

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

FORMULA 1 GULF AIR BAHRAIN GRAND PRIX 2024

The Bahrain Grand Prix (Arabic: جائزة البحرين الكبرى), officially known as the Gulf Air Bahrain Grand Prix for sponsorship reasons, is a Formula One motor racing event in Bahrain.[1] The first race took place at the Bahrain International Circuit on 4 April 2004. It made history as the first Formula One Grand Prix to be held in the Middle East, and was given the award for the "Best Organised Grand Prix" by the FIA.[2] The race has in the past been the second, third, or fourth race of the Formula One calendar. However, in the 2006 season, Bahrain swapped places with the traditional opener, the Australian Grand Prix, which was pushed back to avoid a clash with the Commonwealth Games. In 2010, Bahrain staged the opening race of the 2010 season and the cars drove the full 6.299 km (3.914 mi) "Endurance Circuit" to celebrate F1's 'diamond jubilee'. In 2021, the Bahrain Grand Prix was the season opener again because the 2021 Australian Grand Prix was cancelled due to the COVID-19 pandemic.

The 2011 edition, due to be held on 13 March, was cancelled on 21 February due to the 2011 Bahraini protests[3] after drivers including Damon Hill and Mark Webber had protested.[4] Human rights activists called for a cancellation of the 2012 race due to reports of human rights abuses committed by the Bahraini authorities.[5] Team personnel also voiced concerns about safety,[6] but the race, nonetheless, was held as planned on 22 April 2012.

In 2014, to commemorate the tenth anniversary of the first staging of the Bahrain Grand Prix, the race was held as a night event under floodlights.[7] In so doing it became the second Formula One night race after the Singapore Grand Prix in 2008. Bahrain's inaugural night event was won by Lewis Hamilton. Subsequent races have also been night races. Source: Wikipedia

Obtain session information

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

```
Out[2]:
```

	session_key	session_name	date_start	date_end	gmt_offset
0	9465	Practice 1	2024-02-29T11:30:00+00:00	2024-02-29T12:30:00+00:00	03:00:00
1	9466	Practice 2	2024-02-29T15:00:00+00:00	2024-02-29T16:00:00+00:00	03:00:00
2	9467	Practice 3	2024-03-01T12:30:00+00:00	2024-03-01T13:30:00+00:00	03:00:00
3	9468	Qualifying	2024-03-01T16:00:00+00:00	2024-03-01T17:00:00+00:00	03:00:00
4	9472	Race	2024-03-02T15:00:00+00:00	2024-03-02T17:00:00+00:00	03:00:00

Free Practice 1

```
In [3]: practice = libraryDataF1.obtain_information('laps',session_key=9465)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9465)
drivers = libraryDataF1.obtain_information('drivers',session_key=9465)
```

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

```
Out[4]:
```

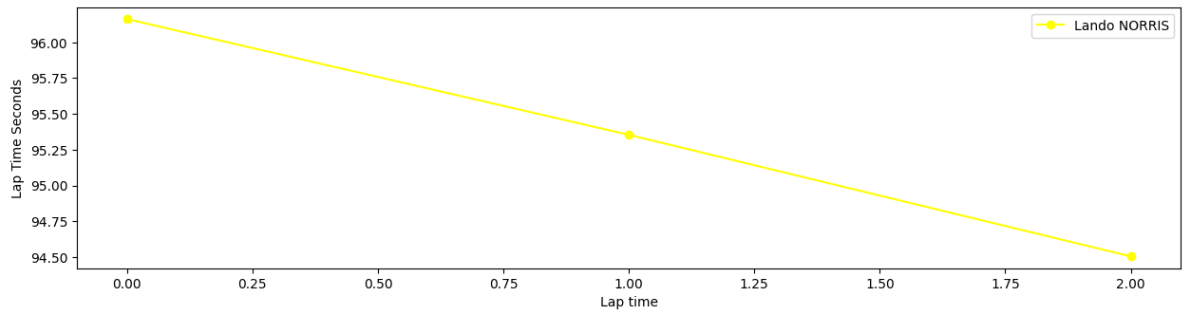
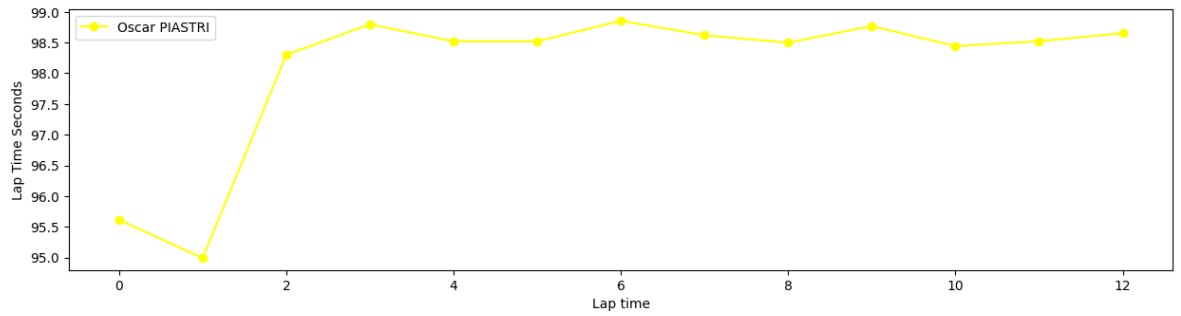
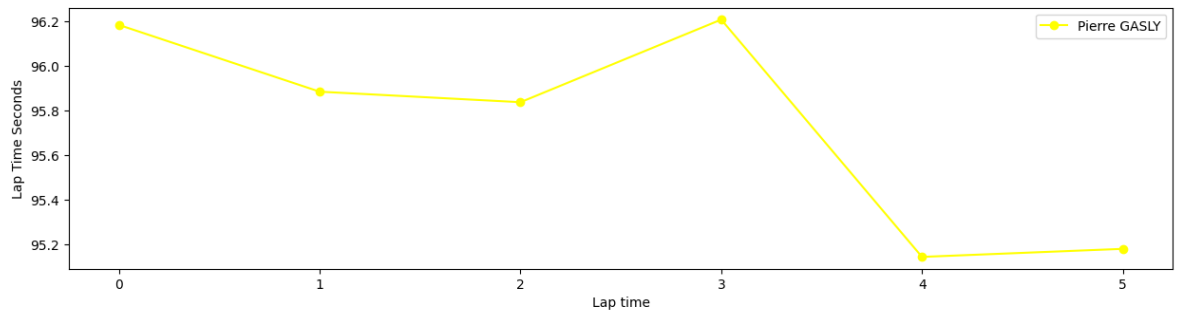
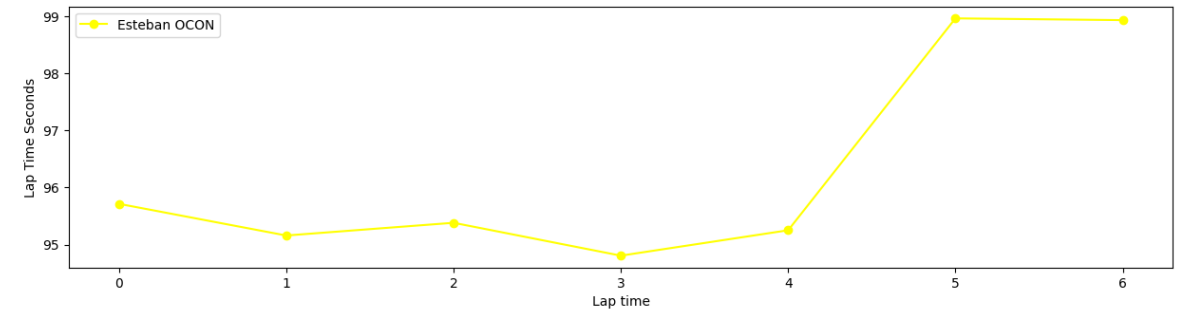
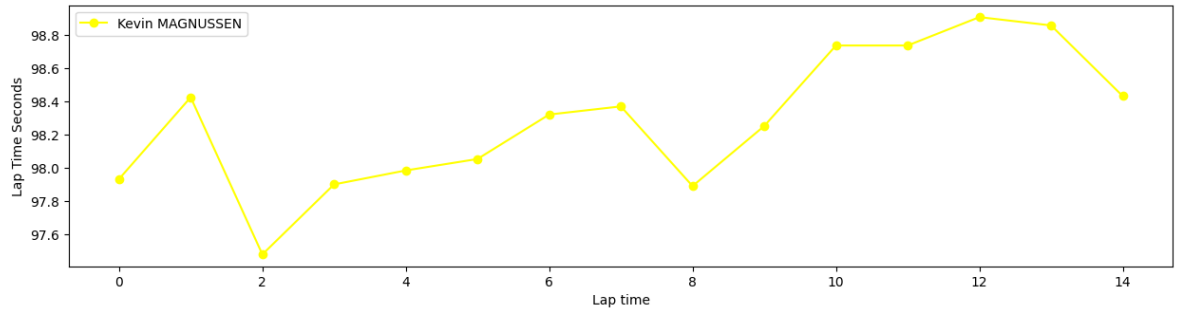
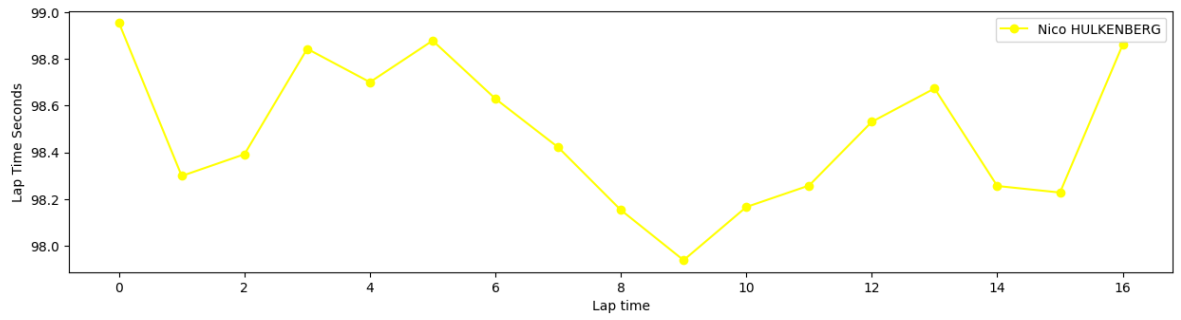
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1229	9465	27	194.0	230	162.0	2024-02-29T11:30:00.0000000
1	1229	9465	77	209.0	199	160.0	2024-02-29T11:30:00.0000000
2	1229	9465	31	153.0	176	54.0	2024-02-29T11:30:00.0000000
3	1229	9465	20	211.0	248	197.0	2024-02-29T11:30:00.0000000
4	1229	9465	81	146.0	171	126.0	2024-02-29T11:30:00.0000000
...
444	1229	9465	24	212.0	250	257.0	2024-02-29T12:33:00.0000000
445	1229	9465	3	202.0	224	250.0	2024-02-29T12:33:00.0000000
446	1229	9465	63	173.0	180	255.0	2024-02-29T12:33:00.0000000
447	1229	9465	11	209.0	223	259.0	2024-02-29T12:33:00.0000000
448	1229	9465	81	222.0	252	261.0	2024-02-29T12:33:00.0000000

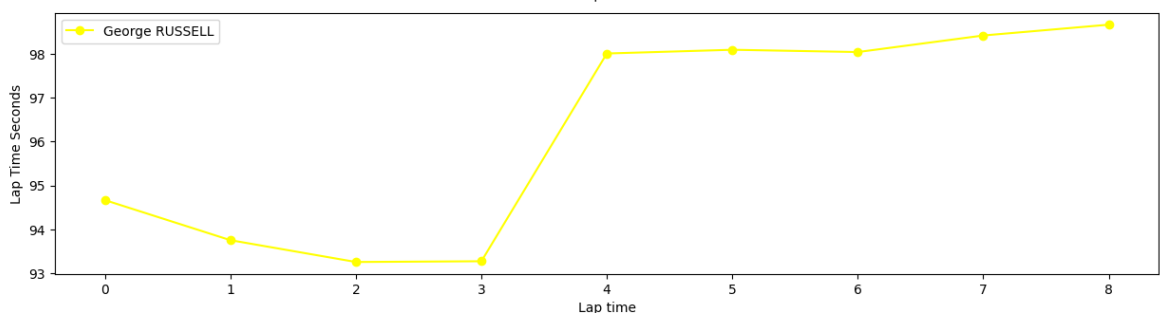
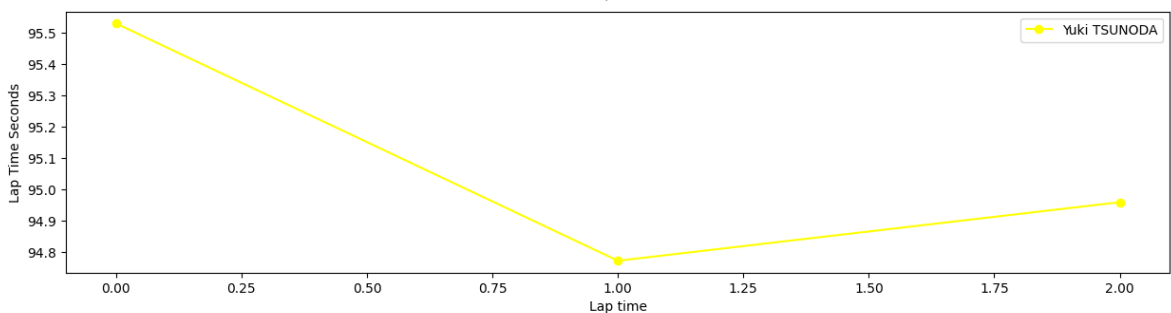
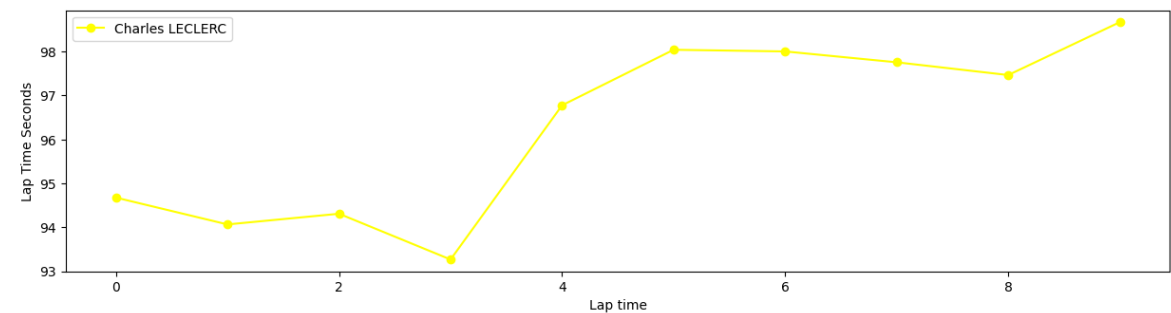
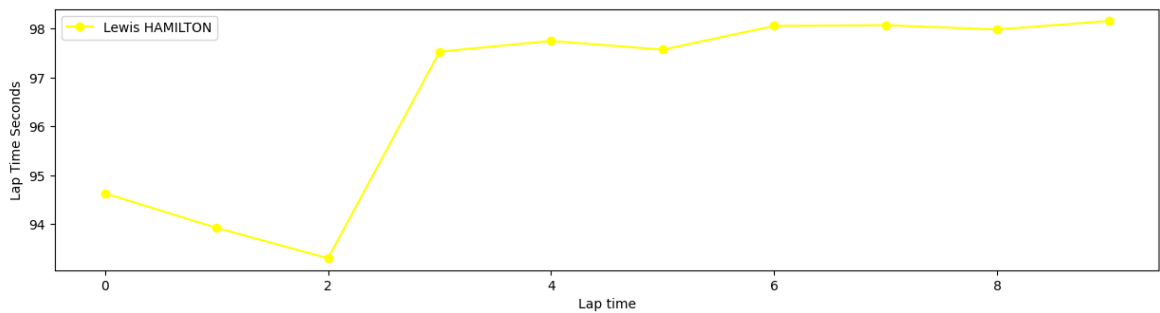
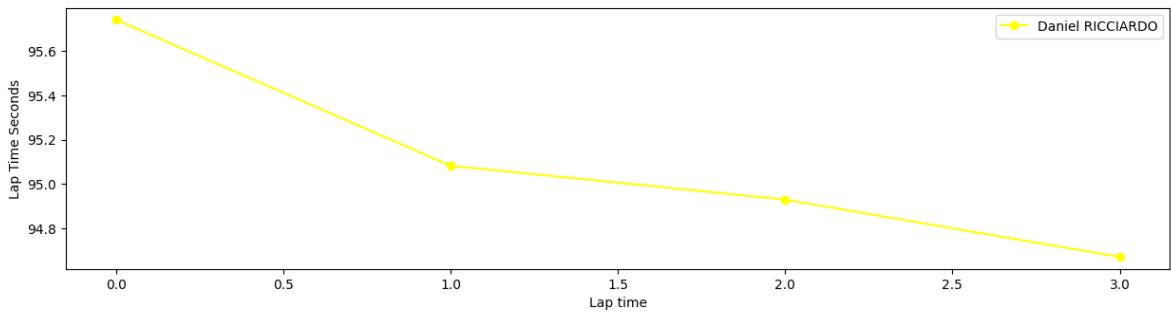
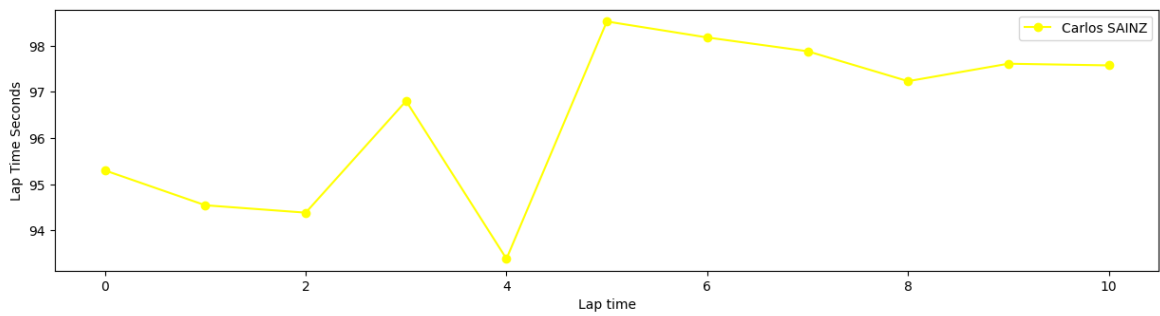
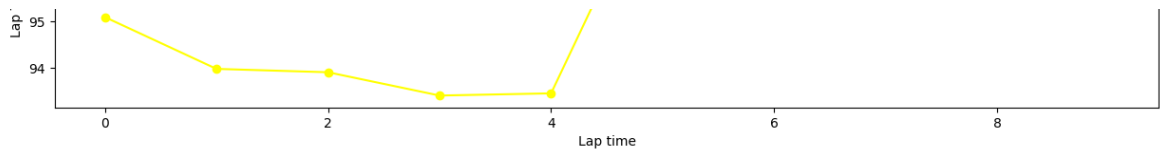
449 rows × 20 columns

