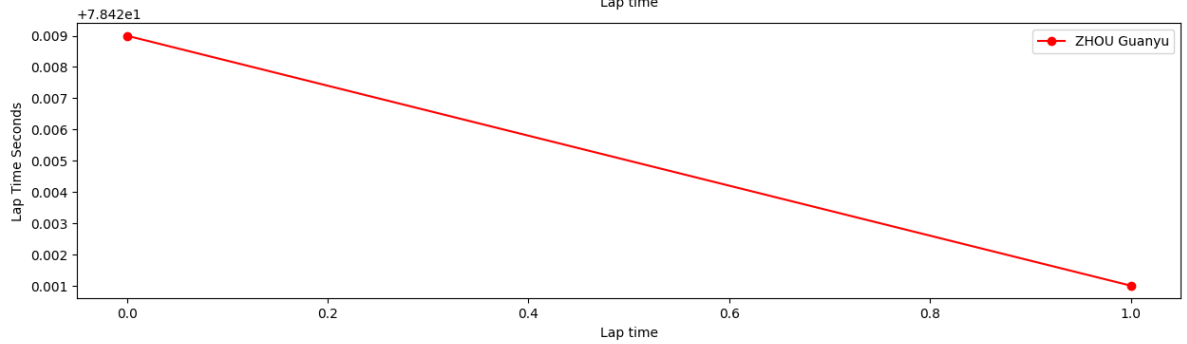
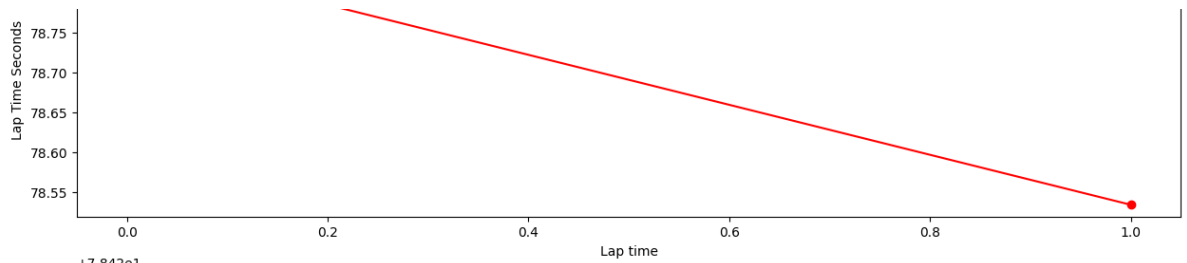


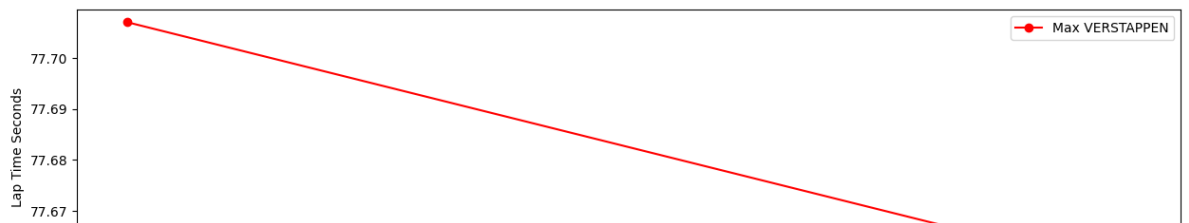
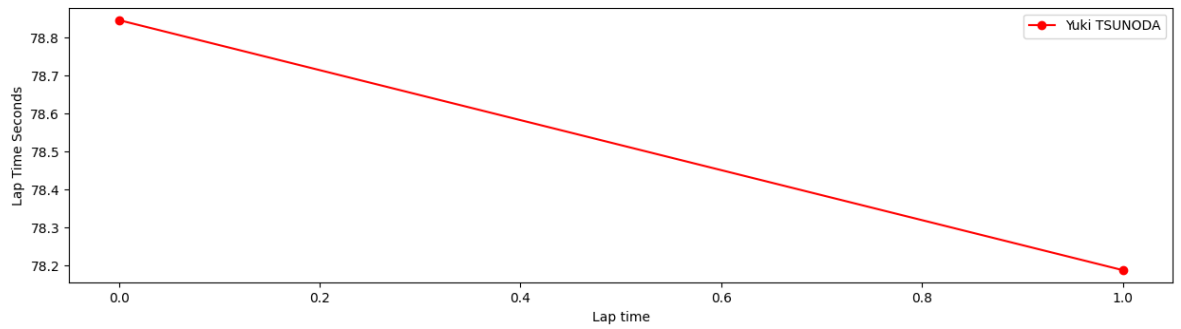
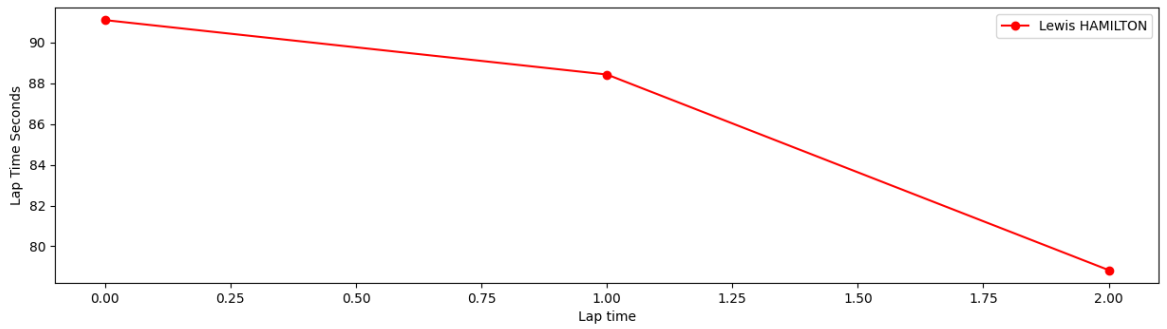
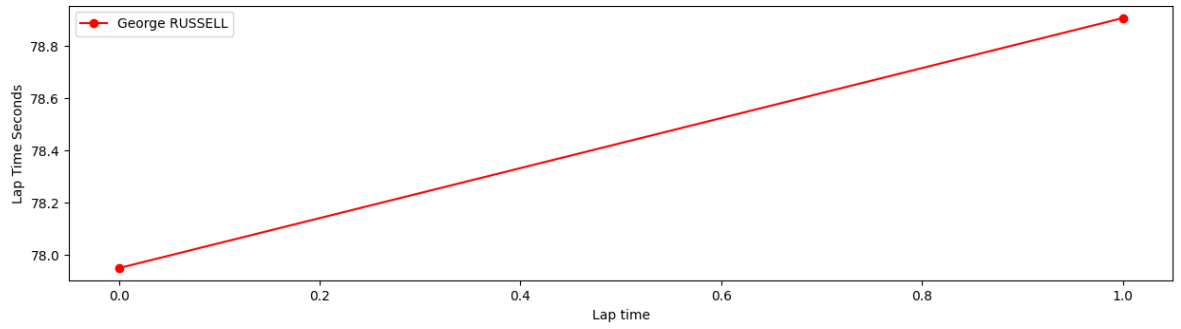
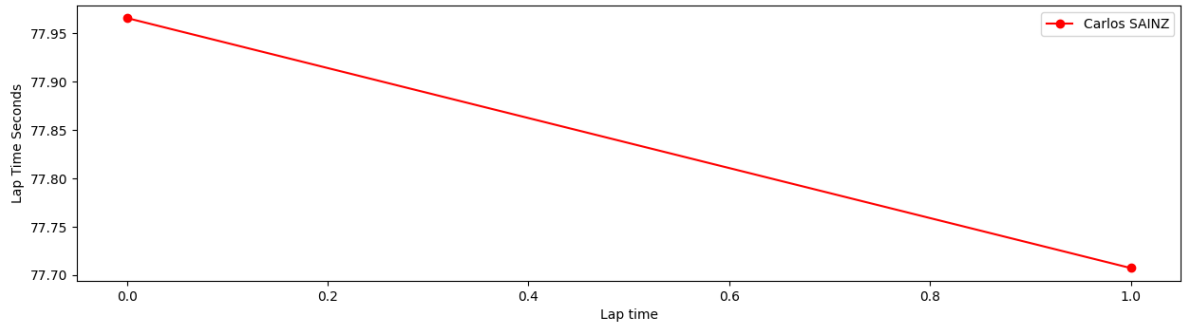
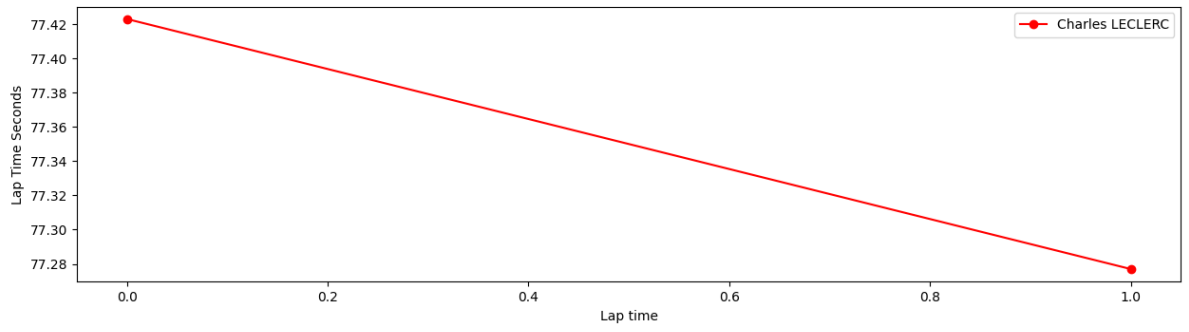
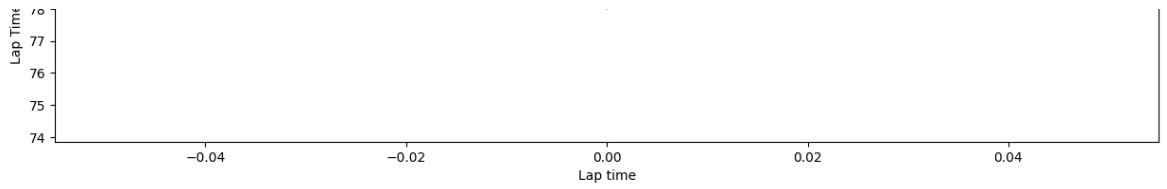


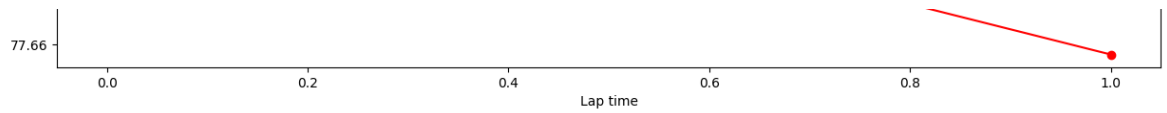
Soft tyres

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







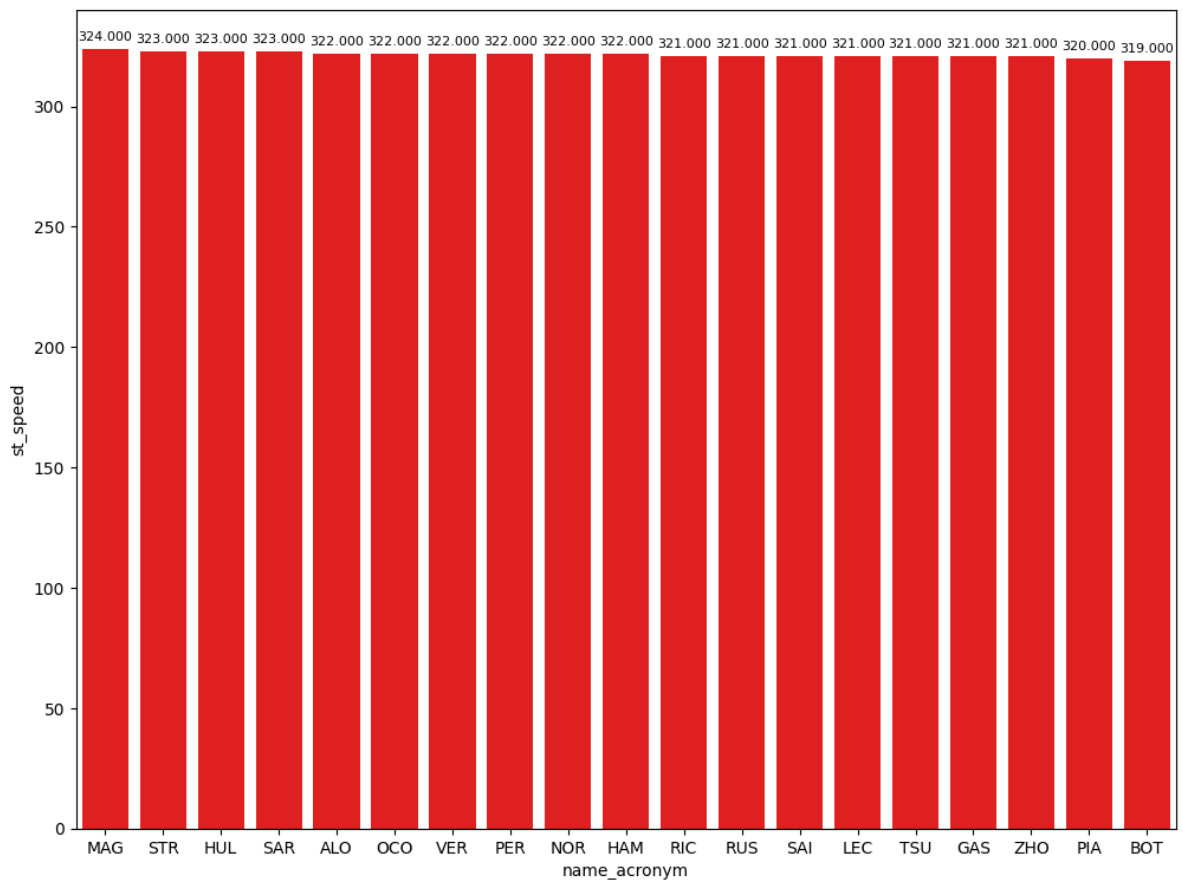


Hard tyres

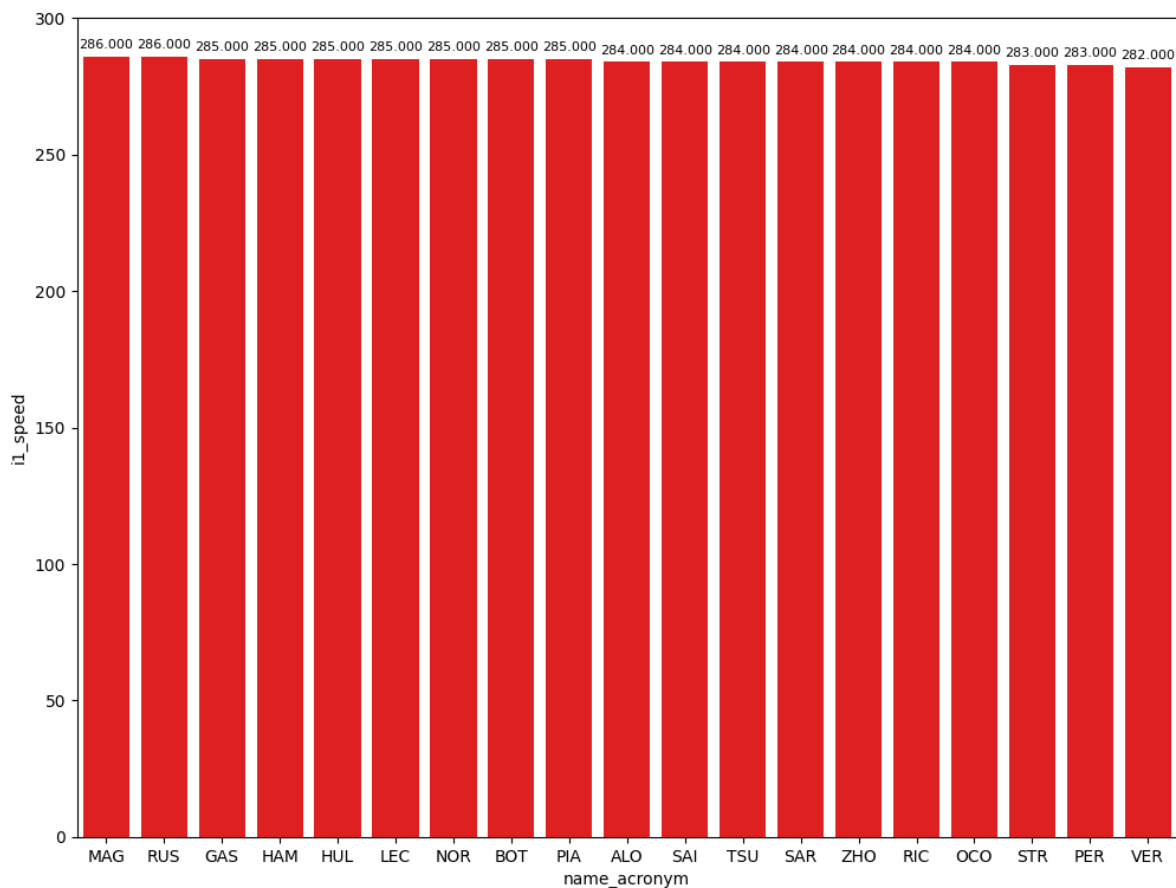
In [48]: `#libraryDataF1.obtain_data_tyres(jointables2,"HARD",93)`

Speed trap

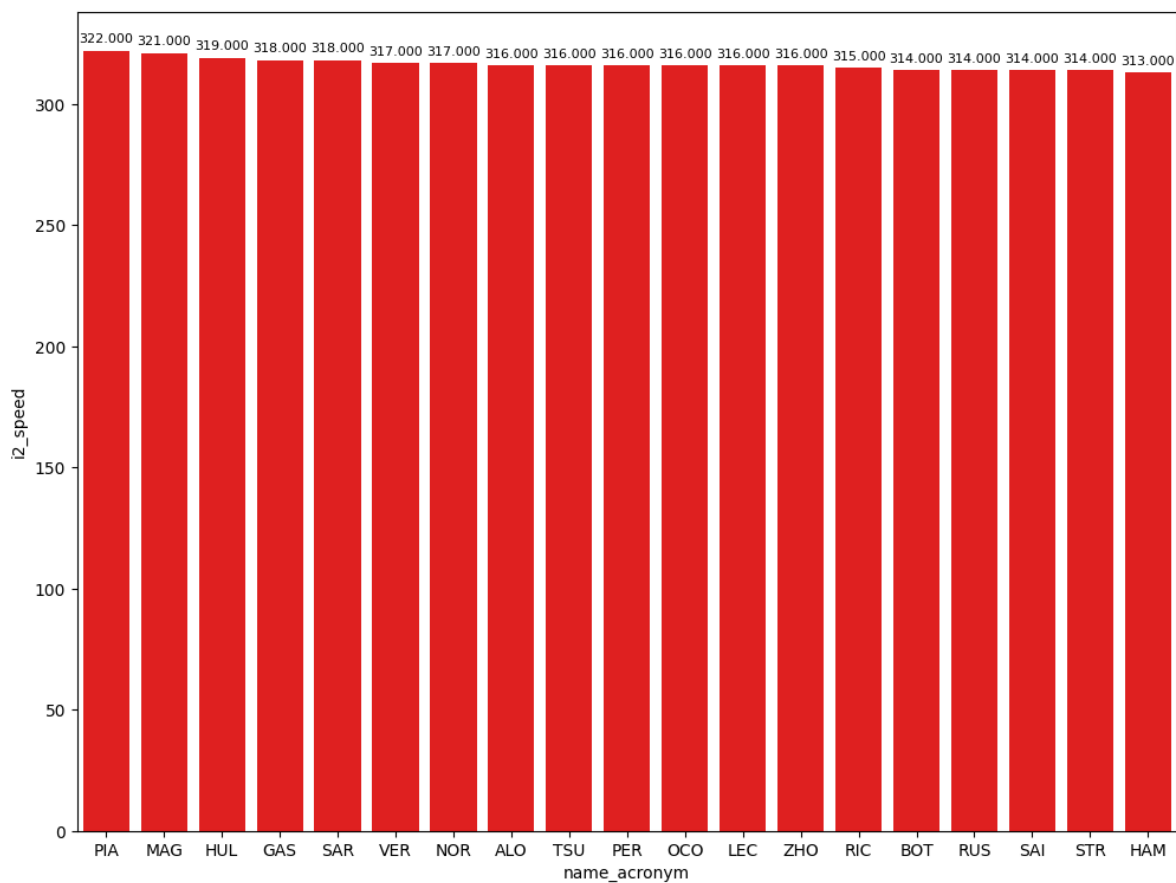
In [49]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed'].max()
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)`



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'].min()  
compoundsPace[['full_name', 'compound', 'duration_sector_1', 'duration_sector_2', 'duration_sector_3', 'lap_duration']]
```

```
Out[52]:
```

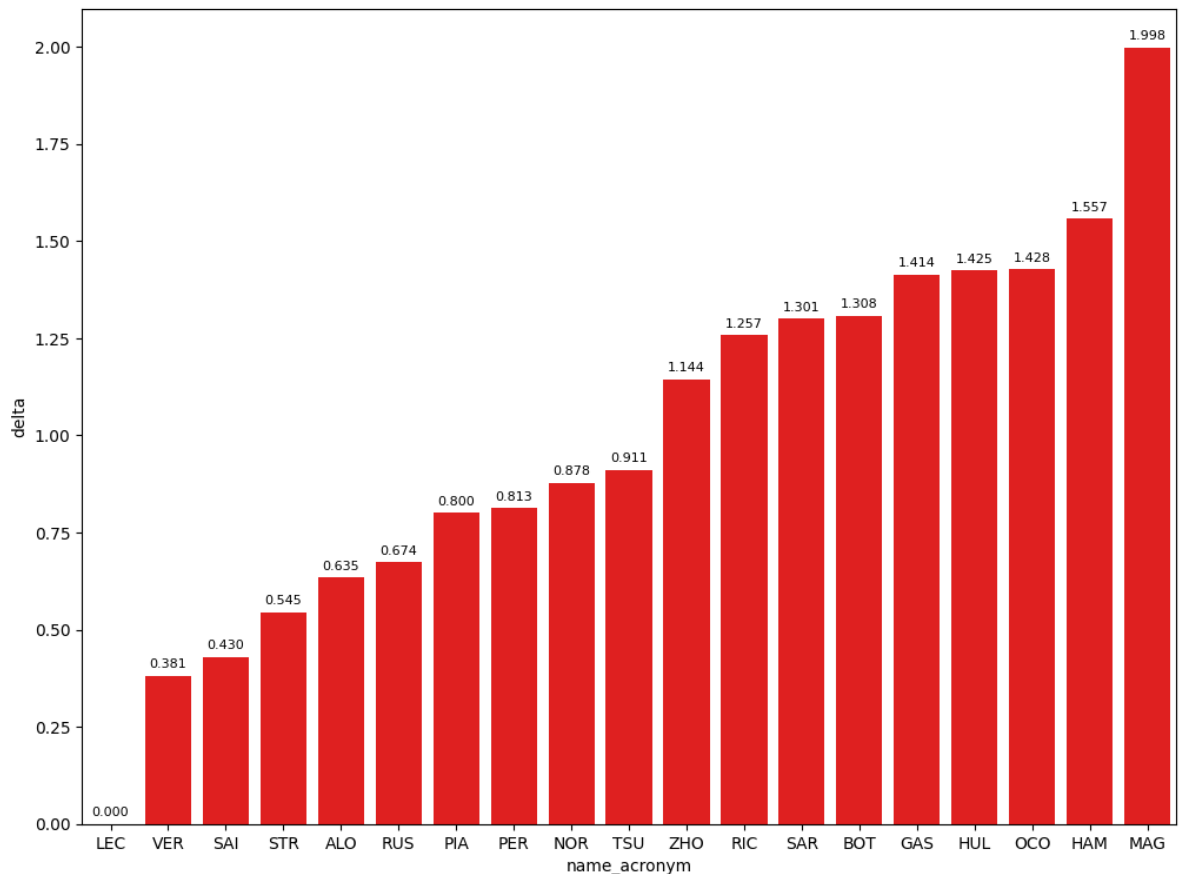
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
133	Charles LECLERC	MEDIUM	27.143	17.660	33.133	77.93
252	Charles LECLERC	SOFT	26.687	17.601	32.989	77.27

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

```
Out[55]:
```

	duration_sector_1	full_name	compound	lap_duration	lap_number
215	26.687	Charles LECLERC	SOFT	77.423	11
250	26.776	George RUSSELL	SOFT	78.907	13
142	26.777	Lance STROLL	SOFT	79.140	7
253	26.828	Carlos SAINZ	SOFT	77.707	12
280	26.839	Max VERSTAPPEN	SOFT	77.707	10
187	26.905	Fernando ALONSO	SOFT	78.031	12
154	27.025	Valtteri BOTTAS	SOFT	78.585	11
210	27.030	Lando NORRIS	SOFT	78.155	8
160	27.034	Oscar PIASTRI	SOFT	78.077	7
209	27.036	Daniel RICCIARDO	SOFT	78.534	14
183	27.053	Sergio PEREZ	SOFT	78.090	13
214	27.060	Kevin MAGNUSSEN	SOFT	79.380	14
266	27.101	Yuki TSUNODA	SOFT	78.188	14
208	27.119	Logan SARGEANT	SOFT	78.784	12
213	27.222	ZHOU Guanyu	SOFT	78.421	14
211	27.227	Pierre GASLY	SOFT	78.691	15
254	27.250	Lewis HAMILTON	SOFT	78.834	15
236	27.253	Esteban OCON	SOFT	78.833	15
233	27.305	Nico HULKENBERG	SOFT	78.702	12

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

```
Out[56]:
```

	duration_sector_2	full_name	compound	lap_duration	lap_number
252	17.601	Charles LECLERC	SOFT	77.277	14
325	17.673	Max VERSTAPPEN	SOFT	77.658	13
184	17.677	Oscar PIASTRI	SOFT	78.187	9
151	17.688	Fernando ALONSO	SOFT	77.912	9
119	17.690	Lando NORRIS	MEDIUM	78.201	5
142	17.691	Lance STROLL	SOFT	79.140	7
219	17.716	George RUSSELL	SOFT	77.951	10
236	17.738	Esteban OCON	SOFT	78.833	15

	duration_sector_2	full_name	compound	lap_duration	lap_number
166	17.741	Kevin MAGNUSSEN	SOFT	92.926	11
253	17.742	Carlos SAINZ	SOFT	77.707	12
224	17.751	Lewis HAMILTON	SOFT	91.093	12
211	17.761	Pierre GASLY	SOFT	78.691	15
163	17.769	Logan SARGEANT	SOFT	78.578	9
266	17.800	Yuki TSUNODA	SOFT	78.188	14
234	17.811	Sergio PEREZ	SOFT	78.346	16
162	17.826	ZHOU Guanyu	SOFT	78.429	11
233	17.846	Nico HULKENBERG	SOFT	78.702	12
209	17.899	Daniel RICCIARDO	SOFT	78.534	14

In [57]:

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

Out[57]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
215	32.923	Charles LECLERC	SOFT	77.423	11
325	33.043	Max VERSTAPPEN	SOFT	77.658	13
218	33.066	Carlos SAINZ	SOFT	77.966	9
183	33.181	Sergio PEREZ	SOFT	78.090	13
159	33.193	Lance STROLL	SOFT	77.822	9
151	33.262	Fernando ALONSO	SOFT	77.912	9
219	33.286	George RUSSELL	SOFT	77.951	10
266	33.287	Yuki TSUNODA	SOFT	78.188	14
160	33.291	Oscar PIASTRI	SOFT	78.077	7
162	33.302	ZHOU Guanyu	SOFT	78.429	11
119	33.339	Lando NORRIS	MEDIUM	78.201	5
233	33.551	Nico HULKENBERG	SOFT	78.702	12
163	33.553	Logan SARGEANT	SOFT	78.578	9
154	33.568	Valtteri BOTTAS	SOFT	78.585	11
251	33.575	Esteban OCON	SOFT	78.705	17
124	33.597	Lewis HAMILTON	MEDIUM	78.861	8
209	33.599	Daniel RICCIARDO	SOFT	78.534	14
117	33.665	Pierre GASLY	MEDIUM	78.911	8
99	33.677	Kevin MAGNUSSEN	MEDIUM	79.275	7

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 < 17"))
race_pace
```

Out[58]:

	lap_duration
--	--------------

compound	
SOFT	80.868857
MEDIUM	83.121831

Long runs

In [59]:

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

Red Bull Racing

In [60]:

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

Out[60]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
	2	1231	9482	1	11	1	6	MEDIUM
	10	1231	9482	1	1	1	9	MEDIUM
	21	1231	9482	2	11	7	9	MEDIUM
	30	1231	9482	2	1	10	12	SOFT
	32	1231	9482	3	11	10	18	SOFT
	43	1231	9482	3	1	13	15	SOFT
	55	1231	9482	4	1	16	22	MEDIUM
	64	1231	9482	4	11	19	30	MEDIUM
	76	1231	9482	5	11	31	34	SOFT

In [61]:

```
libraryDataF1.getinfoLongruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS)
```

Out[61]:

	full_name	compound	date_start	lap_number	duration_sector_1
167	Max VERSTAPPEN	MEDIUM	2024-03-22T05:24:18.661000+00:00	2	27.334
212	Max VERSTAPPEN	MEDIUM	2024-03-22T05:29:08.346000+00:00	5	27.065
239	Max VERSTAPPEN	MEDIUM	2024-03-22T05:32:28.975000+00:00	7	27.042
280	Max VERSTAPPEN	SOFT	2024-03-22T05:40:18.423000+00:00	10	26.839
325	Max VERSTAPPEN	SOFT	2024-03-22T05:45:33.274000+00:00	13	26.942
444	Max VERSTAPPEN	MEDIUM	2024-03-22T05:55:44.751000+00:00	16	29.050
460	Max VERSTAPPEN	MEDIUM	2024-03-22T05:57:09.360000+00:00	17	28.922
477	Max VERSTAPPEN	MEDIUM	2024-03-22T05:58:32.706000+00:00	18	28.645
495	Max VERSTAPPEN	MEDIUM	2024-03-22T05:59:56.680000+00:00	19	28.798


```
In [62]: libraryDataF1.getinfo(longruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
12	Sergio PEREZ	MEDIUM	2024-03-22T05:01:35.427000+00:00	2	28.187	28.187
42	Sergio PEREZ	MEDIUM	2024-03-22T05:05:08.373000+00:00	4	27.757	27.757
101	Sergio PEREZ	MEDIUM	2024-03-22T05:10:42.666000+00:00	7	27.373	27.373
145	Sergio PEREZ	SOFT	2024-03-22T05:20:48.889000+00:00	10	27.146	27.146
183	Sergio PEREZ	SOFT	2024-03-22T05:26:17.969000+00:00	13	27.053	27.053
234	Sergio PEREZ	SOFT	2024-03-22T05:31:25.558000+00:00	16	27.194	27.194
298	Sergio PEREZ	MEDIUM	2024-03-22T05:42:23.376000+00:00	19	28.879	28.879
310	Sergio PEREZ	MEDIUM	2024-03-22T05:43:46.596000+00:00	20	28.791	28.791
322	Sergio PEREZ	MEDIUM	2024-03-22T05:45:10.921000+00:00	21	28.775	28.775
336	Sergio PEREZ	MEDIUM	2024-03-22T05:46:31.808000+00:00	22	28.714	28.714
353	Sergio PEREZ	MEDIUM	2024-03-22T05:47:59.281000+00:00	23	28.831	28.831
370	Sergio PEREZ	MEDIUM	2024-03-22T05:49:22.445000+00:00	24	29.150	29.150
386	Sergio PEREZ	MEDIUM	2024-03-22T05:50:46.786000+00:00	25	28.919	28.919
404	Sergio PEREZ	MEDIUM	2024-03-22T05:52:09.876000+00:00	26	29.324	29.324
421	Sergio PEREZ	MEDIUM	2024-03-22T05:53:33.987000+00:00	27	29.204	29.204
437	Sergio PEREZ	MEDIUM	2024-03-22T05:54:58.364000+00:00	28	29.685	29.685
490	Sergio PEREZ	SOFT	2024-03-22T05:59:32.822000+00:00	31	28.537	28.537

Ferrari

```
In [63]: libraryDataF1.getinfo(longruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
39	Charles LECLERC	MEDIUM	2024-03-22T05:04:40.362000+00:00	2	27.639	27.639
108	Charles LECLERC	MEDIUM	2024-03-22T05:11:41.647000+00:00	6	27.127	27.127
133	Charles LECLERC	MEDIUM	2024-03-22T05:15:11.163000+00:00	8	27.143	27.143

	full_name	compound	date_start	lap_number	duration_sector_1	du
215	Charles LECLERC	SOFT	2024-03-22T05:29:33.769000+00:00	11	26.687	
252	Charles LECLERC	SOFT	2024-03-22T05:35:16.600000+00:00	14	26.687	
364	Charles LECLERC	MEDIUM	2024-03-22T05:49:09.155000+00:00	17	28.707	
382	Charles LECLERC	MEDIUM	2024-03-22T05:50:32.021000+00:00	18	28.661	
400	Charles LECLERC	MEDIUM	2024-03-22T05:51:54.773000+00:00	19	28.845	
417	Charles LECLERC	MEDIUM	2024-03-22T05:53:17.841000+00:00	20	33.258	
433	Charles LECLERC	MEDIUM	2024-03-22T05:54:45.345000+00:00	21	28.839	
450	Charles LECLERC	MEDIUM	2024-03-22T05:56:08.435000+00:00	22	28.813	
466	Charles LECLERC	MEDIUM	2024-03-22T05:57:31.353000+00:00	23	31.441	

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

Out[64]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
70	Carlos SAINZ	MEDIUM	2024-03-22T05:07:27.066000+00:00	2	27.564	
102	Carlos SAINZ	MEDIUM	2024-03-22T05:11:05.206000+00:00	4	27.485	
130	Carlos SAINZ	MEDIUM	2024-03-22T05:14:48.609000+00:00	6	27.195	
218	Carlos SAINZ	SOFT	2024-03-22T05:29:45.474000+00:00	9	27.047	
253	Carlos SAINZ	SOFT	2024-03-22T05:35:37.208000+00:00	12	26.828	
358	Carlos SAINZ	MEDIUM	2024-03-22T05:48:42.449000+00:00	15	28.922	
376	Carlos SAINZ	MEDIUM	2024-03-22T05:50:05.854000+00:00	16	28.863	
394	Carlos SAINZ	MEDIUM	2024-03-22T05:51:29.033000+00:00	17	28.835	
412	Carlos SAINZ	MEDIUM	2024-03-22T05:52:52.263000+00:00	18	28.624	
428	Carlos SAINZ	MEDIUM	2024-03-22T05:54:14.941000+00:00	19	29.166	
443	Carlos SAINZ	MEDIUM	2024-03-22T05:55:39.932000+00:00	20	28.910	
459	Carlos SAINZ	MEDIUM	2024-03-22T05:57:05.804000+00:00	21	29.163	
476	Carlos SAINZ	MEDIUM	2024-03-22T05:58:29.647000+00:00	22	29.136	

```
full_name compound date_start lap_number duration_sector_1 d
Mercedes
```

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

```
Out[65]:
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	9	1231	9482	1	63	1	8	MEDIUM
	17	1231	9482	1	44	1	10	MEDIUM
	29	1231	9482	2	63	9	15	SOFT
	39	1231	9482	2	44	11	17	SOFT
	56	1231	9482	3	63	16	25	MEDIUM
	62	1231	9482	3	44	18	21	MEDIUM
	69	1231	9482	4	44	22	24	MEDIUM

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

```
Out[66]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	d
40	Lewis HAMILTON	MEDIUM	2024-03-22T05:04:48.324000+00:00	3	27.659	
96	Lewis HAMILTON	MEDIUM	2024-03-22T05:10:02.727000+00:00	6	27.542	
124	Lewis HAMILTON	MEDIUM	2024-03-22T05:13:30.678000+00:00	8	27.507	
224	Lewis HAMILTON	SOFT	2024-03-22T05:30:15.230000+00:00	12	27.282	
249	Lewis HAMILTON	SOFT	2024-03-22T05:34:14.485000+00:00	14	30.502	
254	Lewis HAMILTON	SOFT	2024-03-22T05:35:42.880000+00:00	15	27.250	
369	Lewis HAMILTON	MEDIUM	2024-03-22T05:49:22.085000+00:00	18	30.470	
388	Lewis HAMILTON	MEDIUM	2024-03-22T05:50:54.033000+00:00	19	29.542	

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

```
Out[67]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	d
64	George RUSSELL	MEDIUM	2024-03-22T05:06:55.348000+00:00	2	27.480	
94	George RUSSELL	MEDIUM	2024-03-22T05:09:57.005000+00:00	4	27.392	
122	George RUSSELL	MEDIUM	2024-03-22T05:13:08.736000+00:00	6	27.167	
219	George RUSSELL	SOFT	2024-03-22T05:29:57.060000+00:00	10	26.949	

	full_name	compound	date_start	lap_number	duration_sector_1	di
250	George RUSSELL	SOFT	2024-03-22T05:35:01.574000+00:00	13	26.776	
391	George RUSSELL	MEDIUM	2024-03-22T05:51:09.852000+00:00	16	29.248	
409	George RUSSELL	MEDIUM	2024-03-22T05:52:33.963000+00:00	17	28.982	
425	George RUSSELL	MEDIUM	2024-03-22T05:53:57.866000+00:00	18	28.788	
439	George RUSSELL	MEDIUM	2024-03-22T05:55:21.103000+00:00	19	29.113	
456	George RUSSELL	MEDIUM	2024-03-22T05:56:44.828000+00:00	20	28.825	

McLaren

In [68]:

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

Out[68]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
5	1231	9482	1	81	1	6	MEDIUM	
6	1231	9482	1	4	1	7	MEDIUM	
22	1231	9482	2	81	7	11	SOFT	
25	1231	9482	2	4	8	10	SOFT	
33	1231	9482	3	4	11	13	SOFT	
42	1231	9482	3	81	12	24	MEDIUM	
48	1231	9482	4	4	14	24	MEDIUM	
70	1231	9482	4	81	25	30	SOFT	

In [69]:

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

Out[69]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
73	Lando NORRIS	MEDIUM	2024-03-22T05:07:55.119000+00:00	2	27.381	
119	Lando NORRIS	MEDIUM	2024-03-22T05:12:59.327000+00:00	5	27.172	
210	Lando NORRIS	SOFT	2024-03-22T05:28:55.742000+00:00	8	27.030	
362	Lando NORRIS	MEDIUM	2024-03-22T05:49:01.428000+00:00	14	28.709	
380	Lando NORRIS	MEDIUM	2024-03-22T05:50:24.676000+00:00	15	28.936	
398	Lando NORRIS	MEDIUM	2024-03-22T05:51:48.150000+00:00	16	28.969	
415	Lando NORRIS	MEDIUM	2024-03-22T05:53:11.397000+00:00	17	28.814	
431	Lando NORRIS	MEDIUM	2024-03-22T05:54:34.513000+00:00	18	29.060	

	full_name	compound	date_start	lap_number	duration_sector_1	du
447	Lando NORRIS	MEDIUM	2024-03-22T05:55:57.803000+00:00	19	28.760	
462	Lando NORRIS	MEDIUM	2024-03-22T05:57:20.577000+00:00	20	28.860	

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

Out[70]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
48	Oscar PIASTRI	MEDIUM	2024-03-22T05:05:32.962000+00:00	2	27.814	
83	Oscar PIASTRI	MEDIUM	2024-03-22T05:08:45.970000+00:00	4	27.643	
160	Oscar PIASTRI	SOFT	2024-03-22T05:23:22.707000+00:00	7	27.034	
184	Oscar PIASTRI	SOFT	2024-03-22T05:26:24.689000+00:00	9	27.184	
268	Oscar PIASTRI	MEDIUM	2024-03-22T05:38:21.719000+00:00	12	28.918	
277	Oscar PIASTRI	MEDIUM	2024-03-22T05:39:45.306000+00:00	13	28.723	
287	Oscar PIASTRI	MEDIUM	2024-03-22T05:41:08.191000+00:00	14	28.458	
299	Oscar PIASTRI	MEDIUM	2024-03-22T05:42:30.472000+00:00	15	28.613	
312	Oscar PIASTRI	MEDIUM	2024-03-22T05:43:52.764000+00:00	16	28.866	
323	Oscar PIASTRI	MEDIUM	2024-03-22T05:45:15.576000+00:00	17	28.686	
337	Oscar PIASTRI	MEDIUM	2024-03-22T05:46:38.207000+00:00	18	28.810	
354	Oscar PIASTRI	MEDIUM	2024-03-22T05:48:00.854000+00:00	19	28.737	
371	Oscar PIASTRI	MEDIUM	2024-03-22T05:49:23.972000+00:00	20	29.202	
387	Oscar PIASTRI	MEDIUM	2024-03-22T05:50:47.838000+00:00	21	29.294	
405	Oscar PIASTRI	MEDIUM	2024-03-22T05:52:11.618000+00:00	22	29.438	
422	Oscar PIASTRI	MEDIUM	2024-03-22T05:53:35.837000+00:00	23	29.493	
471	Oscar PIASTRI	SOFT	2024-03-22T05:58:05.210000+00:00	26	28.293	
488	Oscar PIASTRI	SOFT	2024-03-22T05:59:26.846000+00:00	27	28.234	

Aston Martin

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

Out[71]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	3	1231	9482	1	14	1	6	MEDIUM
	4	1231	9482	1	18	1	6	MEDIUM
	23	1231	9482	2	18	7	13	SOFT
	24	1231	9482	2	14	7	14	SOFT
	49	1231	9482	3	18	14	26	MEDIUM
	53	1231	9482	3	14	15	29	MEDIUM
	72	1231	9482	4	18	27	30	SOFT
	74	1231	9482	4	14	30	32	SOFT

In [72]:

```
libraryDataF1.getinfoLongruns(jointables2,14,'Aston Martin',MINIMUM_SECONDS)
```

Out[72]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
22	Fernando ALONSO	MEDIUM	2024-03-22T05:02:54.906000+00:00	2	27.813	
52	Fernando ALONSO	MEDIUM	2024-03-22T05:05:58.772000+00:00	4	27.377	
140	Fernando ALONSO	SOFT	2024-03-22T05:18:36.611000+00:00	7	26.993	
151	Fernando ALONSO	SOFT	2024-03-22T05:21:50.262000+00:00	9	26.962	
187	Fernando ALONSO	SOFT	2024-03-22T05:26:48.018000+00:00	12	26.905	
276	Fernando ALONSO	MEDIUM	2024-03-22T05:39:26.500000+00:00	15	29.541	
286	Fernando ALONSO	MEDIUM	2024-03-22T05:40:51.698000+00:00	16	29.404	
297	Fernando ALONSO	MEDIUM	2024-03-22T05:42:16.797000+00:00	17	29.226	
308	Fernando ALONSO	MEDIUM	2024-03-22T05:43:41.552000+00:00	18	28.903	
321	Fernando ALONSO	MEDIUM	2024-03-22T05:45:05.407000+00:00	19	29.105	
334	Fernando ALONSO	MEDIUM	2024-03-22T05:46:29.021000+00:00	20	28.951	
352	Fernando ALONSO	MEDIUM	2024-03-22T05:47:52.579000+00:00	21	28.916	
367	Fernando ALONSO	MEDIUM	2024-03-22T05:49:20.098000+00:00	22	28.819	
385	Fernando ALONSO	MEDIUM	2024-03-22T05:50:43.720000+00:00	23	28.936	
403	Fernando ALONSO	MEDIUM	2024-03-22T05:52:07.146000+00:00	24	28.958	
420	Fernando ALONSO	MEDIUM	2024-03-22T05:53:30.479000+00:00	25	29.206	
436	Fernando ALONSO	MEDIUM	2024-03-22T05:54:55.148000+00:00	26	29.189	

```
full_name compound date_start lap_number duration_sector_1 du
In [73]: libraryDataF1.getinfo(longruns(jointables2,18,'Aston Martin',MINIMUM_SECONDS))
```

Out[73]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
26	Lance STROLL	MEDIUM	2024-03-22T05:03:06.436000+00:00	2	28.064	
56	Lance STROLL	MEDIUM	2024-03-22T05:06:11.468000+00:00	4	27.561	
142	Lance STROLL	SOFT	2024-03-22T05:19:40.256000+00:00	7	26.777	
159	Lance STROLL	SOFT	2024-03-22T05:23:16.515000+00:00	9	26.831	
186	Lance STROLL	SOFT	2024-03-22T05:26:40.319000+00:00	11	27.125	
278	Lance STROLL	MEDIUM	2024-03-22T05:39:50.656000+00:00	14	29.013	
288	Lance STROLL	MEDIUM	2024-03-22T05:41:14.092000+00:00	15	28.865	
300	Lance STROLL	MEDIUM	2024-03-22T05:42:37.198000+00:00	16	28.857	
313	Lance STROLL	MEDIUM	2024-03-22T05:44:00.109000+00:00	17	28.887	
324	Lance STROLL	MEDIUM	2024-03-22T05:45:23.281000+00:00	18	28.895	
338	Lance STROLL	MEDIUM	2024-03-22T05:46:46.258000+00:00	19	28.974	
355	Lance STROLL	MEDIUM	2024-03-22T05:48:09.528000+00:00	20	28.857	
373	Lance STROLL	MEDIUM	2024-03-22T05:49:32.704000+00:00	21	29.085	
390	Lance STROLL	MEDIUM	2024-03-22T05:50:56.520000+00:00	22	29.568	
408	Lance STROLL	MEDIUM	2024-03-22T05:52:27.927000+00:00	23	29.319	
424	Lance STROLL	MEDIUM	2024-03-22T05:53:52.336000+00:00	24	29.112	
484	Lance STROLL	SOFT	2024-03-22T05:59:04.397000+00:00	27	28.270	

RB

```
meeting_key session_key stint_number driver_number lap_start lap_end compound tyri
In [74]: stintInformation.query('driver_number == 3 or driver_number == 22')
```

Out[74]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyri
12	1231	9482	1	3	1	10	MEDIUM	
14	1231	9482	1	22	1	10	MEDIUM	
37	1231	9482	2	3	11	16	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
38	1231	9482	2	22	11	16	SOFT	
58	1231	9482	3	3	17	26	MEDIUM	
60	1231	9482	3	22	17	28	MEDIUM	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
19	Daniel RICCIARDO	MEDIUM	2024-03-22T05:02:19.258000+00:00	2	27.698	
72	Daniel RICCIARDO	MEDIUM	2024-03-22T05:07:45.886000+00:00	5	27.349	
118	Daniel RICCIARDO	MEDIUM	2024-03-22T05:12:55.487000+00:00	8	27.492	
161	Daniel RICCIARDO	SOFT	2024-03-22T05:23:28.488000+00:00	11	27.272	
209	Daniel RICCIARDO	SOFT	2024-03-22T05:28:49.423000+00:00	14	27.036	
282	Daniel RICCIARDO	MEDIUM	2024-03-22T05:40:26.466000+00:00	17	29.569	
292	Daniel RICCIARDO	MEDIUM	2024-03-22T05:41:52.027000+00:00	18	29.689	
302	Daniel RICCIARDO	MEDIUM	2024-03-22T05:43:17.743000+00:00	19	29.243	
315	Daniel RICCIARDO	MEDIUM	2024-03-22T05:44:42.373000+00:00	20	29.310	
328	Daniel RICCIARDO	MEDIUM	2024-03-22T05:46:06.802000+00:00	21	28.925	
345	Daniel RICCIARDO	MEDIUM	2024-03-22T05:47:30.143000+00:00	22	28.900	
360	Daniel RICCIARDO	MEDIUM	2024-03-22T05:48:53.493000+00:00	23	29.012	
378	Daniel RICCIARDO	MEDIUM	2024-03-22T05:50:17.276000+00:00	24	29.030	
463	Daniel RICCIARDO	MEDIUM	2024-03-22T05:57:25.400000+00:00	27	29.003	
479	Daniel RICCIARDO	MEDIUM	2024-03-22T05:58:48.614000+00:00	28	28.706	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
20	Yuki TSUNODA	MEDIUM	2024-03-22T05:02:44.089000+00:00	2	27.952	
77	Yuki TSUNODA	MEDIUM	2024-03-22T05:08:16.755000+00:00	5	27.503	
125	Yuki TSUNODA	MEDIUM	2024-03-22T05:13:46.579000+00:00	8	27.548	

	full_name	compound	date_start	lap_number	duration_sector_1	d
237	Yuki TSUNODA	SOFT	2024-03-22T05:32:01.954000+00:00	11	27.193	
266	Yuki TSUNODA	SOFT	2024-03-22T05:37:53.035000+00:00	14	27.101	
356	Yuki TSUNODA	MEDIUM	2024-03-22T05:48:23.763000+00:00	17	29.470	
374	Yuki TSUNODA	MEDIUM	2024-03-22T05:49:48.908000+00:00	18	29.203	
392	Yuki TSUNODA	MEDIUM	2024-03-22T05:51:13.406000+00:00	19	29.106	
410	Yuki TSUNODA	MEDIUM	2024-03-22T05:52:37.532000+00:00	20	29.037	
426	Yuki TSUNODA	MEDIUM	2024-03-22T05:54:01.577000+00:00	21	28.881	
440	Yuki TSUNODA	MEDIUM	2024-03-22T05:55:25.185000+00:00	22	29.058	
457	Yuki TSUNODA	MEDIUM	2024-03-22T05:56:49.051000+00:00	23	29.097	
474	Yuki TSUNODA	MEDIUM	2024-03-22T05:58:13.042000+00:00	24	28.982	

Haas

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

Out[77]:

	full_name	compound	date_start	lap_number	duration_sector_1	
16	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:01:58.969000+00:00	2	27.932	
66	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:07:08.636000+00:00	5	27.661	
99	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:10:31.212000+00:00	7	27.618	
155	Kevin MAGNUSSEN	SOFT	2024-03-22T05:22:41.161000+00:00	10	32.097	
166	Kevin MAGNUSSEN	SOFT	2024-03-22T05:24:10.668000+00:00	11	27.145	
214	Kevin MAGNUSSEN	SOFT	2024-03-22T05:29:24.354000+00:00	14	27.060	
294	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:42:02.691000+00:00	17	30.145	
305	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:43:29.454000+00:00	18	30.456	
318	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:44:56.226000+00:00	19	29.707	
331	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:46:22.076000+00:00	20	29.244	
349	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:47:46.376000+00:00	21	29.241	

	full_name	compound	date_start	lap_number	duration_sector_1
365	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:49:10.656000+00:00	22	29.313
383	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:50:35.106000+00:00	23	29.155
401	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:51:59.282000+00:00	24	29.177
418	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:53:23.019000+00:00	25	29.260
434	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:54:47.403000+00:00	26	29.320
451	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:56:11.610000+00:00	27	29.256
467	Kevin MAGNUSSEN	MEDIUM	2024-03-22T05:57:35.422000+00:00	28	29.302

In [78]: `libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS=20))`

Out[78]:

	full_name	compound	date_start	lap_number	duration_sector_1
14	Nico HULKENBERG	MEDIUM	2024-03-22T05:01:47.525000+00:00	2	28.205
68	Nico HULKENBERG	MEDIUM	2024-03-22T05:07:16.294000+00:00	5	27.665
170	Nico HULKENBERG	SOFT	2024-03-22T05:24:27.556000+00:00	8	27.395
233	Nico HULKENBERG	SOFT	2024-03-22T05:31:19.796000+00:00	12	27.305
301	Nico HULKENBERG	MEDIUM	2024-03-22T05:43:07.439000+00:00	15	29.355
314	Nico HULKENBERG	MEDIUM	2024-03-22T05:44:32.071000+00:00	16	29.225
327	Nico HULKENBERG	MEDIUM	2024-03-22T05:45:56.418000+00:00	17	29.305
344	Nico HULKENBERG	MEDIUM	2024-03-22T05:47:20.607000+00:00	18	29.145
359	Nico HULKENBERG	MEDIUM	2024-03-22T05:48:44.802000+00:00	19	29.475
377	Nico HULKENBERG	MEDIUM	2024-03-22T05:50:09.220000+00:00	20	29.225
395	Nico HULKENBERG	MEDIUM	2024-03-22T05:51:33.081000+00:00	21	29.335
413	Nico HULKENBERG	MEDIUM	2024-03-22T05:52:57.283000+00:00	22	29.345
429	Nico HULKENBERG	MEDIUM	2024-03-22T05:54:21.877000+00:00	23	29.615
445	Nico HULKENBERG	MEDIUM	2024-03-22T05:55:46.664000+00:00	24	29.635

Alpine

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
15	Esteban OCON	MEDIUM	2024-03-22T05:01:52.434000+00:00	2	28.158	28.158
43	Esteban OCON	MEDIUM	2024-03-22T05:05:12.827000+00:00	4	27.863	27.863
79	Esteban OCON	MEDIUM	2024-03-22T05:08:27.210000+00:00	6	27.677	27.677
109	Esteban OCON	MEDIUM	2024-03-22T05:11:45.908000+00:00	8	27.565	27.565
177	Esteban OCON	SOFT	2024-03-22T05:25:36.032000+00:00	11	31.780	31.780
191	Esteban OCON	SOFT	2024-03-22T05:27:07.852000+00:00	12	27.387	27.387
236	Esteban OCON	SOFT	2024-03-22T05:31:56.239000+00:00	15	27.253	27.253
251	Esteban OCON	SOFT	2024-03-22T05:35:09.962000+00:00	17	27.379	27.379
326	Esteban OCON	MEDIUM	2024-03-22T05:45:43.408000+00:00	20	29.309	29.309
341	Esteban OCON	MEDIUM	2024-03-22T05:47:07.623000+00:00	21	29.290	29.290
357	Esteban OCON	MEDIUM	2024-03-22T05:48:31.592000+00:00	22	29.150	29.150
375	Esteban OCON	MEDIUM	2024-03-22T05:49:55.391000+00:00	23	29.124	29.124
393	Esteban OCON	MEDIUM	2024-03-22T05:51:19.014000+00:00	24	29.420	29.420
411	Esteban OCON	MEDIUM	2024-03-22T05:52:43.250000+00:00	25	29.126	29.126
427	Esteban OCON	MEDIUM	2024-03-22T05:54:07.314000+00:00	26	29.451	29.451
442	Esteban OCON	MEDIUM	2024-03-22T05:55:33.686000+00:00	27	29.554	29.554
458	Esteban OCON	MEDIUM	2024-03-22T05:56:59.448000+00:00	28	29.429	29.429
475	Esteban OCON	MEDIUM	2024-03-22T05:58:24.076000+00:00	29	29.619	29.619
493	Esteban OCON	MEDIUM	2024-03-22T05:59:49.178000+00:00	30	29.503	29.503

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
21	Pierre GASLY	MEDIUM	2024-03-22T05:02:48.471000+00:00	2	27.893	27.893
51	Pierre GASLY	MEDIUM	2024-03-22T05:05:53.167000+00:00	4	27.712	27.712

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration
89	Pierre GASLY	MEDIUM	2024-03-22T05:09:16.610000+00:00	6	27.431		
117	Pierre GASLY	MEDIUM	2024-03-22T05:12:34.384000+00:00	8	27.398		
134	Pierre GASLY	MEDIUM	2024-03-22T05:15:44.362000+00:00	10	27.301		
181	Pierre GASLY	SOFT	2024-03-22T05:25:52.708000+00:00	13	27.412		
211	Pierre GASLY	SOFT	2024-03-22T05:29:01.334000+00:00	15	27.227		
238	Pierre GASLY	SOFT	2024-03-22T05:32:14.835000+00:00	17	27.319		
304	Pierre GASLY	MEDIUM	2024-03-22T05:43:26.987000+00:00	20	29.222		
317	Pierre GASLY	MEDIUM	2024-03-22T05:44:51.274000+00:00	21	28.906		
330	Pierre GASLY	MEDIUM	2024-03-22T05:46:15.011000+00:00	22	28.946		
348	Pierre GASLY	MEDIUM	2024-03-22T05:47:38.681000+00:00	23	29.030		
363	Pierre GASLY	MEDIUM	2024-03-22T05:49:02.620000+00:00	24	29.085		
381	Pierre GASLY	MEDIUM	2024-03-22T05:50:26.118000+00:00	25	29.071		
399	Pierre GASLY	MEDIUM	2024-03-22T05:51:50.318000+00:00	26	29.313		
416	Pierre GASLY	MEDIUM	2024-03-22T05:53:14.306000+00:00	27	29.184		
432	Pierre GASLY	MEDIUM	2024-03-22T05:54:38.484000+00:00	28	29.407		
---	Pierre	SOFT	2024-03-22T05:58:15.573000+00:00	31	28.122		

Williams

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

Out[81]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration
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In [82]: `libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))`

Out[82]:

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

49	Logan SARGEANT	MEDIUM	2024-03-22T05:05:39.656000+00:00	3	27.776		
86	Logan SARGEANT	MEDIUM	2024-03-22T05:08:56.586000+00:00	5	27.426		
163	Logan SARGEANT	SOFT	2024-03-22T05:23:40.733000+00:00	9	27.256		
208	Logan SARGEANT	SOFT	2024-03-22T05:28:40.455000+00:00	12	27.119		

	full_name	compound	date_start	lap_number	duration_sector_1
284	Logan SARGEANT	SOFT	2024-03-22T05:40:41.682000+00:00	15	29.091
296	Logan SARGEANT	SOFT	2024-03-22T05:42:05.807000+00:00	16	29.199
306	Logan SARGEANT	SOFT	2024-03-22T05:43:29.646000+00:00	17	34.382
319	Logan SARGEANT	SOFT	2024-03-22T05:44:58.615000+00:00	18	29.314
332	Logan SARGEANT	SOFT	2024-03-22T05:46:22.955000+00:00	19	29.157
333	Logan SARGEANT	SOFT	2024-03-22T05:46:55.847000+00:00	20	29.668

Kick Sauber

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

Out[83]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration
17	ZHOU Guanyu	MEDIUM	2024-03-22T05:02:06.119000+00:00	2	28.250	28.250
47	ZHOU Guanyu	MEDIUM	2024-03-22T05:05:26.731000+00:00	4	28.007	28.007
82	ZHOU Guanyu	MEDIUM	2024-03-22T05:08:41.230000+00:00	6	27.695	27.695
112	ZHOU Guanyu	MEDIUM	2024-03-22T05:11:56.448000+00:00	8	27.634	27.634
162	ZHOU Guanyu	SOFT	2024-03-22T05:23:33.874000+00:00	11	27.301	27.301
213	ZHOU Guanyu	SOFT	2024-03-22T05:29:12.955000+00:00	14	27.222	27.222
307	ZHOU Guanyu	MEDIUM	2024-03-22T05:43:34.695000+00:00	19	29.897	29.897
320	ZHOU Guanyu	MEDIUM	2024-03-22T05:45:02.239000+00:00	20	29.100	29.100
333	ZHOU Guanyu	MEDIUM	2024-03-22T05:46:25.840000+00:00	21	29.138	29.138
351	ZHOU Guanyu	MEDIUM	2024-03-22T05:47:49.484000+00:00	22	29.326	29.326
366	ZHOU Guanyu	MEDIUM	2024-03-22T05:49:13.862000+00:00	23	29.391	29.391
384	ZHOU Guanyu	MEDIUM	2024-03-22T05:50:38.208000+00:00	24	29.287	29.287
402	ZHOU Guanyu	MEDIUM	2024-03-22T05:52:02.153000+00:00	25	29.397	29.397
419	ZHOU Guanyu	MEDIUM	2024-03-22T05:53:26.259000+00:00	26	29.616	29.616
435	ZHOU Guanyu	MEDIUM	2024-03-22T05:54:50.981000+00:00	27	29.668	29.668
452	ZHOU Guanyu	MEDIUM	2024-03-22T05:56:16.630000+00:00	28	29.850	29.850

```
full_name compound date_start lap_number duration_sector_1 di
```

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

Out[84]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
13	Valtteri BOTTAS	MEDIUM	2024-03-22T05:01:40.826000+00:00	2	28.286	
41	Valtteri BOTTAS	MEDIUM	2024-03-22T05:04:56.296000+00:00	4	27.929	
74	Valtteri BOTTAS	MEDIUM	2024-03-22T05:08:01.020000+00:00	6	27.647	
103	Valtteri BOTTAS	MEDIUM	2024-03-22T05:11:09.634000+00:00	8	27.548	
154	Valtteri BOTTAS	SOFT	2024-03-22T05:22:27.142000+00:00	11	27.025	
293	Valtteri BOTTAS	MEDIUM	2024-03-22T05:41:56.779000+00:00	18	29.025	
303	Valtteri BOTTAS	MEDIUM	2024-03-22T05:43:21.033000+00:00	19	28.843	
316	Valtteri BOTTAS	MEDIUM	2024-03-22T05:44:44.443000+00:00	20	29.090	
329	Valtteri BOTTAS	MEDIUM	2024-03-22T05:46:08.257000+00:00	21	28.921	
346	Valtteri BOTTAS	MEDIUM	2024-03-22T05:47:31.382000+00:00	22	28.961	
361	Valtteri BOTTAS	MEDIUM	2024-03-22T05:48:57.275000+00:00	23	29.082	
379	Valtteri BOTTAS	MEDIUM	2024-03-22T05:50:20.961000+00:00	24	29.010	
397	Valtteri BOTTAS	MEDIUM	2024-03-22T05:51:44.574000+00:00	25	29.284	
414	Valtteri BOTTAS	MEDIUM	2024-03-22T05:53:08.985000+00:00	26	29.633	
430	Valtteri BOTTAS	MEDIUM	2024-03-22T05:54:33.747000+00:00	27	29.279	
448	Valtteri BOTTAS	MEDIUM	2024-03-22T05:56:00.063000+00:00	28	30.027	
464	Valtteri BOTTAS	MEDIUM	2024-03-22T05:57:27.990000+00:00	29	29.719	
480	Valtteri BOTTAS	MEDIUM	2024-03-22T05:58:53.367000+00:00	30	29.481	

Free Practice 3

Obtain setup

```
In [85]: practice = libraryDataF1.obtain_information('laps',session_key=9483)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9483)
drivers = libraryDataF1.obtain_information('drivers',session_key=9483)
```

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

Out[86]:

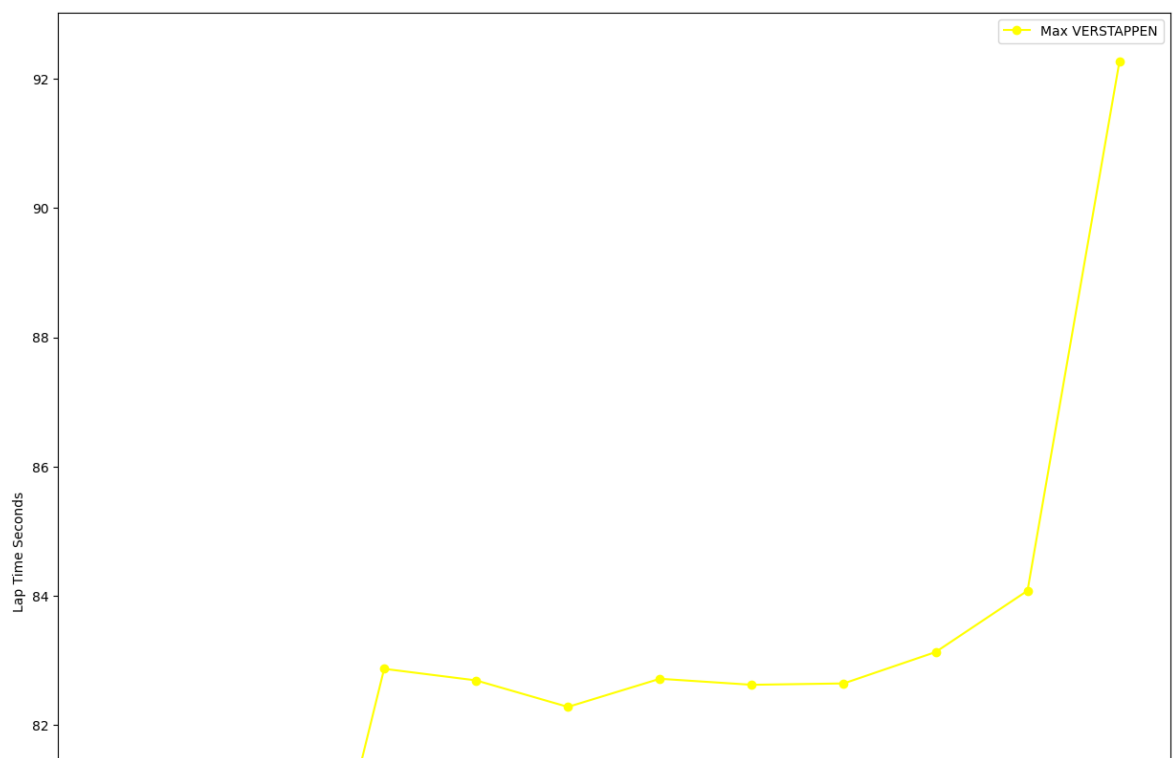
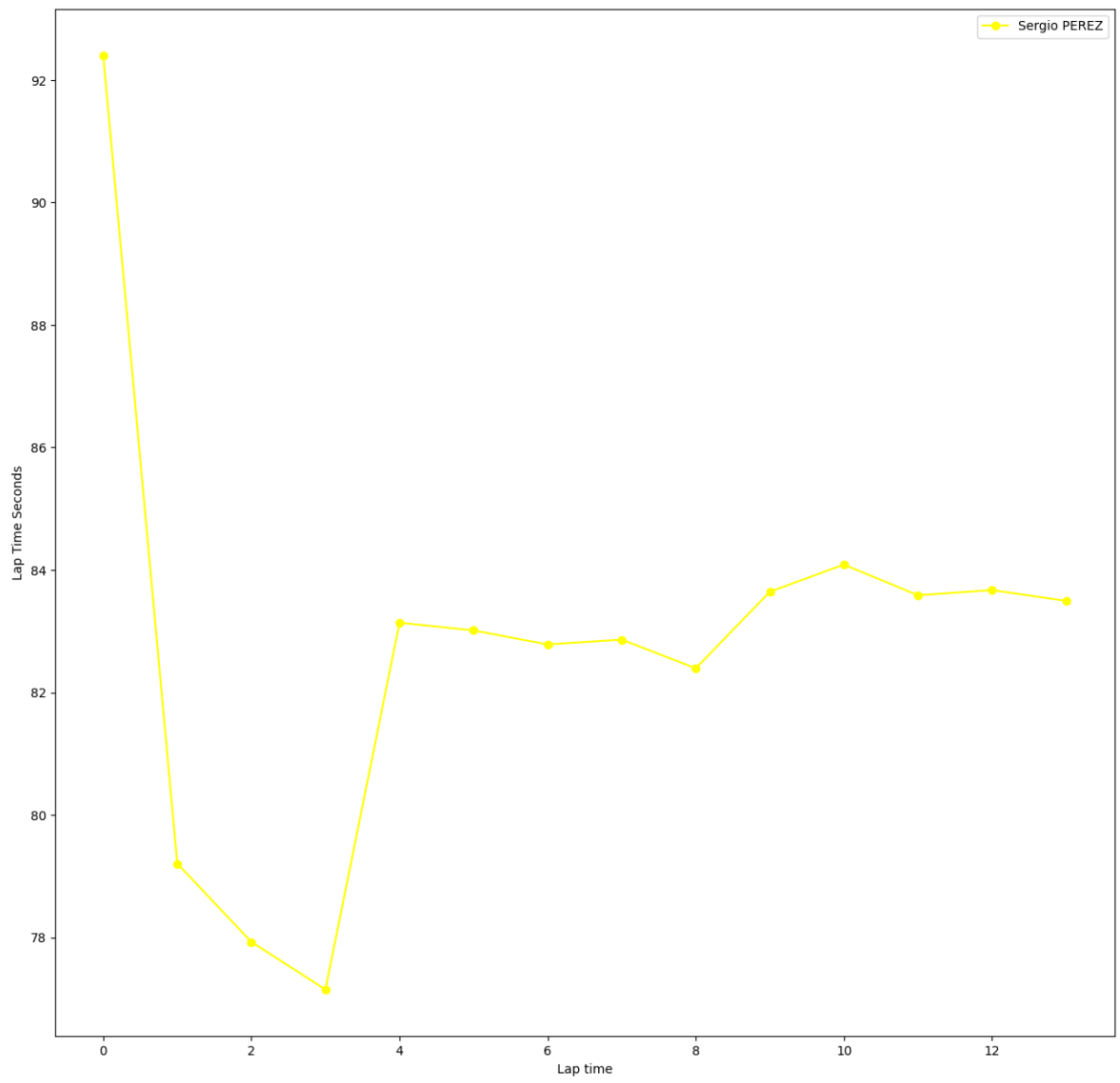
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1231	9483	81	199.0	197	168.0	2024-03-23T01:31:00.000000
1	1231	9483	4	251.0	181	148.0	2024-03-23T01:31:00.000000
2	1231	9483	77	243.0	285	189.0	2024-03-23T01:31:00.000000
3	1231	9483	24	240.0	249	149.0	2024-03-23T01:32:00.000000
4	1231	9483	4	248.0	198	220.0	2024-03-23T01:33:00.000000
...
392	1231	9483	24	273.0	273	247.0	2024-03-23T02:33:00.000000
393	1231	9483	16	251.0	278	256.0	2024-03-23T02:33:00.000000
394	1231	9483	63	262.0	284	243.0	2024-03-23T02:33:00.000000
395	1231	9483	11	257.0	296	259.0	2024-03-23T02:33:00.000000
396	1231	9483	81	261.0	279	258.0	2024-03-23T02:33:00.000000

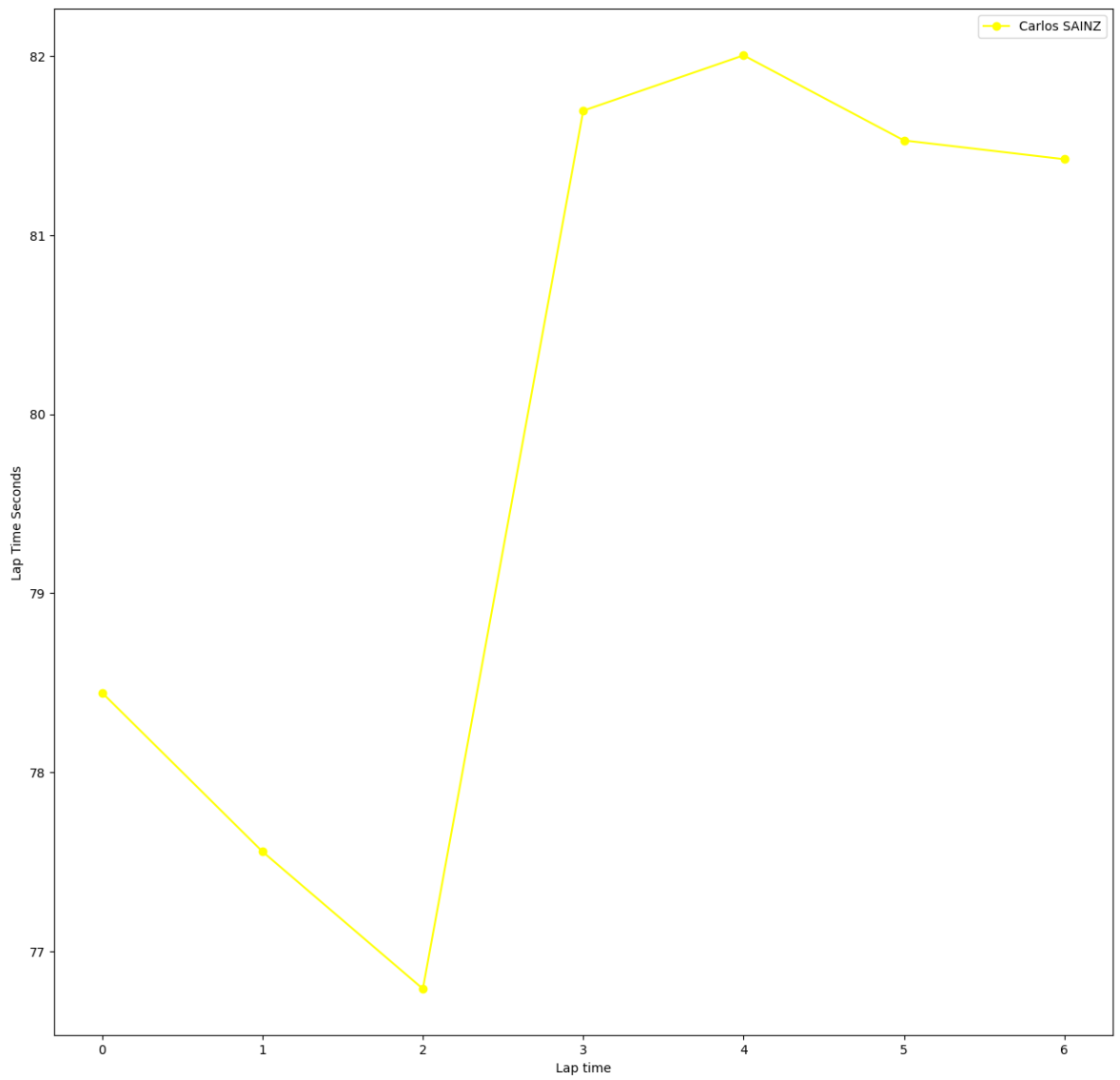
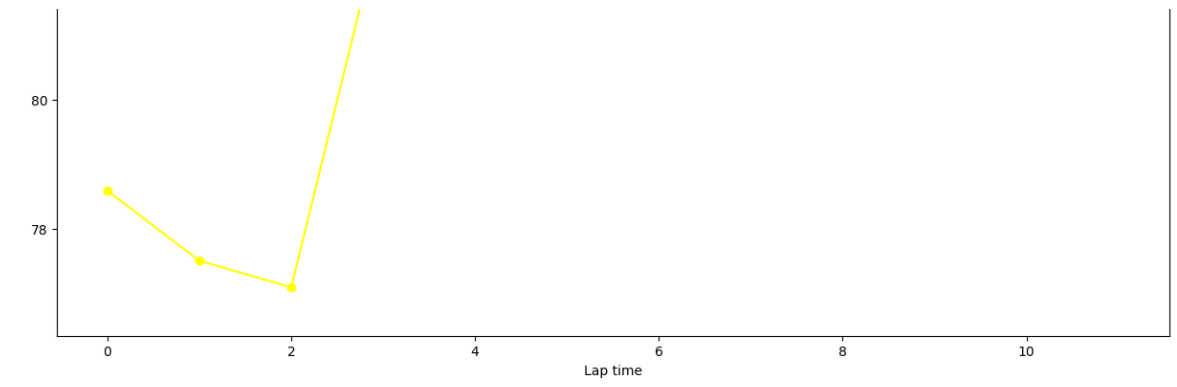
397 rows × 20 columns

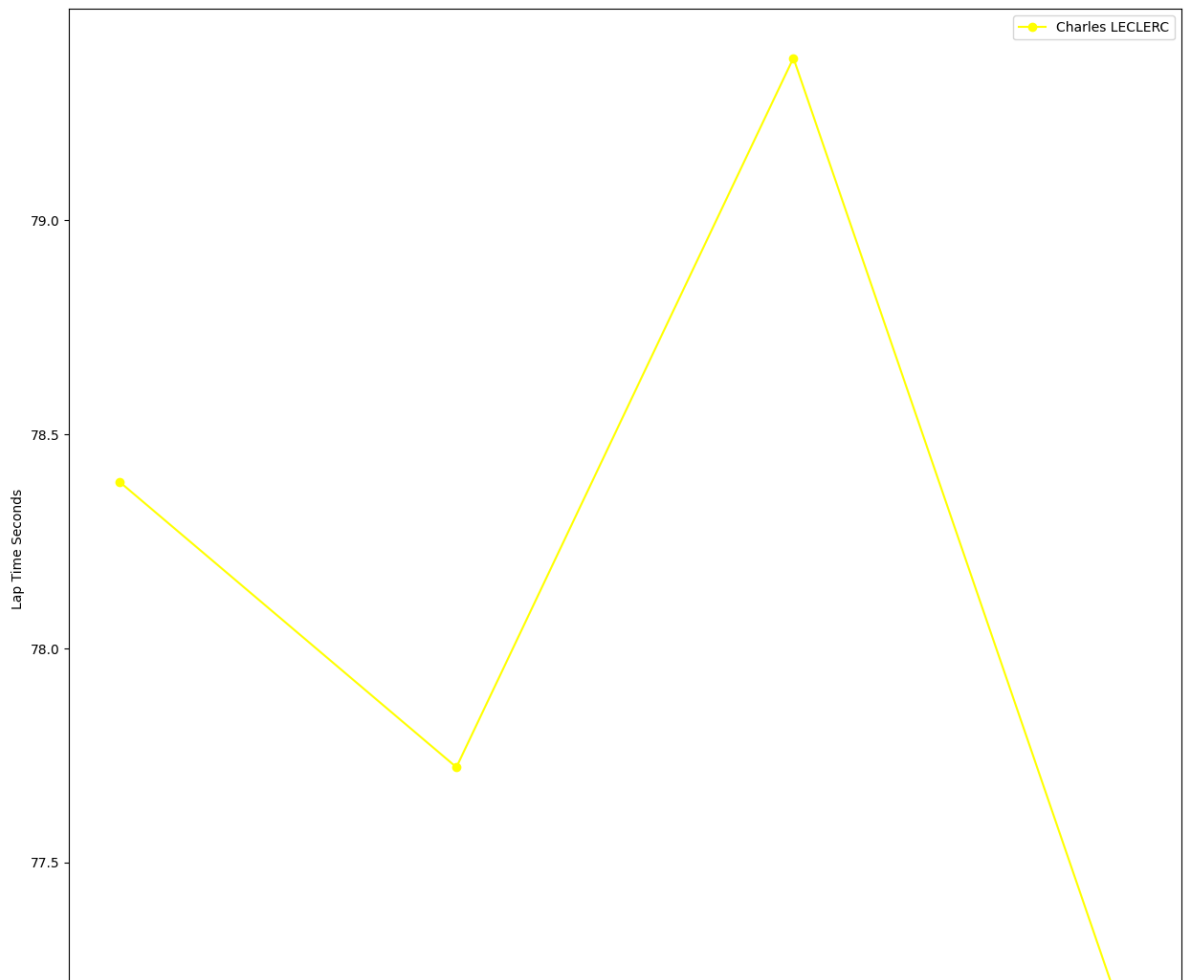
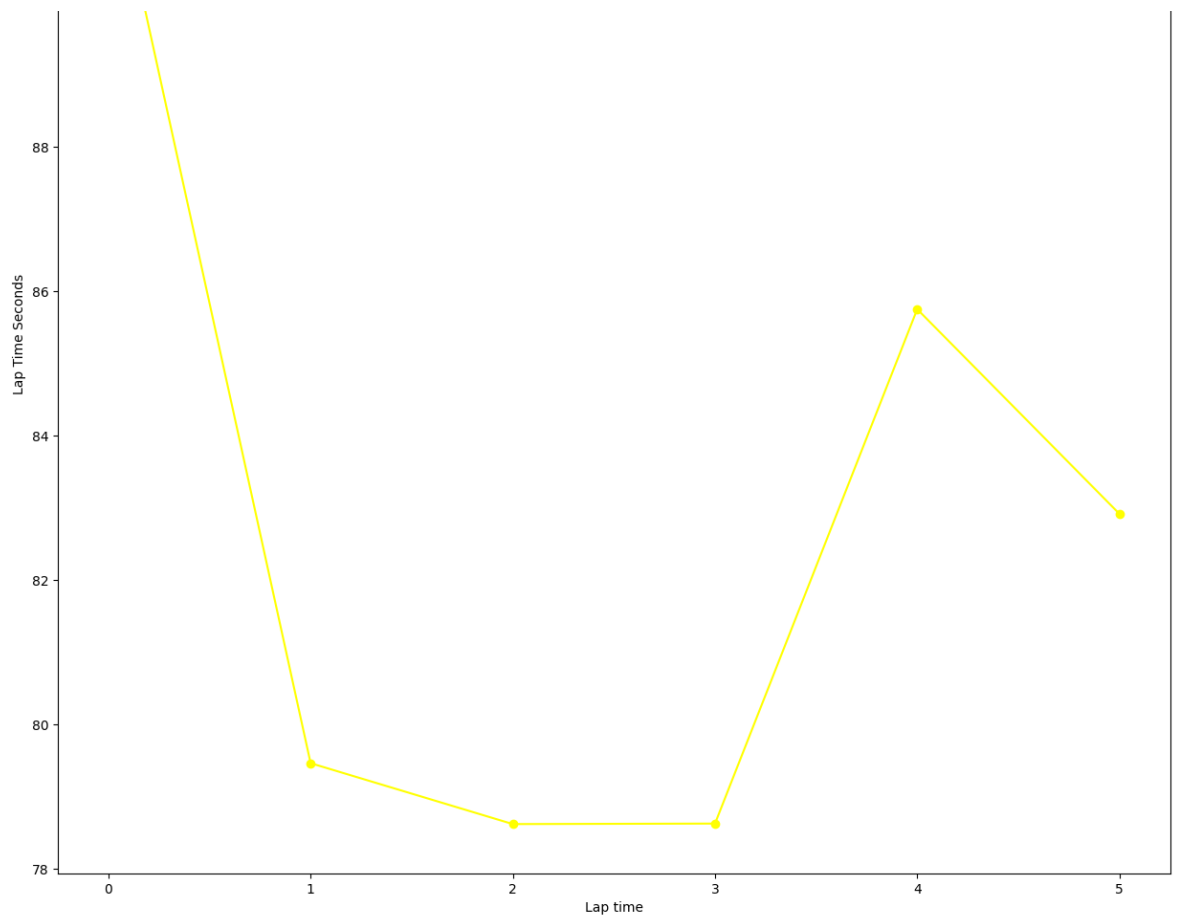
See race pace by means of the charts

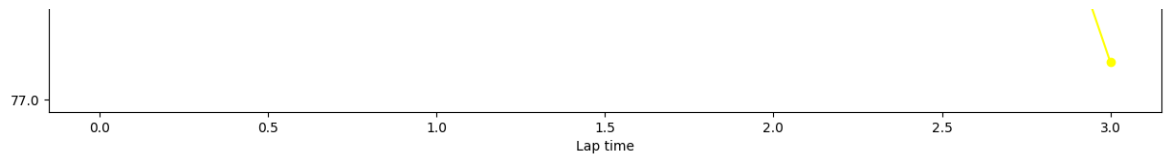
Medium tyres