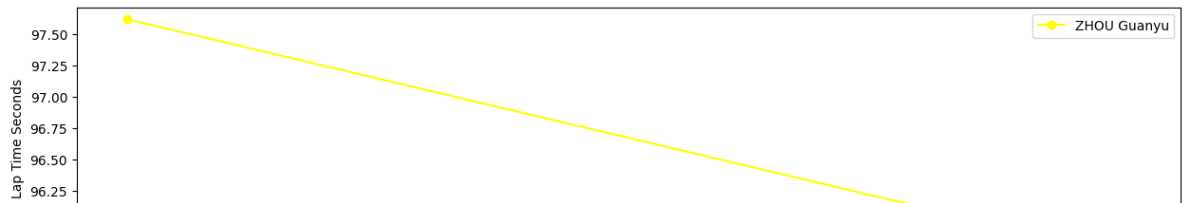
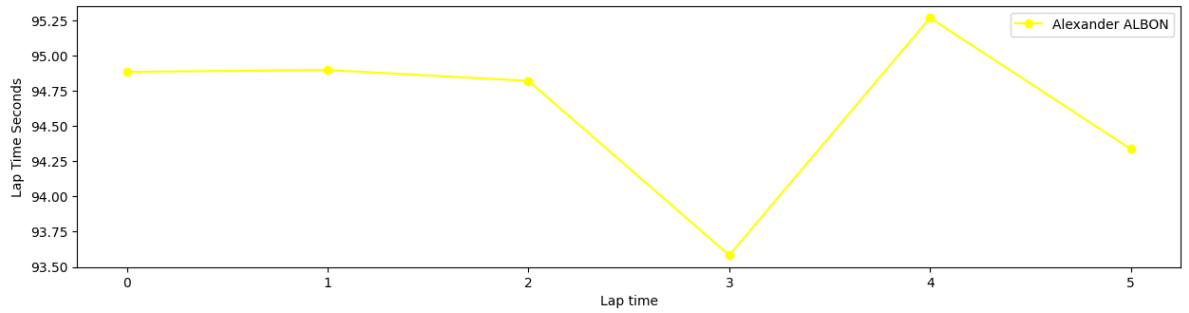
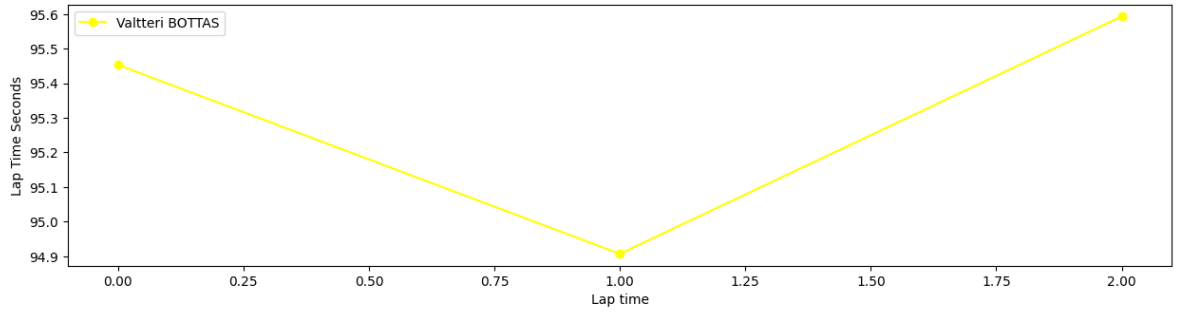
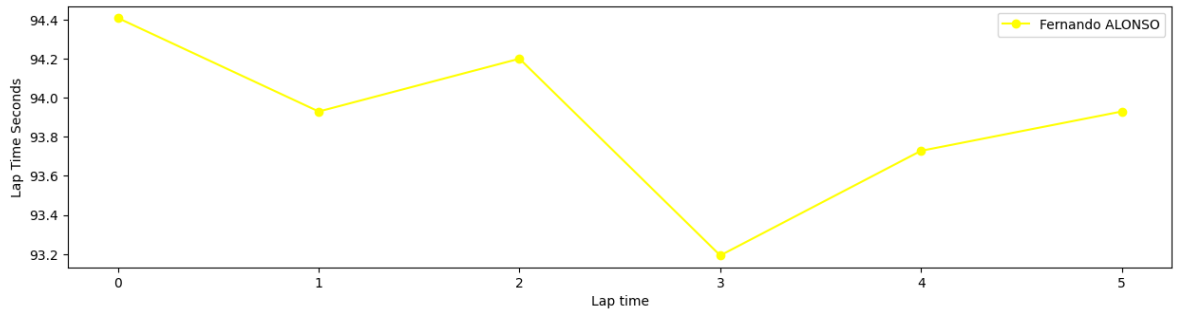
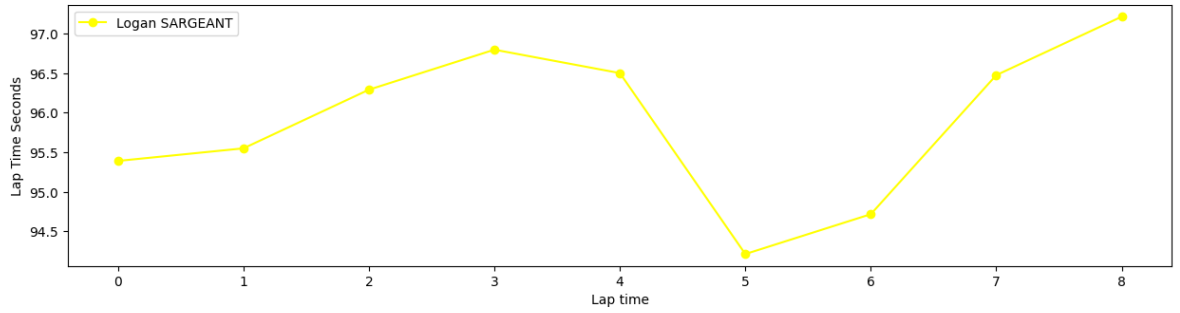
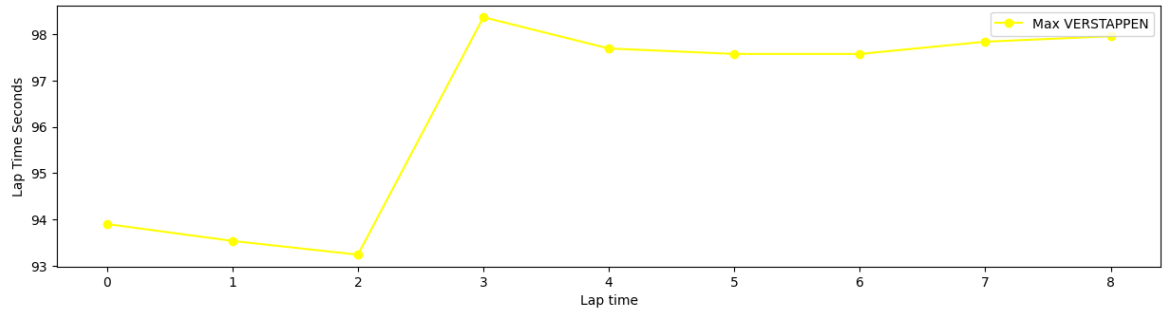
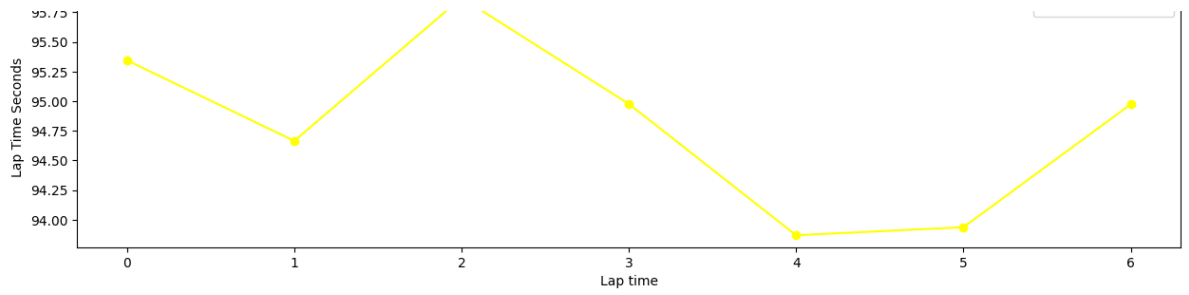
See race pace by means of the charts

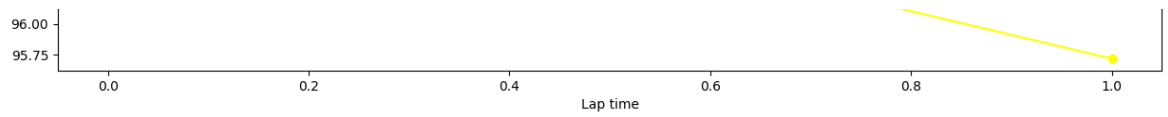
Medium tyres

```
In [5]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",99)
```



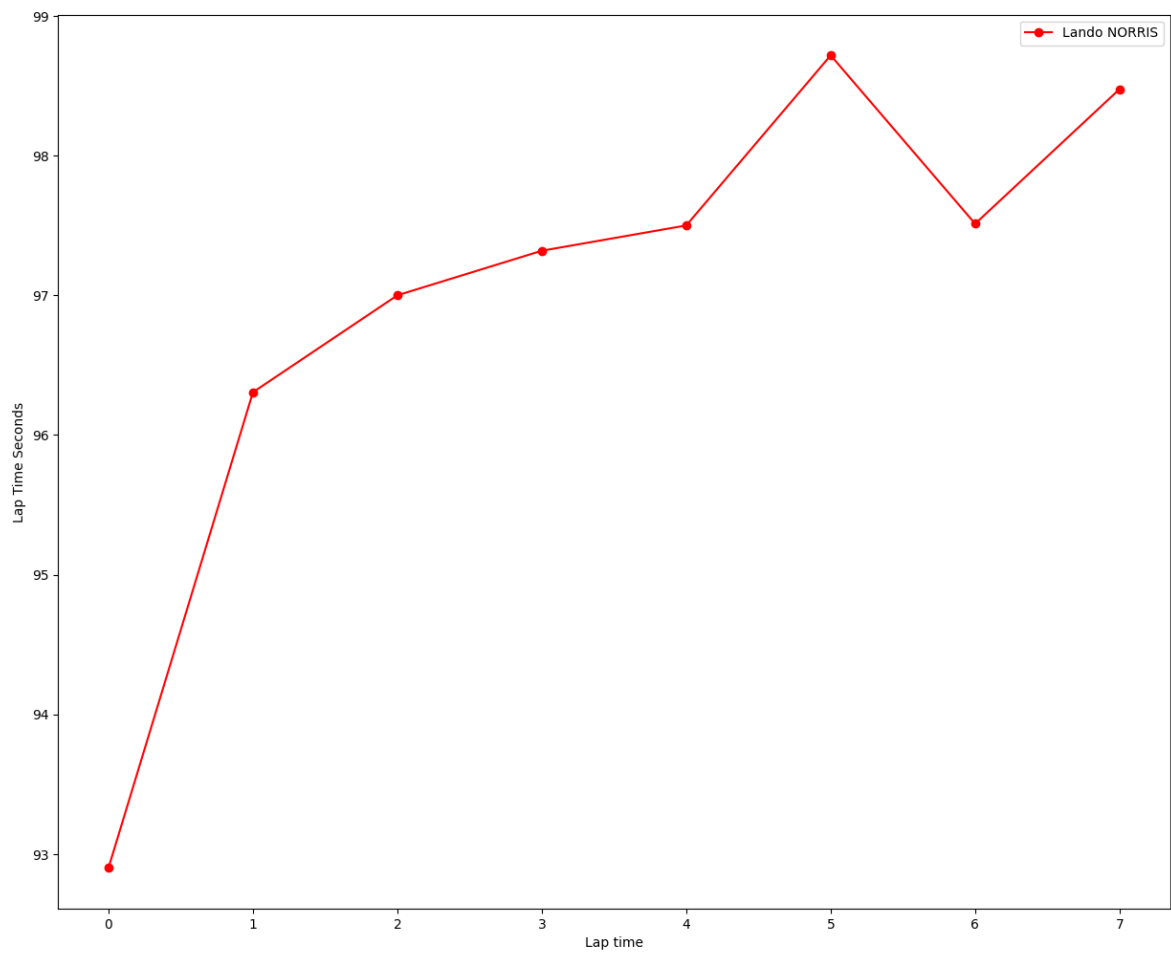
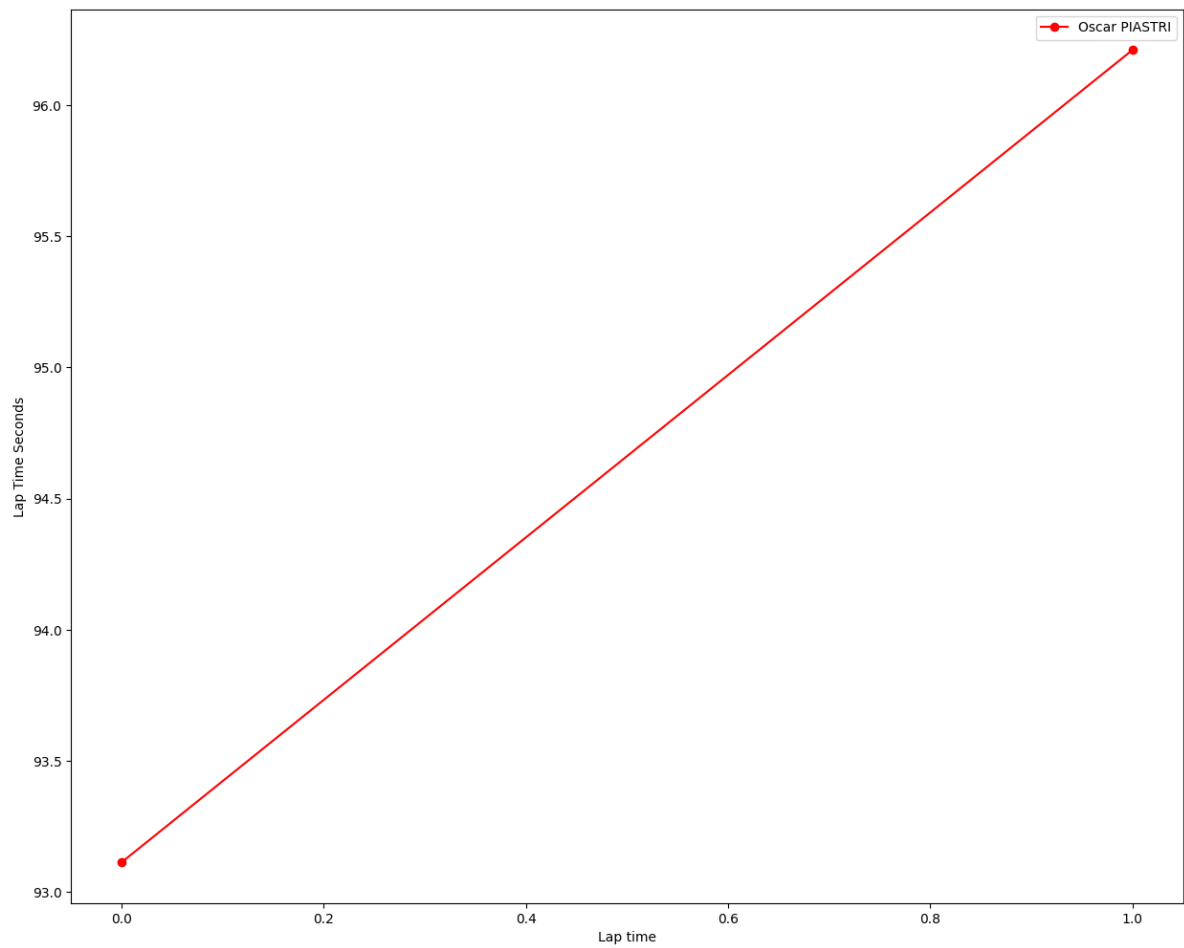


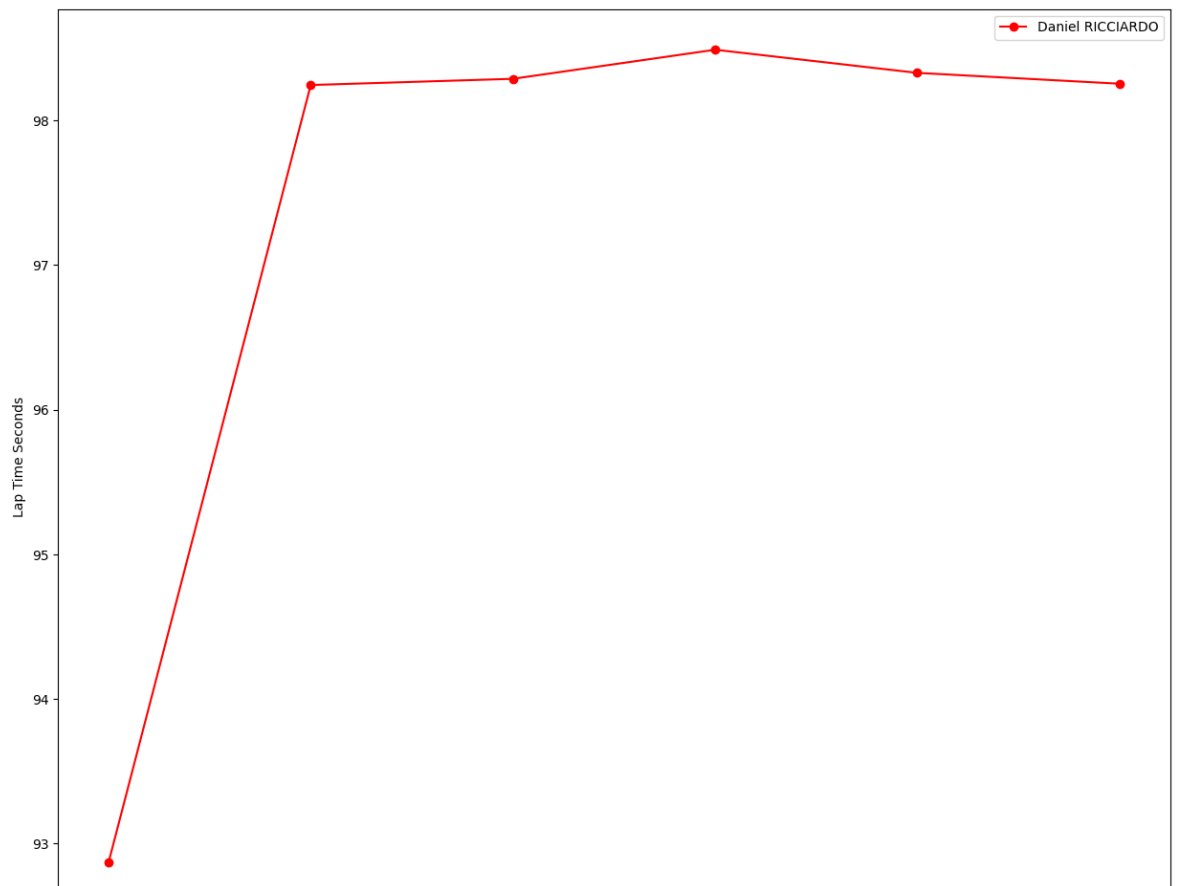
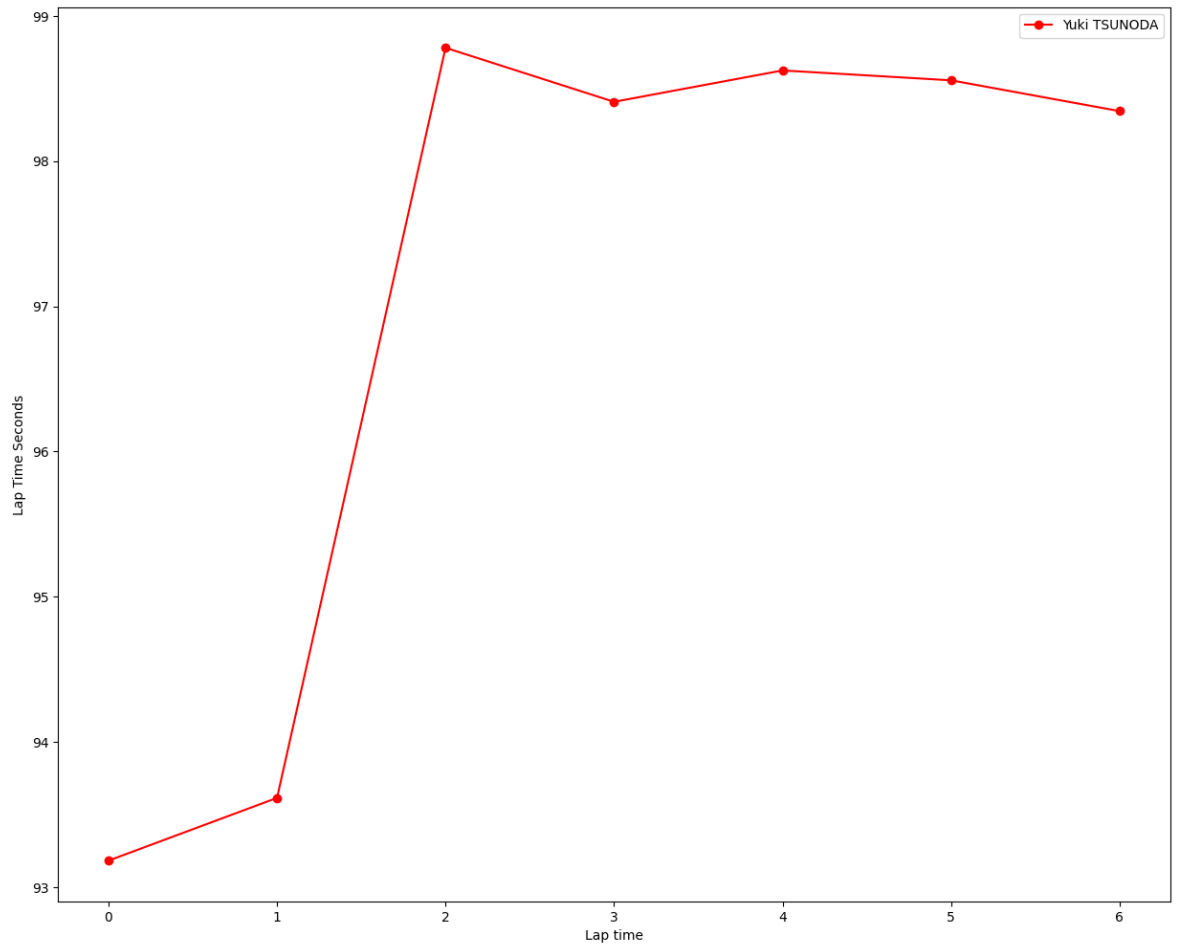


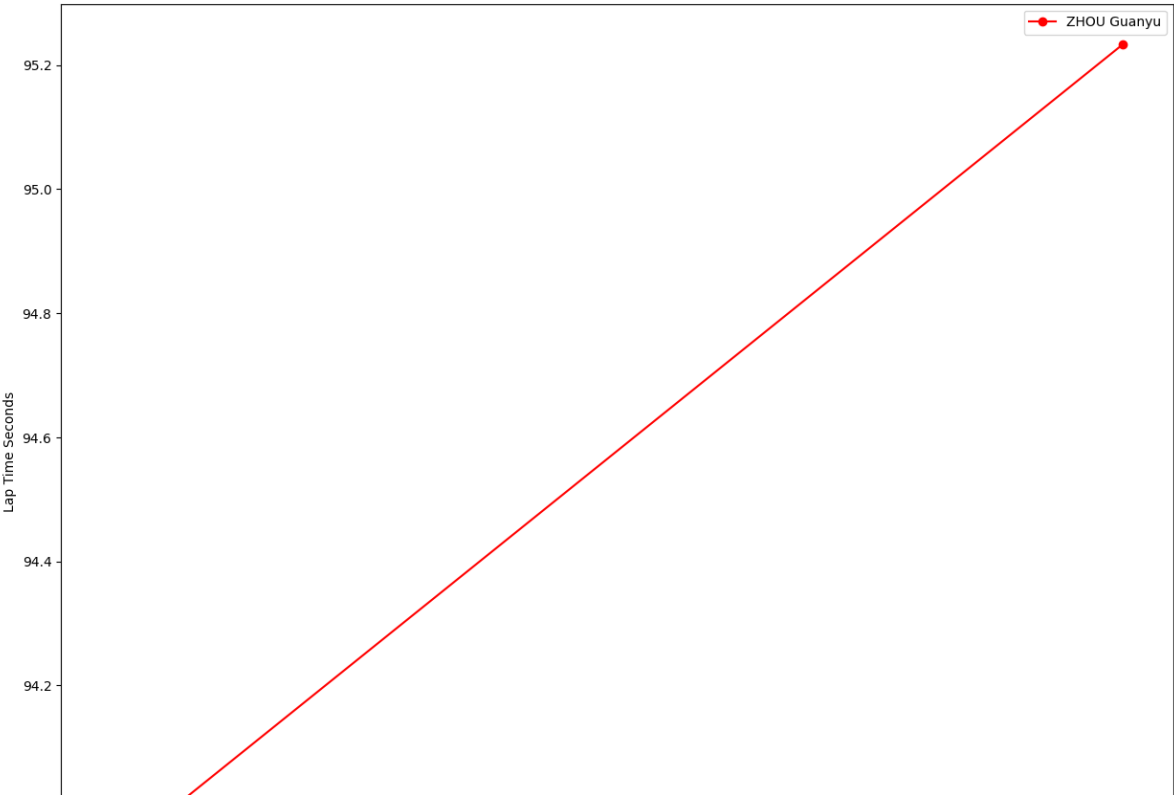
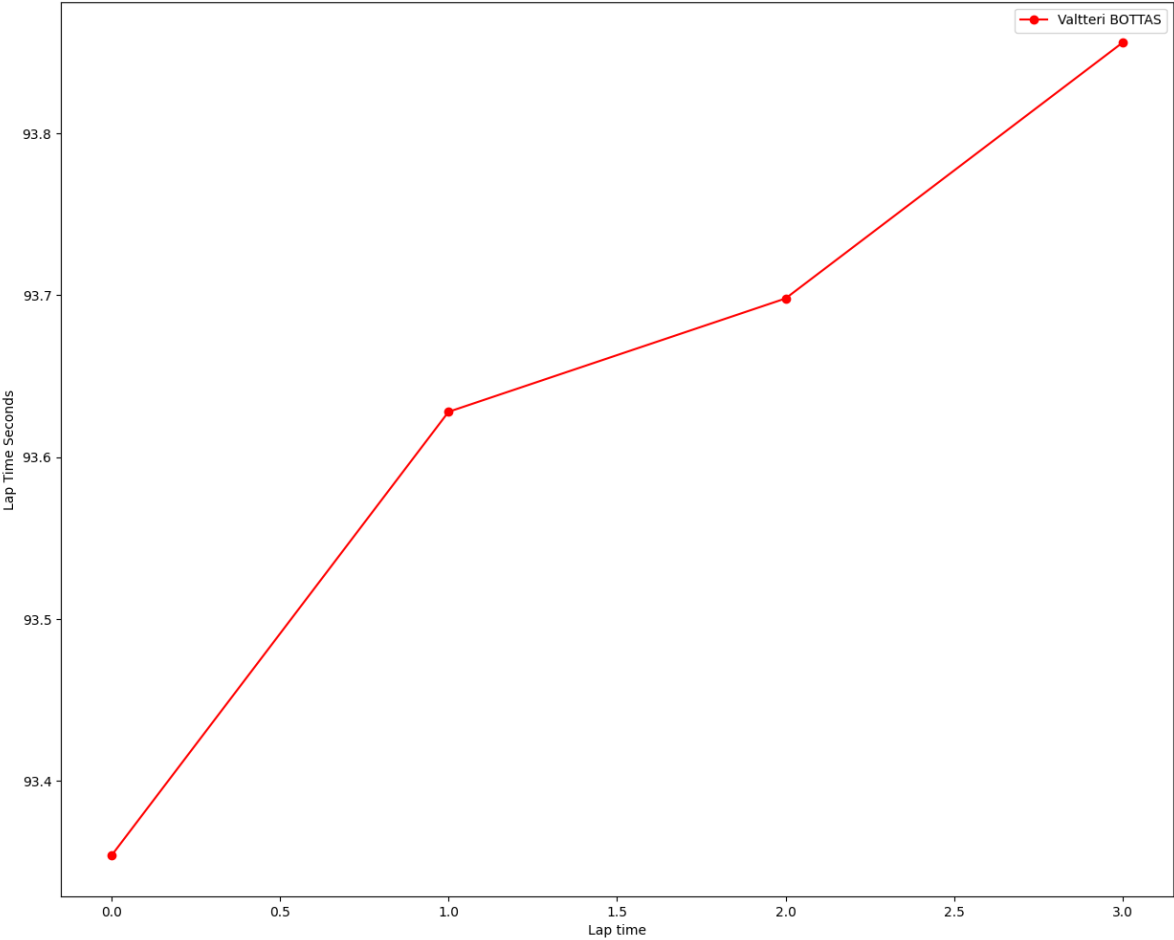
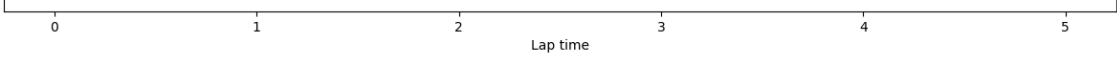


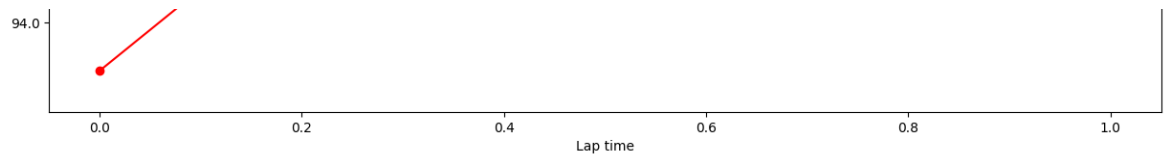
Soft tyres

```
In [6]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",99)
```







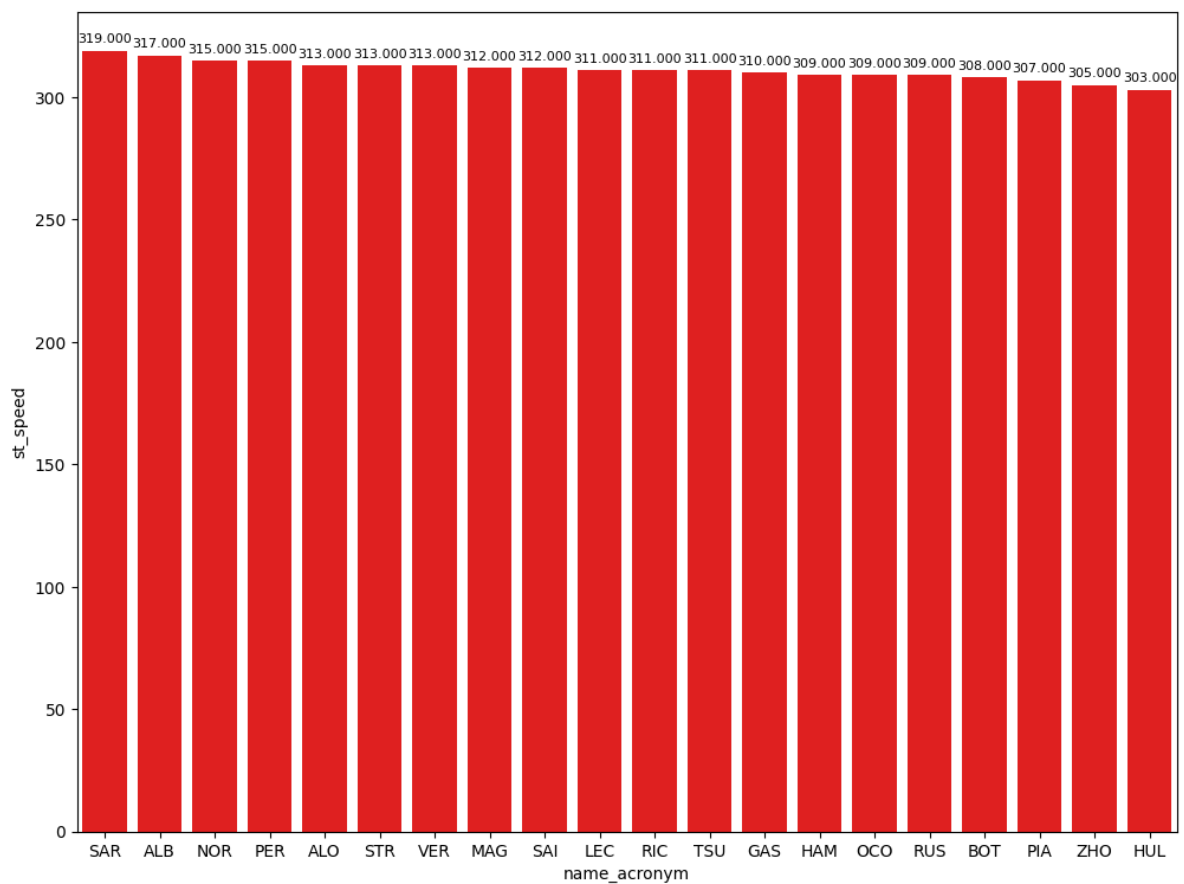


Hard tyres

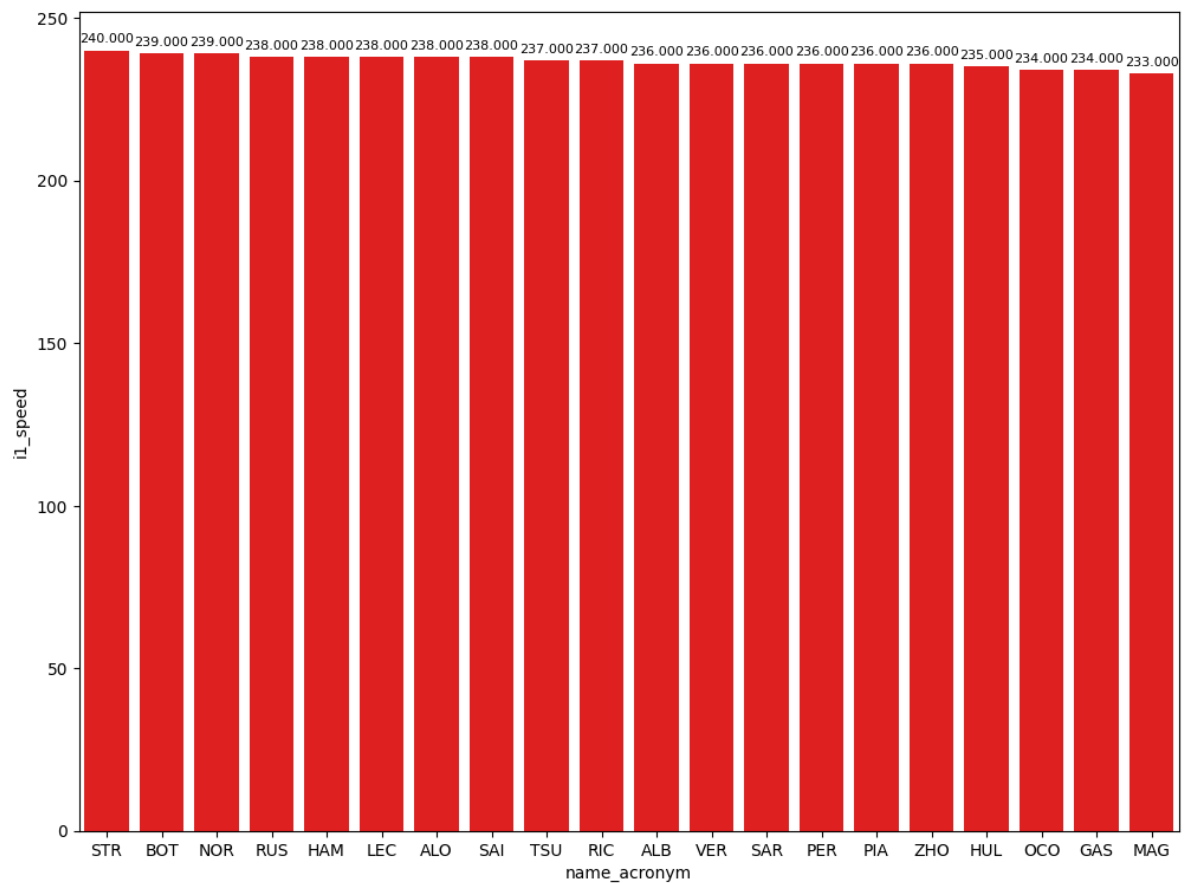
In [7]: `#libraryDataF1.obtain_data_tyres(jointables2,"HARD",99)`

Speed trap

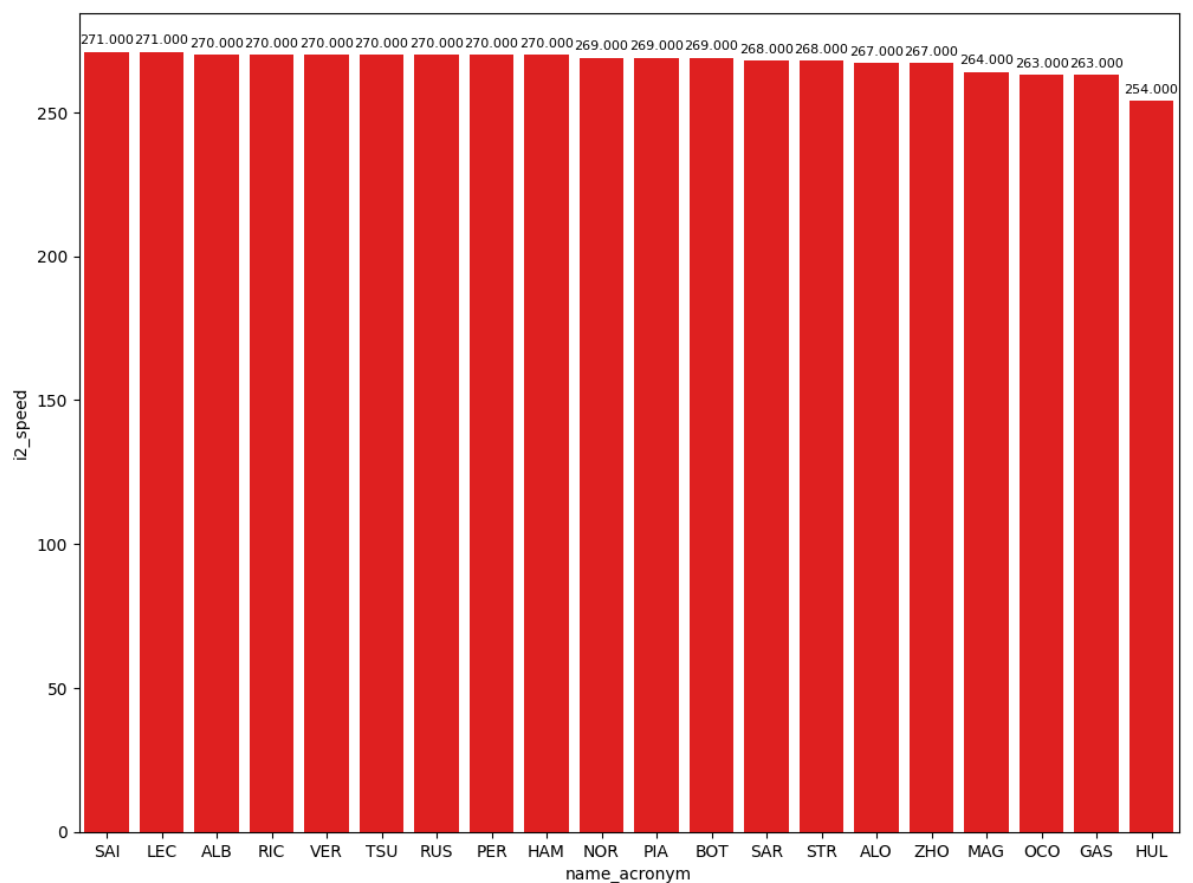
In [8]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed']
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)`



In [9]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['il_speed']
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]:
```

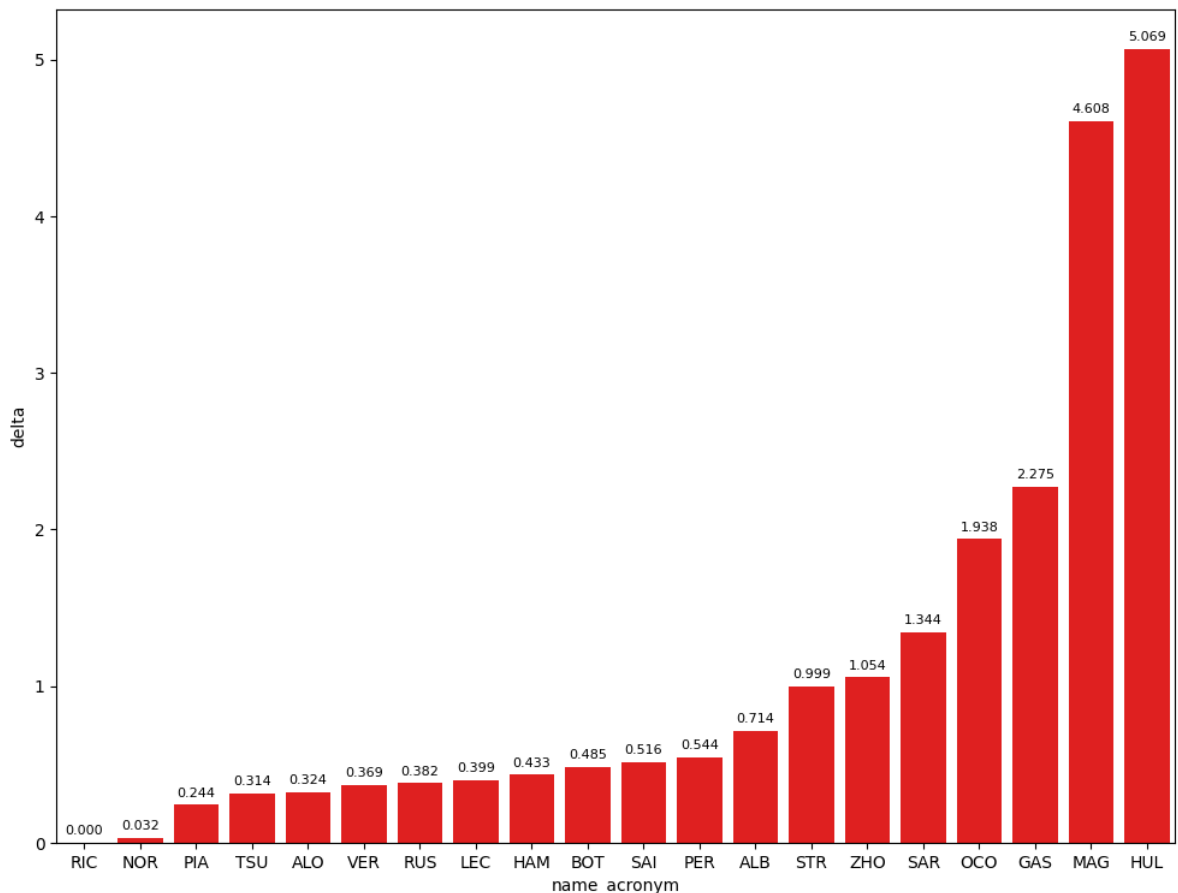
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
297	Fernando ALONSO	MEDIUM	29.892	39.920	23.381	93.193
205	Daniel RICCIARDO	SOFT	29.787	39.866	23.216	92.869

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
198	29.715	Yuki TSUNODA	SOFT	93.183	11
205	29.787	Daniel RICCIARDO	SOFT	92.869	12
129	29.835	Fernando ALONSO	MEDIUM	93.929	6
166	29.925	Oscar PIASTRI	SOFT	93.113	8
195	29.930	Lewis HAMILTON	MEDIUM	93.302	9
185	29.939	Max VERSTAPPEN	MEDIUM	110.215	8
235	29.946	Sergio PEREZ	MEDIUM	93.460	14
250	29.957	Alexander ALBON	MEDIUM	93.583	11
178	30.005	Lando NORRIS	SOFT	92.901	11
203	30.014	Charles LECLERC	MEDIUM	93.268	11
371	30.026	Valtteri BOTTAS	SOFT	93.698	17
237	30.091	George RUSSELL	MEDIUM	93.268	14
78	30.112	Lance STROLL	MEDIUM	94.664	4
220	30.197	Carlos SAINZ	MEDIUM	93.385	14
267	30.223	ZHOU Guanyu	SOFT	93.923	9
313	30.283	Logan SARGEANT	MEDIUM	94.717	13
48	30.366	Esteban OCON	MEDIUM	95.160	4
81	30.503	Pierre GASLY	MEDIUM	95.837	6
335	31.183	Kevin MAGNUSSEN	MEDIUM	98.736	19
86	31.266	Nico HULKENBERG	MEDIUM	98.392	7

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
178	39.663	Lando NORRIS	SOFT	92.901	11
203	39.844	Charles LECLERC	MEDIUM	93.268	11
166	39.852	Oscar PIASTRI	SOFT	93.113	8
205	39.866	Daniel RICCIARDO	SOFT	92.869	12
207	39.914	George RUSSELL	MEDIUM	93.251	12
297	39.920	Fernando ALONSO	MEDIUM	93.193	13
236	39.953	Max VERSTAPPEN	MEDIUM	93.238	11

	duration_sector_2	full_name	compound	lap_duration	lap_number
213	39.965	Valtteri BOTTAS	SOFT	93.354	11
220	40.041	Carlos SAINZ	MEDIUM	93.385	14
198	40.048	Yuki TSUNODA	SOFT	93.183	11
195	40.088	Lewis HAMILTON	MEDIUM	93.302	9
184	40.111	Sergio PEREZ	MEDIUM	93.413	11
299	40.121	Lance STROLL	MEDIUM	93.868	13
267	40.186	ZHOU Guanyu	SOFT	93.923	9
250	40.222	Alexander ALBON	MEDIUM	93.583	11
283	40.311	Logan SARGEANT	MEDIUM	94.213	11
217	40.467	Esteban OCON	MEDIUM	94.807	10
199	40.748	Pierre GASLY	MEDIUM	95.144	12
229	42.025	Kevin MAGNUSSEN	MEDIUM	97.477	10

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
220	23.147	Carlos SAINZ	MEDIUM	93.385	14
207	23.175	George RUSSELL	MEDIUM	93.251	12
96	23.202	Lewis HAMILTON	MEDIUM	93.925	6
184	23.214	Sergio PEREZ	MEDIUM	93.413	11
205	23.216	Daniel RICCIARDO	SOFT	92.869	12
178	23.233	Lando NORRIS	SOFT	92.901	11
272	23.235	Alexander ALBON	MEDIUM	95.267	13
213	23.261	Valtteri BOTTAS	SOFT	93.354	11
236	23.262	Max VERSTAPPEN	MEDIUM	93.238	11
166	23.336	Oscar PIASTRI	SOFT	93.113	8
297	23.381	Fernando ALONSO	MEDIUM	93.193	13
71	23.400	Charles LECLERC	MEDIUM	94.066	5
198	23.420	Yuki TSUNODA	SOFT	93.183	11
379	23.442	Lance STROLL	MEDIUM	94.973	17
283	23.492	Logan SARGEANT	MEDIUM	94.213	11
267	23.514	ZHOU Guanyu	SOFT	93.923	9
217	23.543	Esteban OCON	MEDIUM	94.807	10
226	23.752	Pierre GASLY	MEDIUM	95.180	14
223	24.088	Nico HULKENBERG	MEDIUM	98.153	15
241	24.262	Kevin MAGNUSSEN	MEDIUM	97.899	11

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	93.414000
MEDIUM	94.184213

Long runs