```
In [87]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",93)
```



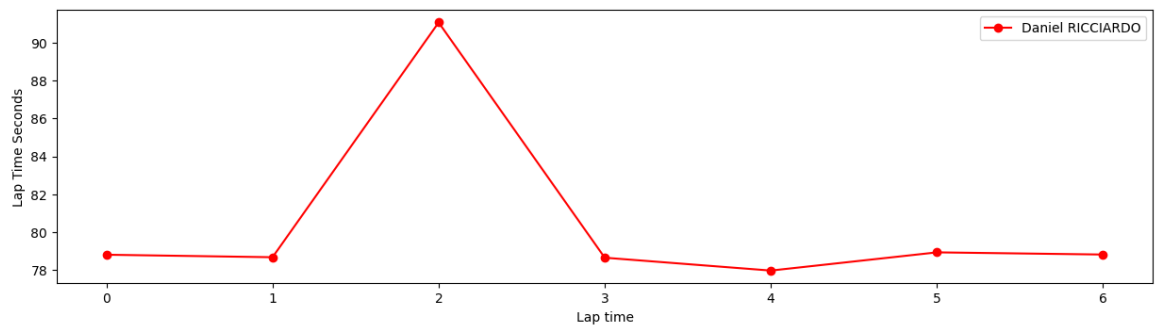
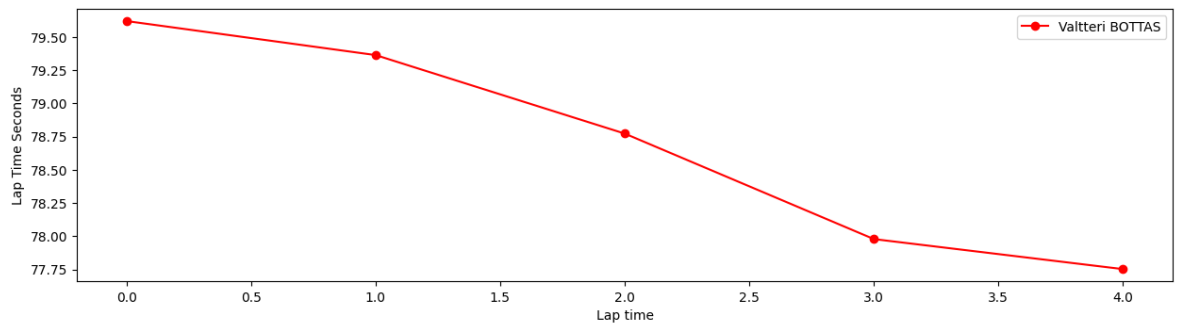
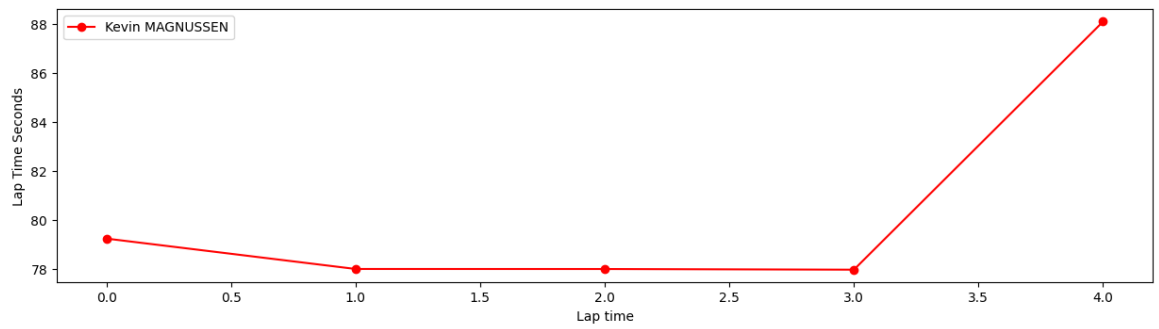
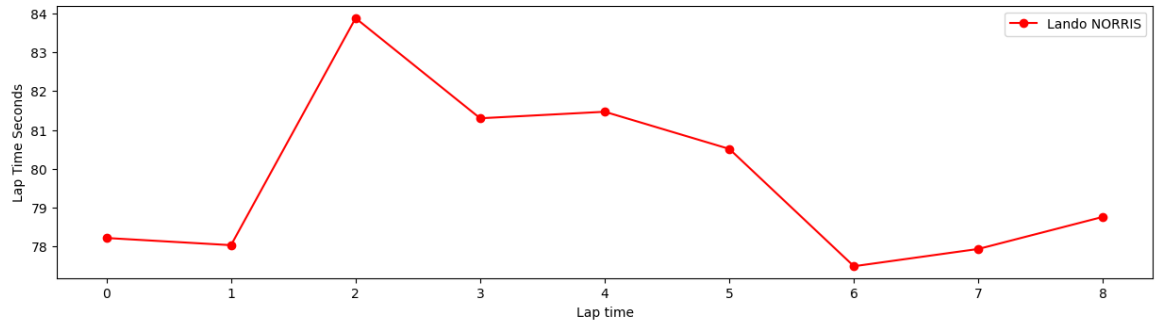
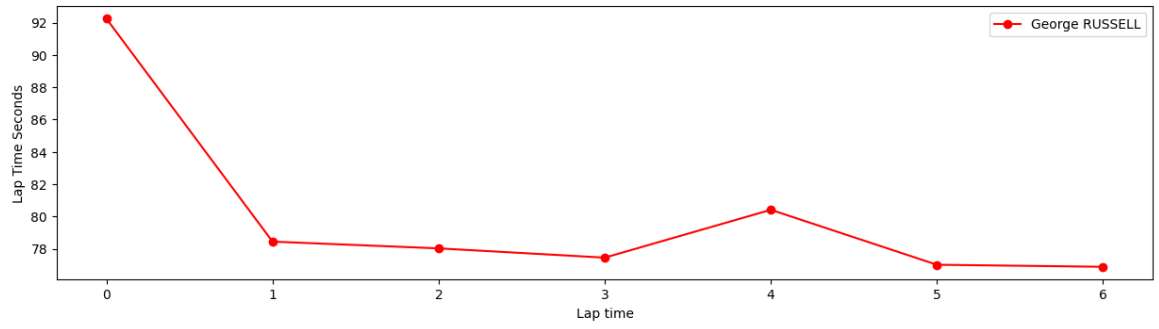
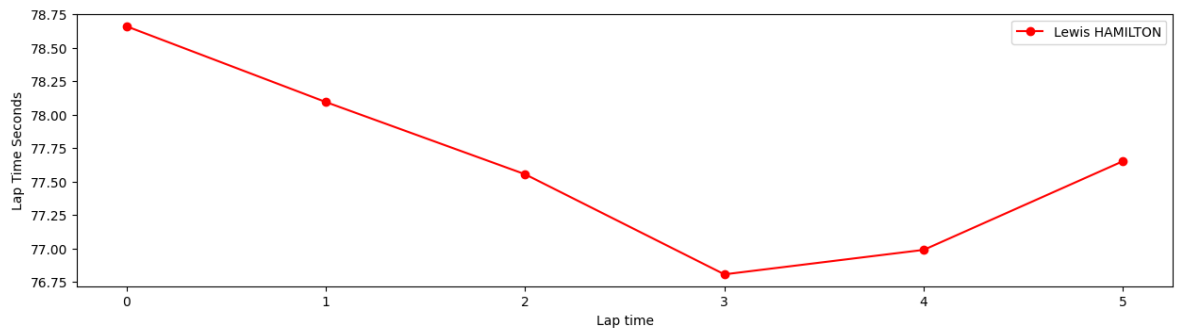


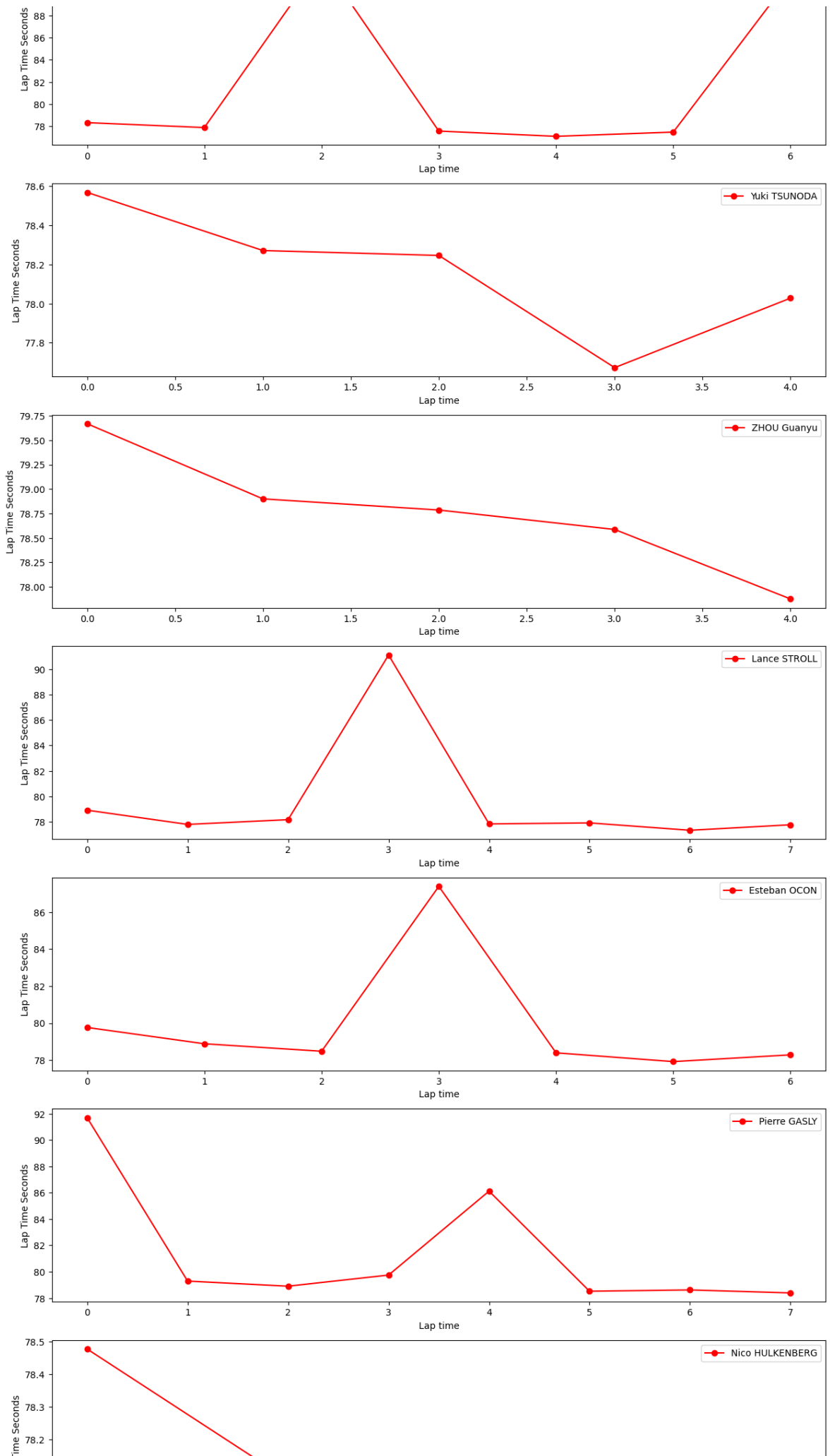


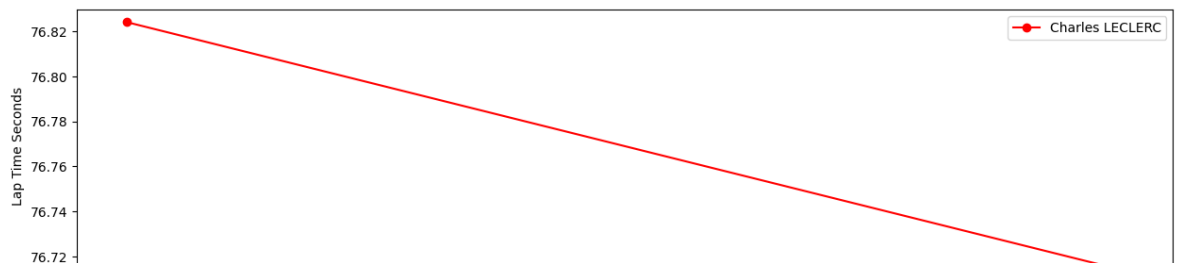
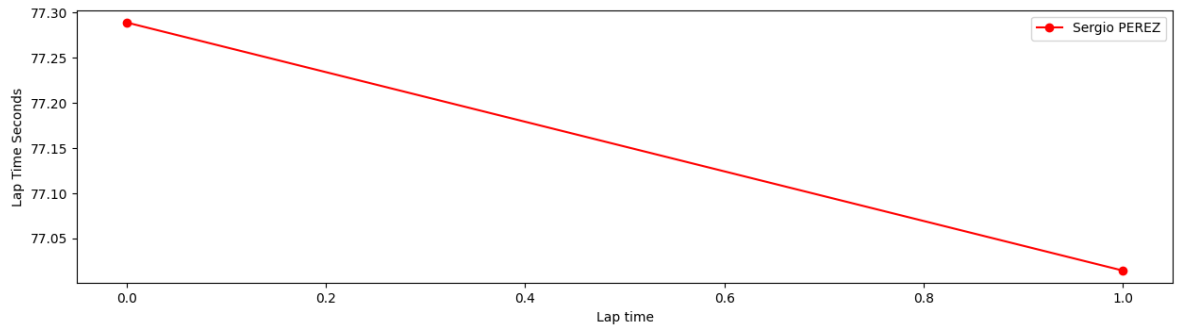
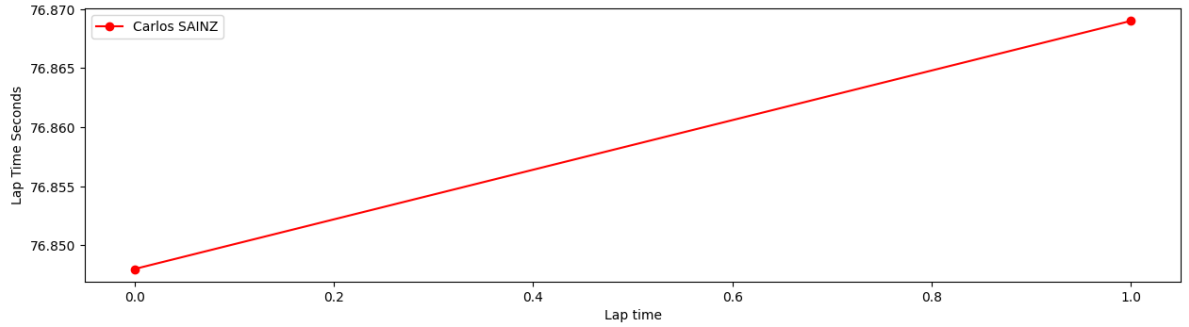
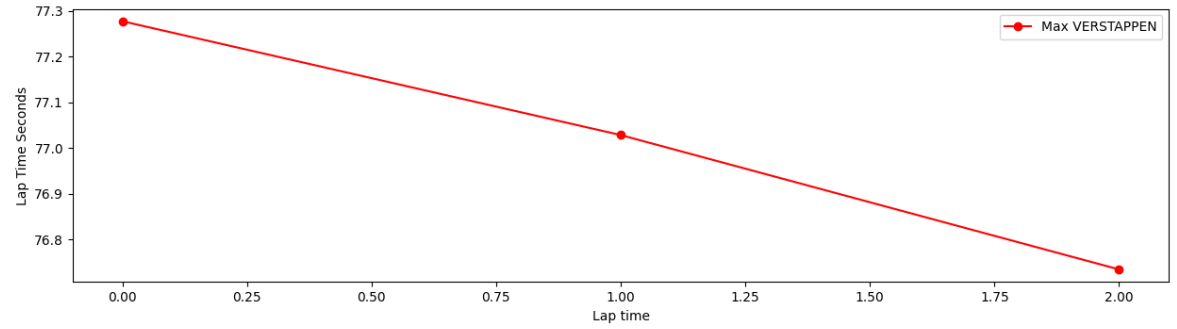
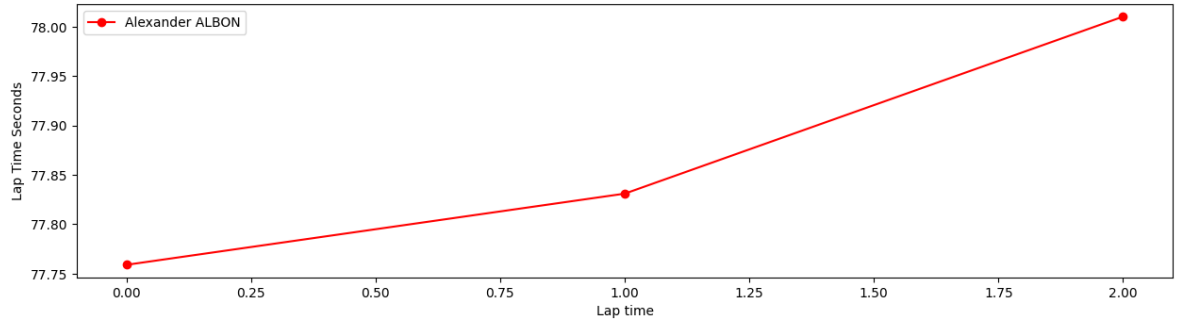
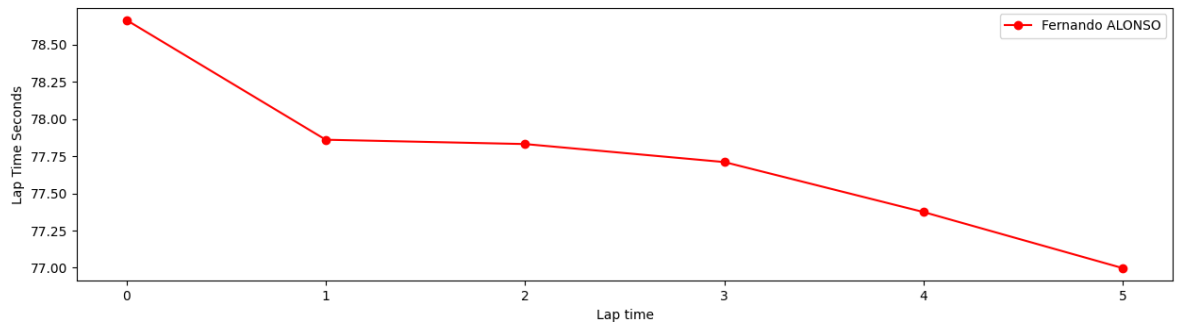
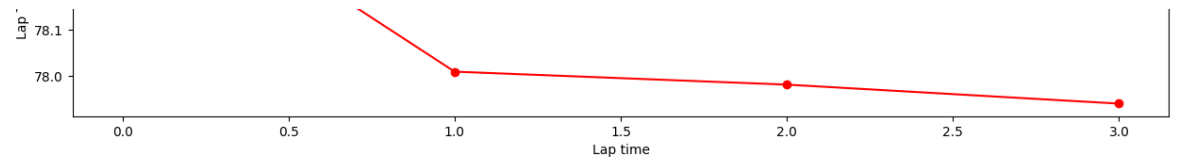


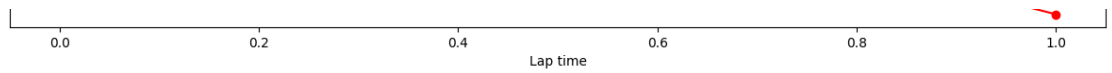
Soft tyres

```
In [88]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",93)
```







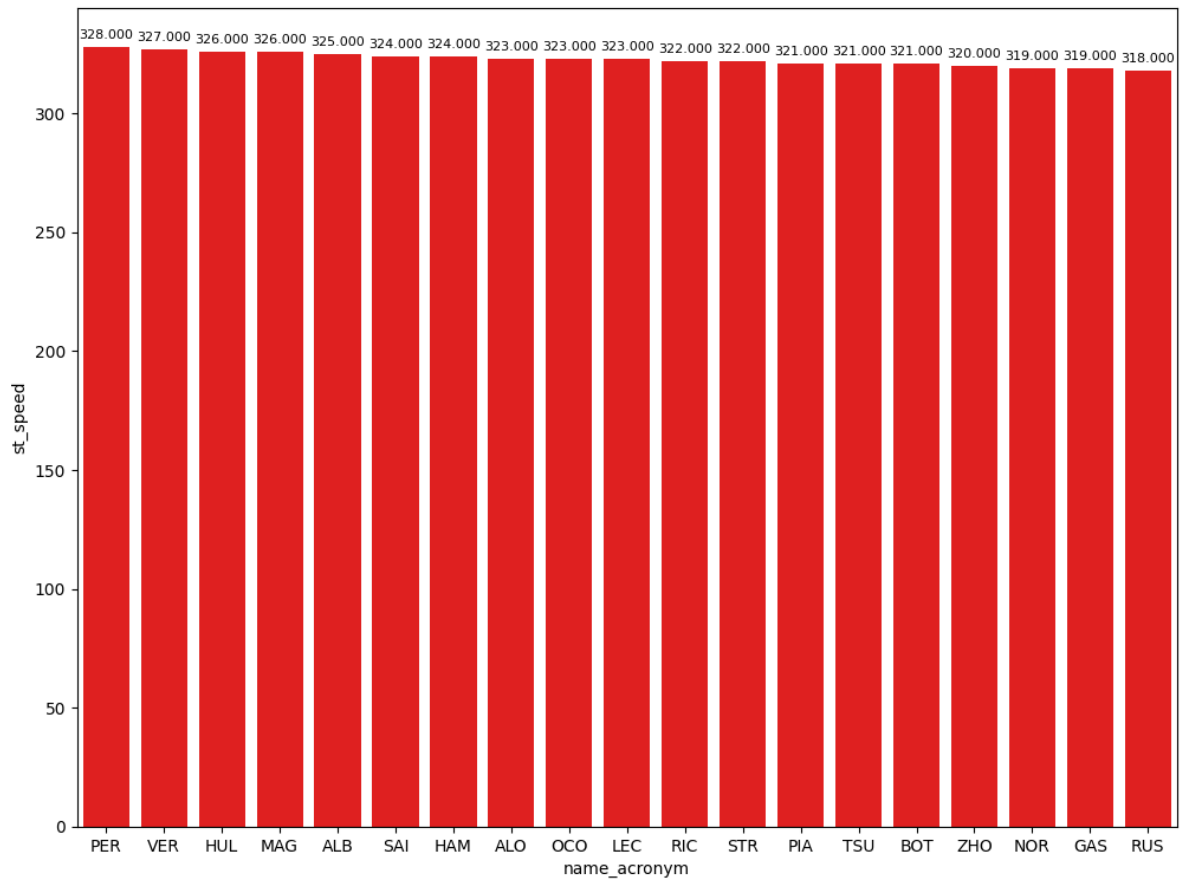


Hard tyres

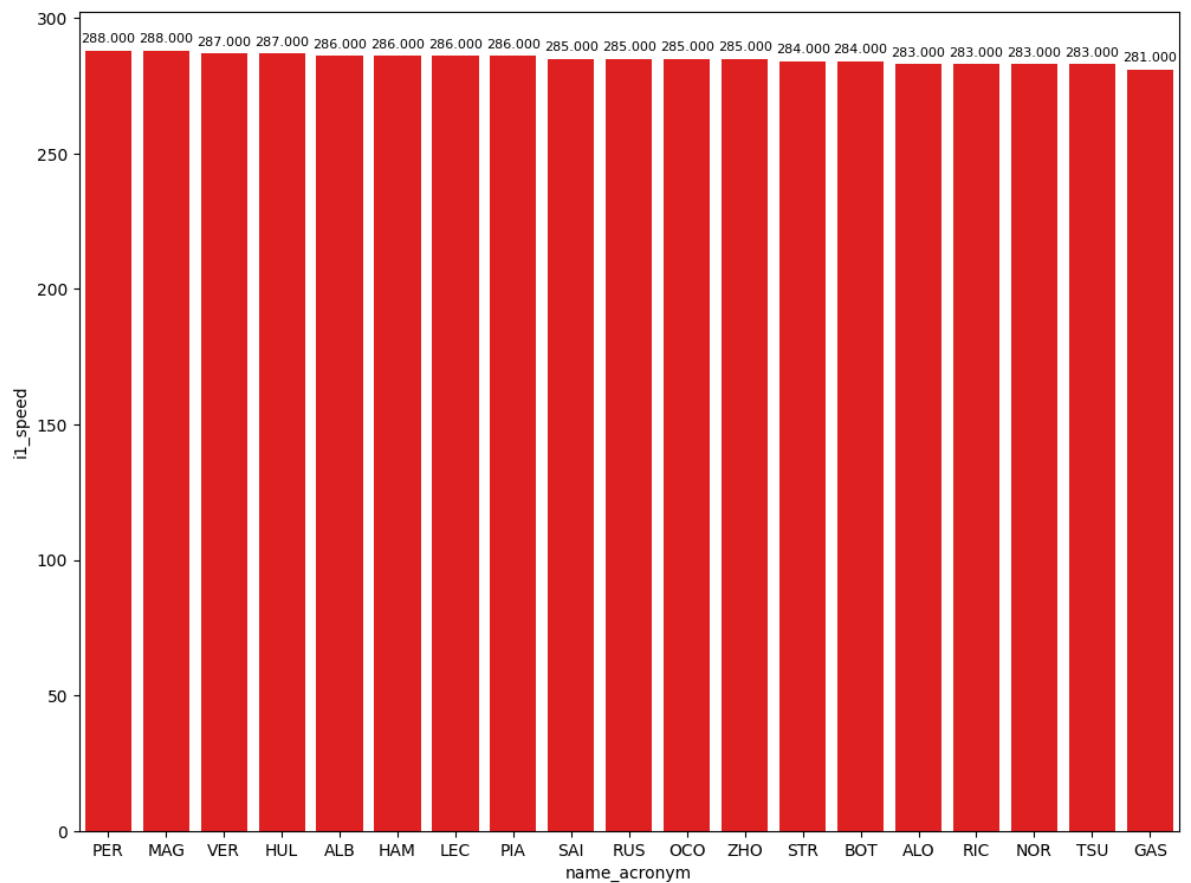
```
In [89]: #libraryDataF1.obtain_data_tyres(jointables2,"HARD",99)
```

Speed trap

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

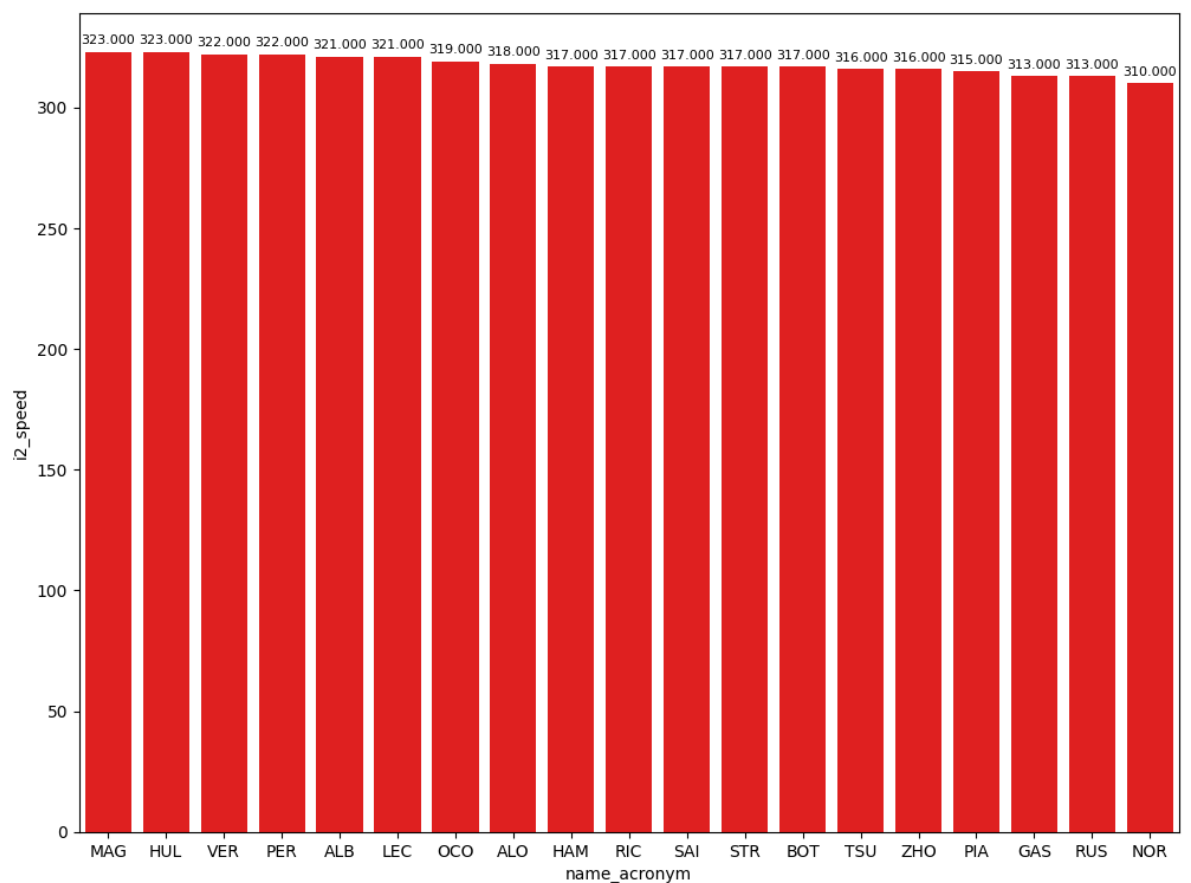


```
In [91]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed']]
libraryDataF1.obtainchart("name_acronym","i1_speed",top_speed)
```



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]:
```

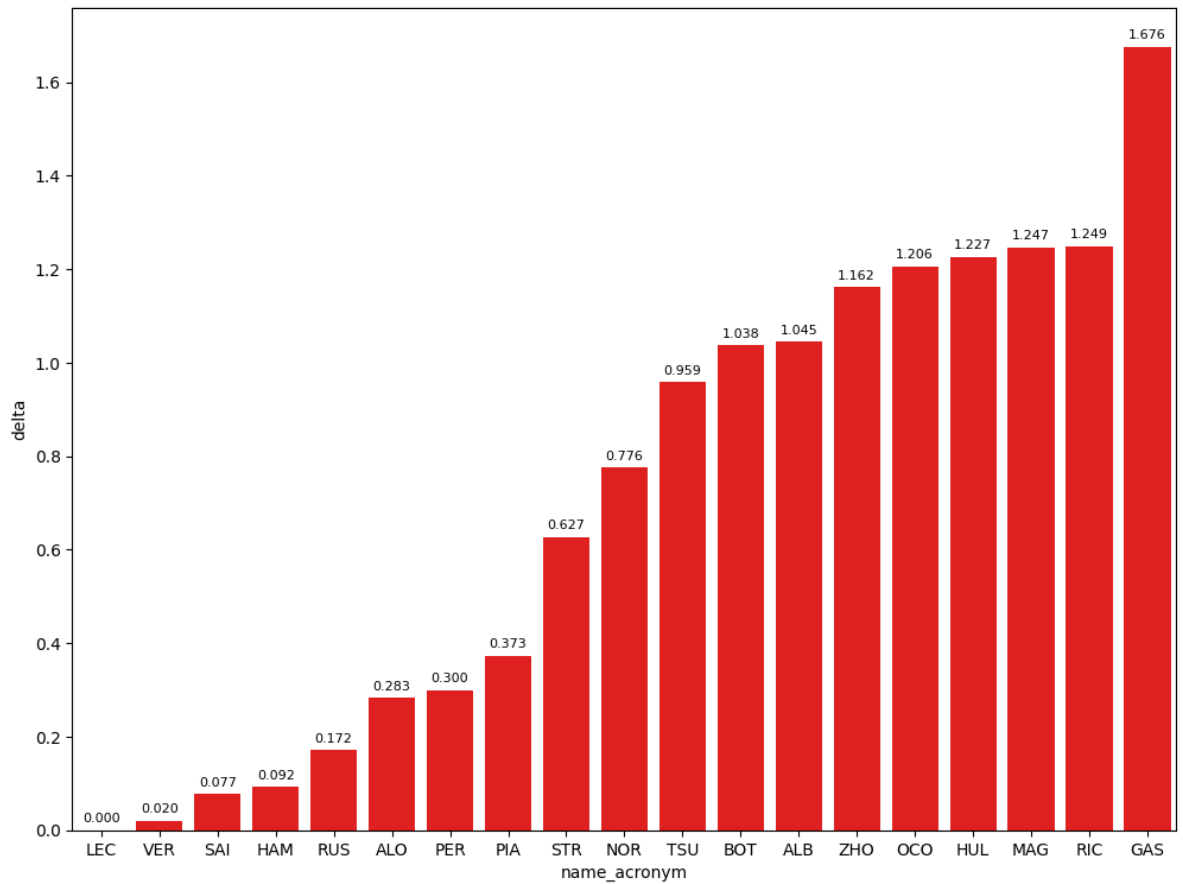
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
58	Valtteri BOTTAS	HARD	37.756	19.030	37.126	93.91
51	Carlos SAINZ	MEDIUM	26.703	17.584	32.504	76.79
360	Charles LECLERC	SOFT	26.715	17.434	32.565	76.71

Deltas

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

```
In [94]: practiceCleaned = jointables2.query("lap_duration > 1")  
drivers_list = list(practiceCleaned['driver_number'].unique())  
newdataset = pd.DataFrame()  
for driver in drivers_list:  
    newdataset = libraryDataF1.obtain_fastest_lap(driver, practiceCleaned, newdataset)  
  
arr = libraryDataF1.obtain_deltas(newdataset)  
newdataset.insert(3, 'delta', arr)
```

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



Track dominance

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

In [96]:

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

Out[96]:

	duration_sector_1	full_name	compound	lap_duration	lap_number
308	26.548	George RUSSELL	SOFT	76.886	19
341	26.558	Carlos SAINZ	SOFT	76.869	18
218	26.581	Oscar PIASTRI	SOFT	77.087	12
238	26.582	Lando NORRIS	SOFT	77.490	14
300	26.627	Lewis HAMILTON	SOFT	76.989	16
310	26.638	Charles LECLERC	SOFT	76.824	17
351	26.638	Max VERSTAPPEN	SOFT	76.734	26
356	26.652	Fernando ALONSO	SOFT	76.997	18
226	26.695	Lance STROLL	SOFT	77.841	13
339	26.783	Sergio PEREZ	SOFT	77.014	25
284	26.794	Yuki TSUNODA	SOFT	77.673	13
209	26.832	Alexander ALBON	SOFT	77.759	12
267	26.866	Daniel RICCIARDO	SOFT	77.963	12
252	26.893	Valtteri BOTTAS	SOFT	77.978	14

	duration_sector_1	full_name	compound	lap_duration	lap_number
318	26.896	Esteban OCON	SOFT	77.920	14
253	26.944	Nico HULKENBERG	SOFT	77.982	11
243	26.945	Kevin MAGNUSSEN	SOFT	77.988	10
286	27.030	ZHOU Guanyu	SOFT	77.876	15

In [97]:

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

Out[97]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
351	17.364	Max VERSTAPPEN	SOFT	76.734	26
339	17.417	Sergio PEREZ	SOFT	77.014	25
360	17.434	Charles LECLERC	SOFT	76.714	20
356	17.467	Fernando ALONSO	SOFT	76.997	18
300	17.484	Lewis HAMILTON	SOFT	76.989	16
253	17.545	Nico HULKENBERG	SOFT	77.982	11
210	17.554	Oscar PIASTRI	SOFT	77.559	10
240	17.566	Alexander ALBON	SOFT	77.831	16
266	17.581	George RUSSELL	SOFT	77.012	16
51	17.584	Carlos SAINZ	MEDIUM	76.791	6
243	17.593	Kevin MAGNUSSEN	SOFT	77.988	10
318	17.652	Esteban OCON	SOFT	77.920	14
353	17.668	Lance STROLL	SOFT	77.774	20
284	17.696	Yuki TSUNODA	SOFT	77.673	13
345	17.722	Lando NORRIS	SOFT	78.763	20
267	17.727	Daniel RICCIARDO	SOFT	77.963	12
273	17.795	Valtteri BOTTAS	SOFT	77.752	16
286	17.812	ZHOU Guanyu	SOFT	77.876	15
357	17.843	Pierre GASLY	SOFT	78.390	17

In [98]:

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

Out[98]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
51	32.504	Carlos SAINZ	MEDIUM	76.791	6
310	32.553	Charles LECLERC	SOFT	76.824	17
251	32.631	Lewis HAMILTON	SOFT	76.806	13
308	32.702	George RUSSELL	SOFT	76.886	19
351	32.732	Max VERSTAPPEN	SOFT	76.734	26
339	32.814	Sergio PEREZ	SOFT	77.014	25
356	32.878	Fernando ALONSO	SOFT	76.997	18

	duration_sector_3	full_name	compound	lap_duration	lap_number
323	32.912	Lance STROLL	SOFT	77.341	18
218	32.936	Oscar PIASTRI	SOFT	77.087	12
273	32.963	Valtteri BOTTAS	SOFT	77.752	16
286	33.034	ZHOU Guanyu	SOFT	77.876	15
271	33.058	Lando NORRIS	SOFT	77.936	17
284	33.183	Yuki TSUNODA	SOFT	77.673	13
126	33.228	Kevin MAGNUSSEN	SOFT	77.990	5
140	33.273	Nico HULKENBERG	SOFT	78.010	6
209	33.321	Alexander ALBON	SOFT	77.759	12
357	33.330	Pierre GASLY	SOFT	78.390	17
267	33.370	Daniel RICCIARDO	SOFT	77.963	12

Mean pace with the different compound used on the session

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

```
Out[99]:
```

	lap_duration
compound	
MEDIUM	82.044581
SOFT	85.233478

Long runs

```
In [100... MINIMUM_SECONDS = 76
MAXIMUM_SECONDS = 93
```

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
8	1231	9483	1	11	1	6	MEDIUM	
12	1231	9483	1	1	1	9	MEDIUM	
35	1231	9483	2	11	7	9	MEDIUM	
46	1231	9483	2	1	10	19	MEDIUM	
48	1231	9483	3	11	10	21	MEDIUM	
81	1231	9483	3	1	20	29	SOFT	
82	1231	9483	4	11	22	24	SOFT	
85	1231	9483	5	11	25	29	SOFT	

In [102...

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

Out[102...

	full_name	compound	date_start	lap_number	duration_sector_1
16	Max VERSTAPPEN	MEDIUM	2024-03-23T01:36:54.596000+00:00	3	27.351
23	Max VERSTAPPEN	MEDIUM	2024-03-23T01:40:07.947000+00:00	5	26.983
32	Max VERSTAPPEN	MEDIUM	2024-03-23T01:43:20.981000+00:00	7	26.678
104	Max VERSTAPPEN	MEDIUM	2024-03-23T01:54:21.147000+00:00	10	28.815
118	Max VERSTAPPEN	MEDIUM	2024-03-23T01:55:44.096000+00:00	11	28.667
135	Max VERSTAPPEN	MEDIUM	2024-03-23T01:57:06.819000+00:00	12	28.630
150	Max VERSTAPPEN	MEDIUM	2024-03-23T01:58:29.135000+00:00	13	28.809
162	Max VERSTAPPEN	MEDIUM	2024-03-23T01:59:51.792000+00:00	14	28.746
175	Max VERSTAPPEN	MEDIUM	2024-03-23T02:01:14.413000+00:00	15	28.866
185	Max VERSTAPPEN	MEDIUM	2024-03-23T02:02:37.093000+00:00	16	29.016
191	Max VERSTAPPEN	MEDIUM	2024-03-23T02:04:00.238000+00:00	17	29.117
265	Max VERSTAPPEN	SOFT	2024-03-23T02:18:55.230000+00:00	20	26.751
304	Max VERSTAPPEN	SOFT	2024-03-23T02:23:57.940000+00:00	23	26.711
351	Max VERSTAPPEN	SOFT	2024-03-23T02:29:21.410000+00:00	26	26.638

In [103...

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

Out[103...

	full_name	compound	date_start	lap_number	duration_sector_1	du
11	Sergio PEREZ	MEDIUM	2024-03-23T01:34:55.897000+00:00	2	27.595	
18	Sergio PEREZ	MEDIUM	2024-03-23T01:38:25.715000+00:00	4	27.208	
33	Sergio PEREZ	MEDIUM	2024-03-23T01:43:37.591000+00:00	7	26.808	
111	Sergio PEREZ	MEDIUM	2024-03-23T01:55:02.720000+00:00	10	28.727	
127	Sergio PEREZ	MEDIUM	2024-03-23T01:56:25.708000+00:00	11	28.818	
141	Sergio PEREZ	MEDIUM	2024-03-23T01:57:48.757000+00:00	12	28.747	
157	Sergio PEREZ	MEDIUM	2024-03-23T01:59:11.580000+00:00	13	28.703	

	full_name	compound	date_start	lap_number	duration_sector_1	du
170	Sergio PEREZ	MEDIUM	2024-03-23T02:00:34.479000+00:00	14	28.752	
181	Sergio PEREZ	MEDIUM	2024-03-23T02:01:56.830000+00:00	15	29.314	
190	Sergio PEREZ	MEDIUM	2024-03-23T02:03:20.483000+00:00	16	29.351	
196	Sergio PEREZ	MEDIUM	2024-03-23T02:04:44.534000+00:00	17	29.019	
202	Sergio PEREZ	MEDIUM	2024-03-23T02:06:08.097000+00:00	18	28.967	
206	Sergio PEREZ	MEDIUM	2024-03-23T02:07:31.796000+00:00	19	28.981	
294	Sergio PEREZ	SOFT	2024-03-23T02:22:27.923000+00:00	22	26.801	
---	Sergio	---	---	---	---	---

Ferrari

In [104... `libraryDataF1.getinfo(longruns(jointables2,16,'Ferrari',MINIMUM_SECONDS,MAXI`

Out[104...

	full_name	compound	date_start	lap_number	duration_sector_1	du
35	Charles LECLERC	MEDIUM	2024-03-23T01:44:32.563000+00:00	3	27.358	
47	Charles LECLERC	MEDIUM	2024-03-23T01:48:03.588000+00:00	5	27.031	
75	Charles LECLERC	MEDIUM	2024-03-23T01:51:38.786000+00:00	7	26.847	
134	Charles LECLERC	MEDIUM	2024-03-23T01:57:05.210000+00:00	10	26.729	
310	Charles LECLERC	SOFT	2024-03-23T02:24:40.785000+00:00	17	26.638	
360	Charles LECLERC	SOFT	2024-03-23T02:29:52.742000+00:00	20	26.715	

In [105... `libraryDataF1.getinfo(longruns(jointables2,55,'Ferrari',MINIMUM_SECONDS,MAXI`

Out[105...

	full_name	compound	date_start	lap_number	duration_sector_1	du
27	Carlos SAINZ	MEDIUM	2024-03-23T01:41:37.377000+00:00	2	27.287	
39	Carlos SAINZ	MEDIUM	2024-03-23T01:45:12.150000+00:00	4	26.876	
51	Carlos SAINZ	MEDIUM	2024-03-23T01:48:48.289000+00:00	6	26.703	
180	Carlos SAINZ	MEDIUM	2024-03-23T02:01:55.378000+00:00	9	28.312	
189	Carlos SAINZ	MEDIUM	2024-03-23T02:03:17.029000+00:00	10	28.484	
195	Carlos SAINZ	MEDIUM	2024-03-23T02:04:38.952000+00:00	11	28.373	

	full_name	compound	date_start	lap_number	duration_sector_1	di
200	Carlos SAINZ	MEDIUM	2024-03-23T02:06:00.629000+00:00	12	28.158	
293	Carlos SAINZ	SOFT	2024-03-23T02:22:25.261000+00:00	15	26.579	
344	Carlos	SOFT	2024-03-23T02:22:15.710000+00:00	18	26.552	

Mercedes

In [106...

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

Out[106...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
7	1231	9483	1	44	1	4	SOFT	
18	1231	9483	1	63	1	11	SOFT	
31	1231	9483	2	44	5	7	SOFT	
37	1231	9483	3	44	8	10	SOFT	
51	1231	9483	4	44	11	15	SOFT	
59	1231	9483	2	63	12	21	SOFT	
73	1231	9483	5	44	16	21	SOFT	
84	1231	9483	3	63	22	24	SOFT	

In [107...

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

Out[107...

	full_name	compound	date_start	lap_number	duration_sector_1	d
45	Lewis HAMILTON	SOFT	2024-03-23T01:46:49.437000+00:00	2	27.501	
89	Lewis HAMILTON	SOFT	2024-03-23T01:52:47.362000+00:00	5	27.208	
151	Lewis HAMILTON	SOFT	2024-03-23T01:58:39.933000+00:00	8	26.750	
251	Lewis HAMILTON	SOFT	2024-03-23T02:16:53.414000+00:00	13	26.653	
300	Lewis HAMILTON	SOFT	2024-03-23T02:22:53.153000+00:00	16	26.627	
342	Lewis HAMILTON	SOFT	2024-03-23T02:28:26.910000+00:00	19	26.904	

In [108...

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

Out[108...

	full_name	compound	date_start	lap_number	duration_sector_1	d
48	George RUSSELL	SOFT	2024-03-23T01:48:05.597000+00:00	2	32.669	
57	George RUSSELL	SOFT	2024-03-23T01:49:37.868000+00:00	3	27.202	
108	George RUSSELL	SOFT	2024-03-23T01:54:43.384000+00:00	6	26.942	

	full_name	compound	date_start	lap_number	duration_sector_1	di
165	George RUSSELL	SOFT	2024-03-23T02:00:04.897000+00:00	9	26.763	
232	George RUSSELL	SOFT	2024-03-23T02:13:52.350000+00:00	13	26.819	
266	George RUSSELL	SOFT	2024-03-23T02:19:11.444000+00:00	16	26.712	

McLaren

In [109...