```
In [18]: MINIMUM_SECONDS = 90
MAXIMUM_SECONDS = 99
```

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	tyr
4	1229	9465	1	1	1	4	MEDIUM	
5	1229	9465	1	11	1	4	MEDIUM	
25	1229	9465	2	1	5	7	MEDIUM	
26	1229	9465	2	11	5	10	MEDIUM	
32	1229	9465	3	1	8	13	MEDIUM	
47	1229	9465	3	11	11	13	MEDIUM	
62	1229	9465	4	11	14	16	MEDIUM	
63	1229	9465	4	1	14	22	MEDIUM	
71	1229	9465	5	11	17	25	MEDIUM	

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

Out[20]:

	full_name	compound	date_start	lap_number	duration_sector_1
64	Max VERSTAPPEN	MEDIUM	2024-02-29T11:38:29.545000+00:00	2	30.147
123	Max VERSTAPPEN	MEDIUM	2024-02-29T11:45:10.062000+00:00	5	29.959
236	Max VERSTAPPEN	MEDIUM	2024-02-29T12:08:53.595000+00:00	11	30.023
315	Max VERSTAPPEN	MEDIUM	2024-02-29T12:20:53.460000+00:00	14	31.644
332	Max VERSTAPPEN	MEDIUM	2024-02-29T12:22:31.845000+00:00	15	31.532
350	Max VERSTAPPEN	MEDIUM	2024-02-29T12:24:09.514000+00:00	16	31.333

	full_name	compound	date_start	lap_number	duration_sector_1
366	Max VERSTAPPEN	MEDIUM	2024-02-29T12:25:47.046000+00:00	17	31.330
382	Max VERSTAPPEN	MEDIUM	2024-02-29T12:27:24.708000+00:00	18	31.443

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
22	Sergio PEREZ	MEDIUM	2024-02-29T11:33:03.591000+00:00	2	30.485	
75	Sergio PEREZ	MEDIUM	2024-02-29T11:39:50.445000+00:00	5	29.993	
133	Sergio PEREZ	MEDIUM	2024-02-29T11:46:18.880000+00:00	8	30.072	
184	Sergio PEREZ	MEDIUM	2024-02-29T12:01:55.621000+00:00	11	30.088	
235	Sergio PEREZ	MEDIUM	2024-02-29T12:08:45.308000+00:00	14	29.946	
339	Sergio PEREZ	MEDIUM	2024-02-29T12:23:02.710000+00:00	18	31.649	
356	Sergio PEREZ	MEDIUM	2024-02-29T12:24:41.317000+00:00	19	31.422	
372	Sergio PEREZ	MEDIUM	2024-02-29T12:26:19.185000+00:00	20	31.422	
388	Sergio PEREZ	MEDIUM	2024-02-29T12:27:57.291000+00:00	21	31.553	
405	Sergio PEREZ	MEDIUM	2024-02-29T12:29:35.835000+00:00	22	31.585	

Ferrari

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration
41	Charles LECLERC	MEDIUM	2024-02-29T11:35:30.909000+00:00	3	30.372	
71	Charles LECLERC	MEDIUM	2024-02-29T11:39:30.932000+00:00	5	30.230	
132	Charles LECLERC	MEDIUM	2024-02-29T11:46:12.391000+00:00	8	30.148	
203	Charles LECLERC	MEDIUM	2024-02-29T12:04:26.824000+00:00	11	30.014	
320	Charles LECLERC	MEDIUM	2024-02-29T12:21:15.547000+00:00	17	31.316	
337	Charles LECLERC	MEDIUM	2024-02-29T12:22:52.340000+00:00	18	31.503	
354	Charles LECLERC	MEDIUM	2024-02-29T12:24:30.375000+00:00	19	31.419	

	full_name	compound	date_start	lap_number	duration_sector_1	du
370	Charles LECLERC	MEDIUM	2024-02-29T12:26:08.370000+00:00	20	31.399	
386	Charles LECLERC	MEDIUM	2024-02-29T12:27:46.155000+00:00	21	31.470	

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

Out[23]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
24	Carlos SAINZ	MEDIUM	2024-02-29T11:33:17.056000+00:00	2	30.803	
57	Carlos SAINZ	MEDIUM	2024-02-29T11:37:30.481000+00:00	4	30.350	
130	Carlos SAINZ	MEDIUM	2024-02-29T11:46:02.980000+00:00	8	30.398	
158	Carlos SAINZ	MEDIUM	2024-02-29T11:51:58.782000+00:00	11	30.355	
220	Carlos SAINZ	MEDIUM	2024-02-29T12:06:26.650000+00:00	14	30.197	
312	Carlos SAINZ	MEDIUM	2024-02-29T12:20:40.349000+00:00	19	31.688	
330	Carlos SAINZ	MEDIUM	2024-02-29T12:22:18.780000+00:00	20	31.660	
347	Carlos SAINZ	MEDIUM	2024-02-29T12:23:57.036000+00:00	21	31.679	
364	Carlos SAINZ	MEDIUM	2024-02-29T12:25:34.862000+00:00	22	31.186	
381	Carlos SAINZ	MEDIUM	2024-02-29T12:27:12.940000+00:00	23	31.511	
398	Carlos SAINZ	MEDIUM	2024-02-29T12:28:49.717000+00:00	24	31.467	

Mercedes

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

Out[24]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1229	9465	1	44	1	5	MEDIUM	
18	1229	9465	1	63	1	10	MEDIUM	
27	1229	9465	2	44	6	8	MEDIUM	
38	1229	9465	3	44	9	11	MEDIUM	
51	1229	9465	2	63	11	16	MEDIUM	
56	1229	9465	4	44	12	20	MEDIUM	
74	1229	9465	3	63	17	26	MEDIUM	
77	1229	9465	5	44	21	23	MEDIUM	

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

Out[25]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
39	Lewis HAMILTON	MEDIUM	2024-02-29T11:35:16.017000+00:00	3	30.332	
96	Lewis HAMILTON	MEDIUM	2024-02-29T11:41:59.001000+00:00	6	30.133	
195	Lewis HAMILTON	MEDIUM	2024-02-29T12:03:04.077000+00:00	9	29.930	
271	Lewis HAMILTON	MEDIUM	2024-02-29T12:14:59.970000+00:00	12	31.386	
279	Lewis HAMILTON	MEDIUM	2024-02-29T12:16:37.543000+00:00	13	31.504	
289	Lewis HAMILTON	MEDIUM	2024-02-29T12:18:15.258000+00:00	14	31.457	
306	Lewis HAMILTON	MEDIUM	2024-02-29T12:19:52.988000+00:00	15	31.771	
323	Lewis HAMILTON	MEDIUM	2024-02-29T12:21:31.036000+00:00	16	31.538	
340	Lewis HAMILTON	MEDIUM	2024-02-29T12:23:09.065000+00:00	17	31.439	
357	Lewis HAMILTON	MEDIUM	2024-02-29T12:24:47.044000+00:00	18	31.559	

In [26]:

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

Out[26]:

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_lap	d
44	George RUSSELL	MEDIUM	2024-02-29T11:35:42.739000+00:00	2	30.375				
115	George RUSSELL	MEDIUM	2024-02-29T11:44:12.058000+00:00	6	30.178				
207	George RUSSELL	MEDIUM	2024-02-29T12:04:56.883000+00:00	12	30.162				
237	George RUSSELL	MEDIUM	2024-02-29T12:08:58.367000+00:00	14	30.091				
307	George RUSSELL	MEDIUM	2024-02-29T12:19:54.643000+00:00	17	31.414				
341	George RUSSELL	MEDIUM	2024-02-29T12:23:12.899000+00:00	19	31.348				
358	George RUSSELL	MEDIUM	2024-02-29T12:24:50.977000+00:00	20	31.463				
374	George RUSSELL	MEDIUM	2024-02-29T12:26:29.055000+00:00	21	31.522				
389	George RUSSELL	MEDIUM	2024-02-29T12:28:07.378000+00:00	22	31.624				

McLaren

In [27]:

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

Out[27]:

meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
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	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
10	1229	9465	1	81	1	7	MEDIUM	
11	1229	9465	1	4	1	8	MEDIUM	
31	1229	9465	2	81	8	12	SOFT	
36	1229	9465	2	4	9	10	MEDIUM	
48	1229	9465	3	4	11	15	SOFT	
61	1229	9465	3	81	13	26	MEDIUM	

In [28]:

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

Out[28]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
21	Lando NORRIS	MEDIUM	2024-02-29T11:32:58.417000+00:00	2	31.113	
53	Lando NORRIS	MEDIUM	2024-02-29T11:37:05.037000+00:00	4	30.611	
85	Lando NORRIS	MEDIUM	2024-02-29T11:41:05.418000+00:00	6	30.481	
178	Lando NORRIS	SOFT	2024-02-29T12:01:13.826000+00:00	11	30.005	
225	Lando NORRIS	SOFT	2024-02-29T12:07:22.750000+00:00	14	30.185	
286	Lando NORRIS	SOFT	2024-02-29T12:17:47.674000+00:00	16	31.320	
302	Lando NORRIS	SOFT	2024-02-29T12:19:24.713000+00:00	17	31.220	
336	Lando NORRIS	SOFT	2024-02-29T12:22:45.414000+00:00	19	31.352	
353	Lando NORRIS	SOFT	2024-02-29T12:24:22.998000+00:00	20	31.312	
369	Lando NORRIS	SOFT	2024-02-29T12:26:01.646000+00:00	21	31.011	
384	Lando NORRIS	SOFT	2024-02-29T12:27:39.167000+00:00	22	31.559	

In [29]:

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

Out[29]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
20	Oscar PIASTRI	MEDIUM	2024-02-29T11:32:52.419000+00:00	2	31.174	
51	Oscar PIASTRI	MEDIUM	2024-02-29T11:36:55.694000+00:00	4	30.570	
82	Oscar PIASTRI	MEDIUM	2024-02-29T11:40:50.663000+00:00	6	30.243	
166	Oscar PIASTRI	SOFT	2024-02-29T11:56:16.437000+00:00	8	29.925	
190	Oscar PIASTRI	SOFT	2024-02-29T12:02:35.590000+00:00	11	30.019	

	full_name	compound	date_start	lap_number	duration_sector_1	du
273	Oscar PIASTRI	MEDIUM	2024-02-29T12:15:09.302000+00:00	14	31.885	
281	Oscar PIASTRI	MEDIUM	2024-02-29T12:16:48.093000+00:00	15	31.876	
292	Oscar PIASTRI	MEDIUM	2024-02-29T12:18:26.668000+00:00	16	31.778	
308	Oscar PIASTRI	MEDIUM	2024-02-29T12:20:05.078000+00:00	17	31.825	
327	Oscar PIASTRI	MEDIUM	2024-02-29T12:21:43.984000+00:00	18	31.610	
344	Oscar PIASTRI	MEDIUM	2024-02-29T12:23:22.577000+00:00	19	31.469	
361	Oscar PIASTRI	MEDIUM	2024-02-29T12:25:01.108000+00:00	20	31.627	
376	Oscar PIASTRI	MEDIUM	2024-02-29T12:26:39.939000+00:00	21	31.599	
392	Oscar PIASTRI	MEDIUM	2024-02-29T12:28:18.265000+00:00	22	31.560	

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
1	1229	9465	1	14	1	2	MEDIUM	
13	1229	9465	1	18	1	8	MEDIUM	
21	1229	9465	2	14	3	8	MEDIUM	
39	1229	9465	3	14	9	12	MEDIUM	
40	1229	9465	2	18	9	12	MEDIUM	
59	1229	9465	4	14	13	21	MEDIUM	
60	1229	9465	3	18	13	21	MEDIUM	

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

Out[31]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
95	Fernando ALONSO	MEDIUM	2024-02-29T11:41:53.854000+00:00	4	29.984	
129	Fernando ALONSO	MEDIUM	2024-02-29T11:45:57.320000+00:00	6	29.835	
206	Fernando ALONSO	MEDIUM	2024-02-29T12:04:49.324000+00:00	9	30.182	
297	Fernando ALONSO	MEDIUM	2024-02-29T12:18:57.842000+00:00	13	29.892	
338	Fernando ALONSO	MEDIUM	2024-02-29T12:23:00.997000+00:00	15	30.090	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
45	Lance STROLL	MEDIUM	2024-02-29T11:35:59.686000+00:00	2	30.494	30.494
78	Lance STROLL	MEDIUM	2024-02-29T11:40:10.036000+00:00	4	30.112	30.112
116	Lance STROLL	MEDIUM	2024-02-29T11:44:19.848000+00:00	6	31.003	31.003
181	Lance STROLL	MEDIUM	2024-02-29T12:01:23.160000+00:00	9	30.387	30.387
299	Lance STROLL	MEDIUM	2024-02-29T12:19:14.539000+00:00	13	30.226	30.226
342	Lance STROLL	MEDIUM	2024-02-29T12:23:20.330000+00:00	15	30.117	30.117
379	Lance STROLL	MEDIUM	2024-02-29T12:27:00.089000+00:00	17	30.789	30.789

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	tyre
17	1229	9465	1	22	1	10	MEDIUM	
19	1229	9465	1	3	1	11	MEDIUM	
50	1229	9465	2	22	11	16	SOFT	
54	1229	9465	2	3	12	14	SOFT	
64	1229	9465	3	3	15	15	SOFT	
67	1229	9465	4	3	16	24	SOFT	
73	1229	9465	3	22	17	25	SOFT	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
30	Daniel RICCIARDO	MEDIUM	2024-02-29T11:34:03.186000+00:00	2	30.701	30.701
79	Daniel RICCIARDO	MEDIUM	2024-02-29T11:40:18.285000+00:00	5	30.413	30.413
114	Daniel RICCIARDO	MEDIUM	2024-02-29T11:44:05.602000+00:00	7	30.365	30.365
146	Daniel RICCIARDO	MEDIUM	2024-02-29T11:48:21.259000+00:00	9	30.378	30.378
205	Daniel RICCIARDO	SOFT	2024-02-29T12:04:40.900000+00:00	12	29.787	29.787

	full_name	compound	date_start	lap_number	duration_sector_1
343	Daniel RICCIARDO	SOFT	2024-02-29T12:23:21.094000+00:00	17	31.318
360	Daniel RICCIARDO	SOFT	2024-02-29T12:24:59.242000+00:00	18	31.463
375	Daniel RICCIARDO	SOFT	2024-02-29T12:26:37.531000+00:00	19	31.360
391	Daniel RICCIARDO	SOFT	2024-02-29T12:28:15.961000+00:00	20	31.450

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
42	Yuki TSUNODA	MEDIUM	2024-02-29T11:35:36.621000+00:00	3	30.245	
72	Yuki TSUNODA	MEDIUM	2024-02-29T11:39:40.068000+00:00	5	30.380	
126	Yuki TSUNODA	MEDIUM	2024-02-29T11:45:44.950000+00:00	8	30.146	
198	Yuki TSUNODA	SOFT	2024-02-29T12:03:36.338000+00:00	11	29.715	
244	Yuki TSUNODA	SOFT	2024-02-29T12:10:23.654000+00:00	14	29.880	
328	Yuki TSUNODA	SOFT	2024-02-29T12:21:55.384000+00:00	18	31.307	
346	Yuki TSUNODA	SOFT	2024-02-29T12:23:34.270000+00:00	19	31.354	
363	Yuki TSUNODA	SOFT	2024-02-29T12:25:12.583000+00:00	20	31.455	
378	Yuki TSUNODA	SOFT	2024-02-29T12:26:51.154000+00:00	21	31.454	
394	Yuki TSUNODA	SOFT	2024-02-29T12:28:29.824000+00:00	22	31.381	

Haas

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
16	Kevin MAGNUSSEN	MEDIUM	2024-02-29T11:32:04.852000+00:00	2	31.366	
29	Kevin MAGNUSSEN	MEDIUM	2024-02-29T11:33:42.869000+00:00	3	31.676	
229	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:07:57.178000+00:00	10	31.184	
241	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:09:34.609000+00:00	11	31.327	
251	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:11:12.576000+00:00	12	31.308	

	full_name	compound	date_start	lap_number	duration_sector_1
261	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:12:50.547000+00:00	13	31.327
269	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:14:28.642000+00:00	14	31.359
277	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:16:06.900000+00:00	15	31.510
285	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:17:45.283000+00:00	16	31.329
300	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:19:23.256000+00:00	17	31.433
335	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:22:41.198000+00:00	19	31.183
351	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:24:19.930000+00:00	20	31.525
367	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:25:58.842000+00:00	21	31.607
383	Kevin MAGNUSSEN	MEDIUM	2024-02-29T12:27:37.572000+00:00	22	31.831

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

Out[37]:

	full_name	compound	date_start	lap_number	duration_sector_1
14	Nico HULKENBERG	MEDIUM	2024-02-29T11:31:51.133000+00:00	2	31.886
38	Nico HULKENBERG	MEDIUM	2024-02-29T11:35:09.234000+00:00	4	31.595
86	Nico HULKENBERG	MEDIUM	2024-02-29T11:41:08.437000+00:00	7	31.266
103	Nico HULKENBERG	MEDIUM	2024-02-29T11:42:46.880000+00:00	8	31.749
117	Nico HULKENBERG	MEDIUM	2024-02-29T11:44:25.676000+00:00	9	31.635
183	Nico HULKENBERG	MEDIUM	2024-02-29T12:01:47.190000+00:00	12	31.715
196	Nico HULKENBERG	MEDIUM	2024-02-29T12:03:27.402000+00:00	13	31.486
208	Nico HULKENBERG	MEDIUM	2024-02-29T12:05:04.647000+00:00	14	31.496
223	Nico HULKENBERG	MEDIUM	2024-02-29T12:06:43.109000+00:00	15	31.415
231	Nico HULKENBERG	MEDIUM	2024-02-29T12:08:21.140000+00:00	16	31.466
242	Nico HULKENBERG	MEDIUM	2024-02-29T12:09:59.113000+00:00	17	31.435
254	Nico HULKENBERG	MEDIUM	2024-02-29T12:11:37.352000+00:00	18	31.279
265	Nico HULKENBERG	MEDIUM	2024-02-29T12:13:15.656000+00:00	19	31.576
270	Nico HULKENBERG	MEDIUM	2024-02-29T12:14:54.107000+00:00	20	31.579

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
278	Nico HULKENBERG	MEDIUM	2024-02-29T12:16:32.888000+00:00	21	31.608	
288	Nico HULKENBERG	MEDIUM	2024-02-29T12:18:12.793000+00:00	22	31.576	
305	Nico HULKENBERG	MEDIUM	2024-02-29T12:19:49.299000+00:00	23	31.677	

Alpine

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
18	Esteban OCON	MEDIUM	2024-02-29T11:32:39.595000+00:00	2	30.784	
48	Esteban OCON	MEDIUM	2024-02-29T11:36:44.821000+00:00	4	30.366	
83	Esteban OCON	MEDIUM	2024-02-29T11:40:56.727000+00:00	6	30.516	
217	Esteban OCON	MEDIUM	2024-02-29T12:06:18.102000+00:00	10	30.797	
260	Esteban OCON	MEDIUM	2024-02-29T12:12:48.047000+00:00	13	30.489	
345	Esteban OCON	MEDIUM	2024-02-29T12:23:30.942000+00:00	16	31.841	
393	Esteban OCON	MEDIUM	2024-02-29T12:28:28.395000+00:00	19	31.906	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
19	Pierre GASLY	MEDIUM	2024-02-29T11:32:45.419000+00:00	2	30.839	
47	Pierre GASLY	MEDIUM	2024-02-29T11:36:38.129000+00:00	4	30.682	
81	Pierre GASLY	MEDIUM	2024-02-29T11:40:45.556000+00:00	6	30.503	
173	Pierre GASLY	MEDIUM	2024-02-29T11:59:56.939000+00:00	10	30.819	
199	Pierre GASLY	MEDIUM	2024-02-29T12:03:46.643000+00:00	12	30.515	
226	Pierre GASLY	MEDIUM	2024-02-29T12:07:42.651000+00:00	14	30.622	

Williams

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
107	Alexander ALBON	MEDIUM	2024-02-29T11:43:22.030000+00:00	3	30.310	

	full_name	compound	date_start	lap_number	duration_sector_1	du
	ALBON					
138	Alexander ALBON	MEDIUM	2024-02-29T11:47:01.121000+00:00	5	30.174	
161	Alexander ALBON	MEDIUM	2024-02-29T11:52:59.594000+00:00	8	30.591	
250	Alexander ALBON	MEDIUM	2024-02-29T12:11:04.326000+00:00	11	29.957	
272	Alexander ALBON	MEDIUM	2024-02-29T12:15:05.036000+00:00	13	29.996	
	Alexander					

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

	full_name	compound	date_start	lap_number	duration_sector_1	du
88	Logan SARGEANT	MEDIUM	2024-02-29T11:41:17.763000+00:00	2	30.409	
121	Logan SARGEANT	MEDIUM	2024-02-29T11:44:59.960000+00:00	4	30.701	
135	Logan SARGEANT	MEDIUM	2024-02-29T11:46:35.569000+00:00	5	30.906	
144	Logan SARGEANT	MEDIUM	2024-02-29T11:48:11.897000+00:00	6	31.378	
150	Logan SARGEANT	MEDIUM	2024-02-29T11:49:48.685000+00:00	7	31.211	
283	Logan SARGEANT	MEDIUM	2024-02-29T12:17:08.949000+00:00	11	30.410	
313	Logan SARGEANT	MEDIUM	2024-02-29T12:20:46.865000+00:00	13	30.283	
331	Logan SARGEANT	MEDIUM	2024-02-29T12:22:21.589000+00:00	14	31.706	
348	Logan SARGEANT	MEDIUM	2024-02-29T12:23:58.029000+00:00	15	31.038	

Kick Sauber

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

	full_name	compound	date_start	lap_number	duration_sector_1	du
119	ZHOU Guanyu	MEDIUM	2024-02-29T11:44:51.812000+00:00	3	31.789	
149	ZHOU Guanyu	MEDIUM	2024-02-29T11:48:42.098000+00:00	5	30.669	
267	ZHOU Guanyu	SOFT	2024-02-29T12:13:47.716000+00:00	9	30.223	
311	ZHOU Guanyu	SOFT	2024-02-29T12:20:35.030000+00:00	12	30.359	

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

Out[43]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
106	Valtteri BOTTAS	MEDIUM	2024-02-29T11:43:11.067000+00:00	3	30.865	
137	Valtteri BOTTAS	MEDIUM	2024-02-29T11:46:55.231000+00:00	5	30.334	
155	Valtteri BOTTAS	MEDIUM	2024-02-29T11:50:40.447000+00:00	7	30.681	
213	Valtteri BOTTAS	SOFT	2024-02-29T12:05:25.855000+00:00	11	30.128	
252	Valtteri BOTTAS	SOFT	2024-02-29T12:11:31.352000+00:00	14	30.035	
371	Valtteri BOTTAS	SOFT	2024-02-29T12:26:15.883000+00:00	17	30.026	
406	Valtteri BOTTAS	SOFT	2024-02-29T12:29:42.842000+00:00	19	30.092	

In []:

In []:

Free Practice 2

Obtain setup

In [44]:

```
practice = libraryDataF1.obtain_information('laps',session_key=9466)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9466)
drivers = libraryDataF1.obtain_information('drivers',session_key=9466)
```

In [45]:

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

Out[45]:

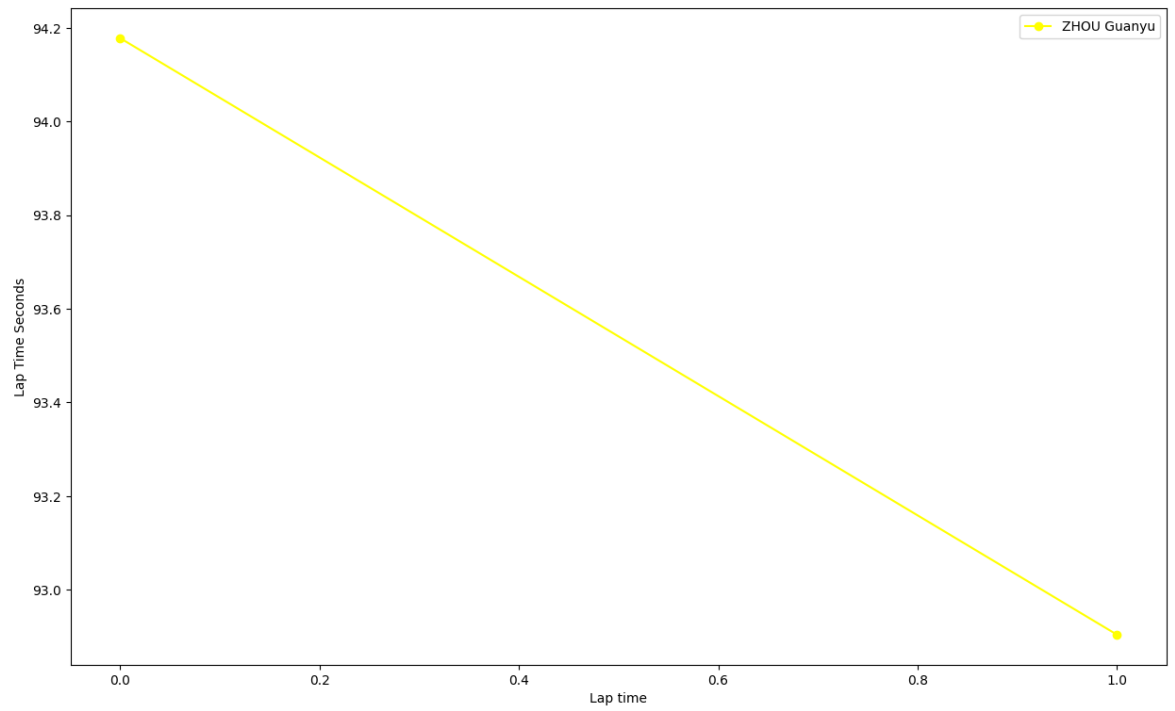
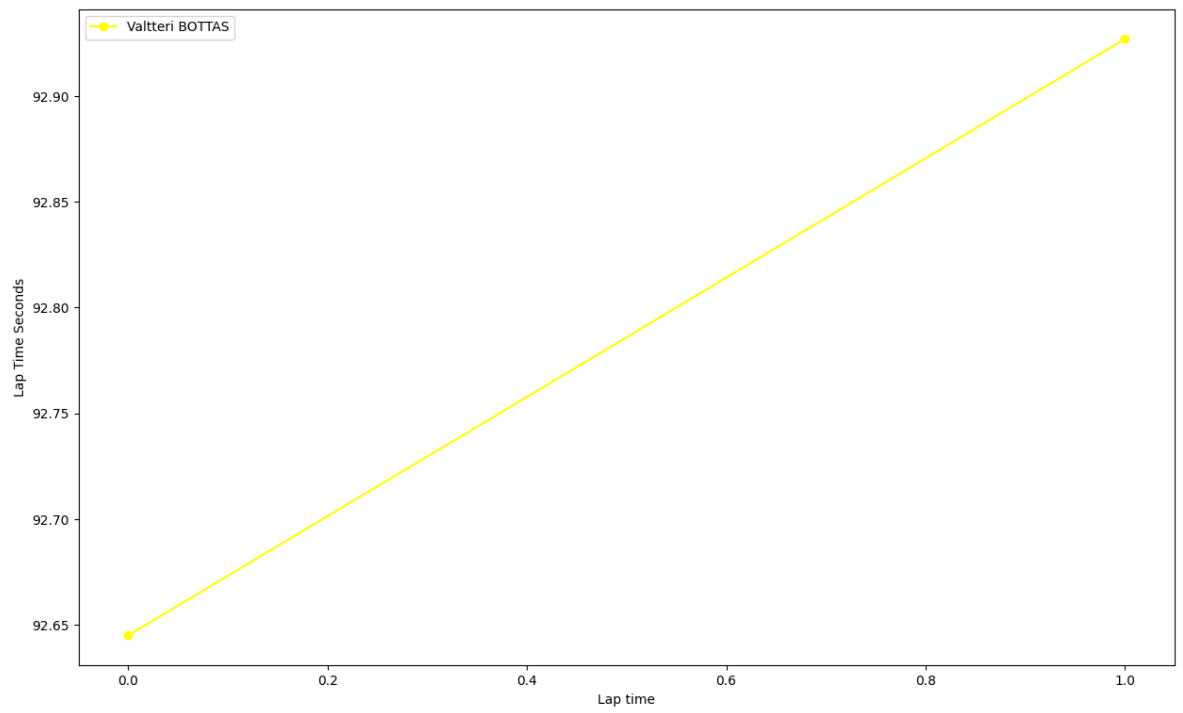
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1229	9466	77	207.0	226	201.0	2024-02-29T14:45:00.000000+00:00
1	1229	9466	24	214.0	141	147.0	2024-02-29T15:00:00.000000+00:00
2	1229	9466	27	175.0	195	165.0	2024-02-29T15:00:00.000000+00:00
3	1229	9466	81	163.0	181	195.0	2024-02-29T15:00:00.000000+00:00
4	1229	9466	23	223.0	254	155.0	2024-02-29T15:00:00.000000+00:00
...

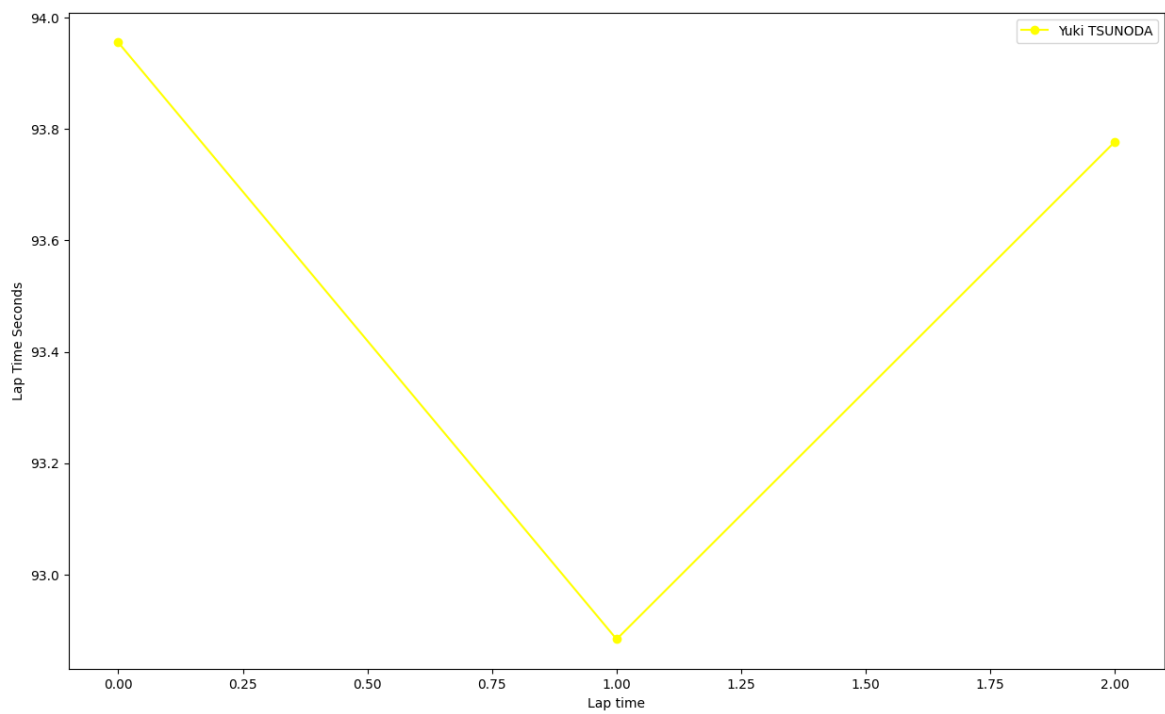
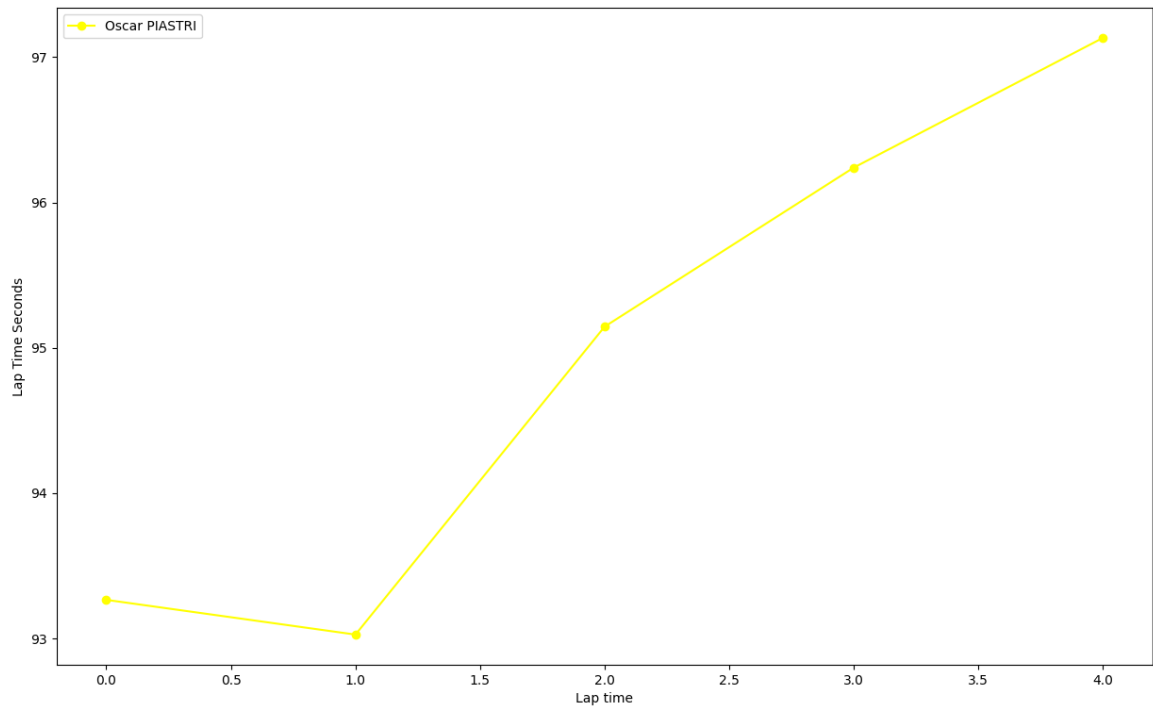
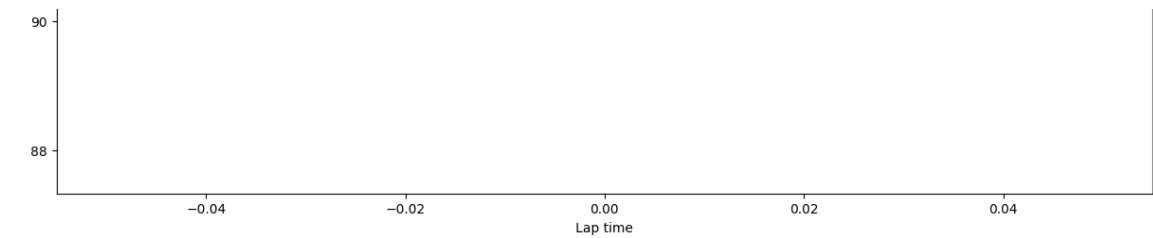
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
506	1229	9466	10	228.0	246	260.0	2024-02-29T16:03:
507	1229	9466	24	231.0	209	265.0	2024-02-29T16:03:
508	1229	9466	14	231.0	202	266.0	2024-02-29T16:03:
509	1229	9466	44	200.0	243	270.0	2024-02-29T16:03:
510	1229	9466	2	169.0	201	263.0	2024-02-29T16:03:

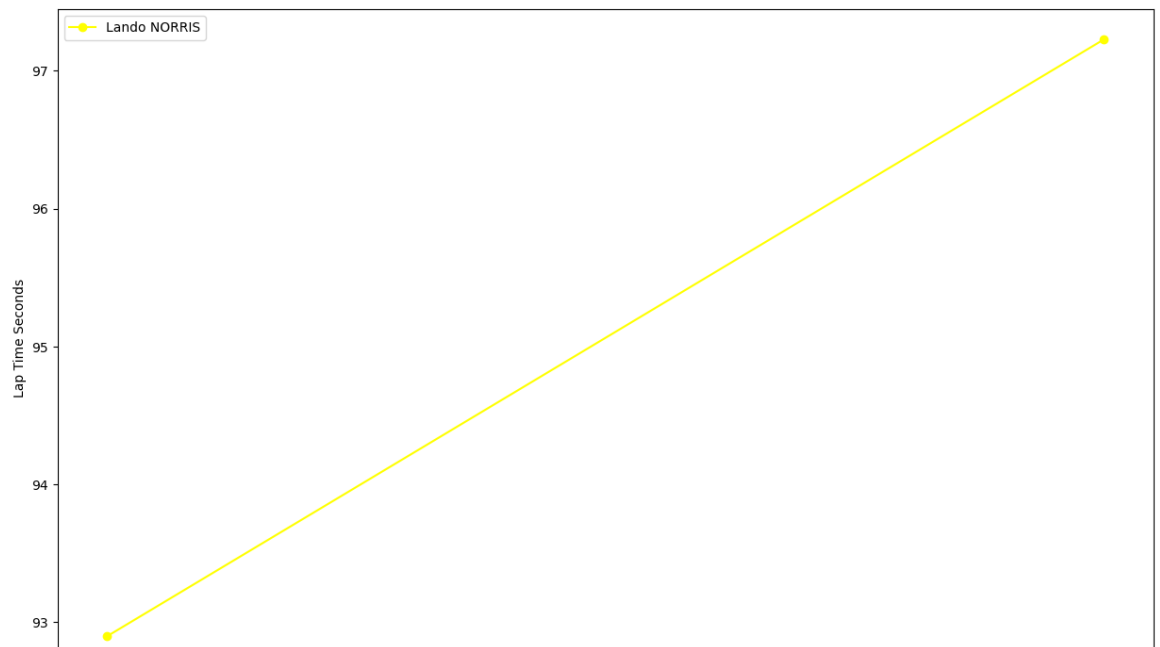
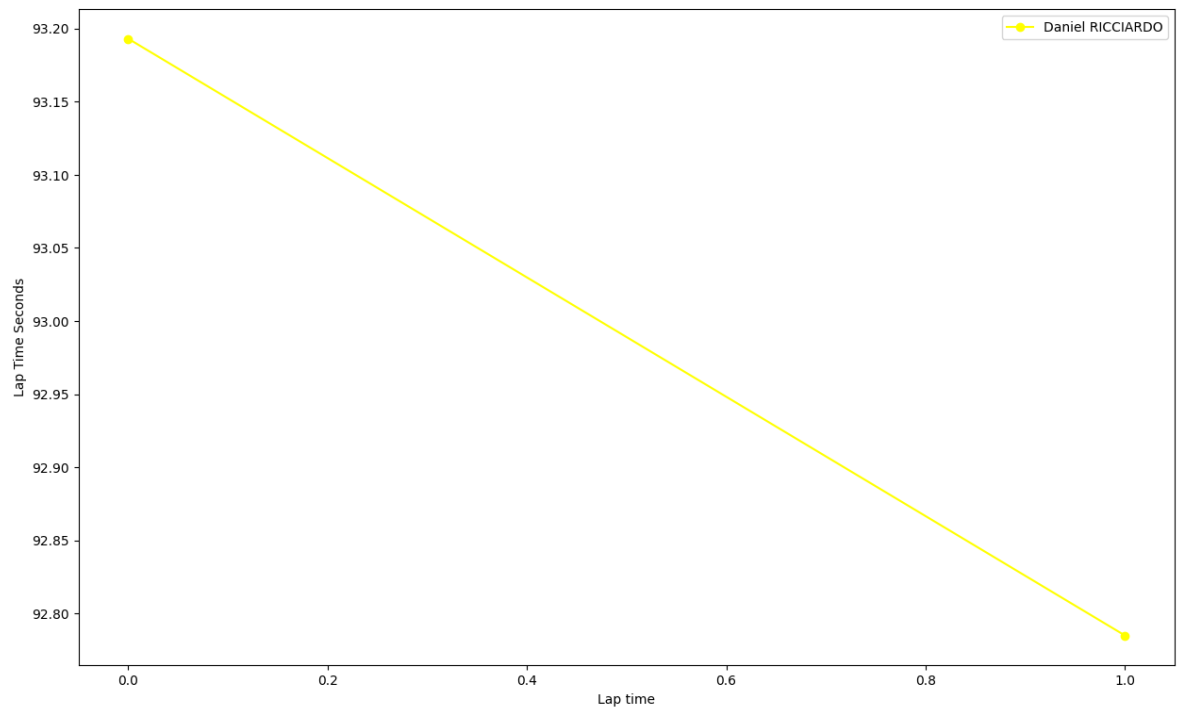
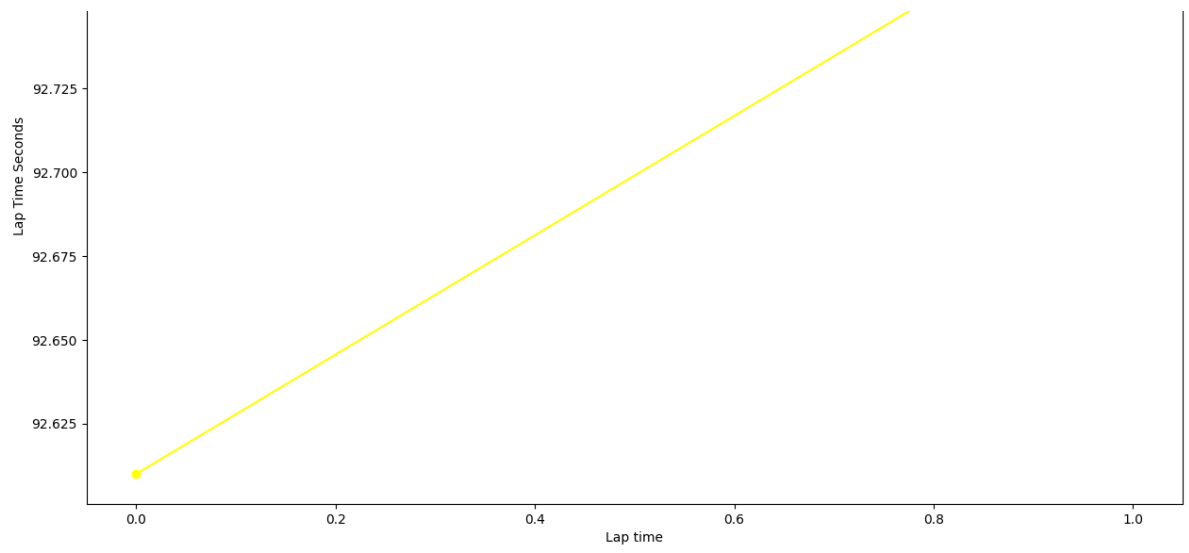
See race pace by means of the charts

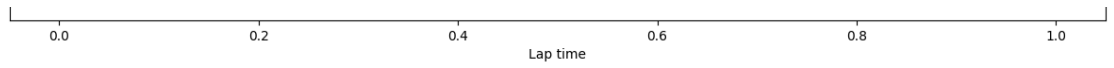
Medium tyres