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

Out[109...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
0	1231	9483	1	4	1	2	HARD	
5	1231	9483	1	81	1	2	HARD	
19	1231	9483	2	4	3	3	HARD	
24	1231	9483	2	81	3	3	HARD	
29	1231	9483	3	81	4	9	SOFT	
30	1231	9483	3	4	4	12	SOFT	
44	1231	9483	4	81	10	14	SOFT	
64	1231	9483	4	4	13	19	SOFT	
66	1231	9483	5	81	15	15	SOFT	
71	1231	9483	6	81	16	20	SOFT	
80	1231	9483	5	4	20	23	SOFT	


```
In [110... libraryDataF1.getinfo(longruns(jointables2,4,'McLaren',MINIMUM_SECONDS,MAXI
```

	full_name	compound	date_start	lap_number	duration_sector_1	du
52	Lando NORRIS	SOFT	2024-03-23T01:49:01.274000+00:00	4	26.946	
82	Lando NORRIS	SOFT	2024-03-23T01:52:28.102000+00:00	6	26.979	
99	Lando NORRIS	SOFT	2024-03-23T01:53:45.984000+00:00	7	28.731	
112	Lando NORRIS	SOFT	2024-03-23T01:55:10.700000+00:00	8	28.026	
128	Lando NORRIS	SOFT	2024-03-23T01:56:31.317000+00:00	9	28.203	
142	Lando NORRIS	SOFT	2024-03-23T01:57:52.835000+00:00	10	27.828	
238	Lando NORRIS	SOFT	2024-03-23T02:14:55.833000+00:00	14	26.582	
271	Lando NORRIS	SOFT	2024-03-23T02:20:06.498000+00:00	17	26.955	
345	Lando NORRIS	SOFT	2024-03-23T02:28:47.294000+00:00	20	26.719	

```
In [111... libraryDataF1.getinfo(longruns(jointables2,81,'McLaren',MINIMUM_SECONDS,MAXI
```

	full_name	compound	date_start	lap_number	duration_sector_1	du
77	Oscar PIASTRI	SOFT	2024-03-23T01:51:58.761000+00:00	4	27.339	
130	Oscar PIASTRI	SOFT	2024-03-23T01:56:43.039000+00:00	7	27.023	
210	Oscar PIASTRI	SOFT	2024-03-23T02:08:26.160000+00:00	10	26.888	
218	Oscar PIASTRI	SOFT	2024-03-23T02:11:23.157000+00:00	12	26.581	
344	Oscar PIASTRI	SOFT	2024-03-23T02:28:39.750000+00:00	16	26.766	
361	Oscar PIASTRI	SOFT	2024-03-23T02:29:57.183000+00:00	17	30.992	

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	tyr
1	1231	9483	1	14	1	2	HARD	
2	1231	9483	1	18	1	2	HARD	
20	1231	9483	2	14	3	3	HARD	
21	1231	9483	2	18	3	3	HARD	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
25	1231	9483	3	14	4	4	MEDIUM	
26	1231	9483	3	18	4	4	MEDIUM	
33	1231	9483	4	14	5	11	SOFT	
34	1231	9483	4	18	5	11	SOFT	
52	1231	9483	5	14	12	12	SOFT	
53	1231	9483	5	18	12	12	SOFT	
60	1231	9483	6	14	13	15	SOFT	
62	1231	9483	6	18	13	17	SOFT	
72	1231	9483	7	14	16	21	SOFT	

In [113... `libraryDataF1.getinfo(longruns(jointables2,14,'Aston Martin',MINIMUM_SECONDS=`

Out[113...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
109	Fernando ALONSO	SOFT	2024-03-23T01:54:48.346000+00:00	5	27.427	
143	Fernando ALONSO	SOFT	2024-03-23T01:58:00.263000+00:00	7	26.993	
173	Fernando ALONSO	SOFT	2024-03-23T02:01:05.942000+00:00	9	26.936	
231	Fernando ALONSO	SOFT	2024-03-23T02:13:41.582000+00:00	13	26.854	
325	Fernando ALONSO	SOFT	2024-03-23T02:26:34.804000+00:00	16	26.970	
356	Fernando ALONSO	SOFT	2024-03-23T02:29:39.219000+00:00	18	26.652	

In [114... `libraryDataF1.getinfo(longruns(jointables2,18,'Aston Martin',MINIMUM_SECONDS=`

Out[114...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
80	Lance STROLL	SOFT	2024-03-23T01:52:20.492000+00:00	5	27.222	
114	Lance STROLL	SOFT	2024-03-23T01:55:17.002000+00:00	7	26.965	
148	Lance STROLL	SOFT	2024-03-23T01:58:21.810000+00:00	9	27.129	
226	Lance STROLL	SOFT	2024-03-23T02:13:00.312000+00:00	13	26.695	
246	Lance STROLL	SOFT	2024-03-23T02:15:59.481000+00:00	15	26.876	
323	Lance STROLL	SOFT	2024-03-23T02:26:28.553000+00:00	18	26.748	
353	Lance STROLL	SOFT	2024-03-23T02:29:30.241000+00:00	20	26.983	

RB

In [115...

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

Out[115...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1231	9483	1	3	1	4	SOFT	
15	1231	9483	1	22	1	10	SOFT	
32	1231	9483	2	3	5	10	SOFT	
49	1231	9483	3	3	11	11	SOFT	
50	1231	9483	2	22	11	11	SOFT	
54	1231	9483	3	22	12	12	SOFT	
58	1231	9483	4	3	12	21	SOFT	
65	1231	9483	4	22	13	20	SOFT	

In [116...

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

Out[116...

	full_name	compound	date_start	lap_number	duration_sector_1	d
74	Daniel RICCIARDO	SOFT	2024-03-23T01:51:27.638000+00:00	2	27.348	
133	Daniel RICCIARDO	SOFT	2024-03-23T01:56:58.422000+00:00	5	27.323	
168	Daniel RICCIARDO	SOFT	2024-03-23T02:00:21.464000+00:00	7	32.716	
179	Daniel RICCIARDO	SOFT	2024-03-23T02:01:52.509000+00:00	8	27.291	
267	Daniel RICCIARDO	SOFT	2024-03-23T02:19:18.696000+00:00	12	26.866	
309	Daniel RICCIARDO	SOFT	2024-03-23T02:24:30.717000+00:00	15	27.146	
349	Daniel RICCIARDO	SOFT	2024-03-23T02:29:15.096000+00:00	18	27.236	

In [117...

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

Out[117...

	full_name	compound	date_start	lap_number	duration_sector_1	d
78	Yuki TSUNODA	SOFT	2024-03-23T01:52:06.737000+00:00	2	27.198	
138	Yuki TSUNODA	SOFT	2024-03-23T01:57:34.471000+00:00	5	27.161	
186	Yuki TSUNODA	SOFT	2024-03-23T02:02:56.133000+00:00	8	27.127	
284	Yuki TSUNODA	SOFT	2024-03-23T02:21:18.380000+00:00	13	26.794	
327	Yuki TSUNODA	SOFT	2024-03-23T02:26:53.203000+00:00	16	26.945	

Haas

In [118... `libraryDataF1.getinfo(longruns(jointables2,20,'Haas F1 Team',MINIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1
72	Kevin MAGNUSSEN	SOFT	2024-03-23T01:51:06.911000+00:00	2	27.732
126	Kevin MAGNUSSEN	SOFT	2024-03-23T01:56:19.029000+00:00	5	27.074
243	Kevin MAGNUSSEN	SOFT	2024-03-23T02:15:17.875000+00:00	10	26.945
275	Kevin MAGNUSSEN	SOFT	2024-03-23T02:20:23.990000+00:00	13	27.085
359	Kevin MAGNUSSEN	SOFT	2024-03-23T02:29:47.318000+00:00	16	29.651

In [119... `libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1
87	Nico HULKENBERG	SOFT	2024-03-23T01:52:42.326000+00:00	3	27.214
140	Nico HULKENBERG	SOFT	2024-03-23T01:57:47.435000+00:00	6	27.157
253	Nico HULKENBERG	SOFT	2024-03-23T02:17:10.189000+00:00	11	26.944
278	Nico HULKENBERG	SOFT	2024-03-23T02:20:41.091000+00:00	13	27.015

Alpine

In [120... `libraryDataF1.getinfo(longruns(jointables2,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
83	Esteban OCON	SOFT	2024-03-23T01:52:33.525000+00:00	3	27.865	27.865
119	Esteban OCON	SOFT	2024-03-23T01:55:50.804000+00:00	5	27.425	27.425
153	Esteban OCON	SOFT	2024-03-23T01:58:59.123000+00:00	7	27.235	27.235
268	Esteban OCON	SOFT	2024-03-23T02:19:38.133000+00:00	10	30.560	30.560
282	Esteban OCON	SOFT	2024-03-23T02:21:05.627000+00:00	11	27.073	27.073
318	Esteban OCON	SOFT	2024-03-23T02:25:53.630000+00:00	14	26.896	26.896
347	Esteban OCON	SOFT	2024-03-23T02:29:00.660000+00:00	16	27.093	27.093

In [121... `libraryDataF1.getinfo(longruns(jointables2,10,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS,`

Out[121...

	full_name	compound	date_start	lap_number	duration_sector_1	di
85	Pierre GASLY	SOFT	2024-03-23T01:52:35.561000+00:00	2	31.854	
121	Pierre GASLY	SOFT	2024-03-23T01:55:56.250000+00:00	4	27.621	
154	Pierre GASLY	SOFT	2024-03-23T01:59:03.590000+00:00	6	27.346	
192	Pierre GASLY	SOFT	2024-03-23T02:04:06.090000+00:00	9	27.183	
289	Pierre GASLY	SOFT	2024-03-23T02:21:57.773000+00:00	12	30.720	
301	Pierre GASLY	SOFT	2024-03-23T02:23:24.072000+00:00	13	27.085	
326	Pierre GASLY	SOFT	2024-03-23T02:26:40.988000+00:00	15	27.256	
357	Pierre GASLY	SOFT	2024-03-23T02:29:43.573000+00:00	17	27.217	

Williams

In [122...

libraryDataF1.getinfo(longruns(jointables2,23,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[122...

	full_name	compound	date_start	lap_number	duration_sector_1	di
34	Alexander ALBON	MEDIUM	2024-03-23T01:43:50.319000+00:00	2	33.379	
40	Alexander ALBON	MEDIUM	2024-03-23T01:45:22.355000+00:00	3	27.639	
50	Alexander ALBON	MEDIUM	2024-03-23T01:48:36.036000+00:00	5	27.149	
76	Alexander ALBON	MEDIUM	2024-03-23T01:51:53.022000+00:00	7	27.135	
93	Alexander ALBON	MEDIUM	2024-03-23T01:53:11.715000+00:00	8	30.140	
107	Alexander ALBON	MEDIUM	2024-03-23T01:54:37.376000+00:00	9	28.809	
209	Alexander ALBON	SOFT	2024-03-23T02:07:58.406000+00:00	12	26.832	
240	Alexander ALBON	SOFT	2024-03-23T02:15:01.462000+00:00	16	26.939	
319	Alexander ALBON	SOFT	2024-03-23T02:25:56.495000+00:00	19	26.917	

In [123...

libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[123...

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

Kick Sauber

```
In [124... libraryDataF1.getinfo(longruns(jointables2,24,'Kick Sauber',MINIMUM_SECONDS
```

	full_name	compound	date_start	lap_number	duration_sector_1	du
79	ZHOU Guanyu	SOFT	2024-03-23T01:52:12.366000+00:00	4	27.809	
116	ZHOU Guanyu	SOFT	2024-03-23T01:55:31.143000+00:00	6	27.490	
174	ZHOU Guanyu	SOFT	2024-03-23T02:01:11.547000+00:00	9	27.419	
247	ZHOU Guanyu	SOFT	2024-03-23T02:16:05.655000+00:00	12	27.361	
286	ZHOU Guanyu	SOFT	2024-03-23T02:21:32.538000+00:00	15	27.030	

```
In [125... libraryDataF1.getinfo(longruns(jointables2,77,'Kick Sauber',MINIMUM_SECONDS
```

	full_name	compound	date_start	lap_number	duration_sector_1	du
73	Valtteri BOTTAS	SOFT	2024-03-23T01:51:15.743000+00:00	4	27.630	
106	Valtteri BOTTAS	SOFT	2024-03-23T01:54:32.369000+00:00	6	27.604	
166	Valtteri BOTTAS	SOFT	2024-03-23T02:00:09.372000+00:00	9	27.312	
252	Valtteri BOTTAS	SOFT	2024-03-23T02:17:02.670000+00:00	14	26.893	
273	Valtteri BOTTAS	SOFT	2024-03-23T02:20:18.773000+00:00	16	26.994	

Qualyfing

Set up

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

Race control

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

```
In [126... libraryDataF1.obtain_information('race_control',session_key=9484)
```

	session_key	meeting_key	date	category	flag	lap_number
0	9484	1231	2024-03-23T04:45:13+00:00	Other	None	None

	session_key	meeting_key	date	category	flag	lap_number
1	9484	1231	2024-03-23T04:48:45+00:00	Other	None	None
2	9484	1231	2024-03-23T05:00:01+00:00	Flag	GREEN	None
3	9484	1231	2024-03-23T05:03:21+00:00	Other	None	None
4	9484	1231	2024-03-23T05:04:37+00:00	Other	None	None
5	9484	1231	2024-03-23T05:05:40+00:00	Other	None	None
6	9484	1231	2024-03-23T05:11:01+00:00	Other	None	None
7	9484	1231	2024-03-23T05:12:14+00:00	Other	None	None
8	9484	1231	2024-03-23T05:18:00+00:00	Flag	CHEQUERED	None
9	9484	1231	2024-03-23T05:18:07+00:00	Other	None	None
10	9484	1231	2024-03-23T05:18:34+00:00	Other	None	None
11	9484	1231	2024-03-23T05:22:40+00:00	Other	None	None
12	9484	1231	2024-03-23T05:23:20+00:00	Other	None	None

	session_key	meeting_key	date	category	flag	lap_number
13	9484	1231	2024-03-23T05:25:01+00:00	Flag	GREEN	None
14	9484	1231	2024-03-23T05:40:00+00:00	Flag	CHEQUERED	None
15	9484	1231	2024-03-23T05:40:08+00:00	Other	None	None
16	9484	1231	2024-03-23T05:48:01+00:00	Flag	GREEN	None
17	9484	1231	2024-03-23T05:51:03+00:00	Other	None	None
18	9484	1231	2024-03-23T05:51:28+00:00	CarEvent	None	None
19	9484	1231	2024-03-23T05:51:35+00:00	Flag	CLEAR	None
20	9484	1231	2024-03-23T06:00:01+00:00	Flag	CHEQUERED	None
21	9484	1231	2024-03-23T06:00:20+00:00	Other	None	None
22	9484	1231	2024-03-23T06:02:43+00:00	Other	None	None
23	9484	1231	2024-03-23T06:03:17+00:00	Flag	DOUBLE YELLOW	None
24	9484	1231	2024-03-23T06:03:29+00:00	Flag	YELLOW	None
25	9484	1231	2024-03-23T06:03:44+00:00	Flag	YELLOW	None
26	9484	1231	2024-03-23T06:03:45+00:00	Other	None	None
27	9484	1231	2024-03-23T06:03:48+00:00	Flag	DOUBLE YELLOW	None

	session_key	meeting_key	date	category	flag	lap_number
28	9484	1231	2024-03-23T06:04:02+00:00	Flag	YELLOW	None
29	9484	1231	2024-03-23T06:04:03+00:00	Other	None	None
30	9484	1231	2024-03-23T06:04:36+00:00	Flag	YELLOW	None
31	9484	1231	2024-03-23T06:06:01+00:00	Flag	CLEAR	None
32	9484	1231	2024-03-23T06:06:54+00:00	Flag	CLEAR	None
33	9484	1231	2024-03-23T06:07:00+00:00	Flag	CLEAR	None
34	9484	1231	2024-03-23T06:07:41+00:00	Flag	CLEAR	None
35	9484	1231	2024-03-23T06:07:46+00:00	Other	None	None
36	9484	1231	2024-03-23T06:07:49+00:00	Flag	CLEAR	None

Obtain setup

In [127...

```
qualyfing = libraryDataF1.obtain_information('laps',session_key=9484)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9484)
drivers = libraryDataF1.obtain_information('drivers',session_key=9484)
```

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

In [128...

```
qualyfing = qualyfing.drop(131)
```

In [129...

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

Out[129...

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed
297	1231	9484	1	288.0	320	326 2024-03-23T05:58:

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 = qualifyng.query("is_pit_out_lap == False and lap_duration < 1.5")
competitiveLaps
```

Out[130...

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
10	1231	9484	23	285.0	318	321	2024-03-23T05:01:00.000
11	1231	9484	31	258.0	300	288	2024-03-23T05:01:00.000
12	1231	9484	10	NaN	303	291	2024-03-23T05:01:00.000
13	1231	9484	27	286.0	325	324	2024-03-23T05:02:00.000
15	1231	9484	20	286.0	322	324	2024-03-23T05:02:00.000
...
301	1231	9484	4	287.0	315	320	2024-03-23T05:58:00.000
302	1231	9484	63	286.0	314	320	2024-03-23T05:58:00.000
304	1231	9484	18	285.0	317	324	2024-03-23T05:59:00.000
305	1231	9484	22	286.0	317	322	2024-03-23T05:59:00.000
306	1231	9484	14	285.0	320	323	2024-03-23T05:59:00.000

111 rows × 16 columns

```
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...

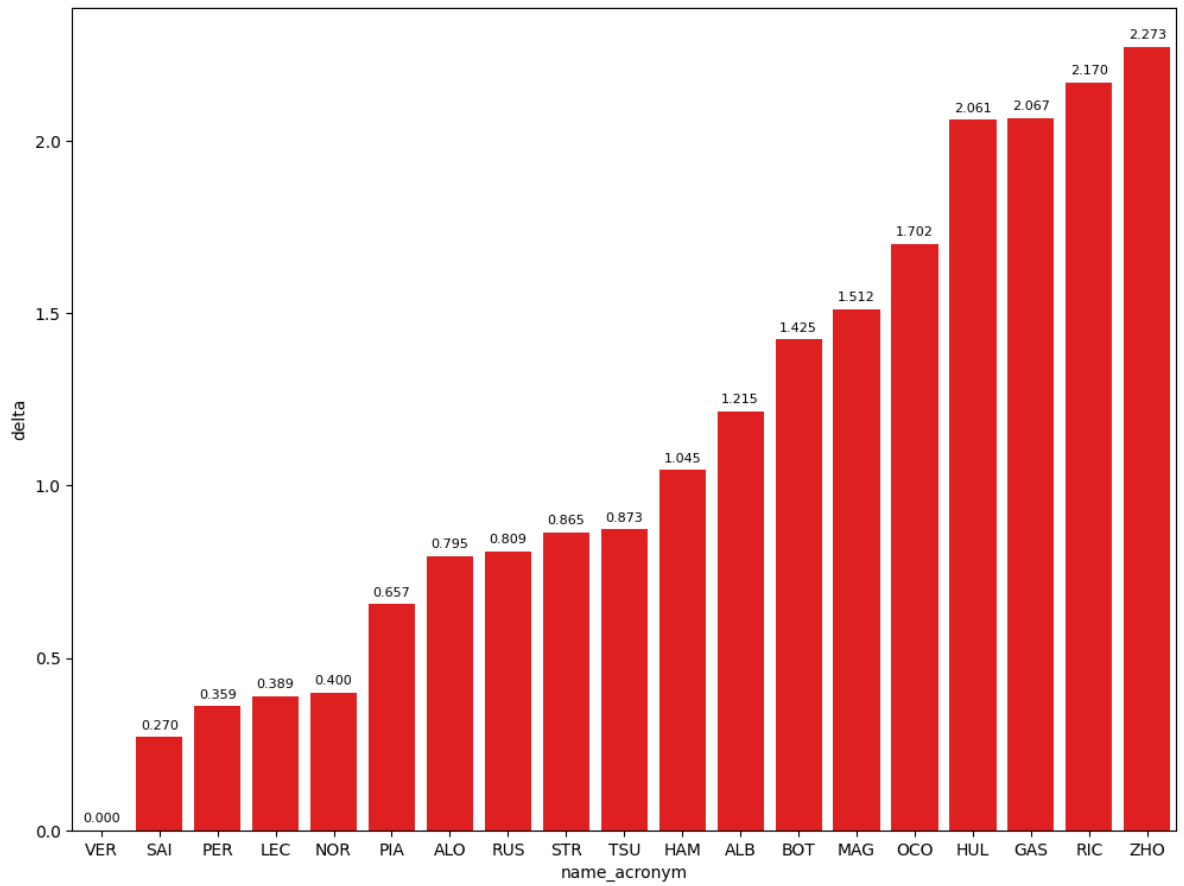
	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
7	1	75.915	0.000	325	286.0	319	9484	1231
11	55	76.185	0.270	320	286.0	315	9484	1231
8	11	76.274	0.359	325	288.0	319	9484	1231

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
12	16	76.304	0.389	321	285.0	317	9484	1231
13	4	76.315	0.400	320	285.0	312	9484	1231
14	81	76.572	0.657	321	286.0	308	9484	1231
10	14	76.710	0.795	159	267.0	268	9484	1231
15	63	76.724	0.809	245	189.0	295	9484	1231
9	18	76.780	0.865	292	251.0	289	9484	1231
17	22	76.788	0.873	320	284.0	314	9484	1231
16	44	76.960	1.045	318	285.0	313	9484	1231
0	23	77.130	1.215	321	285.0	318	9484	1231
5	77	77.340	1.425	319	283.0	314	9484	1231
4	20	77.427	1.512	324	286.0	320	9484	1231
1	31	77.617	1.702	288	253.0	297	9484	1231
3	27	77.976	2.061	324	286.0	322	9484	1231
2	10	77.982	2.067	291	265.0	303	9484	1231
18	3	78.085	2.170	320	285.0	316	9484	1231
6	24	78.188	2.273	318	283.0	313	9484	1231

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

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

In [132... `libraryDataF1.obtainchart("name_acronym","delta",jointables.sort_values(by=`

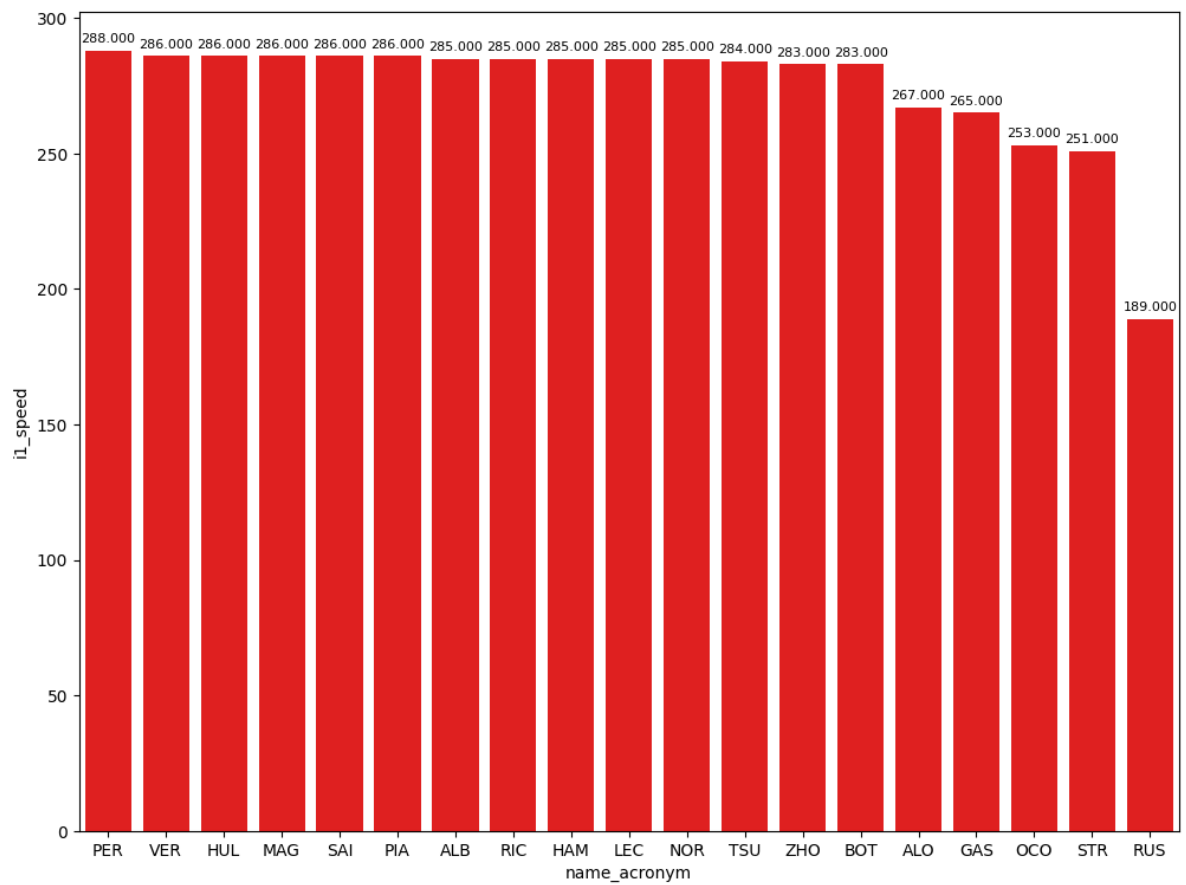


Speed trap

Maximum speed per drivers

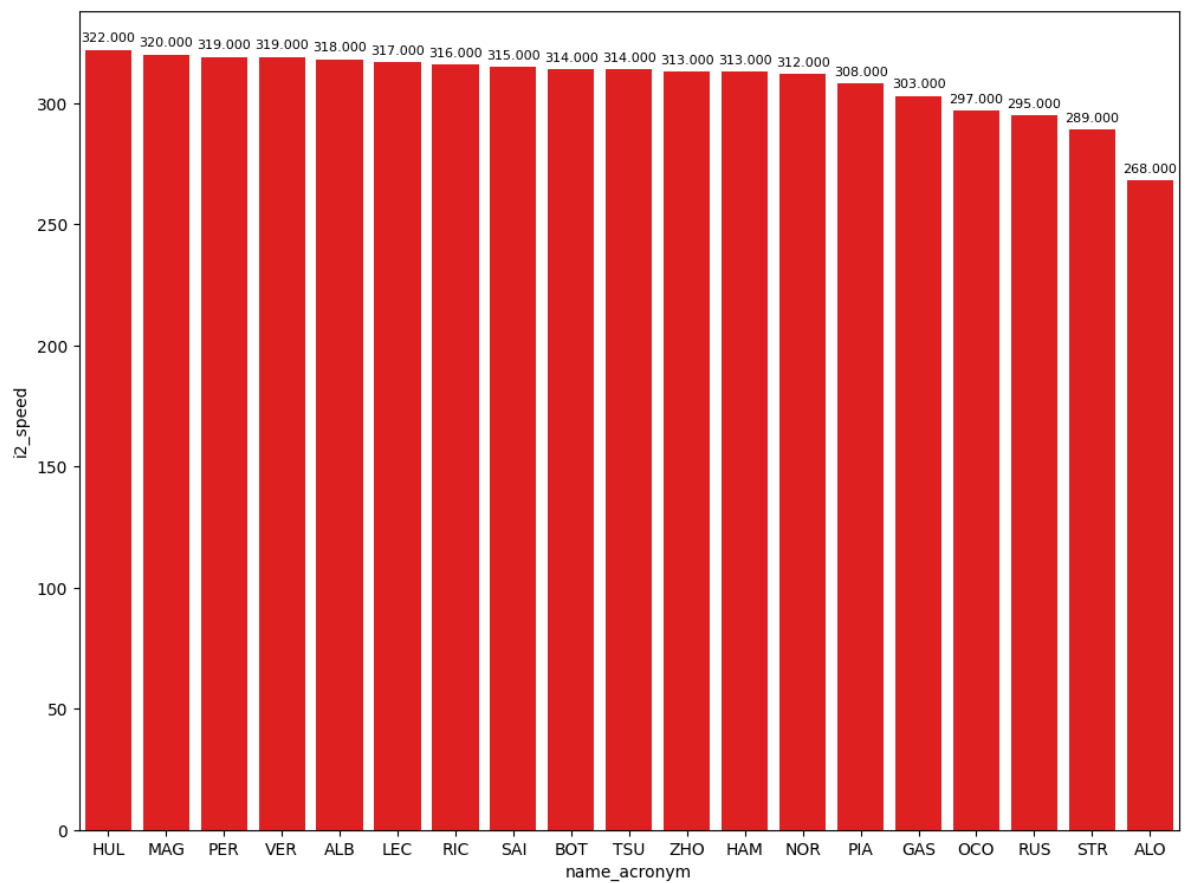
In [133...

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



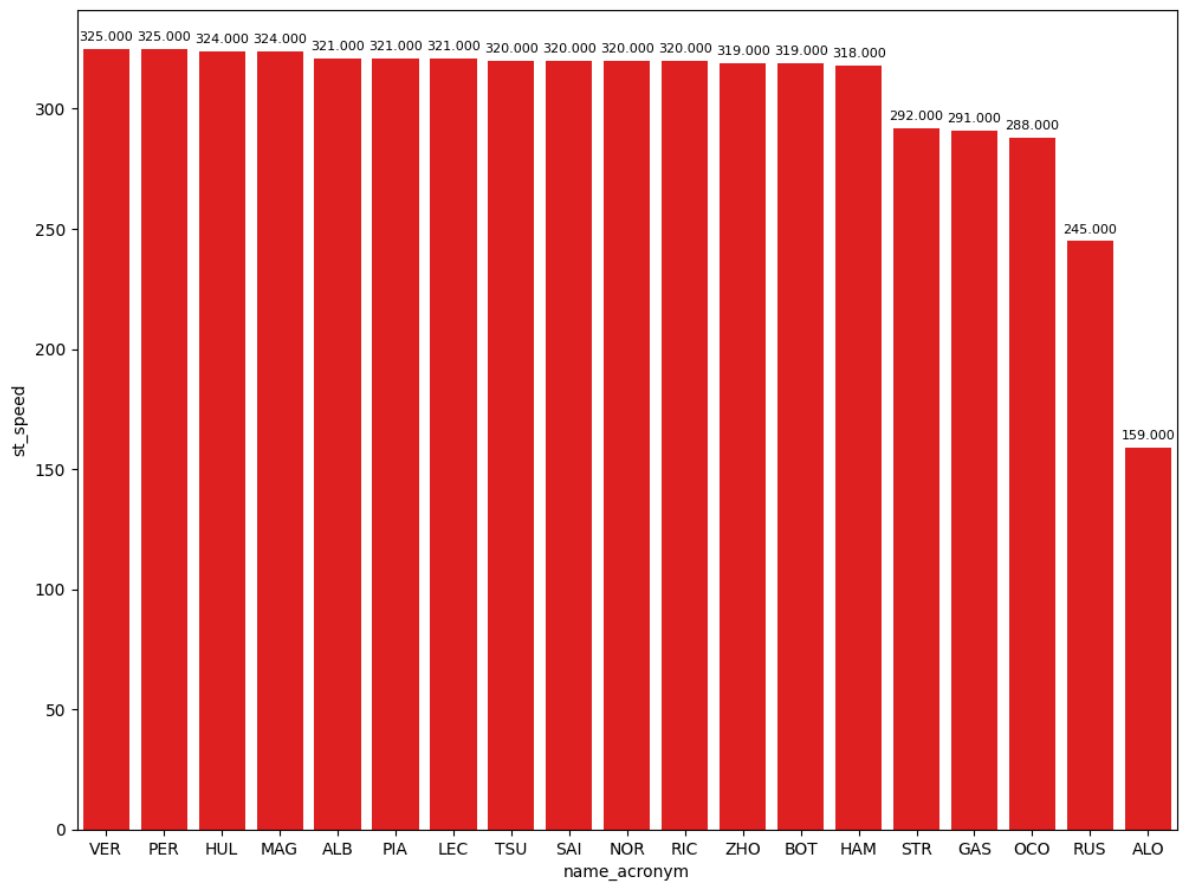
In [134...

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



In [135...

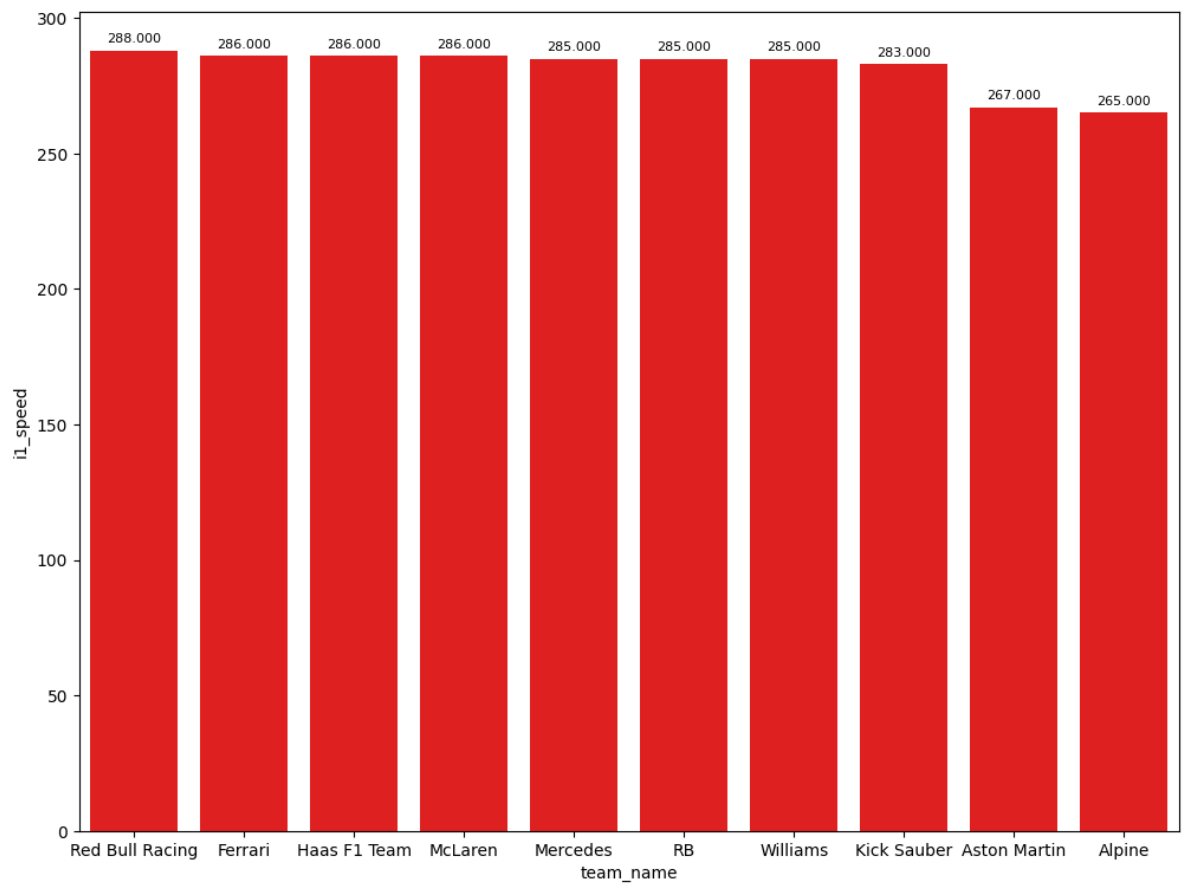
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['st_speed']  
libraryDataFl.obtainchart("name_acronym","st_speed",top_speed)
```



Maximum speed per teams

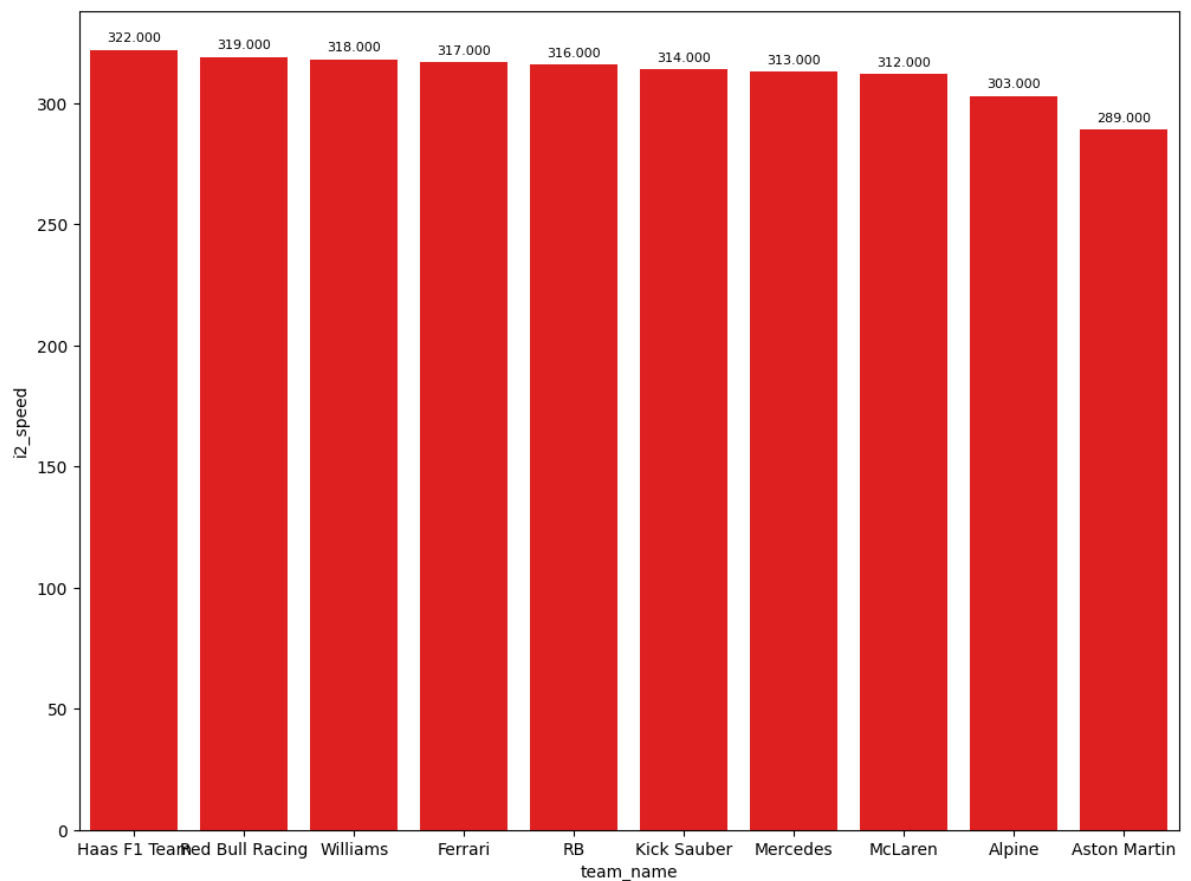
In [136...

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

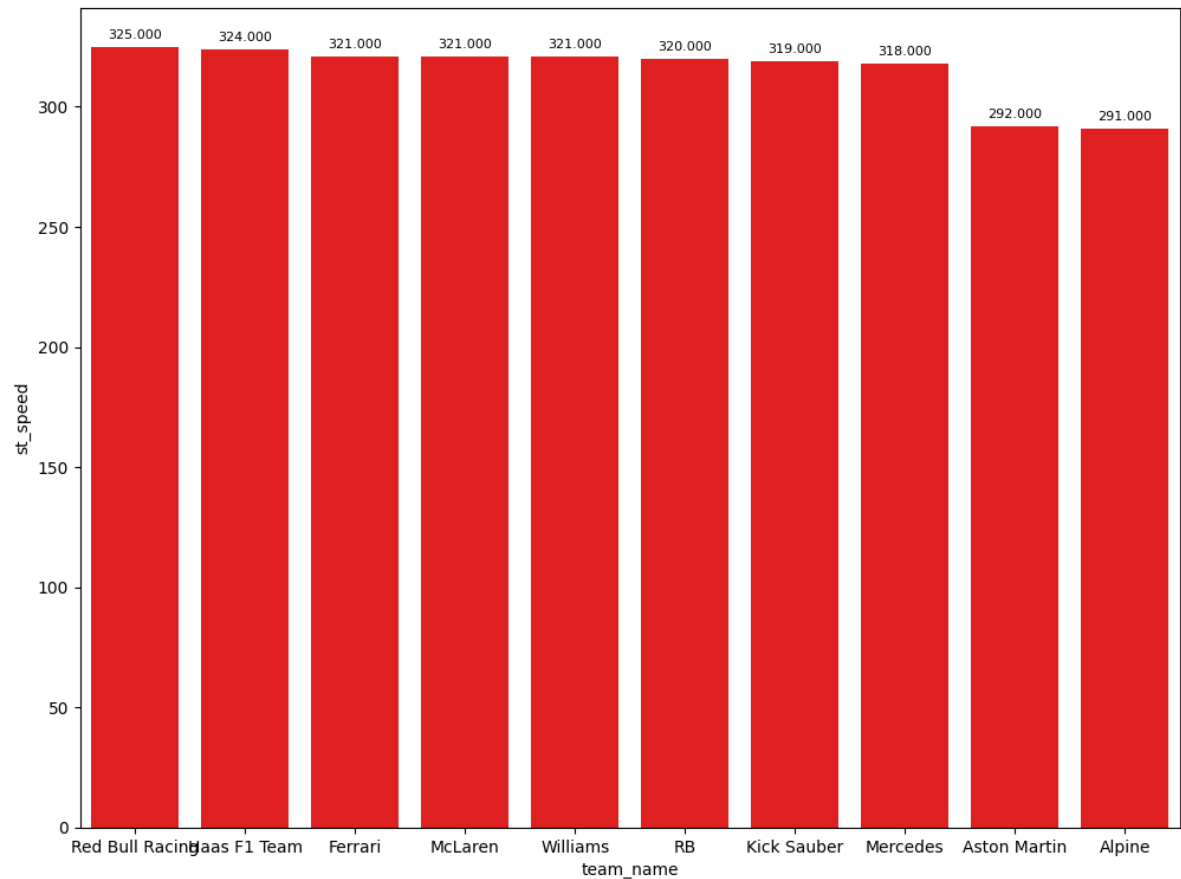


In [137...

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



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



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

meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
0	1231	9484	23	285.0	318	321 2024-03-23T0
1	1231	9484	23	285.0	318	324 2024-03-23T0
2	1231	9484	23	287.0	318	323 2024-03-23T0
3	1231	9484	23	286.0	319	323 2024-03-23T0
4	1231	9484	23	287.0	318	322 2024-03-23T0
...
106	1231	9484	22	284.0	316	321 2024-03-23T0
107	1231	9484	22	285.0	317	322 2024-03-23T0
108	1231	9484	22	285.0	314	320 2024-03-23T0
109	1231	9484	22	286.0	317	322 2024-03-23T0

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
110	1231	9484	3	285.0	316	320	2024-03-23T0

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

In [140...

```
maximumDateQ1 = "date_start <'2024-03-23T05:25:01+00:00'"
maximumDateQ2 = "date_start <'2024-03-23T05:48:01+00:00' and date_start >'"
maximumDateQ3 = "date_start >'2024-03-23T05:48:01+00:00'"
```

Qualyfinfing 1

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

In [141...

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

Out[141...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
68	1231	9484	55	286.0	318	322	2024-03-23T0
43	1231	9484	11	288.0	319	326	2024-03-23T0
36	1231	9484	1	287.0	319	326	2024-03-23T0
74	1231	9484	16	287.0	319	322	2024-03-23T0
60	1231	9484	14	285.0	315	324	2024-03-23T0
92	1231	9484	63	286.0	315	320	2024-03-23T0
2	1231	9484	23	287.0	318	323	2024-03-23T0
105	1231	9484	22	285.0	316	321	2024-03-23T0
86	1231	9484	81	288.0	315	323	2024-03-23T0
51	1231	9484	18	281.0	313	322	2024-03-23T0
80	1231	9484	4	288.0	315	322	2024-03-23T0
100	1231	9484	44	286.0	313	318	2024-03-23T0
28	1231	9484	77	285.0	318	320	2024-03-23T0
9	1231	9484	31	286.0	320	323	2024-03-23T0

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
23	1231	9484	20	288.0	321	325	2024-03-23T0
21	1231	9484	27	289.0	322	324	2024-03-23T0
17	1231	9484	10	286.0	317	322	2024-03-23T0
110	1231	9484	3	285.0	316	320	2024-03-23T0
32	1231	9484	24	285.0	313	322	2024-03-23T0

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	
23	1231	9484	20	288.0	321	325	2024-03-23T05

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: Kevin MAGNUSSEN Sector 1: 26.823 Sector 2: 17.531 Sector 3: 33.355

In [144...

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

Out[144...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
21	1231	9484	27	289.0	322	324	2024-03-23T0
17	1231	9484	10	286.0	317	322	2024-03-23T0
110	1231	9484	3	285.0	316	320	2024-03-23T0
32	1231	9484	24	285.0	313	322	2024-03-23T0

4 rows × 28 columns

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

As Ricciardo's best lap was deleted, Magnussen qualified to Q2 but, as I only use the valid lap, I will analyse Magnussen's laptime compared to the eliminated drivers. Once said this one, we can see that the gap with the eliminated drivers is enough to determine that Magnussen was at risk.