```
In [46]: libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",99)
```



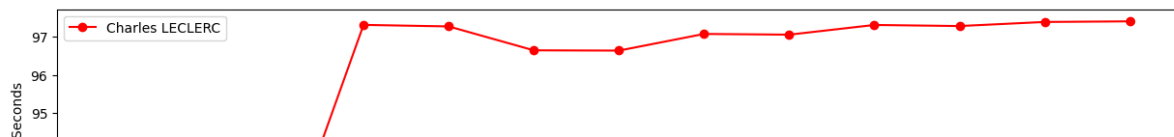
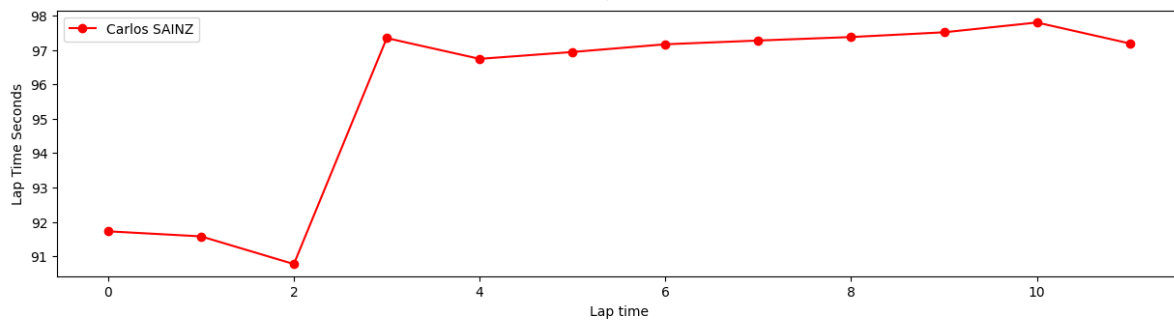
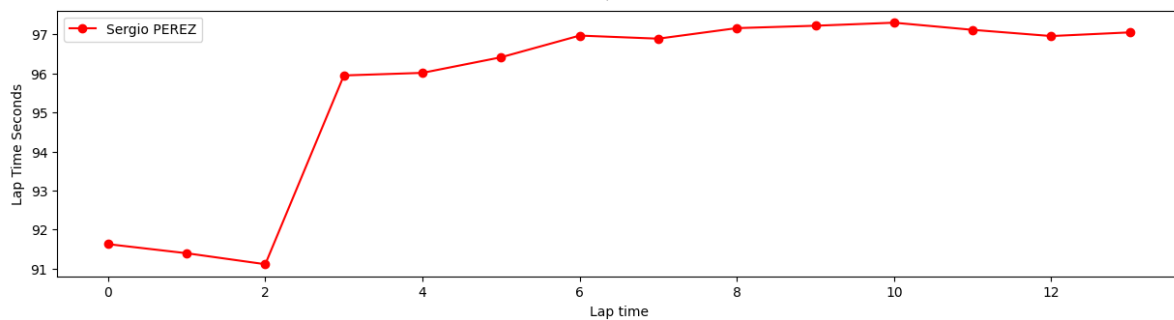
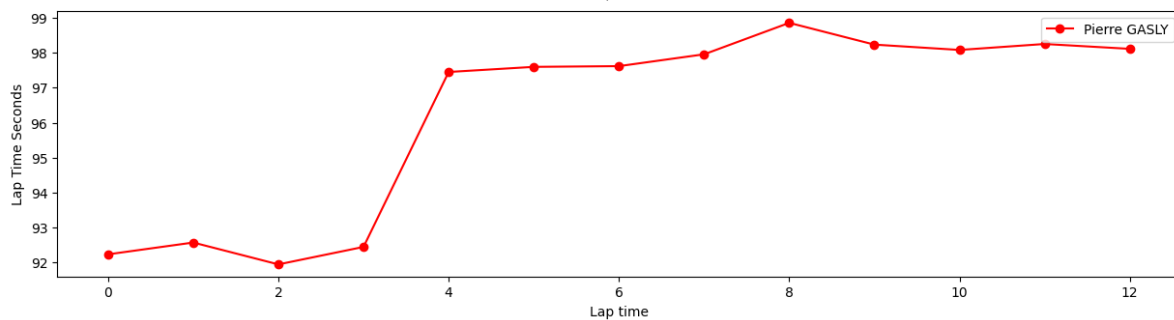
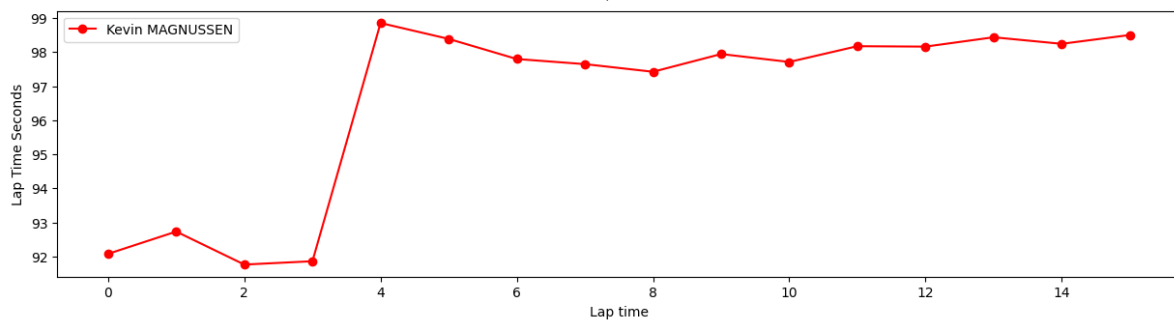
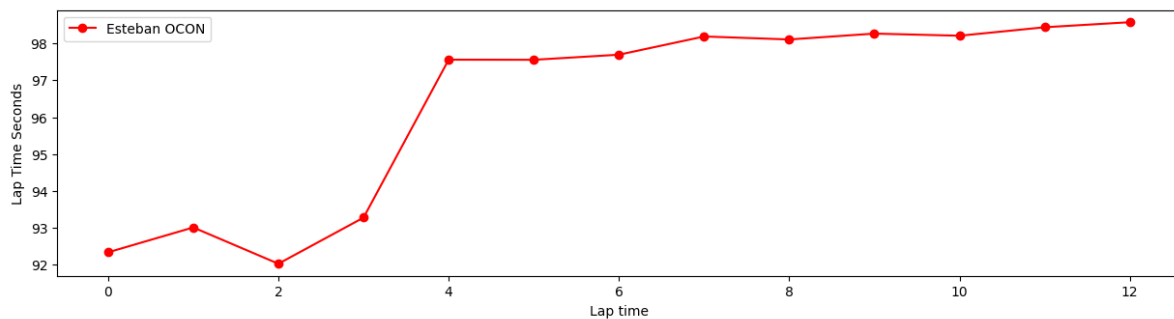
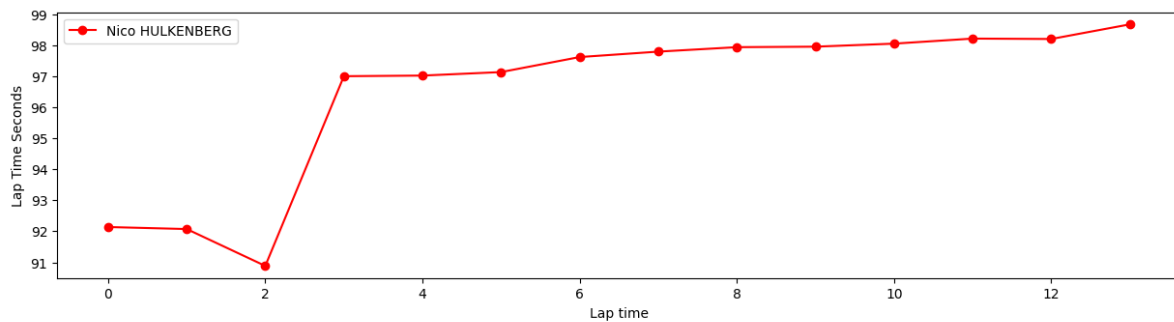


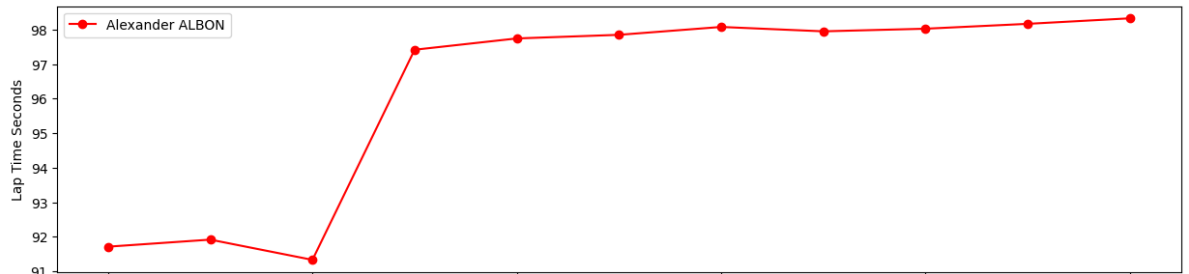
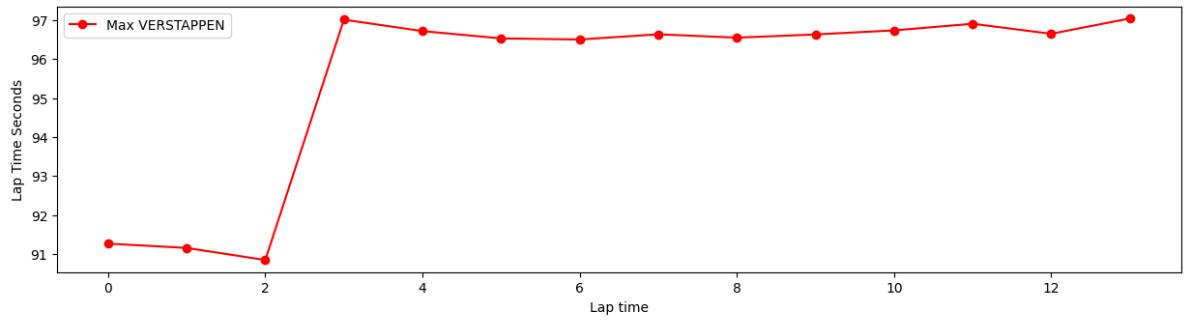
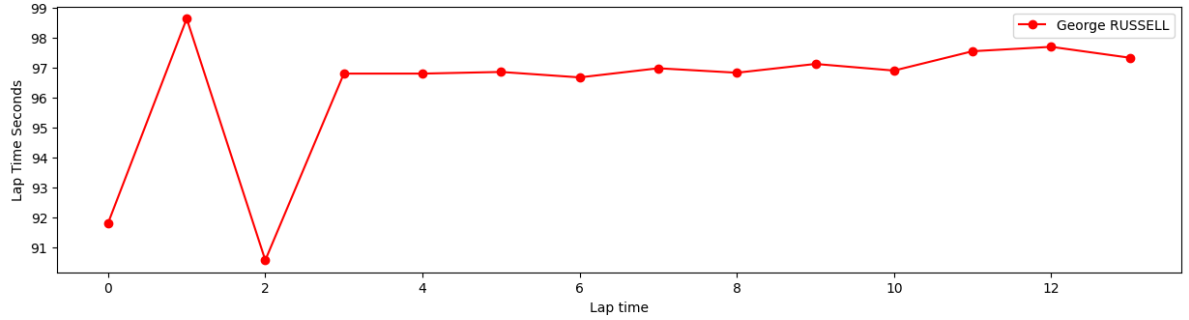
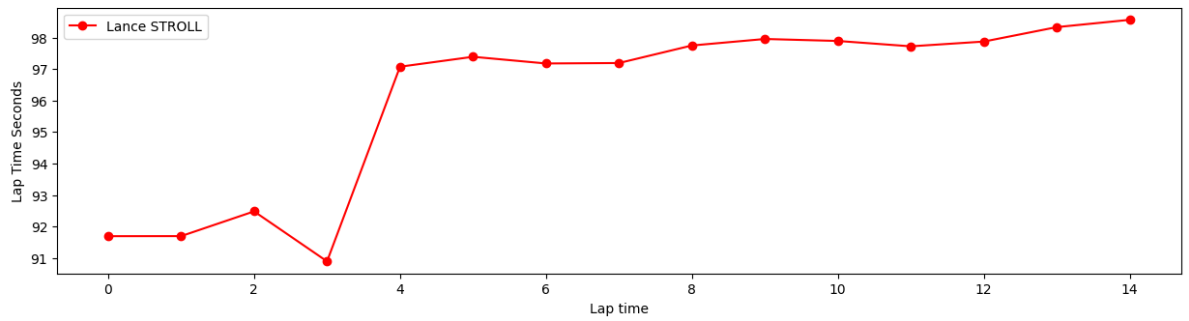
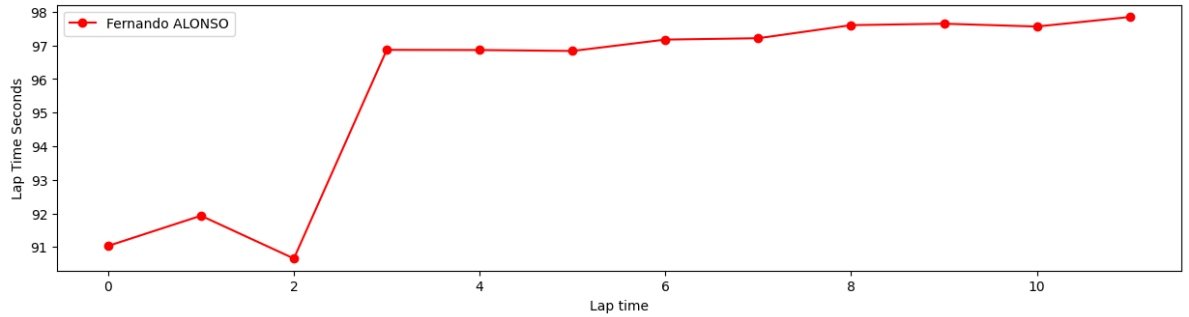
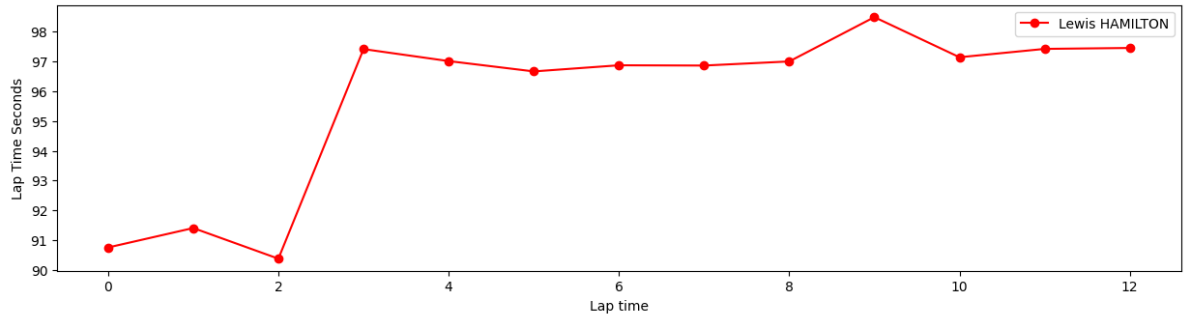
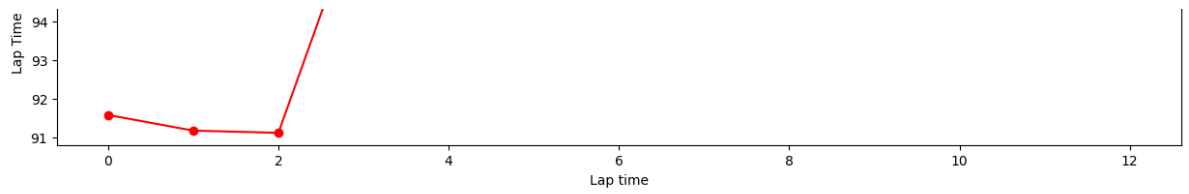


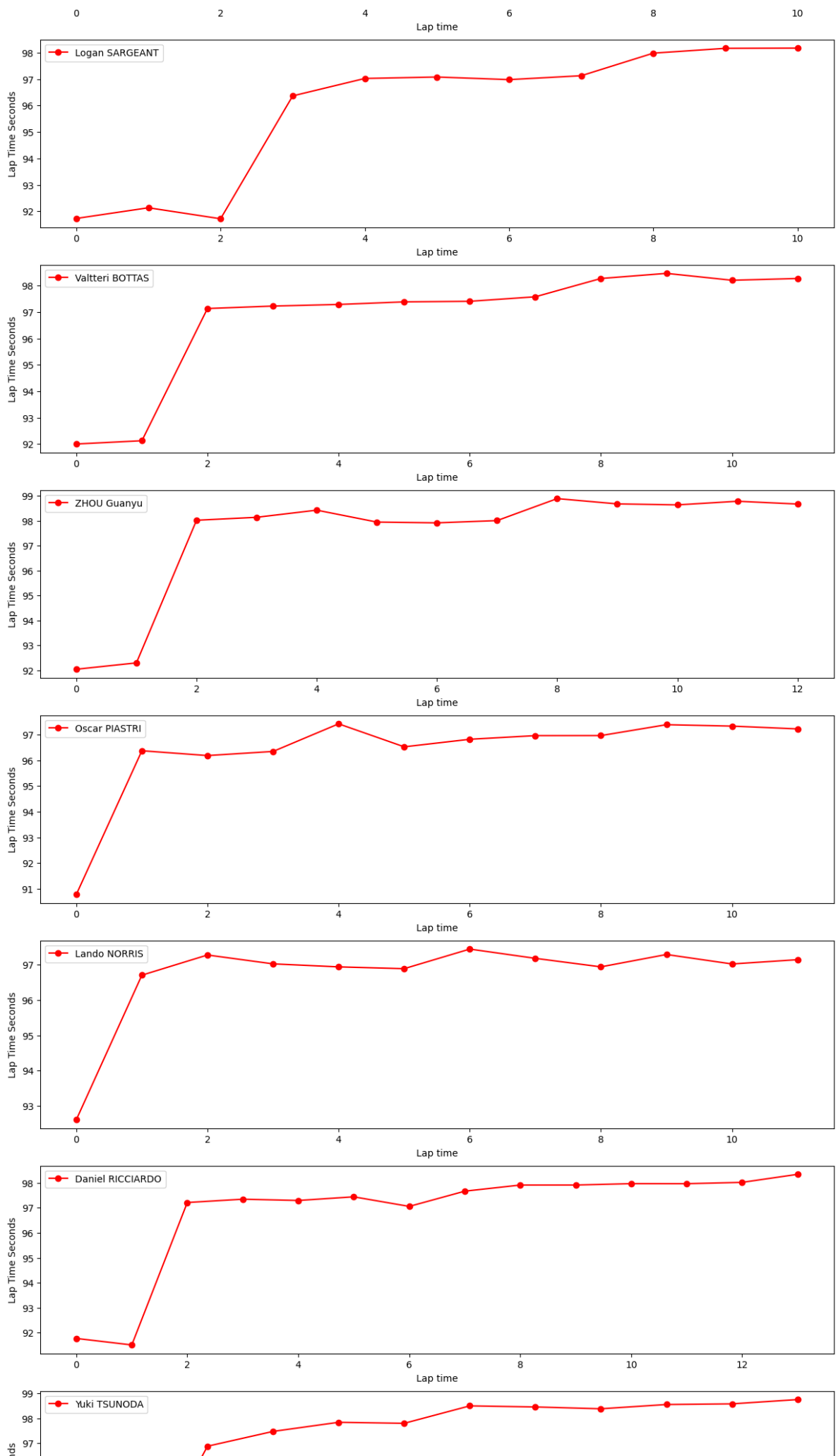


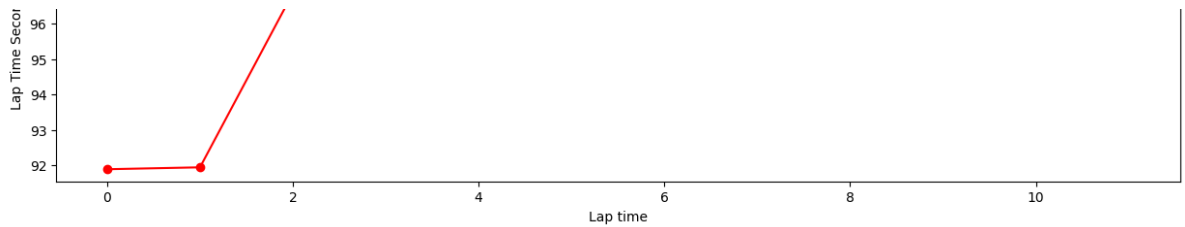
Soft tyres