```
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          27          0.267          -0.041          0.086          0.222
1          10          0.273           0.094          0.101          0.078
2           3          0.376           0.231          0.220         -0.075
3          24          0.479           0.168          0.413         -0.102
```

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. Magnussen's laptime was good in the first and second sector being better than others drivers such as Norris and Hamilton but, his third sector was so slow such as degree that the drivers that were worse laptimes were able to finish in a better postion than the Danish 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          55         -0.978          -0.119          0.029         -0.888
1          11         -0.904          -0.144         -0.050         -0.710
2           1         -0.890          -0.278         -0.027         -0.585
3          16         -0.725           0.065         -0.005         -0.785
4          14         -0.718          -0.185         -0.012         -0.521
5          63         -0.647          -0.213           0.018         -0.452
6          23         -0.579          -0.180           0.033         -0.432
7          22         -0.353          -0.147           0.145         -0.351
8          81         -0.340           0.008           0.032         -0.380
9          18         -0.333          -0.124           0.174         -0.383
10          4         -0.279           0.025           0.030         -0.334
11          44         -0.210           0.107           0.001         -0.318
12          77         -0.166          -0.112           0.212         -0.266
```

driver number lap duration difference sector 1 difference sector 2 difference sector 3 n

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...
```

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

name_acronym	
VER	26.545
RUS	26.610
ALO	26.638
ALB	26.643
TSU	26.676
PER	26.679
STR	26.699
SAI	26.704
BOT	26.711
HUL	26.782
MAG	26.823
PIA	26.831
NOR	26.848
OCO	26.857
LEC	26.888
GAS	26.917
HAM	26.930
ZHO	26.991
RIC	27.054

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

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

name_acronym	
PER	17.481
VER	17.504
ALO	17.519
LEC	17.526
MAG	17.531
HAM	17.532
RUS	17.549
SAI	17.560

	duration_sector_2
name_acronym	
NOR	17.561
PIA	17.563
ALB	17.564
OCO	17.613
HUL	17.617
GAS	17.632
TSU	17.676
STR	17.705
BOT	17.743

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

Out[149...

	duration_sector_3
name_acronym	
SAI	32.467
LEC	32.570
PER	32.645
VER	32.770
ALO	32.834
RUS	32.903
ALB	32.923
STR	32.972
PIA	32.975
TSU	33.004
NOR	33.021
HAM	33.037
BOT	33.089
OCO	33.147
ZHO	33.253
RIC	33.280
MAG	33.355
GAS	33.433
HUL	33.577

Qualyfing 2

In this session, we had the surprise of the fall of Mercedes being Hamilton knocked-out of Q2 and Russell finishing P10. Also, I have to stand out Tsunoda laptime that was able to beat

both Mercedes in this session

In [150...

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

Out[150...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
70	1231	9484	55	287.0	316	322	2024-03-23T0
77	1231	9484	16	285.0	318	321	2024-03-23T0
37	1231	9484	1	289.0	321	327	2024-03-23T0
87	1231	9484	81	288.0	315	325	2024-03-23T0
45	1231	9484	11	288.0	320	325	2024-03-23T0
64	1231	9484	14	284.0	317	322	2024-03-23T0
81	1231	9484	4	287.0	312	322	2024-03-23T0
55	1231	9484	18	284.0	319	323	2024-03-23T0
107	1231	9484	22	285.0	317	322	2024-03-23T0
94	1231	9484	63	286.0	312	318	2024-03-23T0
103	1231	9484	44	287.0	315	319	2024-03-23T0
4	1231	9484	23	287.0	318	322	2024-03-23T0
30	1231	9484	77	286.0	319	319	2024-03-23T0
25	1231	9484	20	288.0	320	325	2024-03-23T0
13	1231	9484	31	287.0	322	323	2024-03-23T0

15 rows × 28 columns

Comparaision 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 comparaision 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: George RUSSELL Sector 1: 26.644 Sector 2: 17.568 Sector 3: 32.689

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

The third sector of Russell was enough to save him to be eliminated. In general, only Hamilton and Albon would have been able to eliminate Russell. In case of Hamilton, after finishing the second sector, he was 0.16 seconds quicker than Russell. In case of Albon, his second sector was better than Russell being very close to British's laptime (0.19 second worse than Russell) but he lost his chances with a poor third sector, being almost 3 tenths behind Russell.

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	44	0.059	0.076	-0.092	0.075	
1	23	0.266	0.041	-0.022	0.247	
2	77	0.439	0.126	0.036	0.277	
3	20	0.526	0.124	0.007	0.395	
4	31	0.796	0.255	0.013	0.528	

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 this weekend only being better than his rivals in the third sector.

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	55	-0.712	-0.343	-0.033	-0.336	
1	16	-0.597	-0.257	-0.145	-0.195	
2	1	-0.514	-0.167	-0.140	-0.207	

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
3	81	-0.300	-0.224	-0.080	0.004	
4	11	-0.270	-0.011	-0.156	-0.103	
5	14	-0.191	-0.067	-0.111	-0.013	
6	4	-0.151	-0.211	-0.076	0.136	
7	18	-0.121	-0.108	-0.122	0.100	

Best sector per driver

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

In [154... `pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_1'].min().sort`

Out[154...

	duration_sector_1
name_acronym	
SAI	26.301
LEC	26.387
PIA	26.420
NOR	26.433
STR	26.446
VER	26.477
TSU	26.558
ALO	26.577
PER	26.633
RUS	26.644
ALB	26.685
HAM	26.720
MAG	26.768
BOT	26.770
OCO	26.899

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

Out[155...

	duration_sector_2
name_acronym	
PER	17.412
LEC	17.423
VER	17.428
STR	17.446
ALO	17.457
HAM	17.476
PIA	17.488

	duration_sector_2
name_acronym	
NOR	17.492
TSU	17.519
SAI	17.535
ALB	17.546
RUS	17.568
MAG	17.575

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

Out[156...

	duration_sector_3
name_acronym	
SAI	32.353
VER	32.482
LEC	32.494
PER	32.586
ALO	32.676
RUS	32.689
PIA	32.693
TSU	32.714
HAM	32.764
NOR	32.825
STR	32.888
ALB	32.936
BOT	32.966
MAG	33.084
OCO	33.217

Qualyfinfing 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	
40	1231	9484	1	288.0	320	326	2024-03-23T0
72	1231	9484	55	288.0	318	323	2024-03-23T0
47	1231	9484	11	290.0	322	327	2024-03-23T0

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
84	1231	9484	4	287.0	315	320	2024-03-23T0
78	1231	9484	16	287.0	317	322	2024-03-23T0
89	1231	9484	81	288.0	316	321	2024-03-23T0
98	1231	9484	63	286.0	314	320	2024-03-23T0
109	1231	9484	22	286.0	317	322	2024-03-23T0
57	1231	9484	18	285.0	317	324	2024-03-23T0
66	1231	9484	14	285.0	320	323	2024-03-23T0

Comparaison with poleman

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

In [158...

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

Driver: Max VERSTAPPEN Sector 1: 26.262 Sector 2: 17.315 Sector 3: 32.338

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

Ferrari dominated the first sector, Red Bull the second and the third was disputed between them. Carlos Sainz showed a good pace in all the weekend and this session showed as well. Carlos was fastest in the first sector(as the data in free practice shown), Verstappen in the second but in the third, Carlos made a mistake in the exit of turn 12 and this costed the pole.

In [159...

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

Out[159...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	55	0.270	-0.040	0.119	0.191	
1	11	0.359	0.205	-0.026	0.180	
2	4	0.400	0.131	0.052	0.217	
3	16	0.520	0.176	0.226	0.118	
4	81	0.657	0.232	0.128	0.297	
5	63	0.809	0.239	0.187	0.383	

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
6	22	0.873	0.251	0.192	0.430	
7	18	1.157	0.251	0.190	0.716	
-	-	-	-	-	-	-

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_index())
```

```
Out[160]:
```

	duration_sector_1
name_acronym	
SAI	26.222
VER	26.262
NOR	26.393
LEC	26.438
PER	26.467
PIA	26.494
RUS	26.501
STR	26.513
TSU	26.513
ALO	26.838

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

```
Out[161]:
```

	duration_sector_2
name_acronym	
PER	17.289
VER	17.315
NOR	17.367
SAI	17.434
PIA	17.443
RUS	17.502
STR	17.505
TSU	17.507
LEC	17.541
ALO	17.555

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

```
Out[162]:
```

	duration_sector_1
--	-------------------

name_acronym	
SAI	26.222
VER	26.262
NOR	26.393
LEC	26.438
PER	26.467
PIA	26.494
RUS	26.501
STR	26.513
TSU	26.513
ALO	26.838

Best sector per driver of the session (in general)

In [163...

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

Out[163...

	duration_sector_1
name_acronym	
SAI	26.222
VER	26.262
LEC	26.387
NOR	26.393
PIA	26.420
STR	26.445
PER	26.467
RUS	26.501
TSU	26.513
ALO	26.577
ALB	26.643
BOT	26.711
HAM	26.720
MAG	26.768
HUL	26.782
ZHO	26.788
OCO	26.857
GAS	26.917
RIC	27.054

In [164...

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

Out[164...

duration_sector_2

name_acronym	
PER	17.289
VER	17.315
NOR	17.367
LEC	17.423
SAI	17.434
PIA	17.443
STR	17.446
ALO	17.457
HAM	17.476
RUS	17.502
TSU	17.507
HUL	17.515
MAG	17.531
ALB	17.546
OCO	17.581
BOT	17.604
GAS	17.605
ZHO	17.706
RIC	17.751

In [165...

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

Out[165...

duration_sector_3	
name_acronym	
VER	32.338
SAI	32.353
LEC	32.456
PER	32.518
NOR	32.555
PIA	32.622
ALO	32.660
HAM	32.675
RUS	32.689
TSU	32.714
STR	32.872
ALB	32.923
BOT	32.966
MAG	33.084
OCO	33.147

	duration_sector_3
name_acronym	
ZHO	33.253
RIC	33.280

Race

Obtain setup

```
In [166... race = libraryDataF1.obtain_information('laps',session_key=9488)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9488)
drivers = libraryDataF1.obtain_information('drivers',session_key=9488)
```

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

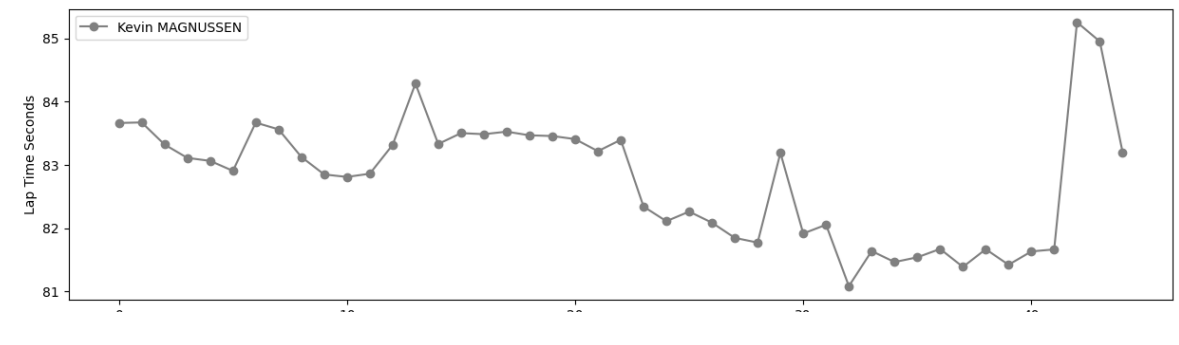
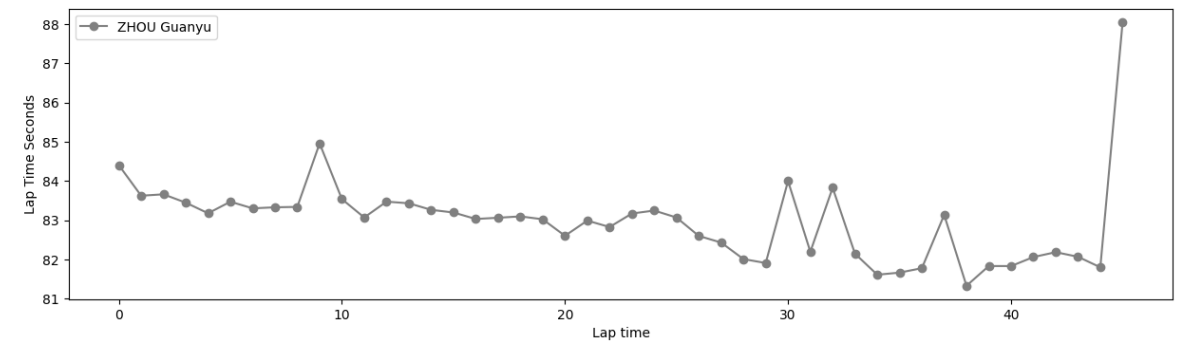
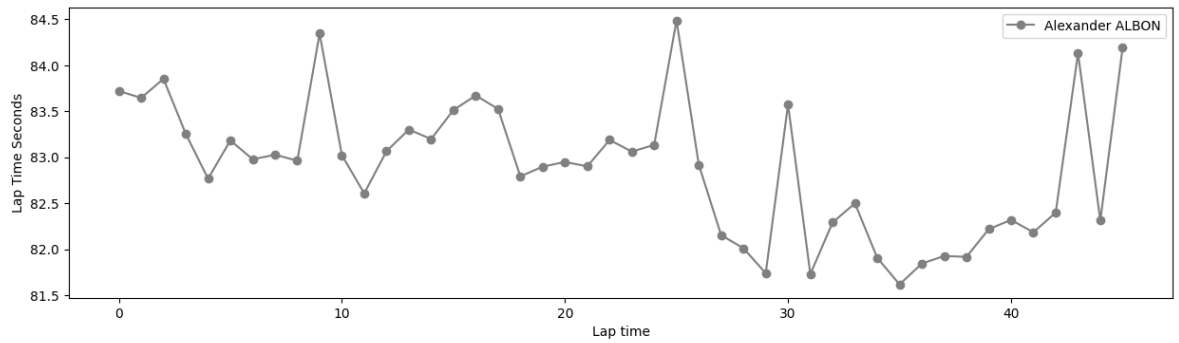
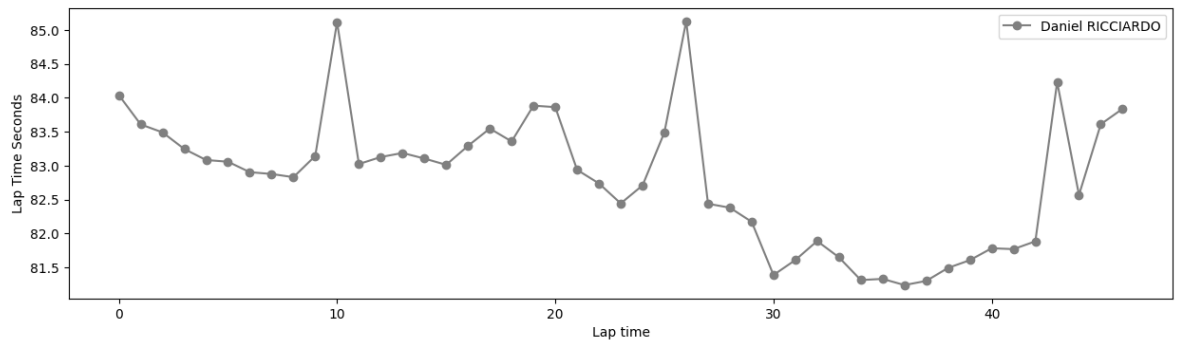
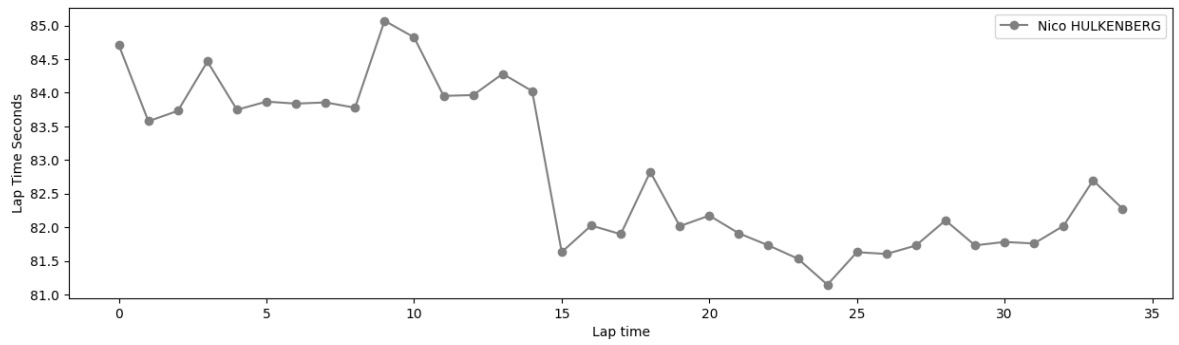
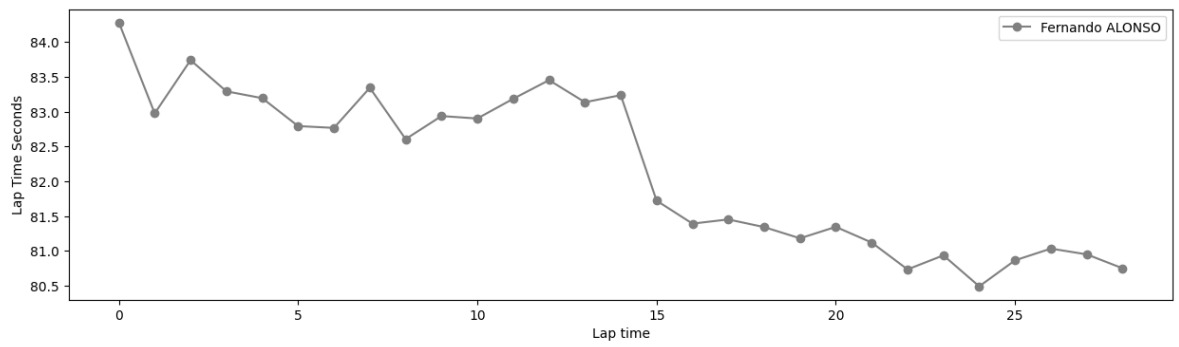
```
In [168... raceLaps = race.query("is_pit_out_lap == False")
jointables = pd.merge(raceLaps,stintsDataFrame,on=['lap_number','driver_number'])
```

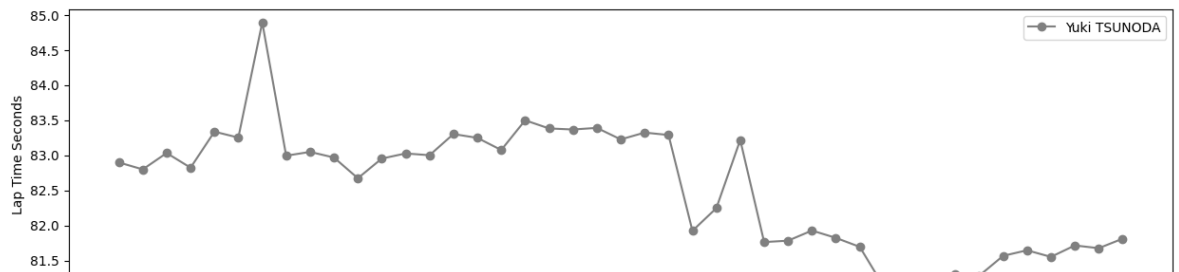
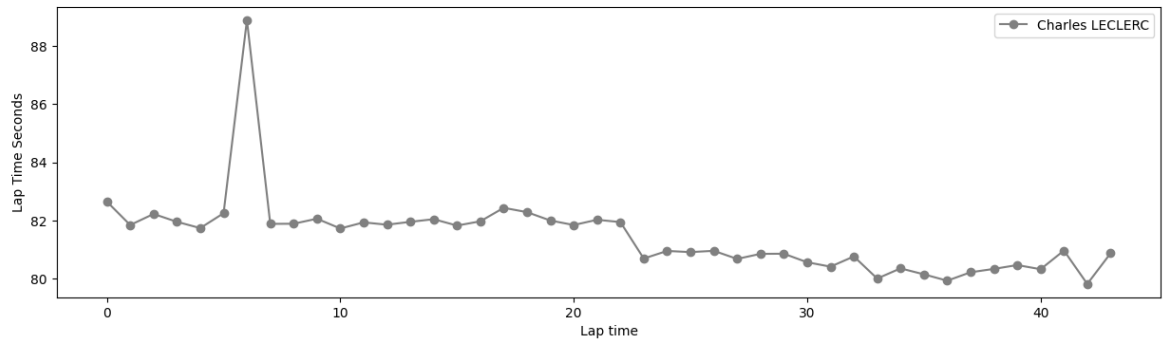
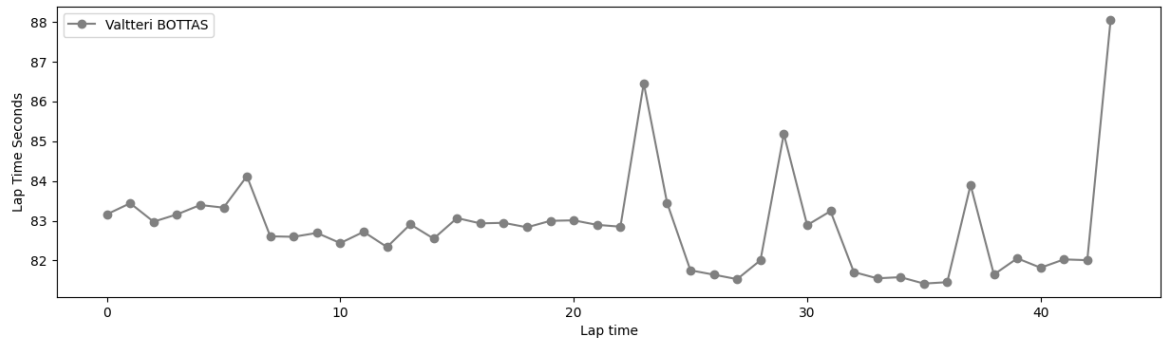
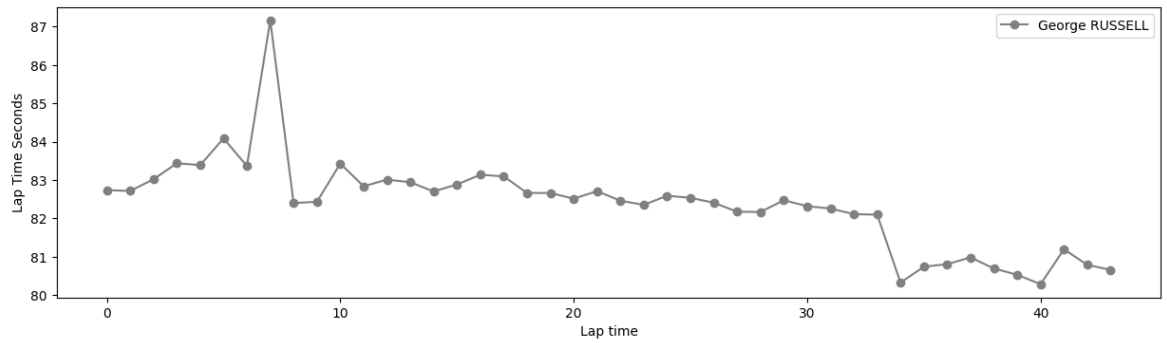
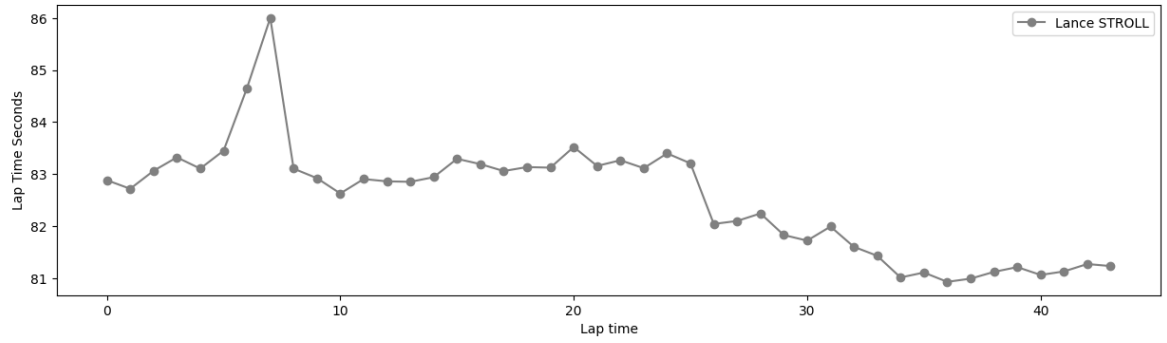
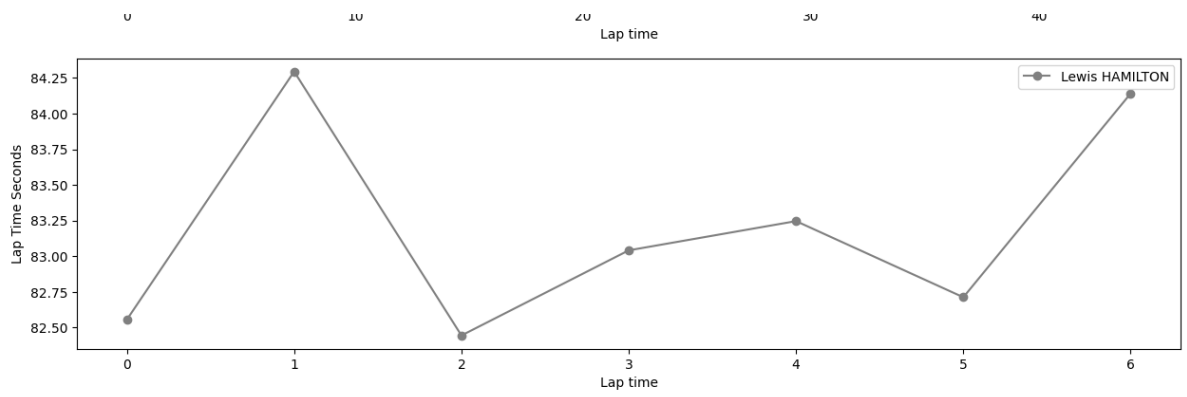
Obtain data tyres

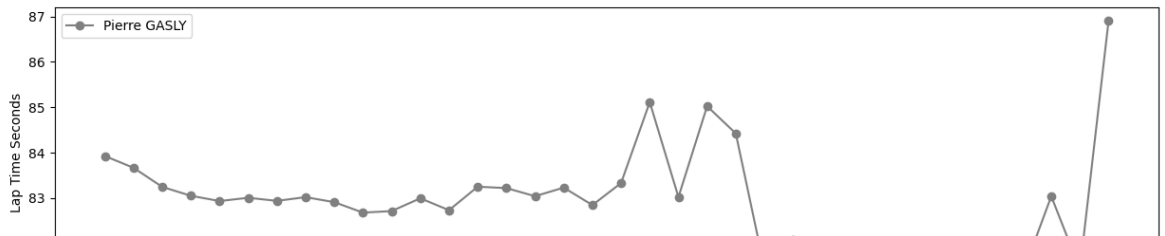
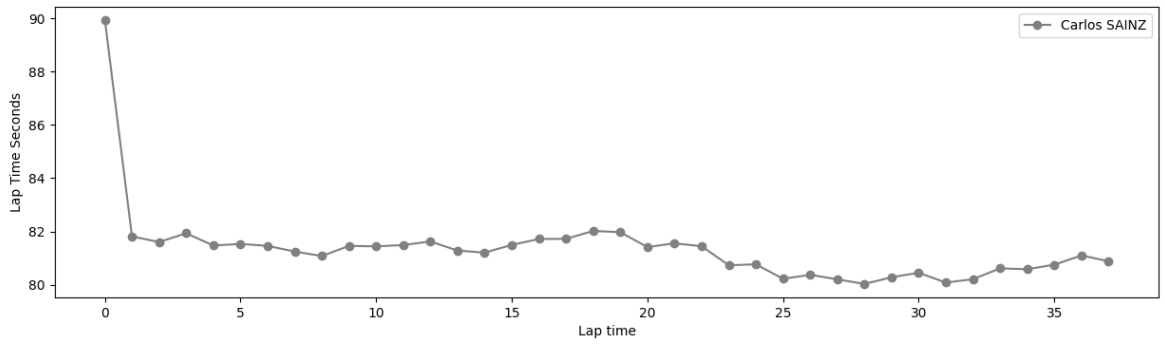
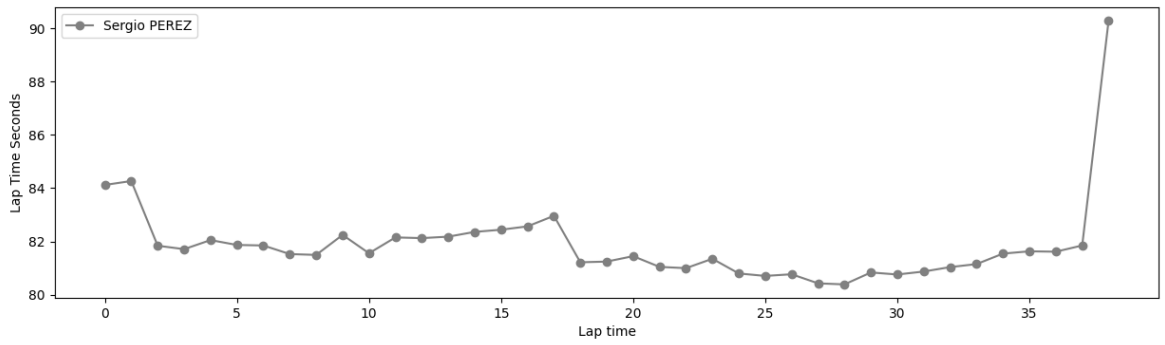
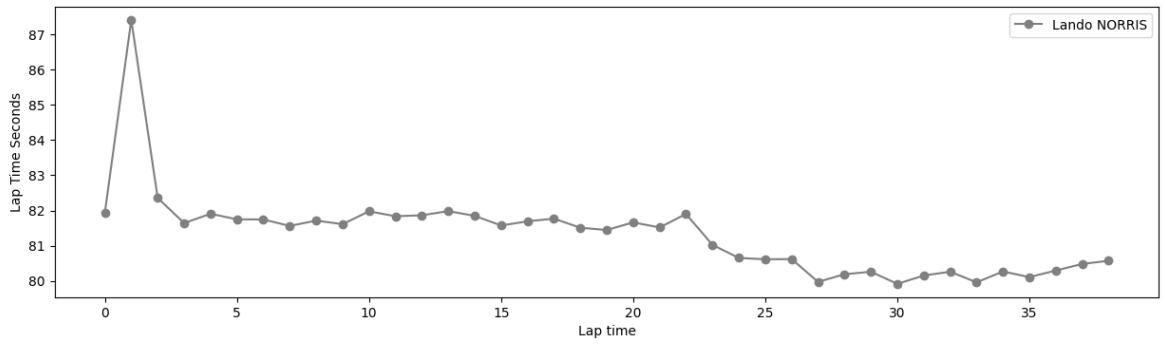
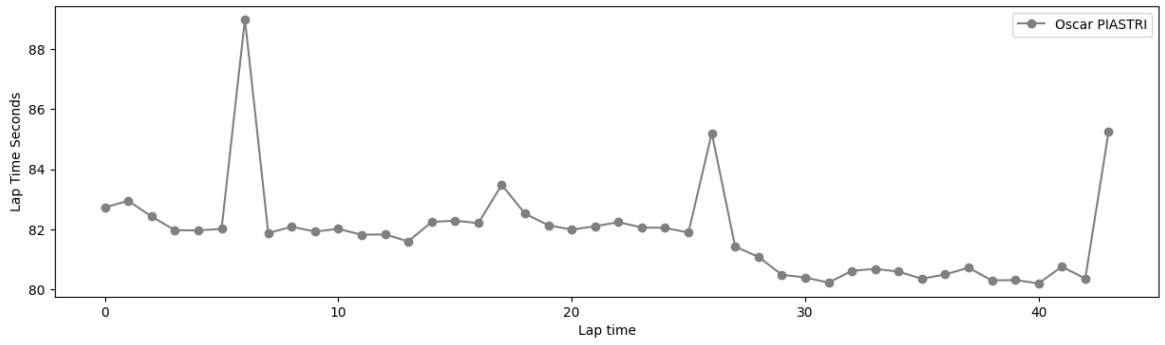
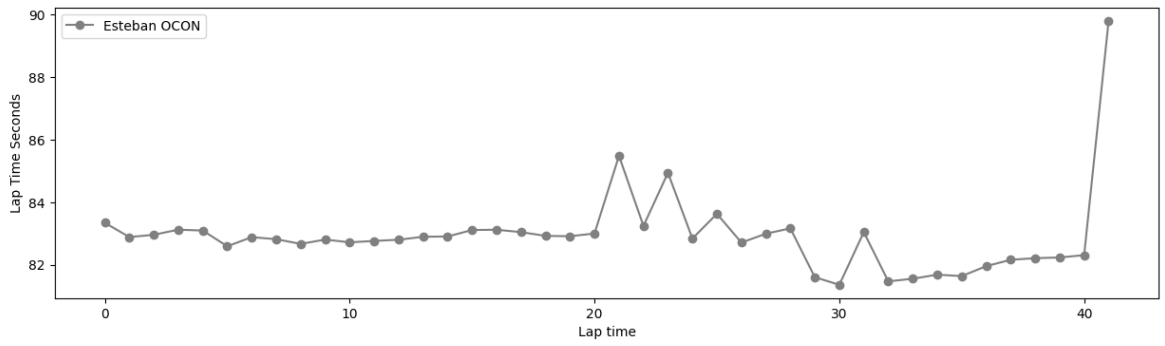
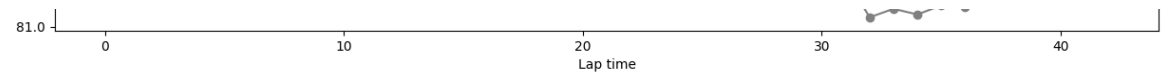
Hard tyres

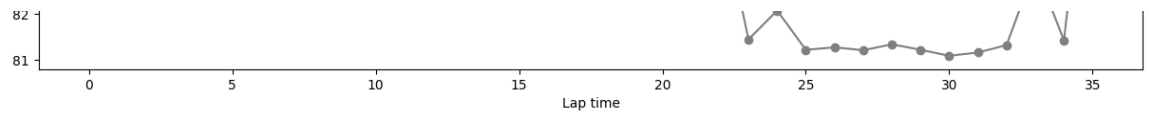
As Pirelli predicted, with this softest compounds that the Italian brand brought to Albert Park, it should stop two times and this occurred. With this compounds, drivers made 22 laps with this compound with a good race pace.

```
In [169... libraryDataF1.obtain_data_tyres(jointables,'HARD',95)
```







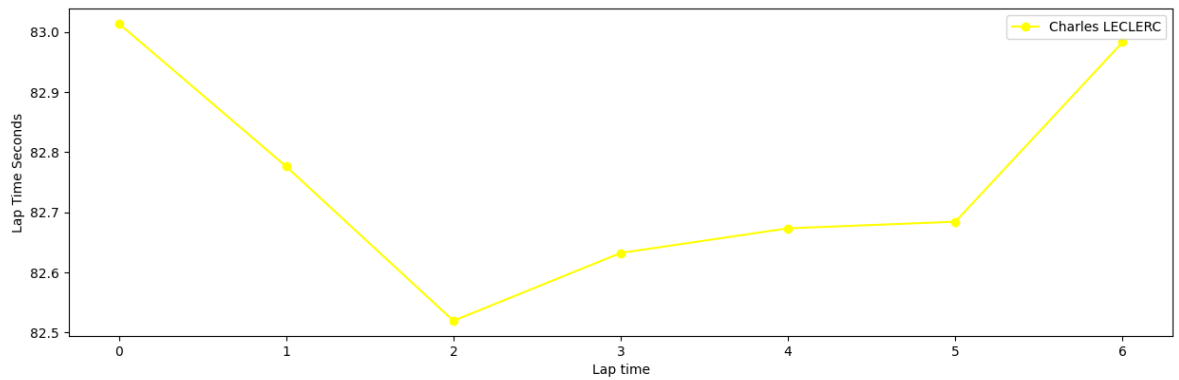
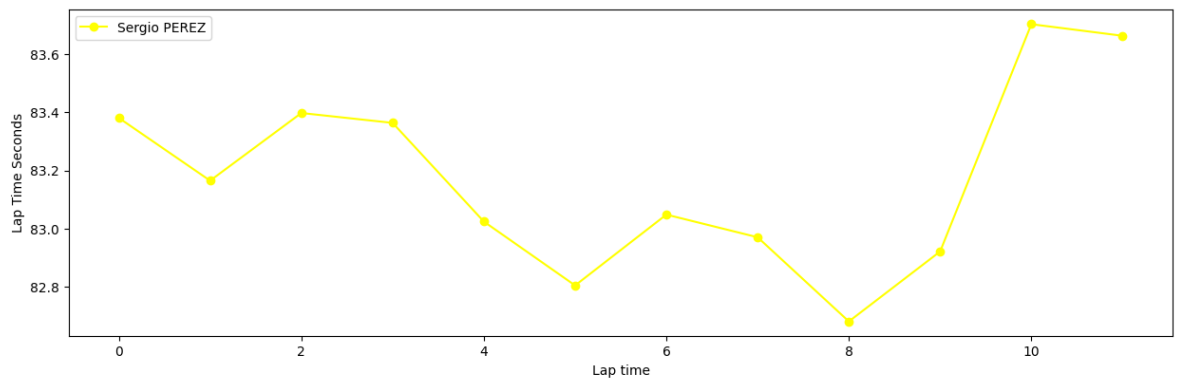
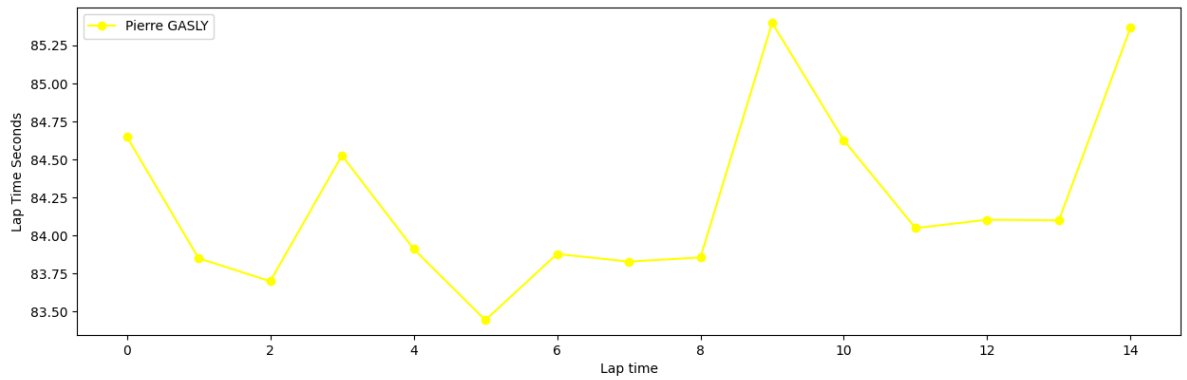
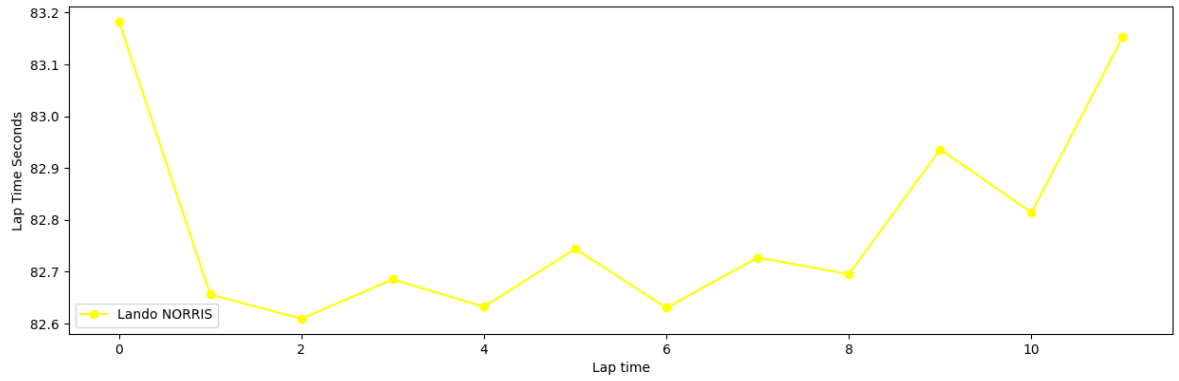
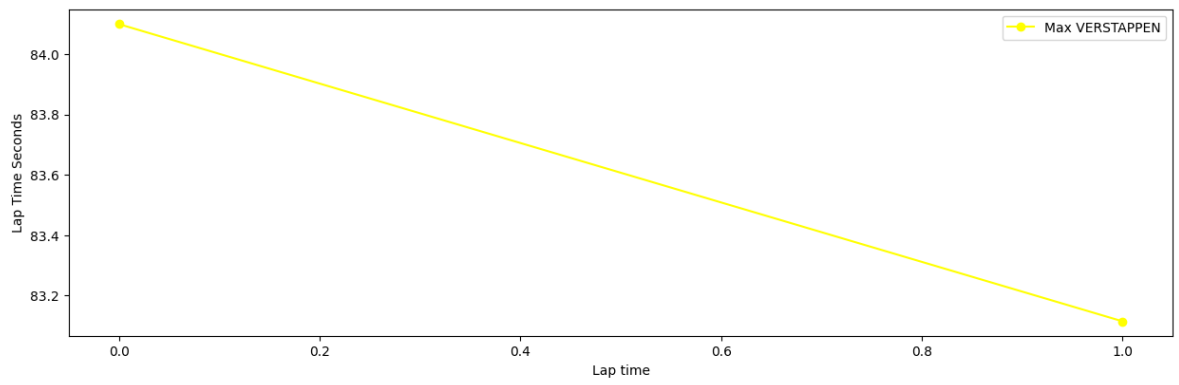


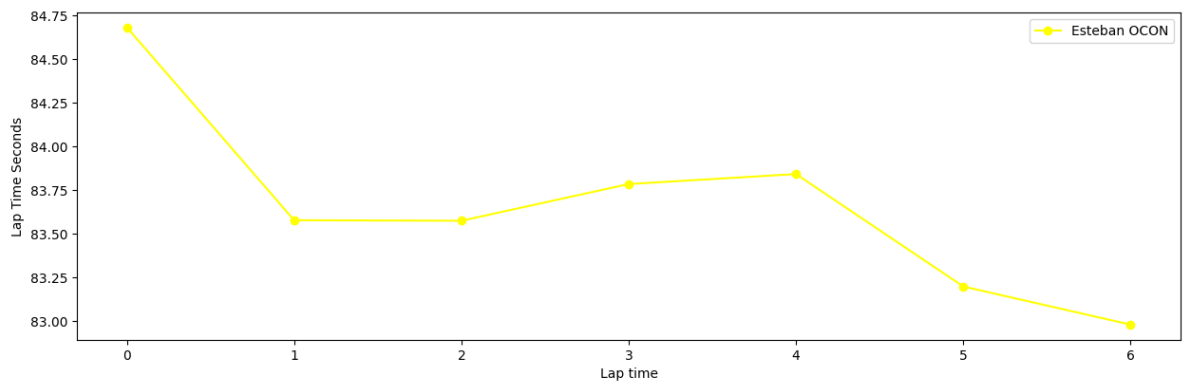
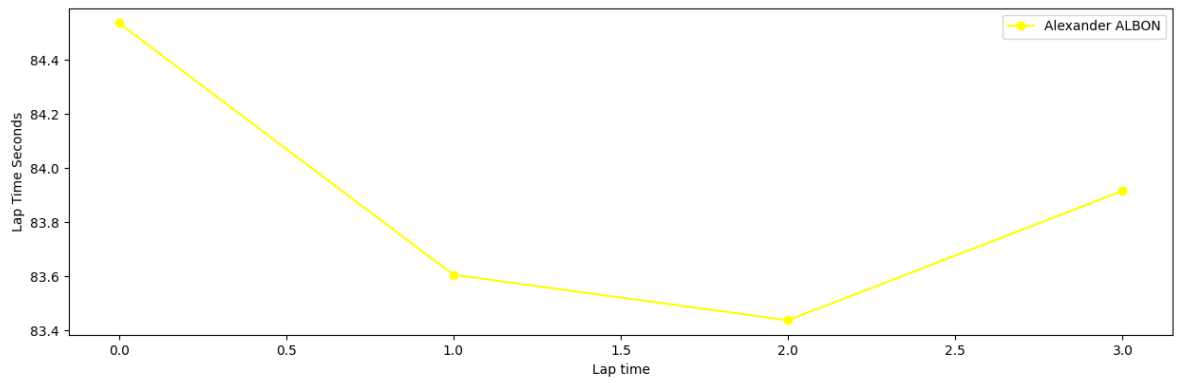
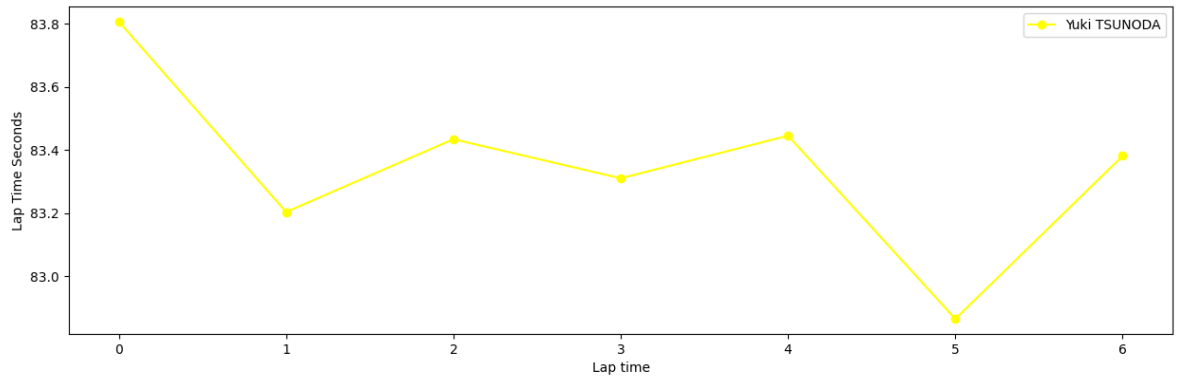
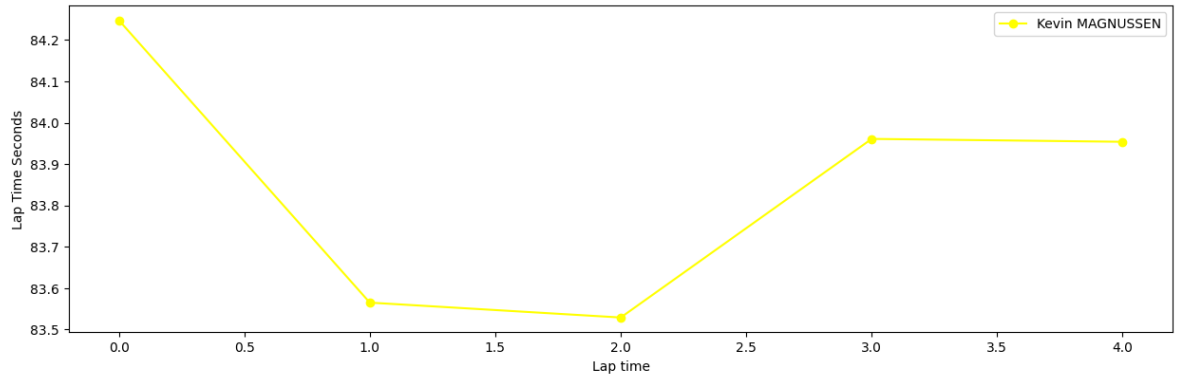
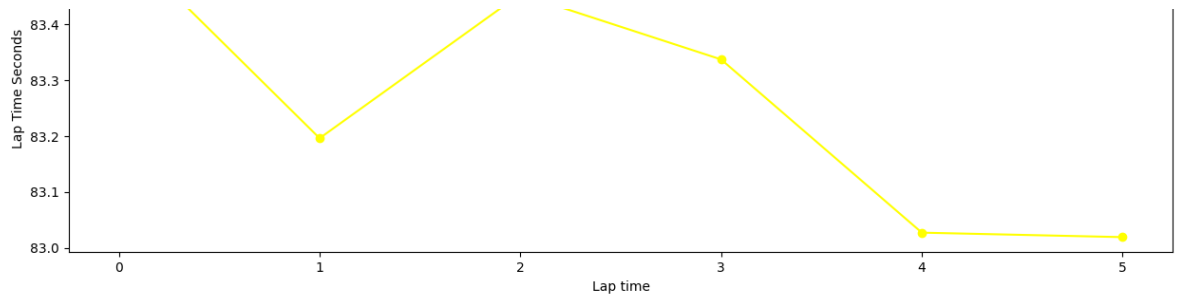
Medium tyres

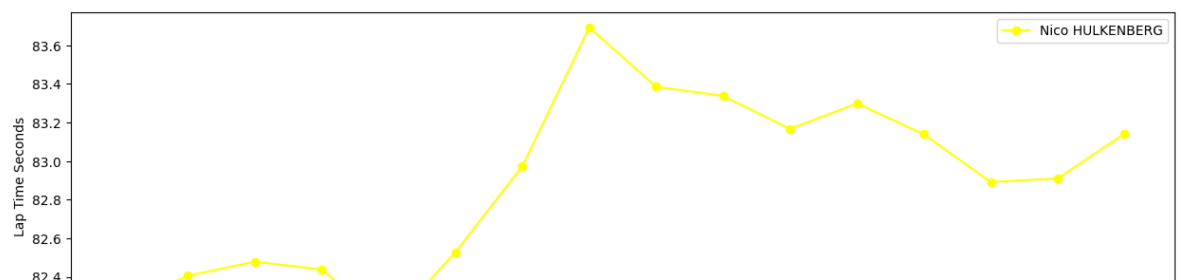
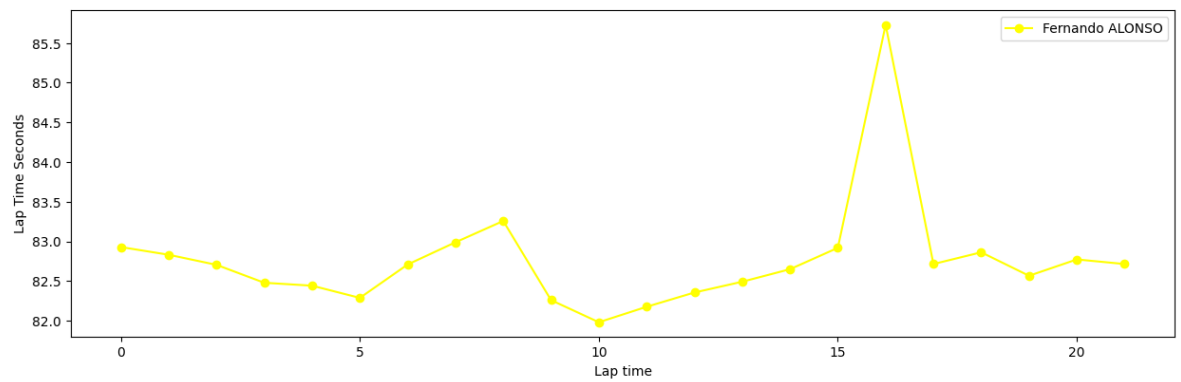
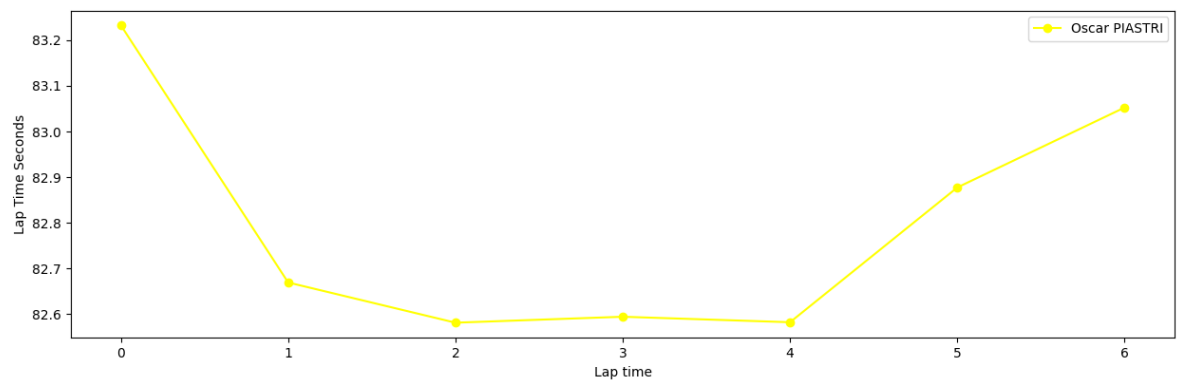
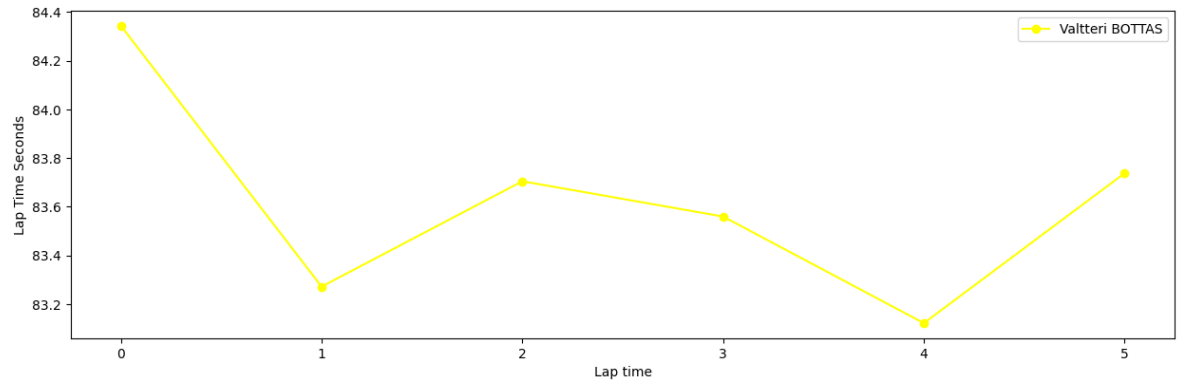
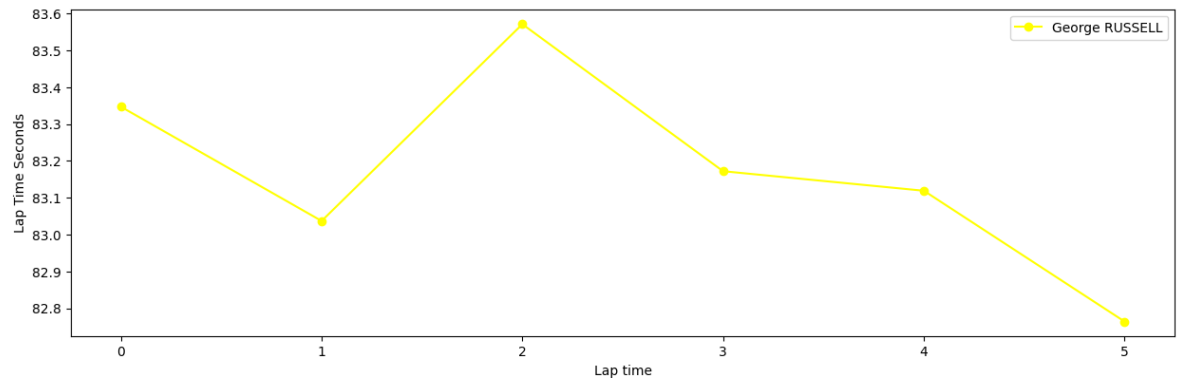
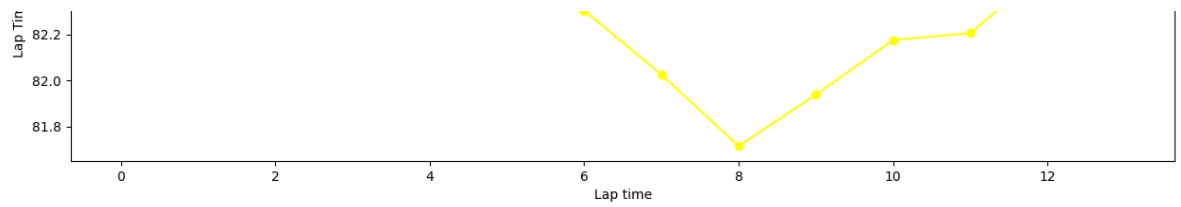
In general, drivers decided to stop early , beetween laps 4-14 except Fernando who waited for one external situation that occurred with Hamilton's retirement. With this strategy Fernando extended his stint until the lap 21 entering in pits with the virtual safety car.

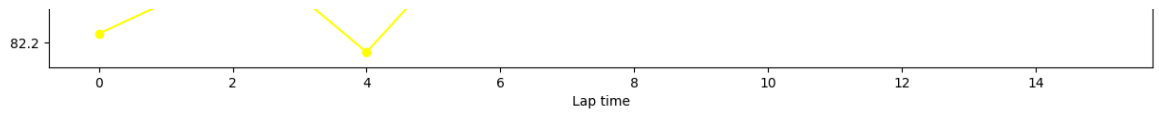
In [170...

```
libraryDataF1.obtain_data_tyres(jointables, 'MEDIUM', 95)
```







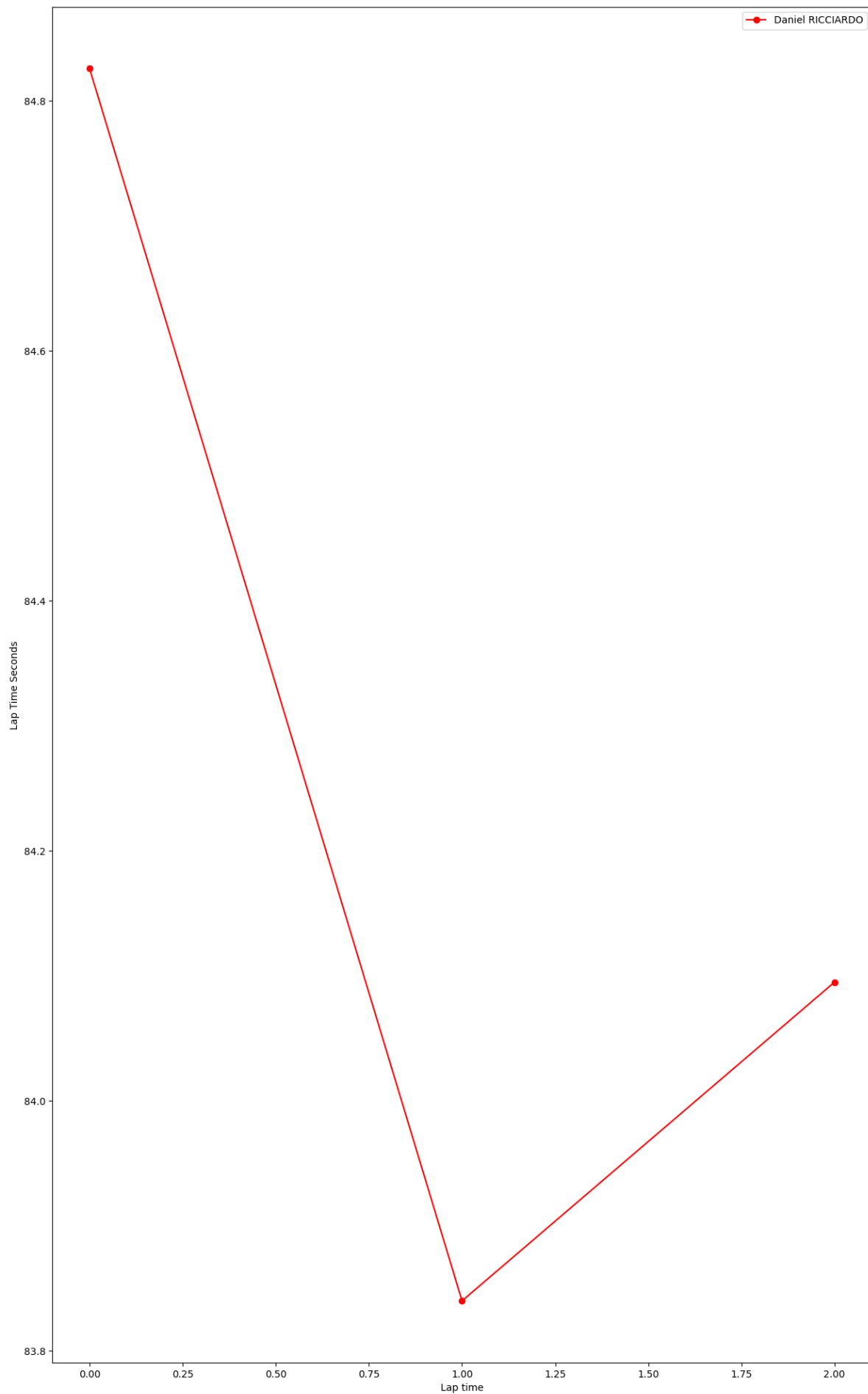


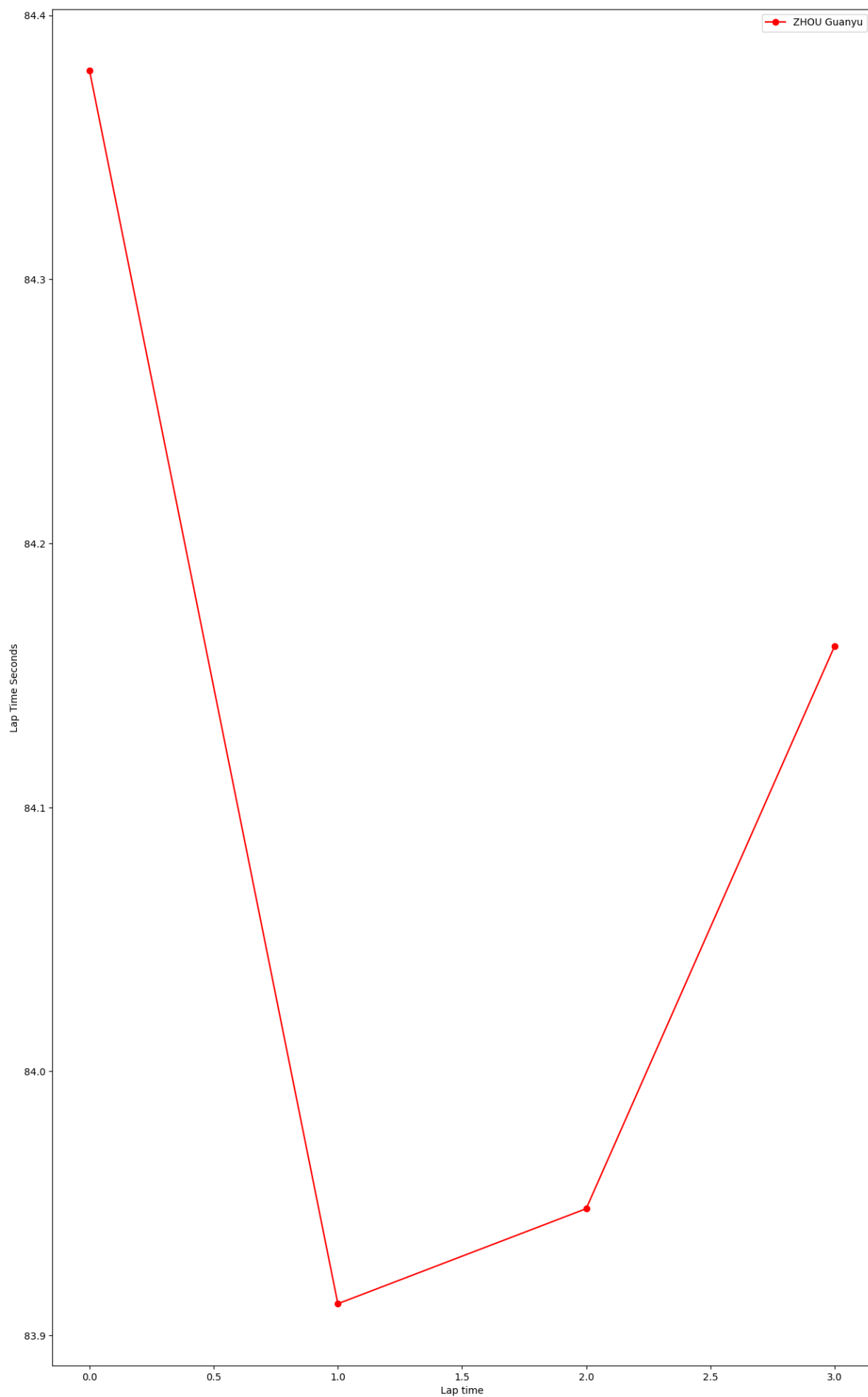
Soft tyres

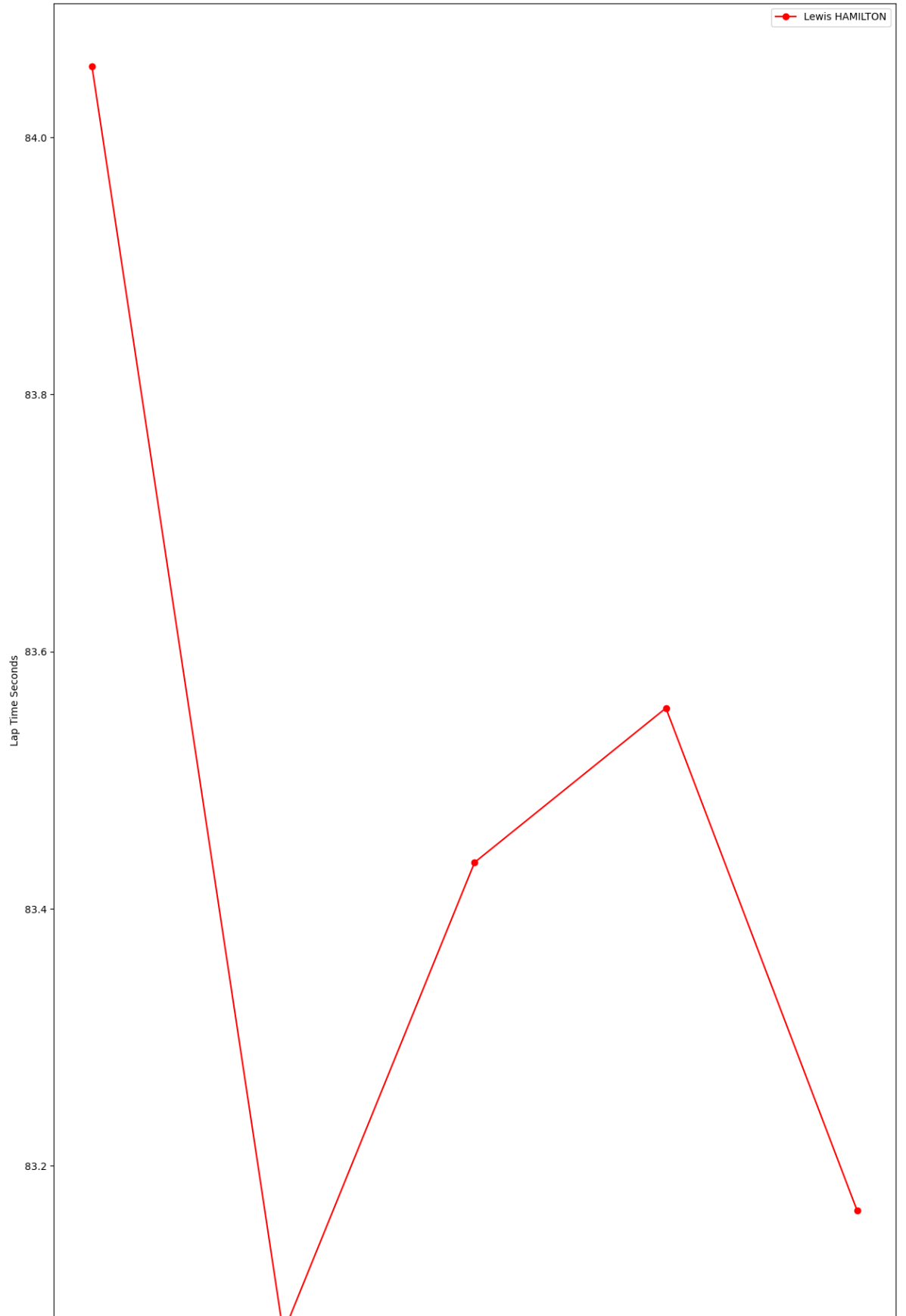
Zhou, Hamilton and Ricciardo decided to bet for the softest tyre in order to gain the most positions that they can but, taking into account that the stop would be very early and waiting for an incident that allows them to take advantage of this strategy.

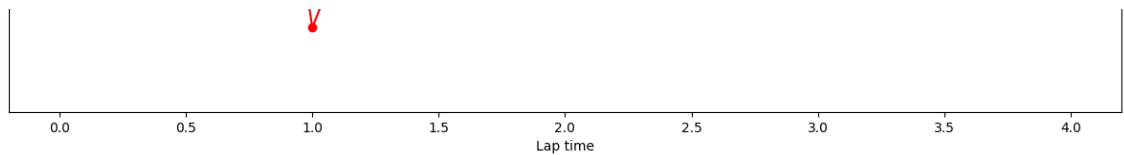
In [171...

```
libraryDataF1.obtain_data_tyres(jointables, 'SOFT', 95)
```









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_race_pace
```

Out[172...

lap_duration	
compound	
HARD	82.401133
MEDIUM	83.143676
SOFT	83.870250

Race pace

General explanation Explanation per teams

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

Out[173...

lap_duration	
team_name	
Ferrari	81.768724
McLaren	81.863882
Red Bull Racing	82.373250
Aston Martin	82.575253
Mercedes	82.632688
RB	82.901547
Haas F1 Team	82.919905
Kick Sauber	82.948127
Williams	83.077257
Alpine	83.159620

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_race_pace
```

Out[174...

duration_sector_1	
team_name	
Ferrari	28.587737
McLaren	28.617000
Red Bull Racing	28.710400
Aston Martin	28.738494
Mercedes	28.794729
Kick Sauber	28.905962
Haas F1 Team	28.916698
Alpine	28.927732
RB	28.936547
Williams	29.051714

Sector 2

General explanation

In [175...

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

Out[175...

duration_sector_2	
team_name	
Red Bull Racing	17.927600
McLaren	17.978906
Haas F1 Team	18.063333
Ferrari	18.094382
Mercedes	18.125396
Alpine	18.136042
Aston Martin	18.185193
RB	18.187062
Williams	18.198171
Kick Sauber	18.323253

Sector 3

General explanation

In [176...

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

Out[176...

duration_sector_3	
team_name	
Ferrari	35.086605

	duration_sector_3
team_name	
McLaren	35.267976
Aston Martin	35.651566
Mercedes	35.712562
Kick Sauber	35.718911
Red Bull Racing	35.735250
RB	35.777938
Williams	35.827371

Comparaison beetween drivers

Red Bull Racing

In [177... `race.query("driver_number== 1 and lap_duration <= 98 and lap_duration > 80")`

Out[177... 83.607

In [178... `race.query("driver_number== 11 and lap_duration <= 98 and lap_duration > 80")`

Out[178... 82.3964716981132

Ferrari

In [179... `race.query("driver_number== 16 and lap_duration <= 98 and lap_duration > 80")`

Out[179... 82.81050943396227

In [180... `race.query("driver_number== 55 and lap_duration <= 98 and lap_duration > 80")`

Out[180... 82.24254545454546

McLaren

In [181... `race.query("driver_number== 4 and lap_duration <= 98 and lap_duration > 80")`

Out[181... 82.27403921568627

In [182... `race.query("driver_number== 81 and lap_duration <= 98 and lap_duration > 80")`

Out[182... 82.98596428571429

Mercedes

In [183... `race.query("driver_number== 44 and lap_duration <= 98 and lap_duration > 80")`

Out[183... 84.62414285714286

In [184... `race.query("driver_number== 63 and lap_duration <= 98 and lap_duration > 80")`

Out[184... 83.17294444444444

Aston Martin

In [185... `race.query("driver_number== 14 and lap_duration <= 98 and lap_duration > 80")`

Out[185... 82.91248148148149

In [186... `race.query("driver_number== 18 and lap_duration <= 98 and lap_duration > 80")`

Out[186... 83.35512962962964

Haas F1 Team

In [187... `race.query("driver_number== 20 and lap_duration <= 98 and lap_duration > 80")`

Out[187... 83.67846296296295

In [188... `race.query("driver_number== 27 and lap_duration <= 98 and lap_duration > 80")`

Out[188... 83.30820370370371

RB

In [189... `race.query("driver_number== 3 and lap_duration <= 98 and lap_duration > 80")`

Out[189... 83.45301886792453

In [190... `race.query("driver_number== 22 and lap_duration <= 98 and lap_duration > 80")`

Out[190... 83.1875283018868

Williams

In [191... `race.query("driver_number== 2 and lap_duration <= 98 and lap_duration > 80")`

Out[191... nan

In [192... `race.query("driver_number== 23 and lap_duration <= 98 and lap_duration > 80")`

Out[192... 83.72937037037038

Alpine

In [193... `race.query("driver_number== 10 and lap_duration <= 98 and lap_duration > 80")`

Out[193... 83.43945283018867

In [194... race.query("driver_number== 31 and lap_duration <= 98 and lap_duration > 80")

Out[194... 83.54736538461538

Kick Sauber

In [195... race.query("driver_number== 24 and lap_duration <= 98 and lap_duration > 80")

Out[195... 83.334249999999998

In [196... race.query("driver_number== 77 and lap_duration <= 98 and lap_duration > 80")

Out[196... 83.17663461538463

Race pace

In [197... MINIMUM_SECONDS = 80
MAXIMUM_SECONDS = 98

Red Bull Racing

In [198... stintInformation.query('driver_number == 1 or driver_number == 11')

Out[198...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1231	9488	1	1	1	4	MEDIUM	
14	1231	9488	1	11	1	14	MEDIUM	
31	1231	9488	2	11	15	35	HARD	
43	1231	9488	3	11	36	59	HARD	

In [199... #libraryDataF1.getinfo(longruns(jointables,1,'Red Bull Racing',MINIMUM_SECONDS,MAXIMUM_SECONDS))

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

Out[200...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_sector_4	duration_sector_5
23	Sergio PEREZ	MEDIUM	2024-03-24T04:04:45.400000+00:00	2	29.370				
42	Sergio PEREZ	MEDIUM	2024-03-24T04:06:08.728000+00:00	3	29.005				
61	Sergio PEREZ	MEDIUM	2024-03-24T04:07:31.776000+00:00	4	28.848				
79	Sergio PEREZ	MEDIUM	2024-03-24T04:08:55.055000+00:00	5	28.964				
96	Sergio PEREZ	MEDIUM	2024-03-24T04:10:18.512000+00:00	6	28.808				
114	Sergio PEREZ	MEDIUM	2024-03-24T04:11:41.673000+00:00	7	28.962				

	full_name	compound	date_start	lap_number	duration_sector_1	di
130	Sergio PEREZ	MEDIUM	2024-03-24T04:13:04.468000+00:00	8	28.744	
146	Sergio PEREZ	MEDIUM	2024-03-24T04:14:27.407000+00:00	9	28.758	
161	Sergio PEREZ	MEDIUM	2024-03-24T04:15:50.358000+00:00	10	28.928	
175	Sergio PEREZ	MEDIUM	2024-03-24T04:17:13.103000+00:00	11	29.025	
193	Sergio PEREZ	MEDIUM	2024-03-24T04:18:36.097000+00:00	12	29.511	
211	Sergio PEREZ	MEDIUM	2024-03-24T04:19:59.888000+00:00	13	29.259	
263	Sergio PEREZ	HARD	2024-03-24T04:24:30.057000+00:00	16	28.669	
295	Sergio PEREZ	HARD	2024-03-24T04:27:37.908000+00:00	18	31.212	
310	Sergio PEREZ	HARD	2024-03-24T04:29:02.240000+00:00	19	28.441	
327	Sergio PEREZ	HARD	2024-03-24T04:30:24.081000+00:00	20	28.353	
344	Sergio PEREZ	HARD	2024-03-24T04:31:45.850000+00:00	21	28.506	
361	Sergio PEREZ	HARD	2024-03-24T04:33:07.769000+00:00	22	28.590	
378	Sergio PEREZ	HARD	2024-03-24T04:34:29.795000+00:00	23	28.617	
395	Sergio PEREZ	HARD	2024-03-24T04:35:51.652000+00:00	24	28.583	
412	Sergio PEREZ	HARD	2024-03-24T04:37:13.148000+00:00	25	28.513	
429	Sergio PEREZ	HARD	2024-03-24T04:38:34.666000+00:00	26	28.587	
446	Sergio PEREZ	HARD	2024-03-24T04:39:56.897000+00:00	27	28.521	
463	Sergio PEREZ	HARD	2024-03-24T04:41:18.339000+00:00	28	28.742	
479	Sergio PEREZ	HARD	2024-03-24T04:42:40.490000+00:00	29	28.645	
495	Sergio PEREZ	HARD	2024-03-24T04:44:02.683000+00:00	30	28.599	
512	Sergio PEREZ	HARD	2024-03-24T04:45:24.823000+00:00	31	28.718	
529	Sergio PEREZ	HARD	2024-03-24T04:46:47.221000+00:00	32	28.807	
546	Sergio PEREZ	HARD	2024-03-24T04:48:09.679000+00:00	33	28.869	
563	Sergio PEREZ	HARD	2024-03-24T04:49:32.242000+00:00	34	28.911	
609	Sergio PEREZ	HARD	2024-03-24T04:54:02.297000+00:00	37	28.323	

	full_name	compound	date_start	lap_number	duration_sector_1	di
624	Sergio PEREZ	HARD	2024-03-24T04:55:23.517000+00:00	38	28.319	
640	Sergio PEREZ	HARD	2024-03-24T04:56:44.713000+00:00	39	28.423	
657	Sergio PEREZ	HARD	2024-03-24T04:58:06.266000+00:00	40	28.400	
672	Sergio PEREZ	HARD	2024-03-24T04:59:27.205000+00:00	41	28.268	
688	Sergio PEREZ	HARD	2024-03-24T05:00:48.215000+00:00	42	28.442	
703	Sergio PEREZ	HARD	2024-03-24T05:02:09.555000+00:00	43	28.267	
719	Sergio PEREZ	HARD	2024-03-24T05:03:30.458000+00:00	44	28.222	
736	Sergio PEREZ	HARD	2024-03-24T05:04:51.037000+00:00	45	28.262	
753	Sergio PEREZ	HARD	2024-03-24T05:06:11.891000+00:00	46	28.204	
769	Sergio PEREZ	HARD	2024-03-24T05:07:32.258000+00:00	47	28.091	
786	Sergio PEREZ	HARD	2024-03-24T05:08:52.681000+00:00	48	28.191	
803	Sergio PEREZ	HARD	2024-03-24T05:10:13.464000+00:00	49	28.140	
820	Sergio PEREZ	HARD	2024-03-24T05:11:34.302000+00:00	50	28.244	
837	Sergio PEREZ	HARD	2024-03-24T05:12:55.182000+00:00	51	28.284	
854	Sergio PEREZ	HARD	2024-03-24T05:14:16.170000+00:00	52	28.380	
871	Sergio PEREZ	HARD	2024-03-24T05:15:37.402000+00:00	53	28.466	
888	Sergio PEREZ	HARD	2024-03-24T05:16:58.877000+00:00	54	28.537	
905	Sergio PEREZ	HARD	2024-03-24T05:18:20.584000+00:00	55	28.522	
922	Sergio PEREZ	HARD	2024-03-24T05:19:42.132000+00:00	56	28.564	

Ferrari

In [201...

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

Out[201...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
9	1231	9488	1	16	1	9	MEDIUM	
15	1231	9488	1	55	1	16	MEDIUM	
28	1231	9488	2	16	10	34	HARD	
33	1231	9488	2	55	17	41	HARD	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	41	1231	9488	3	16	35	59	HARD
In [202...	libraryDataF1.getinfo(longruns(jointables,16,'Ferrari',MINIMUM_SECONDS,MAXI							
Out[202...		full_name	compound		date_start	lap_number	duration_sector_1	du
	25	Charles LECLERC	MEDIUM		2024-03-24T04:04:43.419000+00:00	2	28.731	
	44	Charles LECLERC	MEDIUM		2024-03-24T04:06:06.378000+00:00	3	28.753	
	63	Charles LECLERC	MEDIUM		2024-03-24T04:07:29.213000+00:00	4	28.753	
	81	Charles LECLERC	MEDIUM		2024-03-24T04:08:51.626000+00:00	5	28.895	
	98	Charles LECLERC	MEDIUM		2024-03-24T04:10:14.287000+00:00	6	28.817	
	116	Charles LECLERC	MEDIUM		2024-03-24T04:11:36.961000+00:00	7	28.963	
	132	Charles LECLERC	MEDIUM		2024-03-24T04:12:59.682000+00:00	8	28.769	
	148	Charles LECLERC	MEDIUM		2024-03-24T04:14:22.626000+00:00	9	28.769	
	177	Charles LECLERC	HARD		2024-03-24T04:17:26.591000+00:00	11	28.900	
	195	Charles LECLERC	HARD		2024-03-24T04:18:49.190000+00:00	12	28.454	
	213	Charles LECLERC	HARD		2024-03-24T04:20:11.064000+00:00	13	28.716	
	231	Charles LECLERC	HARD		2024-03-24T04:21:33.341000+00:00	14	28.647	
	247	Charles LECLERC	HARD		2024-03-24T04:22:55.225000+00:00	15	28.447	
	265	Charles LECLERC	HARD		2024-03-24T04:24:17.009000+00:00	16	28.598	
	283	Charles LECLERC	HARD		2024-03-24T04:25:39.183000+00:00	17	28.508	
	296	Charles LECLERC	HARD		2024-03-24T04:27:16.530000+00:00	18	35.361	
	312	Charles LECLERC	HARD		2024-03-24T04:28:45.542000+00:00	19	28.197	
	329	Charles LECLERC	HARD		2024-03-24T04:30:07.454000+00:00	20	28.409	
	346	Charles LECLERC	HARD		2024-03-24T04:31:29.340000+00:00	21	28.477	
	363	Charles LECLERC	HARD		2024-03-24T04:32:51.362000+00:00	22	28.368	
	380	Charles LECLERC	HARD		2024-03-24T04:34:13.099000+00:00	23	28.419	
	397	Charles LECLERC	HARD		2024-03-24T04:35:35.047000+00:00	24	28.455	

	full_name	compound	date_start	lap_number	duration_sector_1	di
414	Charles LECLERC	HARD	2024-03-24T04:36:56.920000+00:00	25	28.587	
431	Charles LECLERC	HARD	2024-03-24T04:38:18.780000+00:00	26	28.596	
448	Charles LECLERC	HARD	2024-03-24T04:39:40.900000+00:00	27	28.590	
465	Charles LECLERC	HARD	2024-03-24T04:41:02.779000+00:00	28	28.496	
481	Charles LECLERC	HARD	2024-03-24T04:42:24.666000+00:00	29	28.845	
497	Charles LECLERC	HARD	2024-03-24T04:43:47.013000+00:00	30	28.708	
514	Charles LECLERC	HARD	2024-03-24T04:45:09.475000+00:00	31	28.587	
531	Charles LECLERC	HARD	2024-03-24T04:46:31.382000+00:00	32	28.706	
548	Charles LECLERC	HARD	2024-03-24T04:47:53.213000+00:00	33	28.743	
565	Charles LECLERC	HARD	2024-03-24T04:49:15.189000+00:00	34	28.835	
596	Charles LECLERC	HARD	2024-03-24T04:52:19.123000+00:00	36	28.493	
611	Charles LECLERC	HARD	2024-03-24T04:53:41.102000+00:00	37	28.238	
626	Charles LECLERC	HARD	2024-03-24T04:55:01.959000+00:00	38	28.100	
642	Charles LECLERC	HARD	2024-03-24T04:56:22.733000+00:00	39	28.184	
659	Charles LECLERC	HARD	2024-03-24T04:57:43.559000+00:00	40	28.187	
674	Charles LECLERC	HARD	2024-03-24T04:59:04.571000+00:00	41	28.107	
689	Charles LECLERC	HARD	2024-03-24T05:00:25.180000+00:00	42	28.366	
705	Charles LECLERC	HARD	2024-03-24T05:01:46.128000+00:00	43	28.089	
721	Charles LECLERC	HARD	2024-03-24T05:03:07.029000+00:00	44	28.069	
738	Charles LECLERC	HARD	2024-03-24T05:04:27.582000+00:00	45	28.110	
755	Charles LECLERC	HARD	2024-03-24T05:05:47.951000+00:00	46	28.049	
788	Charles LECLERC	HARD	2024-03-24T05:08:28.644000+00:00	48	28.125	
805	Charles LECLERC	HARD	2024-03-24T05:09:49.002000+00:00	49	27.919	
839	Charles LECLERC	HARD	2024-03-24T05:12:29.087000+00:00	51	27.948	
856	Charles LECLERC	HARD	2024-03-24T05:13:49.299000+00:00	52	27.976	

	full_name	compound	date_start	lap_number	duration_sector_1	di
873	Charles LECLERC	HARD	2024-03-24T05:15:09.688000+00:00	53	28.073	
890	Charles LECLERC	HARD	2024-03-24T05:16:30.170000+00:00	54	28.019	
907	Charles	HARD	2024-03-24T05:17:50.164000+00:00	55	28.127	

In [203...

libraryDataF1.getinfo(longruns(jointables,55,'Ferrari',MINIMUM_SECONDS,MAXI

Out[203...

	full_name	compound	date_start	lap_number	duration_sector_1	di
34	Carlos SAINZ	MEDIUM	2024-03-24T04:04:41.130000+00:00	2	29.006	
53	Carlos SAINZ	MEDIUM	2024-03-24T04:06:04.021000+00:00	3	29.002	
72	Carlos SAINZ	MEDIUM	2024-03-24T04:07:26.936000+00:00	4	28.643	
90	Carlos SAINZ	MEDIUM	2024-03-24T04:08:49.338000+00:00	5	28.705	
107	Carlos SAINZ	MEDIUM	2024-03-24T04:10:12.002000+00:00	6	28.648	
123	Carlos SAINZ	MEDIUM	2024-03-24T04:11:34.528000+00:00	7	28.670	
139	Carlos SAINZ	MEDIUM	2024-03-24T04:12:56.883000+00:00	8	28.562	
156	Carlos SAINZ	MEDIUM	2024-03-24T04:14:19.169000+00:00	9	28.594	
169	Carlos SAINZ	MEDIUM	2024-03-24T04:15:41.329000+00:00	10	28.426	
186	Carlos SAINZ	MEDIUM	2024-03-24T04:17:03.018000+00:00	11	28.460	
204	Carlos SAINZ	MEDIUM	2024-03-24T04:18:24.885000+00:00	12	28.592	
222	Carlos SAINZ	MEDIUM	2024-03-24T04:19:47.030000+00:00	13	28.595	
240	Carlos SAINZ	MEDIUM	2024-03-24T04:21:09.229000+00:00	14	28.815	
256	Carlos SAINZ	MEDIUM	2024-03-24T04:22:31.840000+00:00	15	28.688	
274	Carlos SAINZ	MEDIUM	2024-03-24T04:23:54.362000+00:00	16	28.715	
303	Carlos SAINZ	HARD	2024-03-24T04:27:14.408000+00:00	18	36.108	
320	Carlos SAINZ	HARD	2024-03-24T04:28:44.304000+00:00	19	28.284	
337	Carlos SAINZ	HARD	2024-03-24T04:30:06.180000+00:00	20	28.321	
354	Carlos SAINZ	HARD	2024-03-24T04:31:27.823000+00:00	21	28.376	
371	Carlos SAINZ	HARD	2024-03-24T04:32:49.712000+00:00	22	28.277	

	full_name	compound	date_start	lap_number	duration_sector_1	di
388	Carlos SAINZ	HARD	2024-03-24T04:34:11.217000+00:00	23	28.345	
405	Carlos SAINZ	HARD	2024-03-24T04:35:32.773000+00:00	24	28.329	
422	Carlos SAINZ	HARD	2024-03-24T04:36:54.265000+00:00	25	28.229	
439	Carlos SAINZ	HARD	2024-03-24T04:38:15.502000+00:00	26	28.144	
456	Carlos SAINZ	HARD	2024-03-24T04:39:36.572000+00:00	27	28.388	
472	Carlos SAINZ	HARD	2024-03-24T04:40:57.982000+00:00	28	28.279	
489	Carlos SAINZ	HARD	2024-03-24T04:42:19.494000+00:00	29	28.336	
505	Carlos SAINZ	HARD	2024-03-24T04:43:40.987000+00:00	30	28.468	
522	Carlos SAINZ	HARD	2024-03-24T04:45:02.512000+00:00	31	28.215	
539	Carlos SAINZ	HARD	2024-03-24T04:46:23.964000+00:00	32	28.209	
556	Carlos SAINZ	HARD	2024-03-24T04:47:45.026000+00:00	33	28.398	
572	Carlos SAINZ	HARD	2024-03-24T04:49:06.612000+00:00	34	28.512	
588	Carlos SAINZ	HARD	2024-03-24T04:50:28.300000+00:00	35	28.432	
602	Carlos SAINZ	HARD	2024-03-24T04:51:49.998000+00:00	36	28.557	
618	Carlos SAINZ	HARD	2024-03-24T04:53:11.980000+00:00	37	28.542	
633	Carlos SAINZ	HARD	2024-03-24T04:54:34.035000+00:00	38	28.380	
650	Carlos SAINZ	HARD	2024-03-24T04:55:55.282000+00:00	39	28.367	
667	Carlos SAINZ	HARD	2024-03-24T04:57:16.830000+00:00	40	28.400	
682	Carlos SAINZ	HARD	2024-03-24T04:58:38.324000+00:00	41	28.241	
712	Carlos SAINZ	HARD	2024-03-24T05:01:41.084000+00:00	43	27.993	
729	Carlos SAINZ	HARD	2024-03-24T05:03:01.857000+00:00	44	28.014	
746	Carlos SAINZ	HARD	2024-03-24T05:04:22.556000+00:00	45	27.853	
763	Carlos SAINZ	HARD	2024-03-24T05:05:42.941000+00:00	46	27.945	
779	Carlos SAINZ	HARD	2024-03-24T05:07:03.177000+00:00	47	27.870	
796	Carlos SAINZ	HARD	2024-03-24T05:08:23.400000+00:00	48	27.935	

	full_name	compound	date_start	lap_number	duration_sector_1	di
813	Carlos SAINZ	HARD	2024-03-24T05:09:43.460000+00:00	49	28.046	
830	Carlos SAINZ	HARD	2024-03-24T05:11:03.708000+00:00	50	28.157	
847	Carlos SAINZ	HARD	2024-03-24T05:12:24.144000+00:00	51	27.905	
864	Carlos SAINZ	HARD	2024-03-24T05:13:44.188000+00:00	52	27.963	
881	Carlos SAINZ	HARD	2024-03-24T05:15:04.415000+00:00	53	27.962	
898	Carlos SAINZ	HARD	2024-03-24T05:16:25.104000+00:00	54	28.193	
915	Carlos SAINZ	HARD	2024-03-24T05:17:45.605000+00:00	55	28.132	
932	Carlos SAINZ	HARD	2024-03-24T05:19:06.367000+00:00	56	28.091	

Mercedes

In [204...