```
In [47]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",99)
```







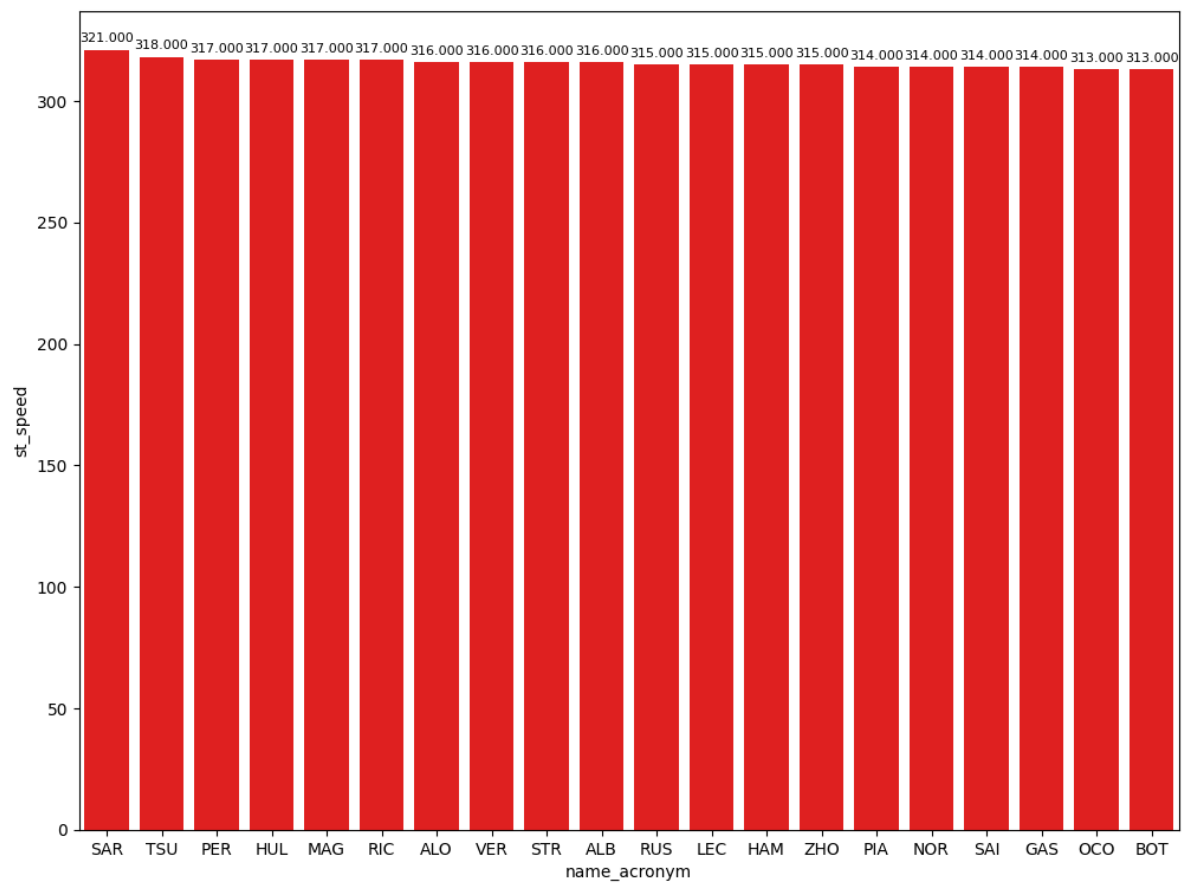


Hard tyres

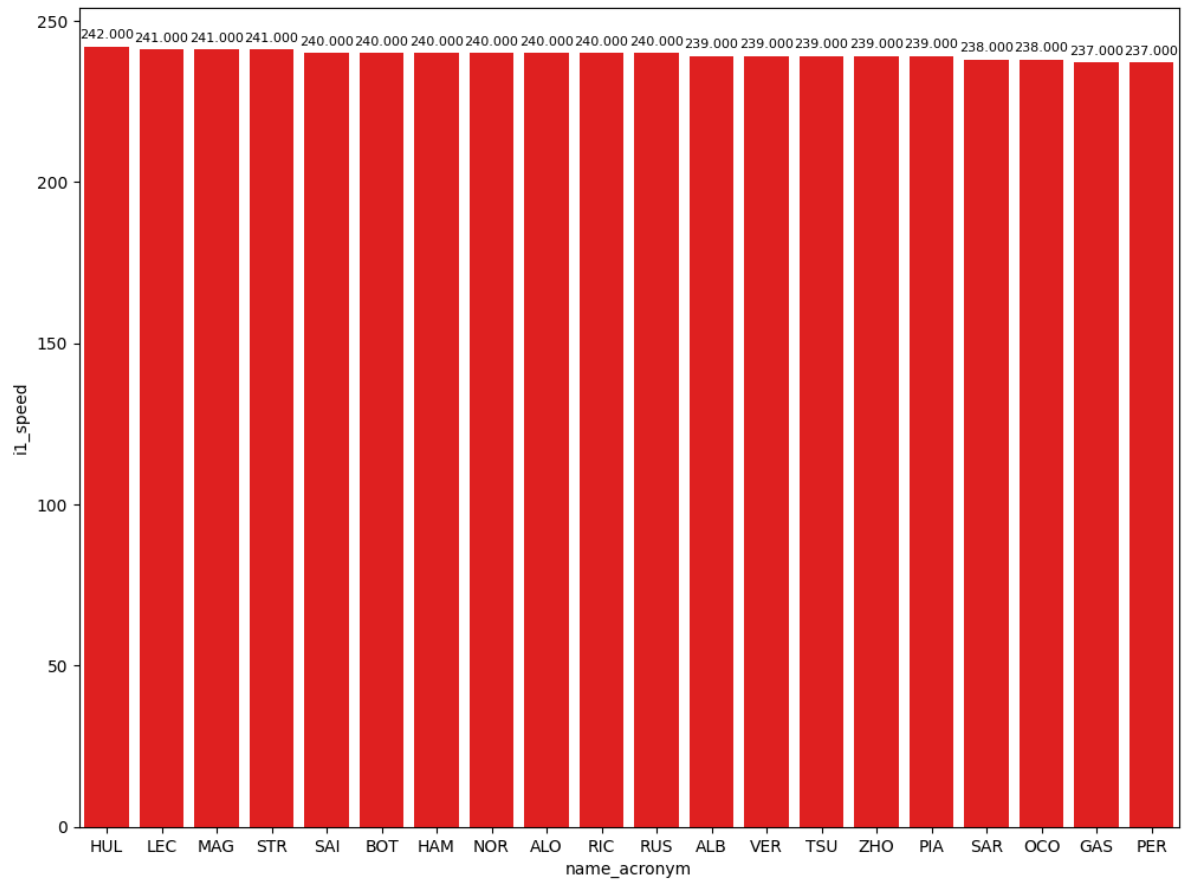
In [48]: `#libraryDataF1.obtain_data_tyres(jointables2,"HARD",99)`

Speed trap

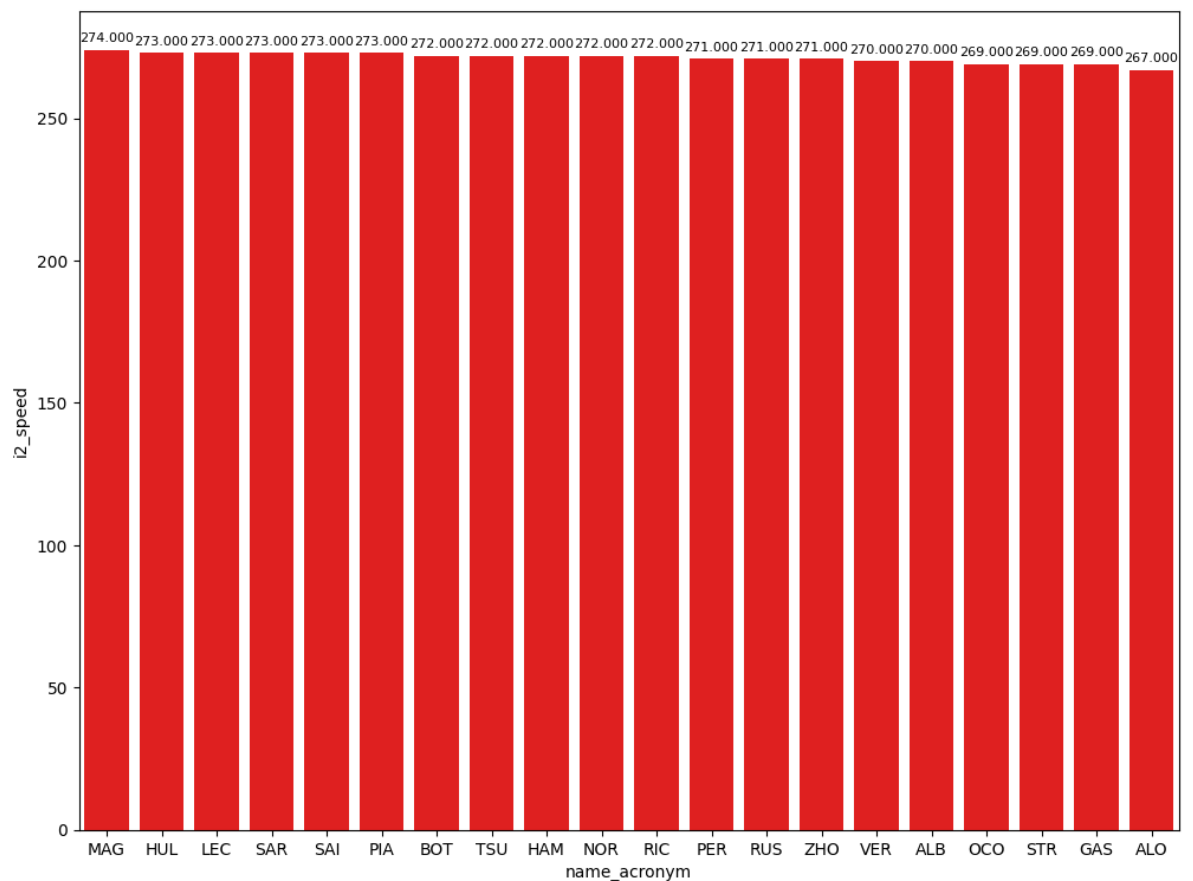
In [49]: `top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed'].max()
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)`



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

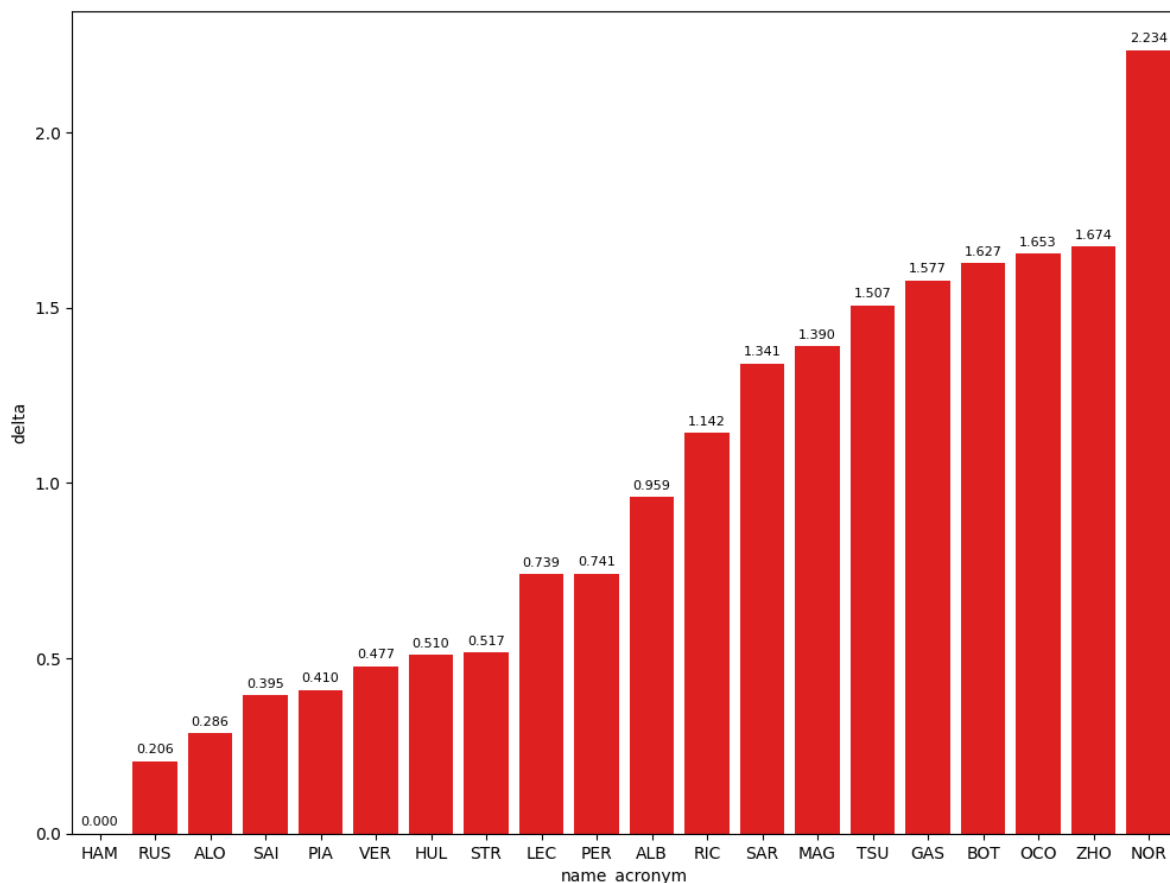
	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_duration
19	Alexander ALBON	MEDIUM	29.741	39.646	23.027	92.414
165	Lewis HAMILTON	SOFT	29.037	38.734	22.603	90.374

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

```
Out[55]:
```

	duration_sector_1	full_name	compound	lap_duration	lap_number
165	29.037	Lewis HAMILTON	SOFT	90.374	8
197	29.081	George RUSSELL	SOFT	90.580	8
139	29.105	Nico HULKENBERG	SOFT	90.884	8
186	29.131	Max VERSTAPPEN	SOFT	90.851	8
194	29.135	Lance STROLL	SOFT	90.891	11
170	29.192	Sergio PEREZ	SOFT	91.115	8
213	29.252	Fernando ALONSO	SOFT	90.660	9
144	29.266	Oscar PIASTRI	SOFT	90.784	8
89	29.331	Charles LECLERC	SOFT	91.171	5
198	29.341	Alexander ALBON	SOFT	91.333	11
152	29.345	Daniel RICCIARDO	SOFT	91.777	7
146	29.347	Lando NORRIS	SOFT	92.608	7
143	29.353	Carlos SAINZ	SOFT	90.769	8
154	29.367	Yuki TSUNODA	SOFT	91.881	10
183	29.382	Kevin MAGNUSSEN	SOFT	91.862	11
116	29.471	Logan SARGEANT	SOFT	91.727	7
166	29.591	Esteban OCON	SOFT	92.027	8
123	29.612	Valtteri BOTTAS	SOFT	92.001	7
181	29.615	Pierre GASLY	SOFT	91.951	8
127	29.664	ZHOU Guanyu	SOFT	92.048	8

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

```
Out[56]:
```

	duration_sector_2	full_name	compound	lap_duration	lap_number
144	38.665	Oscar PIASTRI	SOFT	90.784	8
213	38.692	Fernando ALONSO	SOFT	90.660	9
143	38.705	Carlos SAINZ	SOFT	90.769	8
165	38.734	Lewis HAMILTON	SOFT	90.374	8
186	38.834	Max VERSTAPPEN	SOFT	90.851	8
89	38.920	Charles LECLERC	SOFT	91.171	5
197	38.923	George RUSSELL	SOFT	90.580	8

	duration_sector_2	full_name	compound	lap_duration	lap_number
194	38.939	Lance STROLL	SOFT	90.891	11
170	39.047	Sergio PEREZ	SOFT	91.115	8
139	39.074	Nico HULKENBERG	SOFT	90.884	8
198	39.097	Alexander ALBON	SOFT	91.333	11
116	39.142	Logan SARGEANT	SOFT	91.727	7
181	39.147	Pierre GASLY	SOFT	91.951	8
151	39.194	Kevin MAGNUSSEN	SOFT	91.764	9
146	39.221	Lando NORRIS	SOFT	92.608	7
166	39.278	Esteban OCON	SOFT	92.027	8
127	39.309	ZHOU Guanyu	SOFT	92.048	8
152	39.353	Daniel RICCIARDO	SOFT	91.777	7
123	39.397	Valtteri BOTTAS	SOFT	92.001	7

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
197	22.576	George RUSSELL	SOFT	90.580	8
165	22.603	Lewis HAMILTON	SOFT	90.374	8
193	22.700	Charles LECLERC	SOFT	91.113	11
139	22.705	Nico HULKENBERG	SOFT	90.884	8
52	22.706	Fernando ALONSO	SOFT	91.035	2
143	22.711	Carlos SAINZ	SOFT	90.769	8
195	22.779	Daniel RICCIARDO	SOFT	91.516	10
194	22.817	Lance STROLL	SOFT	90.891	11
113	22.843	Max VERSTAPPEN	SOFT	91.161	5
144	22.853	Oscar PIASTRI	SOFT	90.784	8
85	22.858	Sergio PEREZ	SOFT	91.396	5
198	22.895	Alexander ALBON	SOFT	91.333	11
214	22.925	Logan SARGEANT	SOFT	91.715	14
199	22.948	Yuki TSUNODA	SOFT	91.935	13
123	22.992	Valtteri BOTTAS	SOFT	92.001	7
207	23.031	Esteban OCON	SOFT	93.277	11
174	23.033	ZHOU Guanyu	SOFT	92.303	11
23	23.033	Pierre GASLY	SOFT	92.239	2
22	23.079	Kevin MAGNUSSEN	SOFT	92.079	2
49	23.345	Lando NORRIS	MEDIUM	92.900	3

Mean pace with the different compound used on the session

```
In [58]: race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and l
race_pace
```

Out[58]:

	lap_duration
compound	
SOFT	91.701582
MEDIUM	93.083267

Long runs