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

Out[204...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
5	1231	9488	1	44	1	7	SOFT	
7	1231	9488	1	63	1	8	MEDIUM	
22	1231	9488	2	44	8	16	HARD	
26	1231	9488	2	63	9	45	HARD	
54	1231	9488	3	63	46	57	HARD	

In [205...

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

Out[205...

	full_name	compound	date_start	lap_number	duration_sector_1	d
33	Lewis HAMILTON	SOFT	2024-03-24T04:04:46.549000+00:00	2	29.971	
52	Lewis HAMILTON	SOFT	2024-03-24T04:06:10.572000+00:00	3	29.083	
71	Lewis HAMILTON	SOFT	2024-03-24T04:07:33.713000+00:00	4	29.088	
89	Lewis HAMILTON	SOFT	2024-03-24T04:08:57.046000+00:00	5	28.930	
106	Lewis HAMILTON	SOFT	2024-03-24T04:10:20.639000+00:00	6	29.165	
122	Lewis HAMILTON	SOFT	2024-03-24T04:11:43.950000+00:00	7	28.973	
155	Lewis HAMILTON	HARD	2024-03-24T04:14:48.784000+00:00	9	28.842	
168	Lewis HAMILTON	HARD	2024-03-24T04:16:11.281000+00:00	10	30.157	

	full_name	compound	date_start	lap_number	duration_sector_1	d
185	Lewis HAMILTON	HARD	2024-03-24T04:17:35.795000+00:00	11	28.718	
203	Lewis HAMILTON	HARD	2024-03-24T04:18:58.166000+00:00	12	29.006	
221	Lewis HAMILTON	HARD	2024-03-24T04:20:21.239000+00:00	13	28.911	
239	Lewis HAMILTON	HARD	2024-03-24T04:21:44.422000+00:00	14	28.876	

In [206...

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

Out[206...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_lap	total_time	total_time_formatted
35	George RUSSELL	MEDIUM	2024-03-24T04:04:44.721000+00:00	2	29.070					
54	George RUSSELL	MEDIUM	2024-03-24T04:06:08.136000+00:00	3	28.745					
73	George RUSSELL	MEDIUM	2024-03-24T04:07:31.149000+00:00	4	28.894					
91	George RUSSELL	MEDIUM	2024-03-24T04:08:54.693000+00:00	5	28.763					
108	George RUSSELL	MEDIUM	2024-03-24T04:10:17.889000+00:00	6	28.725					
124	George RUSSELL	MEDIUM	2024-03-24T04:11:40.989000+00:00	7	28.797					
140	George RUSSELL	MEDIUM	2024-03-24T04:13:03.719000+00:00	8	28.679					
170	George RUSSELL	HARD	2024-03-24T04:16:09.084000+00:00	10	28.814					
187	George RUSSELL	HARD	2024-03-24T04:17:31.745000+00:00	11	28.731					
205	George RUSSELL	HARD	2024-03-24T04:18:54.555000+00:00	12	28.851					
223	George RUSSELL	HARD	2024-03-24T04:20:17.459000+00:00	13	28.946					
241	George RUSSELL	HARD	2024-03-24T04:21:40.933000+00:00	14	29.168					
257	George RUSSELL	HARD	2024-03-24T04:23:04.310000+00:00	15	29.392					
275	George RUSSELL	HARD	2024-03-24T04:24:28.411000+00:00	16	28.959					
304	George RUSSELL	HARD	2024-03-24T04:27:33.160000+00:00	18	33.098					
321	George RUSSELL	HARD	2024-03-24T04:29:00.369000+00:00	19	28.473					
338	George RUSSELL	HARD	2024-03-24T04:30:22.873000+00:00	20	28.564					
355	George RUSSELL	HARD	2024-03-24T04:31:45.280000+00:00	21	28.421					

	full_name	compound	date_start	lap_number	duration_sector_1	di
372	George RUSSELL	HARD	2024-03-24T04:33:08.731000+00:00	22	28.819	
389	George RUSSELL	HARD	2024-03-24T04:34:31.481000+00:00	23	28.852	
406	George RUSSELL	HARD	2024-03-24T04:35:54.568000+00:00	24	28.776	
423	George RUSSELL	HARD	2024-03-24T04:37:17.509000+00:00	25	28.600	
440	George RUSSELL	HARD	2024-03-24T04:38:40.169000+00:00	26	28.744	
457	George RUSSELL	HARD	2024-03-24T04:40:03.018000+00:00	27	28.879	
473	George RUSSELL	HARD	2024-03-24T04:41:26.299000+00:00	28	28.885	
490	George RUSSELL	HARD	2024-03-24T04:42:49.353000+00:00	29	28.822	
506	George RUSSELL	HARD	2024-03-24T04:44:12.040000+00:00	30	28.614	
523	George RUSSELL	HARD	2024-03-24T04:45:34.646000+00:00	31	28.718	
540	George RUSSELL	HARD	2024-03-24T04:46:57.145000+00:00	32	28.773	
557	George RUSSELL	HARD	2024-03-24T04:48:19.821000+00:00	33	28.591	
573	George RUSSELL	HARD	2024-03-24T04:49:42.400000+00:00	34	28.601	
589	George RUSSELL	HARD	2024-03-24T04:51:04.738000+00:00	35	28.764	
603	George RUSSELL	HARD	2024-03-24T04:52:27.221000+00:00	36	28.607	
619	George RUSSELL	HARD	2024-03-24T04:53:49.820000+00:00	37	28.510	
634	George RUSSELL	HARD	2024-03-24T04:55:12.245000+00:00	38	28.493	
651	George RUSSELL	HARD	2024-03-24T04:56:34.369000+00:00	39	28.472	
668	George RUSSELL	HARD	2024-03-24T04:57:56.605000+00:00	40	28.756	
683	George RUSSELL	HARD	2024-03-24T04:59:19.059000+00:00	41	28.561	
697	George RUSSELL	HARD	2024-03-24T05:00:41.201000+00:00	42	28.651	
713	George RUSSELL	HARD	2024-03-24T05:02:03.596000+00:00	43	28.479	
730	George RUSSELL	HARD	2024-03-24T05:03:25.698000+00:00	44	28.459	
747	George RUSSELL	HARD	2024-03-24T05:04:47.907000+00:00	45	28.436	
780	George RUSSELL	HARD	2024-03-24T05:07:50.703000+00:00	47	27.721	

	full_name	compound	date_start	lap_number	duration_sector_1	di
797	George RUSSELL	HARD	2024-03-24T05:09:10.920000+00:00	48	27.983	
814	George RUSSELL	HARD	2024-03-24T05:10:31.655000+00:00	49	27.856	
831	George RUSSELL	HARD	2024-03-24T05:11:52.489000+00:00	50	28.097	
848	George RUSSELL	HARD	2024-03-24T05:13:13.399000+00:00	51	27.913	
865	George RUSSELL	HARD	2024-03-24T05:14:34.230000+00:00	52	27.848	
882	George RUSSELL	HARD	2024-03-24T05:15:54.696000+00:00	53	27.824	
899	George RUSSELL	HARD	2024-03-24T05:17:14.936000+00:00	54	28.025	

Aston Martin

In [207...

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

Out[207...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1231	9488	1	18	1	8	MEDIUM	
17	1231	9488	1	14	1	17	HARD	
25	1231	9488	2	18	9	37	HARD	
37	1231	9488	2	14	18	41	MEDIUM	
47	1231	9488	3	18	38	59	HARD	
51	1231	9488	3	14	42	59	HARD	

In [208...

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

Out[208...

	full_name	compound	date_start	lap_number	duration_sector_1	di
24	Fernando ALONSO	HARD	2024-03-24T04:04:47.334000+00:00	2	29.590	
43	Fernando ALONSO	HARD	2024-03-24T04:06:11.730000+00:00	3	28.865	
62	Fernando ALONSO	HARD	2024-03-24T04:07:34.672000+00:00	4	29.019	
80	Fernando ALONSO	HARD	2024-03-24T04:08:58.306000+00:00	5	28.967	
97	Fernando ALONSO	HARD	2024-03-24T04:10:21.745000+00:00	6	29.130	
115	Fernando ALONSO	HARD	2024-03-24T04:11:44.865000+00:00	7	28.901	
131	Fernando ALONSO	HARD	2024-03-24T04:13:07.626000+00:00	8	28.605	
147	Fernando ALONSO	HARD	2024-03-24T04:14:30.321000+00:00	9	29.058	

	full_name	compound	date_start	lap_number	duration_sector_1	di
162	Fernando ALONSO	HARD	2024-03-24T04:15:53.661000+00:00	10	28.563	
176	Fernando ALONSO	HARD	2024-03-24T04:17:16.428000+00:00	11	28.895	
194	Fernando ALONSO	HARD	2024-03-24T04:18:39.258000+00:00	12	28.712	
212	Fernando ALONSO	HARD	2024-03-24T04:20:02.193000+00:00	13	28.986	
230	Fernando ALONSO	HARD	2024-03-24T04:21:25.457000+00:00	14	29.200	
246	Fernando ALONSO	HARD	2024-03-24T04:22:48.713000+00:00	15	28.907	
264	Fernando ALONSO	HARD	2024-03-24T04:24:12.058000+00:00	16	29.002	
311	Fernando ALONSO	MEDIUM	2024-03-24T04:28:54.569000+00:00	19	28.883	
328	Fernando ALONSO	MEDIUM	2024-03-24T04:30:17.466000+00:00	20	28.729	
345	Fernando ALONSO	MEDIUM	2024-03-24T04:31:40.348000+00:00	21	28.737	
362	Fernando ALONSO	MEDIUM	2024-03-24T04:33:03.002000+00:00	22	28.735	
379	Fernando ALONSO	MEDIUM	2024-03-24T04:34:25.503000+00:00	23	28.625	
396	Fernando ALONSO	MEDIUM	2024-03-24T04:35:47.984000+00:00	24	28.695	
413	Fernando ALONSO	MEDIUM	2024-03-24T04:37:10.249000+00:00	25	28.728	
430	Fernando ALONSO	MEDIUM	2024-03-24T04:38:33.030000+00:00	26	28.899	
447	Fernando ALONSO	MEDIUM	2024-03-24T04:39:55.880000+00:00	27	28.790	
464	Fernando ALONSO	MEDIUM	2024-03-24T04:41:19.203000+00:00	28	28.746	
480	Fernando ALONSO	MEDIUM	2024-03-24T04:42:41.572000+00:00	29	28.578	
496	Fernando ALONSO	MEDIUM	2024-03-24T04:44:03.510000+00:00	30	28.685	
513	Fernando ALONSO	MEDIUM	2024-03-24T04:45:25.726000+00:00	31	28.794	
530	Fernando ALONSO	MEDIUM	2024-03-24T04:46:47.900000+00:00	32	28.885	
547	Fernando ALONSO	MEDIUM	2024-03-24T04:48:10.459000+00:00	33	28.882	
564	Fernando ALONSO	MEDIUM	2024-03-24T04:49:33.090000+00:00	34	28.788	
580	Fernando ALONSO	MEDIUM	2024-03-24T04:50:55.995000+00:00	35	31.068	
595	Fernando ALONSO	MEDIUM	2024-03-24T04:52:21.686000+00:00	36	28.579	

	full_name	compound	date_start	lap_number	duration_sector_1	di
610	Fernando ALONSO	MEDIUM	2024-03-24T04:53:44.430000+00:00	37	28.779	
625	Fernando ALONSO	MEDIUM	2024-03-24T04:55:07.374000+00:00	38	28.719	
641	Fernando ALONSO	MEDIUM	2024-03-24T04:56:29.961000+00:00	39	28.724	
658	Fernando ALONSO	MEDIUM	2024-03-24T04:57:52.688000+00:00	40	28.768	
704	Fernando ALONSO	HARD	2024-03-24T05:02:21.657000+00:00	43	28.361	
720	Fernando ALONSO	HARD	2024-03-24T05:03:43.434000+00:00	44	28.280	
737	Fernando ALONSO	HARD	2024-03-24T05:05:04.851000+00:00	45	28.352	
754	Fernando ALONSO	HARD	2024-03-24T05:06:26.317000+00:00	46	28.221	
770	Fernando ALONSO	HARD	2024-03-24T05:07:47.569000+00:00	47	28.291	
787	Fernando ALONSO	HARD	2024-03-24T05:09:08.720000+00:00	48	28.288	
804	Fernando ALONSO	HARD	2024-03-24T05:10:30.191000+00:00	49	28.266	
821	Fernando ALONSO	HARD	2024-03-24T05:11:51.356000+00:00	50	28.053	
838	Fernando ALONSO	HARD	2024-03-24T05:13:12.001000+00:00	51	28.169	
855	Fernando ALONSO	HARD	2024-03-24T05:14:32.898000+00:00	52	27.981	
872	Fernando ALONSO	HARD	2024-03-24T05:15:53.464000+00:00	53	28.122	
889	Fernando ALONSO	HARD	2024-03-24T05:17:14.297000+00:00	54	28.123	
906	Fernando ALONSO	HARD	2024-03-24T05:18:35.413000+00:00	55	28.152	

In [209...

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

Out[209...

	full_name	compound	date_start	lap_number	duration_sector_1	di
26	Lance STROLL	MEDIUM	2024-03-24T04:04:45.727000+00:00	2	29.507	
45	Lance STROLL	MEDIUM	2024-03-24T04:06:09.215000+00:00	3	29.015	
64	Lance STROLL	MEDIUM	2024-03-24T04:07:32.429000+00:00	4	28.949	
82	Lance STROLL	MEDIUM	2024-03-24T04:08:55.843000+00:00	5	28.941	
99	Lance STROLL	MEDIUM	2024-03-24T04:10:19.302000+00:00	6	28.902	

	full_name	compound	date_start	lap_number	duration_sector_1	di
117	Lance STROLL	MEDIUM	2024-03-24T04:11:42.268000+00:00	7	28.945	
133	Lance STROLL	MEDIUM	2024-03-24T04:13:05.271000+00:00	8	28.791	
163	Lance STROLL	HARD	2024-03-24T04:16:10.592000+00:00	10	28.763	
178	Lance STROLL	HARD	2024-03-24T04:17:33.378000+00:00	11	28.755	
196	Lance STROLL	HARD	2024-03-24T04:18:56.182000+00:00	12	28.858	
214	Lance STROLL	HARD	2024-03-24T04:20:19.257000+00:00	13	28.920	
232	Lance STROLL	HARD	2024-03-24T04:21:42.545000+00:00	14	28.867	
248	Lance STROLL	HARD	2024-03-24T04:23:05.778000+00:00	15	29.221	
266	Lance STROLL	HARD	2024-03-24T04:24:29.005000+00:00	16	29.194	
297	Lance STROLL	HARD	2024-03-24T04:27:37.019000+00:00	18	31.146	
313	Lance STROLL	HARD	2024-03-24T04:29:03.045000+00:00	19	28.710	
330	Lance STROLL	HARD	2024-03-24T04:30:26.169000+00:00	20	28.668	
347	Lance STROLL	HARD	2024-03-24T04:31:49.161000+00:00	21	28.674	
364	Lance STROLL	HARD	2024-03-24T04:33:11.712000+00:00	22	28.641	
381	Lance STROLL	HARD	2024-03-24T04:34:34.654000+00:00	23	28.795	
398	Lance STROLL	HARD	2024-03-24T04:35:57.544000+00:00	24	28.715	
415	Lance STROLL	HARD	2024-03-24T04:37:20.358000+00:00	25	28.821	
432	Lance STROLL	HARD	2024-03-24T04:38:43.260000+00:00	26	28.858	
449	Lance STROLL	HARD	2024-03-24T04:40:06.502000+00:00	27	28.780	
466	Lance STROLL	HARD	2024-03-24T04:41:29.690000+00:00	28	28.871	
482	Lance STROLL	HARD	2024-03-24T04:42:52.850000+00:00	29	28.955	
498	Lance STROLL	HARD	2024-03-24T04:44:15.932000+00:00	30	28.875	
515	Lance STROLL	HARD	2024-03-24T04:45:39.151000+00:00	31	29.110	
532	Lance STROLL	HARD	2024-03-24T04:47:02.581000+00:00	32	28.921	
549	Lance STROLL	HARD	2024-03-24T04:48:25.864000+00:00	33	29.001	

	full_name	compound	date_start	lap_number	duration_sector_1	di
566	Lance STROLL	HARD	2024-03-24T04:49:49.066000+00:00	34	28.986	
581	Lance STROLL	HARD	2024-03-24T04:51:12.190000+00:00	35	29.054	
597	Lance STROLL	HARD	2024-03-24T04:52:35.536000+00:00	36	29.035	
612	Lance STROLL	HARD	2024-03-24T04:53:58.622000+00:00	37	28.958	
643	Lance STROLL	HARD	2024-03-24T04:57:04.169000+00:00	39	28.498	
660	Lance STROLL	HARD	2024-03-24T04:58:26.151000+00:00	40	28.665	
675	Lance STROLL	HARD	2024-03-24T04:59:48.186000+00:00	41	28.417	
690	Lance STROLL	HARD	2024-03-24T05:01:10.559000+00:00	42	28.383	
706	Lance STROLL	HARD	2024-03-24T05:02:32.261000+00:00	43	28.380	
722	Lance STROLL	HARD	2024-03-24T05:03:54.072000+00:00	44	28.476	
739	Lance STROLL	HARD	2024-03-24T05:05:16.019000+00:00	45	28.270	
756	Lance STROLL	HARD	2024-03-24T05:06:37.666000+00:00	46	28.260	
772	Lance STROLL	HARD	2024-03-24T05:07:59.133000+00:00	47	28.162	
789	Lance STROLL	HARD	2024-03-24T05:09:20.135000+00:00	48	28.185	
806	Lance STROLL	HARD	2024-03-24T05:10:41.219000+00:00	49	28.058	
823	Lance STROLL	HARD	2024-03-24T05:12:02.131000+00:00	50	28.152	
840	Lance STROLL	HARD	2024-03-24T05:13:23.109000+00:00	51	28.174	
857	Lance STROLL	HARD	2024-03-24T05:14:44.193000+00:00	52	28.234	
874	Lance STROLL	HARD	2024-03-24T05:16:05.445000+00:00	53	28.121	
891	Lance STROLL	HARD	2024-03-24T05:17:26.588000+00:00	54	28.029	
	Lance					

McLaren

In [210...

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

Out[210...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
12	1231	9488	1	81	1	9	MEDIUM	
13	1231	9488	1	4	1	14	MEDIUM	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
30	1231	9488	2	81	10	39	HARD	
32	1231	9488	2	4	15	40	HARD	
48	1231	9488	3	81	40	59	HARD	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_total
21	Lando NORRIS	MEDIUM	2024-03-24T04:04:42.700000+00:00	2	28.814	28.814	28.814	28.814
40	Lando NORRIS	MEDIUM	2024-03-24T04:06:05.908000+00:00	3	28.750	28.750	28.750	28.750
59	Lando NORRIS	MEDIUM	2024-03-24T04:07:28.443000+00:00	4	28.749	28.749	28.749	28.749
77	Lando NORRIS	MEDIUM	2024-03-24T04:08:51.055000+00:00	5	28.740	28.740	28.740	28.740
94	Lando NORRIS	MEDIUM	2024-03-24T04:10:13.759000+00:00	6	28.717	28.717	28.717	28.717
112	Lando NORRIS	MEDIUM	2024-03-24T04:11:36.408000+00:00	7	28.881	28.881	28.881	28.881
128	Lando NORRIS	MEDIUM	2024-03-24T04:12:59.158000+00:00	8	28.705	28.705	28.705	28.705
144	Lando NORRIS	MEDIUM	2024-03-24T04:14:21.861000+00:00	9	28.832	28.832	28.832	28.832
159	Lando NORRIS	MEDIUM	2024-03-24T04:15:44.539000+00:00	10	28.756	28.756	28.756	28.756
173	Lando NORRIS	MEDIUM	2024-03-24T04:17:07.203000+00:00	11	28.880	28.880	28.880	28.880
191	Lando NORRIS	MEDIUM	2024-03-24T04:18:30.178000+00:00	12	28.783	28.783	28.783	28.783
209	Lando NORRIS	MEDIUM	2024-03-24T04:19:53.047000+00:00	13	29.105	29.105	29.105	29.105
261	Lando NORRIS	HARD	2024-03-24T04:24:22.442000+00:00	16	28.534	28.534	28.534	28.534
294	Lando NORRIS	HARD	2024-03-24T04:27:22.631000+00:00	18	34.235	34.235	34.235	34.235
308	Lando NORRIS	HARD	2024-03-24T04:28:50.231000+00:00	19	29.030	29.030	29.030	29.030
325	Lando NORRIS	HARD	2024-03-24T04:30:12.536000+00:00	20	28.355	28.355	28.355	28.355
342	Lando NORRIS	HARD	2024-03-24T04:31:34.145000+00:00	21	28.385	28.385	28.385	28.385
359	Lando NORRIS	HARD	2024-03-24T04:32:56.150000+00:00	22	28.441	28.441	28.441	28.441
376	Lando NORRIS	HARD	2024-03-24T04:34:17.890000+00:00	23	28.381	28.381	28.381	28.381
393	Lando NORRIS	HARD	2024-03-24T04:35:39.622000+00:00	24	28.376	28.376	28.376	28.376
410	Lando NORRIS	HARD	2024-03-24T04:37:01.205000+00:00	25	28.517	28.517	28.517	28.517

	full_name	compound	date_start	lap_number	duration_sector_1	di
427	Lando NORRIS	HARD	2024-03-24T04:38:22.882000+00:00	26	28.398	
444	Lando NORRIS	HARD	2024-03-24T04:39:44.456000+00:00	27	28.523	
461	Lando NORRIS	HARD	2024-03-24T04:41:06.359000+00:00	28	28.562	
477	Lando NORRIS	HARD	2024-03-24T04:42:28.228000+00:00	29	28.483	
493	Lando NORRIS	HARD	2024-03-24T04:43:50.049000+00:00	30	28.568	
510	Lando NORRIS	HARD	2024-03-24T04:45:12.080000+00:00	31	28.565	
527	Lando NORRIS	HARD	2024-03-24T04:46:33.936000+00:00	32	28.394	
544	Lando NORRIS	HARD	2024-03-24T04:47:55.535000+00:00	33	28.570	
561	Lando NORRIS	HARD	2024-03-24T04:49:17.269000+00:00	34	28.421	
577	Lando NORRIS	HARD	2024-03-24T04:50:38.937000+00:00	35	28.479	
593	Lando NORRIS	HARD	2024-03-24T04:52:00.482000+00:00	36	28.511	
607	Lando NORRIS	HARD	2024-03-24T04:53:22.066000+00:00	37	28.425	
622	Lando NORRIS	HARD	2024-03-24T04:54:43.566000+00:00	38	28.457	
638	Lando NORRIS	HARD	2024-03-24T04:56:05.177000+00:00	39	28.746	
655	Lando NORRIS	HARD	2024-03-24T04:57:27.057000+00:00	40	28.505	
687	Lando NORRIS	HARD	2024-03-24T05:00:29.576000+00:00	42	28.317	
701	Lando NORRIS	HARD	2024-03-24T05:01:50.652000+00:00	43	28.003	
717	Lando NORRIS	HARD	2024-03-24T05:03:11.377000+00:00	44	28.003	
734	Lando NORRIS	HARD	2024-03-24T05:04:31.878000+00:00	45	28.171	
767	Lando NORRIS	HARD	2024-03-24T05:07:12.615000+00:00	47	27.953	
784	Lando NORRIS	HARD	2024-03-24T05:08:32.656000+00:00	48	27.979	
818	Lando NORRIS	HARD	2024-03-24T05:11:12.914000+00:00	50	27.914	
835	Lando NORRIS	HARD	2024-03-24T05:12:33.069000+00:00	51	27.985	
869	Lando NORRIS	HARD	2024-03-24T05:15:13.231000+00:00	53	27.968	
886	Lando NORRIS	HARD	2024-03-24T05:16:33.535000+00:00	54	27.907	

	full_name	compound	date_start	lap_number	duration_sector_1	dt
903	Lando NORRIS	HARD	2024-03-24T05:17:53.762000+00:00	55	28.045	
920	Lando NORRIS	HARD	2024-03-24T05:19:13.974000+00:00	56	28.074	

In [212...

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

Out[212...

	full_name	compound	date_start	lap_number	duration_sector_1	dt
37	Oscar PIASTRI	MEDIUM	2024-03-24T04:04:43.928000+00:00	2	29.201	
56	Oscar PIASTRI	MEDIUM	2024-03-24T04:06:07.073000+00:00	3	28.862	
75	Oscar PIASTRI	MEDIUM	2024-03-24T04:07:29.782000+00:00	4	28.914	
93	Oscar PIASTRI	MEDIUM	2024-03-24T04:08:52.326000+00:00	5	28.691	
110	Oscar PIASTRI	MEDIUM	2024-03-24T04:10:14.972000+00:00	6	28.860	
126	Oscar PIASTRI	MEDIUM	2024-03-24T04:11:37.596000+00:00	7	28.930	
142	Oscar PIASTRI	MEDIUM	2024-03-24T04:13:00.522000+00:00	8	28.843	
157	Oscar PIASTRI	MEDIUM	2024-03-24T04:14:23.521000+00:00	9	28.804	
189	Oscar PIASTRI	HARD	2024-03-24T04:17:27.870000+00:00	11	28.662	
207	Oscar PIASTRI	HARD	2024-03-24T04:18:50.513000+00:00	12	29.063	
225	Oscar PIASTRI	HARD	2024-03-24T04:20:13.402000+00:00	13	28.766	
243	Oscar PIASTRI	HARD	2024-03-24T04:21:35.923000+00:00	14	28.644	
259	Oscar PIASTRI	HARD	2024-03-24T04:22:57.776000+00:00	15	28.588	
277	Oscar PIASTRI	HARD	2024-03-24T04:24:19.740000+00:00	16	28.640	
292	Oscar PIASTRI	HARD	2024-03-24T04:25:41.933000+00:00	17	28.639	
306	Oscar PIASTRI	HARD	2024-03-24T04:27:18.571000+00:00	18	35.702	
323	Oscar PIASTRI	HARD	2024-03-24T04:28:47.660000+00:00	19	28.272	
340	Oscar PIASTRI	HARD	2024-03-24T04:30:09.537000+00:00	20	28.580	
357	Oscar PIASTRI	HARD	2024-03-24T04:31:31.591000+00:00	21	28.477	
374	Oscar PIASTRI	HARD	2024-03-24T04:32:53.566000+00:00	22	28.607	

	full_name	compound	date_start	lap_number	duration_sector_1	di
391	Oscar PIASTRI	HARD	2024-03-24T04:34:15.508000+00:00	23	28.496	
408	Oscar PIASTRI	HARD	2024-03-24T04:35:37.338000+00:00	24	28.553	
425	Oscar PIASTRI	HARD	2024-03-24T04:36:59.164000+00:00	25	28.380	
442	Oscar PIASTRI	HARD	2024-03-24T04:38:20.880000+00:00	26	28.631	
459	Oscar PIASTRI	HARD	2024-03-24T04:39:43.045000+00:00	27	28.693	
475	Oscar PIASTRI	HARD	2024-03-24T04:41:05.281000+00:00	28	28.654	
492	Oscar PIASTRI	HARD	2024-03-24T04:42:27.547000+00:00	29	29.906	
508	Oscar PIASTRI	HARD	2024-03-24T04:43:51.050000+00:00	30	28.702	
525	Oscar PIASTRI	HARD	2024-03-24T04:45:13.458000+00:00	31	28.797	
542	Oscar PIASTRI	HARD	2024-03-24T04:46:35.704000+00:00	32	28.664	
559	Oscar PIASTRI	HARD	2024-03-24T04:47:57.653000+00:00	33	28.724	
575	Oscar PIASTRI	HARD	2024-03-24T04:49:19.757000+00:00	34	28.728	
591	Oscar PIASTRI	HARD	2024-03-24T04:50:42.027000+00:00	35	28.716	
605	Oscar PIASTRI	HARD	2024-03-24T04:52:04.109000+00:00	36	28.779	
620	Oscar PIASTRI	HARD	2024-03-24T04:53:26.057000+00:00	37	28.614	
636	Oscar PIASTRI	HARD	2024-03-24T04:54:47.971000+00:00	38	28.686	
653	Oscar PIASTRI	HARD	2024-03-24T04:56:13.205000+00:00	39	28.952	
685	Oscar PIASTRI	HARD	2024-03-24T04:59:16.949000+00:00	41	28.125	
699	Oscar PIASTRI	HARD	2024-03-24T05:00:38.246000+00:00	42	28.312	
715	Oscar PIASTRI	HARD	2024-03-24T05:01:59.409000+00:00	43	28.090	
732	Oscar PIASTRI	HARD	2024-03-24T05:03:19.955000+00:00	44	27.914	
749	Oscar PIASTRI	HARD	2024-03-24T05:04:40.337000+00:00	45	27.948	
765	Oscar PIASTRI	HARD	2024-03-24T05:06:00.665000+00:00	46	27.981	
782	Oscar PIASTRI	HARD	2024-03-24T05:07:21.079000+00:00	47	28.141	
799	Oscar PIASTRI	HARD	2024-03-24T05:08:41.878000+00:00	48	28.039	

	full_name	compound	date_start	lap_number	duration_sector_1	di
816	Oscar PIASTRI	HARD	2024-03-24T05:10:02.379000+00:00	49	28.241	
833	Oscar PIASTRI	HARD	2024-03-24T05:11:22.836000+00:00	50	28.056	
850	Oscar PIASTRI	HARD	2024-03-24T05:12:43.264000+00:00	51	28.193	
867	Oscar PIASTRI	HARD	2024-03-24T05:14:03.924000+00:00	52	27.980	
884	Oscar PIASTRI	HARD	2024-03-24T05:15:24.186000+00:00	53	27.990	
901	Oscar PIASTRI	HARD	2024-03-24T05:16:44.584000+00:00	54	27.903	
918	Oscar PIASTRI	HARD	2024-03-24T05:18:04.719000+00:00	55	28.154	

RB

In [213...

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

Out[213...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
1	1231	9488	1	3	1	5	SOFT	
10	1231	9488	1	22	1	9	MEDIUM	
19	1231	9488	2	3	6	29	HARD	
29	1231	9488	2	22	10	36	HARD	
39	1231	9488	3	3	30	58	HARD	
46	1231	9488	3	22	37	59	HARD	

In [214...

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

Out[214...

	full_name	compound	date_start	lap_number	duration_sector_1	
20	Daniel RICCIARDO	SOFT	2024-03-24T04:04:50.510000+00:00	2	29.987	
39	Daniel RICCIARDO	SOFT	2024-03-24T04:06:15.342000+00:00	3	29.486	
58	Daniel RICCIARDO	SOFT	2024-03-24T04:07:39.126000+00:00	4	29.291	
111	Daniel RICCIARDO	HARD	2024-03-24T04:12:12.605000+00:00	7	29.836	
127	Daniel RICCIARDO	HARD	2024-03-24T04:13:36.726000+00:00	8	29.153	
143	Daniel RICCIARDO	HARD	2024-03-24T04:15:00.248000+00:00	9	29.023	
158	Daniel RICCIARDO	HARD	2024-03-24T04:16:23.792000+00:00	10	29.012	
172	Daniel RICCIARDO	HARD	2024-03-24T04:17:46.979000+00:00	11	28.925	

	full_name	compound	date_start	lap_number	duration_sector_1
190	Daniel RICCIARDO	HARD	2024-03-24T04:19:10.170000+00:00	12	28.940
208	Daniel RICCIARDO	HARD	2024-03-24T04:20:33.189000+00:00	13	28.856
226	Daniel RICCIARDO	HARD	2024-03-24T04:21:56.112000+00:00	14	28.865
244	Daniel RICCIARDO	HARD	2024-03-24T04:23:18.949000+00:00	15	28.787
260	Daniel RICCIARDO	HARD	2024-03-24T04:24:41.871000+00:00	16	28.844
293	Daniel RICCIARDO	HARD	2024-03-24T04:27:49.716000+00:00	18	31.019
307	Daniel RICCIARDO	HARD	2024-03-24T04:29:14.887000+00:00	19	28.660
324	Daniel RICCIARDO	HARD	2024-03-24T04:30:38.004000+00:00	20	28.883
341	Daniel RICCIARDO	HARD	2024-03-24T04:32:01.116000+00:00	21	28.875
358	Daniel RICCIARDO	HARD	2024-03-24T04:33:24.367000+00:00	22	28.810
375	Daniel RICCIARDO	HARD	2024-03-24T04:34:47.314000+00:00	23	28.748
392	Daniel RICCIARDO	HARD	2024-03-24T04:36:10.383000+00:00	24	28.906
409	Daniel RICCIARDO	HARD	2024-03-24T04:37:33.650000+00:00	25	28.966
426	Daniel RICCIARDO	HARD	2024-03-24T04:38:57.220000+00:00	26	28.941
443	Daniel RICCIARDO	HARD	2024-03-24T04:40:20.652000+00:00	27	29.084
460	Daniel RICCIARDO	HARD	2024-03-24T04:41:44.454000+00:00	28	29.169
476	Daniel RICCIARDO	HARD	2024-03-24T04:43:08.428000+00:00	29	29.021
509	Daniel RICCIARDO	HARD	2024-03-24T04:46:16.315000+00:00	31	28.840
526	Daniel RICCIARDO	HARD	2024-03-24T04:47:39.235000+00:00	32	28.592
543	Daniel RICCIARDO	HARD	2024-03-24T04:49:02.033000+00:00	33	28.549
560	Daniel RICCIARDO	HARD	2024-03-24T04:50:24.423000+00:00	34	28.674
576	Daniel RICCIARDO	HARD	2024-03-24T04:51:47.180000+00:00	35	29.175
592	Daniel RICCIARDO	HARD	2024-03-24T04:53:10.670000+00:00	36	30.883
606	Daniel RICCIARDO	HARD	2024-03-24T04:54:35.614000+00:00	37	28.605
621	Daniel RICCIARDO	HARD	2024-03-24T04:55:58.178000+00:00	38	28.792

	full_name	compound	date_start	lap_number	duration_sector_1
637	Daniel RICCIARDO	HARD	2024-03-24T04:57:20.602000+00:00	39	28.698
654	Daniel RICCIARDO	HARD	2024-03-24T04:58:42.737000+00:00	40	28.280
670	Daniel RICCIARDO	HARD	2024-03-24T05:00:04.065000+00:00	41	28.388
686	Daniel RICCIARDO	HARD	2024-03-24T05:01:25.609000+00:00	42	28.421
700	Daniel RICCIARDO	HARD	2024-03-24T05:02:47.546000+00:00	43	28.395
716	Daniel RICCIARDO	HARD	2024-03-24T05:04:09.400000+00:00	44	28.202
733	Daniel RICCIARDO	HARD	2024-03-24T05:05:30.614000+00:00	45	28.362
750	Daniel RICCIARDO	HARD	2024-03-24T05:06:52.007000+00:00	46	28.318
766	Daniel RICCIARDO	HARD	2024-03-24T05:08:13.143000+00:00	47	28.350
783	Daniel RICCIARDO	HARD	2024-03-24T05:09:34.435000+00:00	48	28.441
800	Daniel RICCIARDO	HARD	2024-03-24T05:10:55.948000+00:00	49	28.441
817	Daniel RICCIARDO	HARD	2024-03-24T05:12:17.499000+00:00	50	28.525
834	Daniel RICCIARDO	HARD	2024-03-24T05:13:39.349000+00:00	51	28.534
851	Daniel RICCIARDO	HARD	2024-03-24T05:15:01.007000+00:00	52	28.406
868	Daniel RICCIARDO	HARD	2024-03-24T05:16:23.028000+00:00	53	28.574
885	Daniel RICCIARDO	HARD	2024-03-24T05:17:47.157000+00:00	54	28.907
	Daniel				

In [215...

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

Out[215...

	full_name	compound	date_start	lap_number	duration_sector_1	d
28	Yuki TSUNODA	MEDIUM	2024-03-24T04:04:46.204000+00:00	2	29.709	
47	Yuki TSUNODA	MEDIUM	2024-03-24T04:06:09.953000+00:00	3	29.009	
66	Yuki TSUNODA	MEDIUM	2024-03-24T04:07:33.151000+00:00	4	29.050	
84	Yuki TSUNODA	MEDIUM	2024-03-24T04:08:56.502000+00:00	5	29.072	
101	Yuki TSUNODA	MEDIUM	2024-03-24T04:10:19.879000+00:00	6	29.026	
119	Yuki TSUNODA	MEDIUM	2024-03-24T04:11:43.429000+00:00	7	28.848	

	full_name	compound	date_start	lap_number	duration_sector_1	d
134	Yuki TSUNODA	MEDIUM	2024-03-24T04:13:06.297000+00:00	8	28.869	
180	Yuki TSUNODA	HARD	2024-03-24T04:17:37.643000+00:00	11	28.912	
198	Yuki TSUNODA	HARD	2024-03-24T04:19:00.620000+00:00	12	28.776	
216	Yuki TSUNODA	HARD	2024-03-24T04:20:23.549000+00:00	13	28.720	
234	Yuki TSUNODA	HARD	2024-03-24T04:21:46.423000+00:00	14	28.795	
250	Yuki TSUNODA	HARD	2024-03-24T04:23:09.213000+00:00	15	29.078	
268	Yuki TSUNODA	HARD	2024-03-24T04:24:32.646000+00:00	16	28.921	
299	Yuki TSUNODA	HARD	2024-03-24T04:27:39.408000+00:00	18	30.803	
315	Yuki TSUNODA	HARD	2024-03-24T04:29:04.359000+00:00	19	28.900	
332	Yuki TSUNODA	HARD	2024-03-24T04:30:27.340000+00:00	20	28.775	
349	Yuki TSUNODA	HARD	2024-03-24T04:31:50.432000+00:00	21	28.808	
366	Yuki TSUNODA	HARD	2024-03-24T04:33:13.249000+00:00	22	28.789	
383	Yuki TSUNODA	HARD	2024-03-24T04:34:35.994000+00:00	23	28.884	
400	Yuki TSUNODA	HARD	2024-03-24T04:35:59.014000+00:00	24	28.864	
417	Yuki TSUNODA	HARD	2024-03-24T04:37:22.046000+00:00	25	28.961	
434	Yuki TSUNODA	HARD	2024-03-24T04:38:45.048000+00:00	26	28.853	
451	Yuki TSUNODA	HARD	2024-03-24T04:40:08.234000+00:00	27	29.000	
468	Yuki TSUNODA	HARD	2024-03-24T04:41:31.514000+00:00	28	28.872	
484	Yuki TSUNODA	HARD	2024-03-24T04:42:54.671000+00:00	29	29.078	
500	Yuki TSUNODA	HARD	2024-03-24T04:44:18.091000+00:00	30	28.979	
517	Yuki TSUNODA	HARD	2024-03-24T04:45:41.566000+00:00	31	29.068	
534	Yuki TSUNODA	HARD	2024-03-24T04:47:04.919000+00:00	32	29.119	
551	Yuki TSUNODA	HARD	2024-03-24T04:48:28.330000+00:00	33	29.053	
567	Yuki TSUNODA	HARD	2024-03-24T04:49:51.478000+00:00	34	29.019	
583	Yuki TSUNODA	HARD	2024-03-24T04:51:14.912000+00:00	35	29.056	

	full_name	compound	date_start	lap_number	duration_sector_1	d
599	Yuki TSUNODA	HARD	2024-03-24T04:52:38.190000+00:00	36	29.164	
628	Yuki TSUNODA	HARD	2024-03-24T04:55:44.515000+00:00	38	28.555	
645	Yuki TSUNODA	HARD	2024-03-24T04:57:06.348000+00:00	39	28.595	
662	Yuki TSUNODA	HARD	2024-03-24T04:58:28.604000+00:00	40	28.834	
677	Yuki TSUNODA	HARD	2024-03-24T04:59:51.695000+00:00	41	28.515	
692	Yuki TSUNODA	HARD	2024-03-24T05:01:13.617000+00:00	42	28.437	
708	Yuki TSUNODA	HARD	2024-03-24T05:02:35.275000+00:00	43	28.484	
724	Yuki TSUNODA	HARD	2024-03-24T05:03:57.266000+00:00	44	28.490	
741	Yuki TSUNODA	HARD	2024-03-24T05:05:19.131000+00:00	45	28.467	
758	Yuki TSUNODA	HARD	2024-03-24T05:06:40.829000+00:00	46	28.246	
774	Yuki TSUNODA	HARD	2024-03-24T05:08:01.954000+00:00	47	28.261	
791	Yuki TSUNODA	HARD	2024-03-24T05:09:23.150000+00:00	48	28.276	
808	Yuki TSUNODA	HARD	2024-03-24T05:10:44.277000+00:00	49	28.282	
825	Yuki TSUNODA	HARD	2024-03-24T05:12:05.605000+00:00	50	28.300	
842	Yuki TSUNODA	HARD	2024-03-24T05:13:26.948000+00:00	51	28.220	
859	Yuki TSUNODA	HARD	2024-03-24T05:14:48.454000+00:00	52	28.445	
876	Yuki TSUNODA	HARD	2024-03-24T05:16:10.161000+00:00	53	28.270	
893	Yuki TSUNODA	HARD	2024-03-24T05:17:31.691000+00:00	54	28.338	
910	Yuki TSUNODA	HARD	2024-03-24T05:18:53.187000+00:00	55	28.333	

Haas F1 Team

In [216...

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

Out[216...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
4	1231	9488	1	20	1	7	MEDIUM	
18	1231	9488	1	27	1	17	HARD	
23	1231	9488	2	20	8	33	HARD	
35	1231	9488	2	27	18	35	MEDIUM	
40	1231	9488	3	20	34	58	HARD	

```
meeting_key session_key stint_number driver_number lap_start lap_end compound tyre  
In [217... libraryDataF1.getinfo(longruns(jointables,20,'Haas F1 Team',MINIMUM_SECONDS
```

Out[217...	full_name	compound	date_start	lap_number	duration_sector_1
27	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:04:48.327000+00:00	2	29.856
46	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:06:12.551000+00:00	3	29.255
65	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:07:36.133000+00:00	4	29.068
83	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:08:59.630000+00:00	5	29.446
100	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:10:23.621000+00:00	6	29.211
118	Kevin MAGNUSSEN	MEDIUM	2024-03-24T04:11:47.638000+00:00	7	29.198
149	Kevin MAGNUSSEN	HARD	2024-03-24T04:14:55.555000+00:00	9	29.317
164	Kevin MAGNUSSEN	HARD	2024-03-24T04:16:19.170000+00:00	10	29.145
179	Kevin MAGNUSSEN	HARD	2024-03-24T04:17:42.858000+00:00	11	29.073
197	Kevin MAGNUSSEN	HARD	2024-03-24T04:19:06.195000+00:00	12	29.117
215	Kevin MAGNUSSEN	HARD	2024-03-24T04:20:29.279000+00:00	13	28.848
233	Kevin MAGNUSSEN	HARD	2024-03-24T04:21:52.402000+00:00	14	28.975
249	Kevin MAGNUSSEN	HARD	2024-03-24T04:23:15.312000+00:00	15	29.093
267	Kevin MAGNUSSEN	HARD	2024-03-24T04:24:38.856000+00:00	16	29.073
298	Kevin MAGNUSSEN	HARD	2024-03-24T04:27:47.343000+00:00	18	29.280
314	Kevin MAGNUSSEN	HARD	2024-03-24T04:29:10.533000+00:00	19	28.691
331	Kevin MAGNUSSEN	HARD	2024-03-24T04:30:33.315000+00:00	20	28.859
348	Kevin MAGNUSSEN	HARD	2024-03-24T04:31:56.176000+00:00	21	28.817
365	Kevin MAGNUSSEN	HARD	2024-03-24T04:33:19.014000+00:00	22	28.881
382	Kevin MAGNUSSEN	HARD	2024-03-24T04:34:42.381000+00:00	23	29.063
399	Kevin MAGNUSSEN	HARD	2024-03-24T04:36:06.606000+00:00	24	28.960
416	Kevin MAGNUSSEN	HARD	2024-03-24T04:37:29.960000+00:00	25	29.113

	full_name	compound	date_start	lap_number	duration_sector_1
433	Kevin MAGNUSSEN	HARD	2024-03-24T04:38:53.401000+00:00	26	29.057
450	Kevin MAGNUSSEN	HARD	2024-03-24T04:40:16.966000+00:00	27	29.057
467	Kevin MAGNUSSEN	HARD	2024-03-24T04:41:40.395000+00:00	28	28.881
483	Kevin MAGNUSSEN	HARD	2024-03-24T04:43:03.943000+00:00	29	28.996
499	Kevin MAGNUSSEN	HARD	2024-03-24T04:44:27.467000+00:00	30	29.082
516	Kevin MAGNUSSEN	HARD	2024-03-24T04:45:50.740000+00:00	31	29.001
533	Kevin MAGNUSSEN	HARD	2024-03-24T04:47:13.922000+00:00	32	29.113
550	Kevin MAGNUSSEN	HARD	2024-03-24T04:48:37.355000+00:00	33	29.137
582	Kevin MAGNUSSEN	HARD	2024-03-24T04:51:43.975000+00:00	35	28.467
598	Kevin MAGNUSSEN	HARD	2024-03-24T04:53:06.121000+00:00	36	28.474
613	Kevin MAGNUSSEN	HARD	2024-03-24T04:54:28.257000+00:00	37	28.640
627	Kevin MAGNUSSEN	HARD	2024-03-24T04:55:50.483000+00:00	38	28.649
644	Kevin MAGNUSSEN	HARD	2024-03-24T04:57:12.476000+00:00	39	28.582
661	Kevin MAGNUSSEN	HARD	2024-03-24T04:58:34.312000+00:00	40	28.346
676	Kevin MAGNUSSEN	HARD	2024-03-24T04:59:56.121000+00:00	41	29.007
691	Kevin MAGNUSSEN	HARD	2024-03-24T05:01:19.276000+00:00	42	28.450
707	Kevin MAGNUSSEN	HARD	2024-03-24T05:02:41.314000+00:00	43	28.314
723	Kevin MAGNUSSEN	HARD	2024-03-24T05:04:03.214000+00:00	44	28.418
740	Kevin MAGNUSSEN	HARD	2024-03-24T05:05:24.355000+00:00	45	28.428
757	Kevin MAGNUSSEN	HARD	2024-03-24T05:06:46.047000+00:00	46	28.385
773	Kevin MAGNUSSEN	HARD	2024-03-24T05:08:07.567000+00:00	47	28.307
790	Kevin MAGNUSSEN	HARD	2024-03-24T05:09:29.036000+00:00	48	28.410
807	Kevin MAGNUSSEN	HARD	2024-03-24T05:10:50.722000+00:00	49	28.312
824	Kevin MAGNUSSEN	HARD	2024-03-24T05:12:12.103000+00:00	50	28.432
841	Kevin MAGNUSSEN	HARD	2024-03-24T05:13:33.736000+00:00	51	28.391

	full_name	compound	date_start	lap_number	duration_sector_1
858	Kevin MAGNUSSEN	HARD	2024-03-24T05:14:55.139000+00:00	52	28.441
875	Kevin MAGNUSSEN	HARD	2024-03-24T05:16:16.908000+00:00	53	28.371
892	Kevin MAGNUSSEN	HARD	2024-03-24T05:17:38.452000+00:00	54	28.606

In [218...

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

Out[218...

	full_name	compound	date_start	lap_number	duration_sector_1
31	Nico HULKENBERG	HARD	2024-03-24T04:04:49.823000+00:00	2	29.981
50	Nico HULKENBERG	HARD	2024-03-24T04:06:14.546000+00:00	3	29.211
69	Nico HULKENBERG	HARD	2024-03-24T04:07:38.106000+00:00	4	29.271
87	Nico HULKENBERG	HARD	2024-03-24T04:09:01.715000+00:00	5	29.911
104	Nico HULKENBERG	HARD	2024-03-24T04:10:26.273000+00:00	6	29.454
120	Nico HULKENBERG	HARD	2024-03-24T04:11:50+00:00	7	29.241
137	Nico HULKENBERG	HARD	2024-03-24T04:13:13.822000+00:00	8	29.281
153	Nico HULKENBERG	HARD	2024-03-24T04:14:37.728000+00:00	9	29.291
167	Nico HULKENBERG	HARD	2024-03-24T04:16:01.571000+00:00	10	29.191
183	Nico HULKENBERG	HARD	2024-03-24T04:17:25.360000+00:00	11	29.301
201	Nico HULKENBERG	HARD	2024-03-24T04:18:50.513000+00:00	12	30.301
219	Nico HULKENBERG	HARD	2024-03-24T04:20:15.188000+00:00	13	29.321
237	Nico HULKENBERG	HARD	2024-03-24T04:21:39.181000+00:00	14	29.364
253	Nico HULKENBERG	HARD	2024-03-24T04:23:03.157000+00:00	15	29.481
271	Nico HULKENBERG	HARD	2024-03-24T04:24:27.460000+00:00	16	29.381
318	Nico HULKENBERG	MEDIUM	2024-03-24T04:29:13.905000+00:00	19	28.721
335	Nico HULKENBERG	MEDIUM	2024-03-24T04:30:36.254000+00:00	20	28.781
352	Nico HULKENBERG	MEDIUM	2024-03-24T04:31:58.646000+00:00	21	28.711
369	Nico HULKENBERG	MEDIUM	2024-03-24T04:33:21.050000+00:00	22	28.791

	full_name	compound	date_start	lap_number	duration_sector_1
386	Nico HULKENBERG	MEDIUM	2024-03-24T04:34:43.620000+00:00	23	28.841
403	Nico HULKENBERG	MEDIUM	2024-03-24T04:36:05.595000+00:00	24	28.811
420	Nico HULKENBERG	MEDIUM	2024-03-24T04:37:28.236000+00:00	25	29.021
437	Nico HULKENBERG	MEDIUM	2024-03-24T04:38:51.199000+00:00	26	29.534
454	Nico HULKENBERG	MEDIUM	2024-03-24T04:40:14.803000+00:00	27	29.380
470	Nico HULKENBERG	MEDIUM	2024-03-24T04:41:38.146000+00:00	28	29.038
487	Nico HULKENBERG	MEDIUM	2024-03-24T04:43:01.516000+00:00	29	29.021
503	Nico HULKENBERG	MEDIUM	2024-03-24T04:44:24.675000+00:00	30	29.128
520	Nico HULKENBERG	MEDIUM	2024-03-24T04:45:48.094000+00:00	31	29.150
537	Nico HULKENBERG	MEDIUM	2024-03-24T04:47:11.219000+00:00	32	29.058
554	Nico HULKENBERG	MEDIUM	2024-03-24T04:48:34.073000+00:00	33	29.038
570	Nico HULKENBERG	MEDIUM	2024-03-24T04:49:56.989000+00:00	34	29.041
586	Nico HULKENBERG	MEDIUM	2024-03-24T04:51:20.142000+00:00	35	29.128
616	Nico HULKENBERG	HARD	2024-03-24T04:54:24.664000+00:00	37	28.388
631	Nico HULKENBERG	HARD	2024-03-24T04:55:46.401000+00:00	38	28.498
648	Nico HULKENBERG	HARD	2024-03-24T04:57:08.330000+00:00	39	28.418
665	Nico HULKENBERG	HARD	2024-03-24T04:58:30.300000+00:00	40	28.401
680	Nico HULKENBERG	HARD	2024-03-24T04:59:53.090000+00:00	41	28.708
695	Nico HULKENBERG	HARD	2024-03-24T05:01:15+00:00	42	28.541
711	Nico HULKENBERG	HARD	2024-03-24T05:02:37.306000+00:00	43	28.490
727	Nico HULKENBERG	HARD	2024-03-24T05:03:59.166000+00:00	44	28.458
744	Nico HULKENBERG	HARD	2024-03-24T05:05:20.968000+00:00	45	28.388
761	Nico HULKENBERG	HARD	2024-03-24T05:06:42.461000+00:00	46	28.291
777	Nico HULKENBERG	HARD	2024-03-24T05:08:03.693000+00:00	47	28.571
794	Nico HULKENBERG	HARD	2024-03-24T05:09:25.276000+00:00	48	28.461

	full_name	compound	date_start	lap_number	duration_sector_1
811	Nico HULKENBERG	HARD	2024-03-24T05:10:46.866000+00:00	49	28.586
828	Nico HULKENBERG	HARD	2024-03-24T05:12:08.559000+00:00	50	28.706
845	Nico HULKENBERG	HARD	2024-03-24T05:13:30.650000+00:00	51	28.586
862	Nico HULKENBERG	HARD	2024-03-24T05:14:52.342000+00:00	52	28.556
879	Nico HULKENBERG	HARD	2024-03-24T05:16:14.224000+00:00	53	28.576
896	Nico HULKENBERG	HARD	2024-03-24T05:17:35.899000+00:00	54	28.616

Kick Sauber

In [219...

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

Out[219...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1231	9488	1	24	1	6	SOFT	
8	1231	9488	1	77	1	8	MEDIUM	
21	1231	9488	2	24	7	35	HARD	
24	1231	9488	2	77	9	36	HARD	
42	1231	9488	3	24	36	58	HARD	
45	1231	9488	3	77	37	58	HARD	

In [220...

```
libraryDataF1.getinfo(longruns(jointables,24,'Kick Sauber',MINIMUM_SECONDS,1
```

Out[220...

	full_name	compound	date_start	lap_number	duration_sector_1	du
30	ZHOU Guanyu	SOFT	2024-03-24T04:04:51.598000+00:00	2	29.555	
49	ZHOU Guanyu	SOFT	2024-03-24T04:06:15.948000+00:00	3	29.466	
68	ZHOU Guanyu	SOFT	2024-03-24T04:07:39.879000+00:00	4	29.158	
86	ZHOU Guanyu	SOFT	2024-03-24T04:09:03.825000+00:00	5	29.236	
136	ZHOU Guanyu	HARD	2024-03-24T04:13:38.027000+00:00	8	29.497	
152	ZHOU Guanyu	HARD	2024-03-24T04:15:02.469000+00:00	9	29.129	
166	ZHOU Guanyu	HARD	2024-03-24T04:16:26.049000+00:00	10	29.197	
182	ZHOU Guanyu	HARD	2024-03-24T04:17:49.802000+00:00	11	29.027	
200	ZHOU Guanyu	HARD	2024-03-24T04:19:13.237000+00:00	12	28.869	

	full_name	compound	date_start	lap_number	duration_sector_1	di
218	ZHOU Guanyu	HARD	2024-03-24T04:20:36.428000+00:00	13	29.107	
236	ZHOU Guanyu	HARD	2024-03-24T04:21:59.934000+00:00	14	29.086	
252	ZHOU Guanyu	HARD	2024-03-24T04:23:23.235000+00:00	15	29.070	
270	ZHOU Guanyu	HARD	2024-03-24T04:24:46.467000+00:00	16	28.996	
301	ZHOU Guanyu	HARD	2024-03-24T04:27:54.710000+00:00	18	30.106	
317	ZHOU Guanyu	HARD	2024-03-24T04:29:19.614000+00:00	19	29.184	
334	ZHOU Guanyu	HARD	2024-03-24T04:30:43.155000+00:00	20	28.950	
351	ZHOU Guanyu	HARD	2024-03-24T04:32:06.281000+00:00	21	29.095	
368	ZHOU Guanyu	HARD	2024-03-24T04:33:29.781000+00:00	22	29.084	
385	ZHOU Guanyu	HARD	2024-03-24T04:34:53.213000+00:00	23	28.997	
402	ZHOU Guanyu	HARD	2024-03-24T04:36:16.379000+00:00	24	28.947	
419	ZHOU Guanyu	HARD	2024-03-24T04:37:39.641000+00:00	25	29.065	
436	ZHOU Guanyu	HARD	2024-03-24T04:39:02.690000+00:00	26	28.892	
453	ZHOU Guanyu	HARD	2024-03-24T04:40:25.810000+00:00	27	28.839	
469	ZHOU Guanyu	HARD	2024-03-24T04:41:48.900000+00:00	28	28.924	
486	ZHOU Guanyu	HARD	2024-03-24T04:43:11.900000+00:00	29	28.809	
502	ZHOU Guanyu	HARD	2024-03-24T04:44:34.432000+00:00	30	28.908	
519	ZHOU Guanyu	HARD	2024-03-24T04:45:57.426000+00:00	31	28.813	
536	ZHOU Guanyu	HARD	2024-03-24T04:47:20.252000+00:00	32	28.988	
553	ZHOU Guanyu	HARD	2024-03-24T04:48:43.429000+00:00	33	28.848	
569	ZHOU Guanyu	HARD	2024-03-24T04:50:06.611000+00:00	34	28.927	
615	ZHOU Guanyu	HARD	2024-03-24T04:54:54.935000+00:00	37	28.596	
630	ZHOU Guanyu	HARD	2024-03-24T04:56:17.459000+00:00	38	28.906	
647	ZHOU Guanyu	HARD	2024-03-24T04:57:39.933000+00:00	39	28.476	
664	ZHOU Guanyu	HARD	2024-03-24T04:59:02.032000+00:00	40	28.391	

	full_name	compound	date_start	lap_number	duration_sector_1	di
679	ZHOU Guanyu	HARD	2024-03-24T05:00:23.822000+00:00	41	28.641	
694	ZHOU Guanyu	HARD	2024-03-24T05:01:47.866000+00:00	42	28.581	
710	ZHOU Guanyu	HARD	2024-03-24T05:03:10.086000+00:00	43	30.079	
726	ZHOU Guanyu	HARD	2024-03-24T05:04:33.790000+00:00	44	28.709	
743	ZHOU Guanyu	HARD	2024-03-24T05:05:56.052000+00:00	45	28.403	
760	ZHOU Guanyu	HARD	2024-03-24T05:07:17.611000+00:00	46	28.342	
776	ZHOU Guanyu	HARD	2024-03-24T05:08:39.337000+00:00	47	28.474	
793	ZHOU Guanyu	HARD	2024-03-24T05:10:01.119000+00:00	48	28.701	
810	ZHOU Guanyu	HARD	2024-03-24T05:11:24.269000+00:00	49	28.288	
827	ZHOU Guanyu	HARD	2024-03-24T05:12:45.526000+00:00	50	28.509	
844	ZHOU Guanyu	HARD	2024-03-24T05:14:07.479000+00:00	51	28.516	
861	ZHOU Guanyu	HARD	2024-03-24T05:15:29.280000+00:00	52	28.554	
878	ZHOU Guanyu	HARD	2024-03-24T05:16:51.297000+00:00	53	28.537	
895	ZHOU Guanyu	HARD	2024-03-24T05:18:13.537000+00:00	54	28.629	
---	ZHOU	---	---	---	---	

In [221...

```
libraryDataF1.getinfo(longruns(jointables,77,'Kick Sauber',MINIMUM_SECONDS,I
```

Out[221...

	full_name	compound	date_start	lap_number	duration_sector_1	di
36	Valtteri BOTTAS	MEDIUM	2024-03-24T04:04:47.624000+00:00	2	29.948	
55	Valtteri BOTTAS	MEDIUM	2024-03-24T04:06:12.023000+00:00	3	29.099	
74	Valtteri BOTTAS	MEDIUM	2024-03-24T04:07:35.221000+00:00	4	29.226	
92	Valtteri BOTTAS	MEDIUM	2024-03-24T04:08:58.949000+00:00	5	29.365	
109	Valtteri BOTTAS	MEDIUM	2024-03-24T04:10:22.533000+00:00	6	29.091	
125	Valtteri BOTTAS	MEDIUM	2024-03-24T04:11:45.614000+00:00	7	29.154	
171	Valtteri BOTTAS	HARD	2024-03-24T04:16:45.934000+00:00	10	28.850	
188	Valtteri BOTTAS	HARD	2024-03-24T04:18:09.059000+00:00	11	28.853	

	full_name	compound	date_start	lap_number	duration_sector_1	di
206	Valtteri BOTTAS	HARD	2024-03-24T04:19:32.582000+00:00	12	28.889	
224	Valtteri BOTTAS	HARD	2024-03-24T04:20:55.550000+00:00	13	28.879	
242	Valtteri BOTTAS	HARD	2024-03-24T04:22:18.740000+00:00	14	29.007	
258	Valtteri BOTTAS	HARD	2024-03-24T04:23:42.088000+00:00	15	28.830	
276	Valtteri BOTTAS	HARD	2024-03-24T04:25:05.392000+00:00	16	28.705	
305	Valtteri BOTTAS	HARD	2024-03-24T04:28:14.795000+00:00	18	28.692	
322	Valtteri BOTTAS	HARD	2024-03-24T04:29:37.424000+00:00	19	28.561	
339	Valtteri BOTTAS	HARD	2024-03-24T04:30:59.983000+00:00	20	28.723	
356	Valtteri BOTTAS	HARD	2024-03-24T04:32:22.687000+00:00	21	28.649	
373	Valtteri BOTTAS	HARD	2024-03-24T04:33:45.119000+00:00	22	28.696	
390	Valtteri BOTTAS	HARD	2024-03-24T04:35:07.857000+00:00	23	28.619	
407	Valtteri BOTTAS	HARD	2024-03-24T04:36:30.303000+00:00	24	28.931	
424	Valtteri BOTTAS	HARD	2024-03-24T04:37:53.145000+00:00	25	28.758	
441	Valtteri BOTTAS	HARD	2024-03-24T04:39:15.695000+00:00	26	28.904	
458	Valtteri BOTTAS	HARD	2024-03-24T04:40:38.732000+00:00	27	28.816	
474	Valtteri BOTTAS	HARD	2024-03-24T04:42:01.614000+00:00	28	28.842	
491	Valtteri BOTTAS	HARD	2024-03-24T04:43:24.559000+00:00	29	28.797	
507	Valtteri BOTTAS	HARD	2024-03-24T04:44:47.364000+00:00	30	28.746	
524	Valtteri BOTTAS	HARD	2024-03-24T04:46:10.421000+00:00	31	28.842	
541	Valtteri BOTTAS	HARD	2024-03-24T04:47:33.433000+00:00	32	28.941	
558	Valtteri BOTTAS	HARD	2024-03-24T04:48:56.320000+00:00	33	28.880	
574	Valtteri BOTTAS	HARD	2024-03-24T04:50:19.213000+00:00	34	31.308	
590	Valtteri BOTTAS	HARD	2024-03-24T04:51:45.600000+00:00	35	29.157	
635	Valtteri BOTTAS	HARD	2024-03-24T04:56:15.793000+00:00	38	28.421	
652	Valtteri BOTTAS	HARD	2024-03-24T04:57:37.547000+00:00	39	28.382	

	full_name	compound	date_start	lap_number	duration_sector_1	di
669	Valtteri BOTTAS	HARD	2024-03-24T04:58:59.083000+00:00	40	28.298	
684	Valtteri BOTTAS	HARD	2024-03-24T05:00:20.669000+00:00	41	28.575	
698	Valtteri BOTTAS	HARD	2024-03-24T05:01:42.714000+00:00	42	30.103	
714	Valtteri BOTTAS	HARD	2024-03-24T05:03:07.825000+00:00	43	28.615	
731	Valtteri BOTTAS	HARD	2024-03-24T05:04:30.726000+00:00	44	29.234	
748	Valtteri BOTTAS	HARD	2024-03-24T05:05:54.031000+00:00	45	28.591	
764	Valtteri BOTTAS	HARD	2024-03-24T05:07:15.721000+00:00	46	28.351	
781	Valtteri BOTTAS	HARD	2024-03-24T05:08:37.274000+00:00	47	28.425	
798	Valtteri BOTTAS	HARD	2024-03-24T05:09:58.910000+00:00	48	28.327	
815	Valtteri BOTTAS	HARD	2024-03-24T05:11:20.261000+00:00	49	28.314	
832	Valtteri BOTTAS	HARD	2024-03-24T05:12:41.720000+00:00	50	29.635	
849	Valtteri BOTTAS	HARD	2024-03-24T05:14:05.719000+00:00	51	28.418	
866	Valtteri BOTTAS	HARD	2024-03-24T05:15:27.364000+00:00	52	28.552	
883	Valtteri BOTTAS	HARD	2024-03-24T05:16:49.364000+00:00	53	28.427	
900	Valtteri BOTTAS	HARD	2024-03-24T05:18:11.224000+00:00	54	28.513	
917	Valtteri	HARD	2024-03-24T05:19:33.220000+00:00	55	28.206	

Williams

```
In [222... stintInformation.query('driver_number == 23 or driver_number == 2')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
2	1231	9488	1	23	1	6	MEDIUM	
20	1231	9488	2	23	7	27	HARD	
38	1231	9488	3	23	28	58	HARD	

```
In [223... libraryDataF1.getinfo(longruns(jointables,23,'Williams',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

	full_name	compound	date_start	lap_number	duration_sector_1	di
29	Alexander ALBON	MEDIUM	2024-03-24T04:04:48.660000+00:00	2	30.021	
48	Alexander ALBON	MEDIUM	2024-03-24T04:06:13.314000+00:00	3	29.307	

	full_name	compound	date_start	lap_number	duration_sector_1	di
67	Alexander ALBON	MEDIUM	2024-03-24T04:07:36.823000+00:00	4	29.061	
85	Alexander ALBON	MEDIUM	2024-03-24T04:09:00.159000+00:00	5	29.328	
102	Alexander ALBON	MEDIUM	2024-03-24T04:10:24.053000+00:00	6	29.299	
135	Alexander ALBON	HARD	2024-03-24T04:13:30.411000+00:00	8	29.377	
151	Alexander ALBON	HARD	2024-03-24T04:14:54.146000+00:00	9	29.274	
165	Alexander ALBON	HARD	2024-03-24T04:16:17.782000+00:00	10	29.780	
181	Alexander ALBON	HARD	2024-03-24T04:17:41.564000+00:00	11	29.091	
199	Alexander ALBON	HARD	2024-03-24T04:19:04.910000+00:00	12	29.045	
217	Alexander ALBON	HARD	2024-03-24T04:20:27.632000+00:00	13	28.991	
235	Alexander ALBON	HARD	2024-03-24T04:21:50.820000+00:00	14	29.004	
251	Alexander ALBON	HARD	2024-03-24T04:23:13.830000+00:00	15	28.888	
269	Alexander ALBON	HARD	2024-03-24T04:24:36.902000+00:00	16	28.847	
300	Alexander ALBON	HARD	2024-03-24T04:27:44.132000+00:00	18	30.085	
316	Alexander ALBON	HARD	2024-03-24T04:29:08.443000+00:00	19	28.826	
333	Alexander ALBON	HARD	2024-03-24T04:30:31.529000+00:00	20	28.717	
350	Alexander ALBON	HARD	2024-03-24T04:31:54.033000+00:00	21	28.956	
367	Alexander ALBON	HARD	2024-03-24T04:33:17.090000+00:00	22	28.925	
384	Alexander ALBON	HARD	2024-03-24T04:34:40.432000+00:00	23	28.917	
401	Alexander ALBON	HARD	2024-03-24T04:36:03.680000+00:00	24	28.970	
418	Alexander ALBON	HARD	2024-03-24T04:37:27.130000+00:00	25	29.201	
435	Alexander ALBON	HARD	2024-03-24T04:38:50.811000+00:00	26	29.159	
452	Alexander ALBON	HARD	2024-03-24T04:40:14.342000+00:00	27	29.197	
485	Alexander ALBON	HARD	2024-03-24T04:43:21.019000+00:00	29	28.879	
501	Alexander ALBON	HARD	2024-03-24T04:44:43.905000+00:00	30	28.864	
518	Alexander ALBON	HARD	2024-03-24T04:46:06.631000+00:00	31	28.883	

	full_name	compound	date_start	lap_number	duration_sector_1	di
535	Alexander ALBON	HARD	2024-03-24T04:47:29.625000+00:00	32	28.710	
552	Alexander ALBON	HARD	2024-03-24T04:48:52.622000+00:00	33	28.963	
568	Alexander ALBON	HARD	2024-03-24T04:50:15.728000+00:00	34	28.857	
584	Alexander ALBON	HARD	2024-03-24T04:51:38.661000+00:00	35	28.982	
600	Alexander ALBON	HARD	2024-03-24T04:53:01.993000+00:00	36	29.749	
614	Alexander ALBON	HARD	2024-03-24T04:54:26.448000+00:00	37	29.079	
629	Alexander ALBON	HARD	2024-03-24T04:55:49.322000+00:00	38	28.612	
646	Alexander ALBON	HARD	2024-03-24T04:57:11.525000+00:00	39	28.529	
663	Alexander ALBON	HARD	2024-03-24T04:58:33.521000+00:00	40	28.341	
678	Alexander ALBON	HARD	2024-03-24T04:59:55.297000+00:00	41	29.684	
693	Alexander ALBON	HARD	2024-03-24T05:01:18.863000+00:00	42	28.438	
709	Alexander ALBON	HARD	2024-03-24T05:02:40.574000+00:00	43	28.355	
725	Alexander ALBON	HARD	2024-03-24T05:04:02.848000+00:00	44	28.359	
742	Alexander ALBON	HARD	2024-03-24T05:05:25.238000+00:00	45	28.459	
759	Alexander ALBON	HARD	2024-03-24T05:06:47.208000+00:00	46	28.449	
775	Alexander ALBON	HARD	2024-03-24T05:08:08.818000+00:00	47	28.443	
792	Alexander ALBON	HARD	2024-03-24T05:09:30.617000+00:00	48	28.571	
809	Alexander ALBON	HARD	2024-03-24T05:10:52.536000+00:00	49	28.461	
826	Alexander ALBON	HARD	2024-03-24T05:12:14.577000+00:00	50	28.659	
843	Alexander ALBON	HARD	2024-03-24T05:13:36.789000+00:00	51	28.736	
860	Alexander ALBON	HARD	2024-03-24T05:14:59.079000+00:00	52	28.514	
877	Alexander ALBON	HARD	2024-03-24T05:16:21.323000+00:00	53	28.743	
894	Alexander ALBON	HARD	2024-03-24T05:17:43.715000+00:00	54	28.682	
911	Alexander ALBON	HARD	2024-03-24T05:19:07.844000+00:00	55	28.597	


```
In [224... libraryDataF1.getinfo(longruns(jointables,2,'Williams'),MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

Out[224... full_name compound date_start lap_number duration_sector_1 duration_sector_2 duration_

Alpine

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
11	1231	9488	1	31	1	9	MEDIUM	
16	1231	9488	1	10	1	17	MEDIUM	
27	1231	9488	2	31	10	16	HARD	
34	1231	9488	3	31	17	42	HARD	
36	1231	9488	2	10	18	41	HARD	
50	1231	9488	3	10	42	58	HARD	
53	1231	9488	4	31	43	58	HARD	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration
32	Esteban OCON	MEDIUM	2024-03-24T04:04:49.132000+00:00	2	30.049	
51	Esteban OCON	MEDIUM	2024-03-24T04:06:13.913000+00:00	3	29.145	
70	Esteban OCON	MEDIUM	2024-03-24T04:07:37.370000+00:00	4	29.067	
88	Esteban OCON	MEDIUM	2024-03-24T04:09:01.056000+00:00	5	29.260	
105	Esteban OCON	MEDIUM	2024-03-24T04:10:24.784000+00:00	6	29.312	
121	Esteban OCON	MEDIUM	2024-03-24T04:11:48.589000+00:00	7	29.006	
138	Esteban OCON	MEDIUM	2024-03-24T04:13:11.884000+00:00	8	28.720	
154	Esteban OCON	MEDIUM	2024-03-24T04:14:34.712000+00:00	9	29.049	
184	Esteban OCON	HARD	2024-03-24T04:17:42.133000+00:00	11	29.052	
202	Esteban OCON	HARD	2024-03-24T04:19:05.488000+00:00	12	29.059	
220	Esteban OCON	HARD	2024-03-24T04:20:28.398000+00:00	13	29.000	
238	Esteban OCON	HARD	2024-03-24T04:21:51.360000+00:00	14	29.032	
254	Esteban OCON	HARD	2024-03-24T04:23:14.501000+00:00	15	28.883	

	full_name	compound	date_start	lap_number	duration_sector_1	di
302	Esteban OCON	HARD	2024-03-24T04:28:15.223000+00:00	18	28.802	
319	Esteban OCON	HARD	2024-03-24T04:29:37.852000+00:00	19	28.874	
336	Esteban OCON	HARD	2024-03-24T04:31:00.853000+00:00	20	28.867	
353	Esteban OCON	HARD	2024-03-24T04:32:23.604000+00:00	21	28.765	
370	Esteban OCON	HARD	2024-03-24T04:33:46.211000+00:00	22	28.775	
387	Esteban OCON	HARD	2024-03-24T04:35:09+00:00	23	28.865	
404	Esteban OCON	HARD	2024-03-24T04:36:31.751000+00:00	24	28.786	
421	Esteban OCON	HARD	2024-03-24T04:37:54.461000+00:00	25	28.949	
438	Esteban OCON	HARD	2024-03-24T04:39:17.345000+00:00	26	28.887	
455	Esteban OCON	HARD	2024-03-24T04:40:40.202000+00:00	27	28.822	
471	Esteban OCON	HARD	2024-03-24T04:42:03.094000+00:00	28	29.033	
488	Esteban OCON	HARD	2024-03-24T04:43:26.190000+00:00	29	29.026	
504	Esteban OCON	HARD	2024-03-24T04:44:49.402000+00:00	30	28.846	
521	Esteban OCON	HARD	2024-03-24T04:46:12.385000+00:00	31	28.916	
538	Esteban OCON	HARD	2024-03-24T04:47:35.242000+00:00	32	28.954	
555	Esteban OCON	HARD	2024-03-24T04:48:58.181000+00:00	33	28.880	
571	Esteban OCON	HARD	2024-03-24T04:50:21.258000+00:00	34	29.603	
587	Esteban OCON	HARD	2024-03-24T04:51:46.612000+00:00	35	29.090	
601	Esteban OCON	HARD	2024-03-24T04:53:09.899000+00:00	36	29.138	
617	Esteban OCON	HARD	2024-03-24T04:54:34.864000+00:00	37	28.899	
632	Esteban OCON	HARD	2024-03-24T04:55:57.750000+00:00	38	28.734	
649	Esteban OCON	HARD	2024-03-24T04:57:21.259000+00:00	39	28.807	
666	Esteban OCON	HARD	2024-03-24T04:58:43.982000+00:00	40	28.867	
681	Esteban OCON	HARD	2024-03-24T05:00:07.058000+00:00	41	28.965	
728	Esteban OCON	HARD	2024-03-24T05:04:36.526000+00:00	44	28.464	

	full_name	compound	date_start	lap_number	duration_sector_1	di
745	Esteban OCON	HARD	2024-03-24T05:05:58.150000+00:00	45	28.306	
762	Esteban OCON	HARD	2024-03-24T05:07:19.479000+00:00	46	28.332	
778	Esteban OCON	HARD	2024-03-24T05:08:42.503000+00:00	47	28.349	
795	Esteban OCON	HARD	2024-03-24T05:10:04.087000+00:00	48	28.342	
812	Esteban OCON	HARD	2024-03-24T05:11:25.536000+00:00	49	28.478	
829	Esteban OCON	HARD	2024-03-24T05:12:47.309000+00:00	50	28.521	
846	Esteban OCON	HARD	2024-03-24T05:14:08.839000+00:00	51	28.499	
863	Esteban OCON	HARD	2024-03-24T05:15:30.920000+00:00	52	28.631	
880	Esteban OCON	HARD	2024-03-24T05:16:53.035000+00:00	53	28.556	
897	Esteban OCON	HARD	2024-03-24T05:18:15.188000+00:00	54	28.646	
914	Esteban OCON	HARD	2024-03-24T05:19:37.486000+00:00	55	28.627	

In [227...

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

Out[227...

	full_name	compound	date_start	lap_number	duration_sector_1	di
22	Pierre GASLY	MEDIUM	2024-03-24T04:04:50.139000+00:00	2	29.905	
41	Pierre GASLY	MEDIUM	2024-03-24T04:06:14.858000+00:00	3	29.379	
60	Pierre GASLY	MEDIUM	2024-03-24T04:07:38.665000+00:00	4	29.050	
78	Pierre GASLY	MEDIUM	2024-03-24T04:09:02.395000+00:00	5	29.693	
95	Pierre GASLY	MEDIUM	2024-03-24T04:10:26.993000+00:00	6	29.368	
113	Pierre GASLY	MEDIUM	2024-03-24T04:11:50.794000+00:00	7	29.068	
129	Pierre GASLY	MEDIUM	2024-03-24T04:13:14.260000+00:00	8	29.380	
145	Pierre GASLY	MEDIUM	2024-03-24T04:14:38.092000+00:00	9	29.349	
160	Pierre GASLY	MEDIUM	2024-03-24T04:16:01.924000+00:00	10	29.318	
174	Pierre GASLY	MEDIUM	2024-03-24T04:17:25.830000+00:00	11	29.402	
192	Pierre GASLY	MEDIUM	2024-03-24T04:18:51.202000+00:00	12	29.816	
210	Pierre GASLY	MEDIUM	2024-03-24T04:20:15.782000+00:00	13	29.379	

	full_name	compound	date_start	lap_number	duration_sector_1	di
228	Pierre GASLY	MEDIUM	2024-03-24T04:21:39.972000+00:00	14	29.430	
245	Pierre GASLY	MEDIUM	2024-03-24T04:23:03.920000+00:00	15	29.378	
262	Pierre GASLY	MEDIUM	2024-03-24T04:24:27.991000+00:00	16	29.942	
309	Pierre GASLY	HARD	2024-03-24T04:29:21.147000+00:00	19	29.141	
326	Pierre GASLY	HARD	2024-03-24T04:30:45.098000+00:00	20	29.060	
343	Pierre GASLY	HARD	2024-03-24T04:32:08.710000+00:00	21	28.904	
360	Pierre GASLY	HARD	2024-03-24T04:33:31.982000+00:00	22	28.793	
377	Pierre GASLY	HARD	2024-03-24T04:34:54.924000+00:00	23	28.898	
394	Pierre GASLY	HARD	2024-03-24T04:36:17.927000+00:00	24	28.729	
411	Pierre GASLY	HARD	2024-03-24T04:37:40.946000+00:00	25	28.803	
428	Pierre GASLY	HARD	2024-03-24T04:39:03.988000+00:00	26	28.851	
445	Pierre GASLY	HARD	2024-03-24T04:40:26.931000+00:00	27	28.749	
462	Pierre GASLY	HARD	2024-03-24T04:41:49.735000+00:00	28	28.974	
478	Pierre GASLY	HARD	2024-03-24T04:43:12.541000+00:00	29	28.988	
494	Pierre GASLY	HARD	2024-03-24T04:44:35.166000+00:00	30	28.857	
511	Pierre GASLY	HARD	2024-03-24T04:45:58.238000+00:00	31	28.855	
528	Pierre GASLY	HARD	2024-03-24T04:47:20.943000+00:00	32	28.996	
545	Pierre GASLY	HARD	2024-03-24T04:48:44.169000+00:00	33	28.788	
562	Pierre GASLY	HARD	2024-03-24T04:50:07.349000+00:00	34	28.986	
578	Pierre GASLY	HARD	2024-03-24T04:51:30.406000+00:00	35	28.898	
594	Pierre GASLY	HARD	2024-03-24T04:52:53.651000+00:00	36	28.631	
608	Pierre GASLY	HARD	2024-03-24T04:54:16.446000+00:00	37	28.965	
623	Pierre GASLY	HARD	2024-03-24T04:55:39.726000+00:00	38	30.199	
639	Pierre GASLY	HARD	2024-03-24T04:57:04.959000+00:00	39	28.723	
656	Pierre GASLY	HARD	2024-03-24T04:58:27.816000+00:00	40	28.917	

	full_name	compound	date_start	lap_number	duration_sector_1	di
702	Pierre GASLY	HARD	2024-03-24T05:03:05.731000+00:00	43	28.467	
718	Pierre GASLY	HARD	2024-03-24T05:04:30.056000+00:00	44	28.348	
735	Pierre GASLY	HARD	2024-03-24T05:05:51.550000+00:00	45	29.395	
752	Pierre GASLY	HARD	2024-03-24T05:07:13.587000+00:00	46	28.209	
768	Pierre GASLY	HARD	2024-03-24T05:08:34.812000+00:00	47	28.128	
785	Pierre GASLY	HARD	2024-03-24T05:09:56.157000+00:00	48	28.320	
802	Pierre GASLY	HARD	2024-03-24T05:11:17.282000+00:00	49	28.468	
819	Pierre GASLY	HARD	2024-03-24T05:12:38.618000+00:00	50	28.249	
836	Pierre GASLY	HARD	2024-03-24T05:13:59.918000+00:00	51	28.224	
853	Pierre GASLY	HARD	2024-03-24T05:15:21.034000+00:00	52	28.228	
870	Pierre GASLY	HARD	2024-03-24T05:16:42.165000+00:00	53	28.293	
887	Pierre GASLY	HARD	2024-03-24T05:18:03.525000+00:00	54	29.613	
904	Pierre GASLY	HARD	2024-03-24T05:19:26.523000+00:00	55	28.115	

Pits

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

In [228...

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

In [229...

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

Out[229...

	pit_duration
team_name	
Ferrari	24.075
Red Bull Racing	24.550
Williams	24.600
Mercedes	24.625
Aston Martin	24.675
RB	24.675

	pit_duration
team_name	
McLaren	24.775
Alpine	26.280