```
In [59]: MINIMUM_SECONDS = 90
MAXIMUM_SECONDS = 99
```

Red Bull Racing

```
In [60]: stintInformation.query('driver_number == 1 or driver_number == 11')
```

Out[60]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1229	9466	1	11	1	4	SOFT	
11	1229	9466	1	1	1	7	SOFT	
20	1229	9466	2	11	5	7	SOFT	
31	1229	9466	2	1	8	10	SOFT	
32	1229	9466	3	11	8	10	SOFT	
55	1229	9466	3	1	11	26	SOFT	
57	1229	9466	4	11	11	27	SOFT	

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

Out[61]:

	full_name	compound	date_start	lap_number	duration_sector_1
90	Max VERSTAPPEN	SOFT	2024-02-29T15:10:13.219000+00:00	2	29.279
113	Max VERSTAPPEN	SOFT	2024-02-29T15:16:28.973000+00:00	5	29.249
186	Max VERSTAPPEN	SOFT	2024-02-29T15:28:22.630000+00:00	8	29.131
235	Max VERSTAPPEN	SOFT	2024-02-29T15:39:51.886000+00:00	11	31.246
249	Max VERSTAPPEN	SOFT	2024-02-29T15:41:28.880000+00:00	12	31.071
267	Max VERSTAPPEN	SOFT	2024-02-29T15:43:05.628000+00:00	13	30.981
286	Max VERSTAPPEN	SOFT	2024-02-29T15:44:42.618000+00:00	14	31.053
304	Max VERSTAPPEN	SOFT	2024-02-29T15:46:18.646000+00:00	15	31.162

	full_name	compound	date_start	lap_number	duration_sector_1
324	Max VERSTAPPEN	SOFT	2024-02-29T15:47:55.170000+00:00	16	31.118
364	Max VERSTAPPEN	SOFT	2024-02-29T15:51:12.475000+00:00	18	31.067
384	Max VERSTAPPEN	SOFT	2024-02-29T15:52:48.829000+00:00	19	31.159
404	Max VERSTAPPEN	SOFT	2024-02-29T15:54:25.495000+00:00	20	31.316
444	Max VERSTAPPEN	SOFT	2024-02-29T15:57:44.600000+00:00	22	31.110

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
25	Sergio PEREZ	SOFT	2024-02-29T15:03:06.325000+00:00	2	29.381	
85	Sergio PEREZ	SOFT	2024-02-29T15:09:34.365000+00:00	5	29.391	
170	Sergio PEREZ	SOFT	2024-02-29T15:25:55.259000+00:00	8	29.192	
224	Sergio PEREZ	SOFT	2024-02-29T15:37:52.070000+00:00	11	30.863	
232	Sergio PEREZ	SOFT	2024-02-29T15:39:28.027000+00:00	12	30.875	
247	Sergio PEREZ	SOFT	2024-02-29T15:41:03.947000+00:00	13	30.955	
262	Sergio PEREZ	SOFT	2024-02-29T15:42:40.386000+00:00	14	31.335	
280	Sergio PEREZ	SOFT	2024-02-29T15:44:17.411000+00:00	15	31.156	
300	Sergio PEREZ	SOFT	2024-02-29T15:45:54.279000+00:00	16	31.179	
340	Sergio PEREZ	SOFT	2024-02-29T15:49:11.349000+00:00	18	31.218	
360	Sergio PEREZ	SOFT	2024-02-29T15:50:48.476000+00:00	19	31.282	
380	Sergio PEREZ	SOFT	2024-02-29T15:52:25.856000+00:00	20	31.256	
420	Sergio PEREZ	SOFT	2024-02-29T15:55:44.044000+00:00	22	31.153	
459	Sergio PEREZ	SOFT	2024-02-29T15:59:01.413000+00:00	24	31.198	

Ferrari

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

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

	full_name	compound	date_start	lap_number	duration_sector_1	dt
30	Charles LECLERC	SOFT	2024-02-29T15:03:31.545000+00:00	2	29.577	
89	Charles LECLERC	SOFT	2024-02-29T15:10:05.314000+00:00	5	29.331	
193	Charles LECLERC	SOFT	2024-02-29T15:29:37.384000+00:00	11	29.431	
264	Charles LECLERC	SOFT	2024-02-29T15:42:47.676000+00:00	14	31.259	
282	Charles LECLERC	SOFT	2024-02-29T15:44:25.092000+00:00	15	31.317	
301	Charles LECLERC	SOFT	2024-02-29T15:46:02.352000+00:00	16	31.066	
321	Charles LECLERC	SOFT	2024-02-29T15:47:38.911000+00:00	17	31.153	
361	Charles LECLERC	SOFT	2024-02-29T15:50:56.498000+00:00	19	31.216	
381	Charles LECLERC	SOFT	2024-02-29T15:52:33.445000+00:00	20	31.303	
401	Charles LECLERC	SOFT	2024-02-29T15:54:10.602000+00:00	21	31.362	
421	Charles LECLERC	SOFT	2024-02-29T15:55:47.911000+00:00	22	31.322	
441	Charles LECLERC	SOFT	2024-02-29T15:57:25.187000+00:00	23	31.312	
	Charles					

In [64]:

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

Out[64]:

	full_name	compound	date_start	lap_number	duration_sector_1	dt
27	Carlos SAINZ	SOFT	2024-02-29T15:03:18.630000+00:00	2	29.657	
88	Carlos SAINZ	SOFT	2024-02-29T15:09:57.442000+00:00	5	29.439	
143	Carlos SAINZ	SOFT	2024-02-29T15:22:53.024000+00:00	8	29.353	
259	Carlos SAINZ	SOFT	2024-02-29T15:42:28.030000+00:00	13	31.517	
277	Carlos SAINZ	SOFT	2024-02-29T15:44:05.250000+00:00	14	31.244	
297	Carlos SAINZ	SOFT	2024-02-29T15:45:42.055000+00:00	15	31.364	
317	Carlos SAINZ	SOFT	2024-02-29T15:47:19.165000+00:00	16	31.391	
357	Carlos SAINZ	SOFT	2024-02-29T15:50:38.120000+00:00	18	31.416	
377	Carlos SAINZ	SOFT	2024-02-29T15:52:15.285000+00:00	19	31.505	
397	Carlos SAINZ	SOFT	2024-02-29T15:53:52.666000+00:00	20	31.596	

	full_name	compound	date_start	lap_number	duration_sector_1	di
417	Carlos SAINZ	SOFT	2024-02-29T15:55:30.148000+00:00	21	31.666	

Mercedes

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1229	9466	1	44	1	4	SOFT	
10	1229	9466	1	63	1	6	SOFT	
22	1229	9466	2	44	5	7	SOFT	
27	1229	9466	2	63	7	7	SOFT	
35	1229	9466	3	44	8	10	SOFT	
37	1229	9466	3	63	8	10	SOFT	
54	1229	9466	4	63	11	24	SOFT	
56	1229	9466	4	44	11	26	SOFT	

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

	full_name	compound	date_start	lap_number	duration_sector_1	d
36	Lewis HAMILTON	SOFT	2024-02-29T15:03:53.636000+00:00	2	29.170	
95	Lewis HAMILTON	SOFT	2024-02-29T15:10:24.811000+00:00	5	29.341	
165	Lewis HAMILTON	SOFT	2024-02-29T15:25:31.099000+00:00	8	29.037	
237	Lewis HAMILTON	SOFT	2024-02-29T15:40:05.708000+00:00	11	31.261	
253	Lewis HAMILTON	SOFT	2024-02-29T15:41:43.175000+00:00	12	31.200	
271	Lewis HAMILTON	SOFT	2024-02-29T15:43:20.124000+00:00	13	31.092	
290	Lewis HAMILTON	SOFT	2024-02-29T15:44:56.840000+00:00	14	31.187	
308	Lewis HAMILTON	SOFT	2024-02-29T15:46:33.728000+00:00	15	31.156	
348	Lewis HAMILTON	SOFT	2024-02-29T15:49:51.449000+00:00	17	31.289	
368	Lewis HAMILTON	SOFT	2024-02-29T15:51:28.411000+00:00	18	32.014	
408	Lewis HAMILTON	SOFT	2024-02-29T15:54:46.096000+00:00	20	31.195	
450	Lewis HAMILTON	SOFT	2024-02-29T15:58:16.227000+00:00	22	31.398	
470	Lewis HAMILTON	SOFT	2024-02-29T15:59:53.693000+00:00	23	31.431	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
83	George RUSSELL	SOFT	2024-02-29T15:09:23.927000+00:00	3	29.839	29.839
106	George RUSSELL	SOFT	2024-02-29T15:13:28.768000+00:00	5	29.706	29.706
197	George RUSSELL	SOFT	2024-02-29T15:29:59.309000+00:00	8	29.081	29.081
266	George RUSSELL	SOFT	2024-02-29T15:43:01.665000+00:00	11	31.093	31.093
284	George RUSSELL	SOFT	2024-02-29T15:44:38.585000+00:00	12	31.183	31.183
303	George RUSSELL	SOFT	2024-02-29T15:46:15.485000+00:00	13	31.064	31.064
323	George RUSSELL	SOFT	2024-02-29T15:47:52.223000+00:00	14	31.092	31.092
343	George RUSSELL	SOFT	2024-02-29T15:49:28.770000+00:00	15	31.153	31.153
363	George RUSSELL	SOFT	2024-02-29T15:51:05.799000+00:00	16	31.148	31.148
383	George RUSSELL	SOFT	2024-02-29T15:52:42.642000+00:00	17	31.175	31.175
403	George RUSSELL	SOFT	2024-02-29T15:54:19.843000+00:00	18	30.835	30.835
423	George RUSSELL	SOFT	2024-02-29T15:55:56.708000+00:00	19	31.070	31.070
442	George RUSSELL	SOFT	2024-02-29T15:57:34.306000+00:00	20	31.503	31.503
462	George RUSSELL	SOFT	2024-02-29T15:59:12.555000+00:00	21	31.314	31.314

McLaren

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
9	1229	9466	1	4	1	6	MEDIUM	
17	1229	9466	1	81	1	7	MEDIUM	
29	1229	9466	2	4	7	9	SOFT	
38	1229	9466	2	81	8	10	SOFT	
48	1229	9466	3	4	10	22	SOFT	
52	1229	9466	3	81	11	23	SOFT	
76	1229	9466	4	4	23	26	MEDIUM	
77	1229	9466	4	81	24	28	MEDIUM	

```
In [69]: libraryDataF1.getinfo(longruns(jointables2,4,'McLaren',MINIMUM_SECONDS,MAXI
```

Out[69]:		full_name	compound	date_start	lap_number	duration_sector_1	du
	49	Lando NORRIS	MEDIUM	2024-02-29T15:05:10.268000+00:00	3	30.063	
	146	Lando NORRIS	SOFT	2024-02-29T15:23:14.912000+00:00	7	29.347	
	223	Lando NORRIS	SOFT	2024-02-29T15:37:13.997000+00:00	10	31.128	
	228	Lando NORRIS	SOFT	2024-02-29T15:38:50.653000+00:00	11	31.193	
	240	Lando NORRIS	SOFT	2024-02-29T15:40:28+00:00	12	31.201	
	255	Lando NORRIS	SOFT	2024-02-29T15:42:05.101000+00:00	13	31.187	
	273	Lando NORRIS	SOFT	2024-02-29T15:43:41.950000+00:00	14	31.079	
	293	Lando NORRIS	SOFT	2024-02-29T15:45:18.872000+00:00	15	31.125	
	313	Lando NORRIS	SOFT	2024-02-29T15:46:56.328000+00:00	16	31.074	
	333	Lando NORRIS	SOFT	2024-02-29T15:48:33.588000+00:00	17	30.936	
	352	Lando NORRIS	SOFT	2024-02-29T15:50:10.488000+00:00	18	31.181	
	372	Lando NORRIS	SOFT	2024-02-29T15:51:47.797000+00:00	19	31.107	
	392	Lando NORRIS	SOFT	2024-02-29T15:53:24.726000+00:00	20	31.200	
	458	Lando NORRIS	MEDIUM	2024-02-29T15:58:57.994000+00:00	23	31.399	

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

Out[70]:		full_name	compound	date_start	lap_number	duration_sector_1	du
	21	Oscar PIASTRI	MEDIUM	2024-02-29T15:02:36.923000+00:00	2	30.129	
	56	Oscar PIASTRI	MEDIUM	2024-02-29T15:06:25.288000+00:00	4	29.899	
	91	Oscar PIASTRI	MEDIUM	2024-02-29T15:10:16.542000+00:00	6	29.989	
	144	Oscar PIASTRI	SOFT	2024-02-29T15:23:01.060000+00:00	8	29.266	
	221	Oscar PIASTRI	SOFT	2024-02-29T15:36:44.990000+00:00	11	31.101	
	227	Oscar PIASTRI	SOFT	2024-02-29T15:38:21.242000+00:00	12	31.149	
	236	Oscar PIASTRI	SOFT	2024-02-29T15:39:57.551000+00:00	13	31.097	

	full_name	compound	date_start	lap_number	duration_sector_1	du
251	Oscar PIASTRI	SOFT	2024-02-29T15:41:33.865000+00:00	14	31.193	
269	Oscar PIASTRI	SOFT	2024-02-29T15:43:11.384000+00:00	15	30.807	
287	Oscar PIASTRI	SOFT	2024-02-29T15:44:47.733000+00:00	16	31.029	
305	Oscar PIASTRI	SOFT	2024-02-29T15:46:24.580000+00:00	17	31.231	
325	Oscar PIASTRI	SOFT	2024-02-29T15:48:01.716000+00:00	18	31.293	
345	Oscar PIASTRI	SOFT	2024-02-29T15:49:38.550000+00:00	19	31.223	
365	Oscar PIASTRI	SOFT	2024-02-29T15:51:15.995000+00:00	20	31.234	
385	Oscar PIASTRI	SOFT	2024-02-29T15:52:53.318000+00:00	21	31.250	
448	Oscar PIASTRI	MEDIUM	2024-02-29T15:58:07.577000+00:00	24	30.784	
---	Oscar	---	---	--	---	

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
6	1229	9466	1	14	1	5	SOFT	
18	1229	9466	1	18	1	9	SOFT	
26	1229	9466	2	14	6	8	SOFT	
43	1229	9466	3	14	9	11	SOFT	
46	1229	9466	2	18	10	13	SOFT	
59	1229	9466	4	14	12	23	SOFT	
69	1229	9466	3	18	14	27	SOFT	

```
In [72]: libraryDataF1.getinfo(longruns(jointables2,14,'Aston Martin',MINIMUM_SECONDS=10))
```

```
Out[72]:
```

	full_name	compound	date_start	lap_number	duration_sector_1	du
52	Fernando ALONSO	SOFT	2024-02-29T15:05:47.344000+00:00	2	29.455	
124	Fernando ALONSO	SOFT	2024-02-29T15:19:49.314000+00:00	6	29.550	
213	Fernando ALONSO	SOFT	2024-02-29T15:33:59.350000+00:00	9	29.252	
311	Fernando ALONSO	SOFT	2024-02-29T15:46:51.648000+00:00	12	31.057	
331	Fernando ALONSO	SOFT	2024-02-29T15:48:28.841000+00:00	13	31.065	

	full_name	compound	date_start	lap_number	duration_sector_1	du
351	Fernando ALONSO	SOFT	2024-02-29T15:50:05.431000+00:00	14	31.047	
371	Fernando ALONSO	SOFT	2024-02-29T15:51:42.274000+00:00	15	31.150	
391	Fernando ALONSO	SOFT	2024-02-29T15:53:19.449000+00:00	16	31.232	
411	Fernando ALONSO	SOFT	2024-02-29T15:54:56.622000+00:00	17	31.289	
431	Fernando ALONSO	SOFT	2024-02-29T15:56:34.302000+00:00	18	31.238	
449	Fernando ALONSO	SOFT	2024-02-29T15:58:11.795000+00:00	19	31.305	

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

Out[73]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
53	Lance STROLL	SOFT	2024-02-29T15:05:57.505000+00:00	2	29.407	
87	Lance STROLL	SOFT	2024-02-29T15:09:50.494000+00:00	4	29.272	
112	Lance STROLL	SOFT	2024-02-29T15:15:38.718000+00:00	7	29.621	
194	Lance STROLL	SOFT	2024-02-29T15:29:47.321000+00:00	11	29.135	
260	Lance STROLL	SOFT	2024-02-29T15:42:34.687000+00:00	14	31.074	
278	Lance STROLL	SOFT	2024-02-29T15:44:11.722000+00:00	15	31.163	
298	Lance STROLL	SOFT	2024-02-29T15:45:49.215000+00:00	16	31.122	
318	Lance STROLL	SOFT	2024-02-29T15:47:26.289000+00:00	17	31.175	
338	Lance STROLL	SOFT	2024-02-29T15:49:03.545000+00:00	18	31.185	
358	Lance STROLL	SOFT	2024-02-29T15:50:41.235000+00:00	19	31.410	
378	Lance STROLL	SOFT	2024-02-29T15:52:19.229000+00:00	20	31.366	
398	Lance STROLL	SOFT	2024-02-29T15:53:57.098000+00:00	21	31.396	
418	Lance STROLL	SOFT	2024-02-29T15:55:34.832000+00:00	22	31.488	
438	Lance STROLL	SOFT	2024-02-29T15:57:12.961000+00:00	23	31.405	
456	Lance STROLL	SOFT	2024-02-29T15:58:51.035000+00:00	24	31.796	

RB

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

Out[74]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	8	1229	9466	1	3	1	6	MEDIUM
	19	1229	9466	1	22	1	9	MEDIUM
	30	1229	9466	2	3	7	12	SOFT
	47	1229	9466	2	22	10	15	SOFT
	63	1229	9466	3	3	13	27	SOFT
	73	1229	9466	3	22	16	30	SOFT

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

Out[75]:

	full_name	compound	date_start	lap_number	duration_sector_1
31	Daniel RICCIARDO	MEDIUM	2024-02-29T15:03:34.592000+00:00	2	29.890
66	Daniel RICCIARDO	MEDIUM	2024-02-29T15:07:23.618000+00:00	4	29.734
152	Daniel RICCIARDO	SOFT	2024-02-29T15:24:04.277000+00:00	7	29.345
195	Daniel RICCIARDO	SOFT	2024-02-29T15:29:51.278000+00:00	10	29.382
243	Daniel RICCIARDO	SOFT	2024-02-29T15:40:40.709000+00:00	13	31.018
257	Daniel RICCIARDO	SOFT	2024-02-29T15:42:17.835000+00:00	14	31.093
275	Daniel RICCIARDO	SOFT	2024-02-29T15:43:55.245000+00:00	15	31.187
295	Daniel RICCIARDO	SOFT	2024-02-29T15:45:32.728000+00:00	16	31.066
315	Daniel RICCIARDO	SOFT	2024-02-29T15:47:09.898000+00:00	17	31.101
335	Daniel RICCIARDO	SOFT	2024-02-29T15:48:47.049000+00:00	18	31.269
355	Daniel RICCIARDO	SOFT	2024-02-29T15:50:24.586000+00:00	19	31.334
375	Daniel RICCIARDO	SOFT	2024-02-29T15:52:02.558000+00:00	20	31.407
395	Daniel RICCIARDO	SOFT	2024-02-29T15:53:40.493000+00:00	21	31.268
415	Daniel RICCIARDO	SOFT	2024-02-29T15:55:18.422000+00:00	22	31.356
434	Daniel RICCIARDO	SOFT	2024-02-29T15:56:56.439000+00:00	23	31.356
454	Daniel RICCIARDO	SOFT	2024-02-29T15:58:34.379000+00:00	24	31.456

In [76]:

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

Out[76]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
24	Yuki TSUNODA	MEDIUM	2024-02-29T15:03:01.193000+00:00	2	30.328	
80	Yuki TSUNODA	MEDIUM	2024-02-29T15:08:57.628000+00:00	5	29.658	
105	Yuki TSUNODA	MEDIUM	2024-02-29T15:12:44.694000+00:00	7	30.156	
154	Yuki TSUNODA	SOFT	2024-02-29T15:24:11.027000+00:00	10	29.367	
199	Yuki TSUNODA	SOFT	2024-02-29T15:30:29.917000+00:00	13	29.476	
248	Yuki TSUNODA	SOFT	2024-02-29T15:41:12.321000+00:00	16	31.083	
283	Yuki TSUNODA	SOFT	2024-02-29T15:44:29.295000+00:00	18	31.179	
302	Yuki TSUNODA	SOFT	2024-02-29T15:46:06.897000+00:00	19	31.490	
322	Yuki TSUNODA	SOFT	2024-02-29T15:47:44.727000+00:00	20	31.429	
342	Yuki TSUNODA	SOFT	2024-02-29T15:49:22.485000+00:00	21	31.508	
362	Yuki TSUNODA	SOFT	2024-02-29T15:51:01.027000+00:00	22	31.535	
382	Yuki TSUNODA	SOFT	2024-02-29T15:52:39.404000+00:00	23	31.496	
402	Yuki TSUNODA	SOFT	2024-02-29T15:54:17.855000+00:00	24	31.531	
443	Yuki TSUNODA	SOFT	2024-02-29T15:57:36.209000+00:00	26	31.522	
463	Yuki TSUNODA	SOFT	2024-02-29T15:59:14.889000+00:00	27	31.520	

Haas

In [77]:

libraryDataF1.getinfo(longruns(jointables2,20,'Haas F1 Team',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[77]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
22	Kevin MAGNUSSEN	SOFT	2024-02-29T15:02:44.032000+00:00	2	29.386	
82	Kevin MAGNUSSEN	SOFT	2024-02-29T15:09:08.984000+00:00	5	29.634	
151	Kevin MAGNUSSEN	SOFT	2024-02-29T15:23:58.285000+00:00	9	29.482	
183	Kevin MAGNUSSEN	SOFT	2024-02-29T15:27:56.329000+00:00	11	29.382	
245	Kevin MAGNUSSEN	SOFT	2024-02-29T15:40:57.250000+00:00	14	31.441	

	full_name	compound	date_start	lap_number	duration_sector_1
261	Kevin MAGNUSSEN	SOFT	2024-02-29T15:42:36.147000+00:00	15	31.428
279	Kevin MAGNUSSEN	SOFT	2024-02-29T15:44:16.027000+00:00	16	31.147
299	Kevin MAGNUSSEN	SOFT	2024-02-29T15:45:52.353000+00:00	17	31.234
319	Kevin MAGNUSSEN	SOFT	2024-02-29T15:47:29.927000+00:00	18	31.278
339	Kevin MAGNUSSEN	SOFT	2024-02-29T15:49:07.299000+00:00	19	31.174
359	Kevin MAGNUSSEN	SOFT	2024-02-29T15:50:45.312000+00:00	20	31.181
379	Kevin MAGNUSSEN	SOFT	2024-02-29T15:52:23.063000+00:00	21	31.389
399	Kevin MAGNUSSEN	SOFT	2024-02-29T15:54:01.066000+00:00	22	31.373
419	Kevin MAGNUSSEN	SOFT	2024-02-29T15:55:39.425000+00:00	23	31.592
439	Kevin MAGNUSSEN	SOFT	2024-02-29T15:57:17.806000+00:00	24	31.497

In [78]: `libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS=10))`

Out[78]:

	full_name	compound	date_start	lap_number	duration_sector_1
17	Nico HULKENBERG	SOFT	2024-02-29T15:02:04.077000+00:00	2	29.748
72	Nico HULKENBERG	SOFT	2024-02-29T15:07:54.189000+00:00	5	29.516
139	Nico HULKENBERG	SOFT	2024-02-29T15:22:18.050000+00:00	8	29.108
256	Nico HULKENBERG	SOFT	2024-02-29T15:42:09.346000+00:00	11	30.972
274	Nico HULKENBERG	SOFT	2024-02-29T15:43:46.282000+00:00	12	31.018
294	Nico HULKENBERG	SOFT	2024-02-29T15:45:23.372000+00:00	13	31.102
314	Nico HULKENBERG	SOFT	2024-02-29T15:47:00.478000+00:00	14	31.252
334	Nico HULKENBERG	SOFT	2024-02-29T15:48:38.188000+00:00	15	31.378
354	Nico HULKENBERG	SOFT	2024-02-29T15:50:15.893000+00:00	16	31.238
374	Nico HULKENBERG	SOFT	2024-02-29T15:51:53.928000+00:00	17	31.386
394	Nico HULKENBERG	SOFT	2024-02-29T15:53:31.806000+00:00	18	31.448
414	Nico HULKENBERG	SOFT	2024-02-29T15:55:09.840000+00:00	19	31.498

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
433	Nico HULKENBERG	SOFT	2024-02-29T15:56:48.139000+00:00	20	31.362	31.362

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
20	Esteban OCON	SOFT	2024-02-29T15:02:30.452000+00:00	2	29.903	29.903
77	Esteban OCON	SOFT	2024-02-29T15:08:44.819000+00:00	5	29.756	29.756
166	Esteban OCON	SOFT	2024-02-29T15:25:35.179000+00:00	8	29.591	29.591
207	Esteban OCON	SOFT	2024-02-29T15:31:56.675000+00:00	11	29.684	29.684
272	Esteban OCON	SOFT	2024-02-29T15:43:40.207000+00:00	14	31.398	31.398
292	Esteban OCON	SOFT	2024-02-29T15:45:17.741000+00:00	15	31.432	31.432
312	Esteban OCON	SOFT	2024-02-29T15:46:55.275000+00:00	16	31.519	31.519
332	Esteban OCON	SOFT	2024-02-29T15:48:33.078000+00:00	17	31.772	31.772
353	Esteban OCON	SOFT	2024-02-29T15:50:11.460000+00:00	18	31.171	31.171
373	Esteban OCON	SOFT	2024-02-29T15:51:49.347000+00:00	19	31.633	31.633
393	Esteban OCON	SOFT	2024-02-29T15:53:27.648000+00:00	20	31.590	31.590
413	Esteban OCON	SOFT	2024-02-29T15:55:05.777000+00:00	21	31.681	31.681
451	Esteban OCON	SOFT	2024-02-29T15:58:23.289000+00:00	23	31.774	31.774

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
23	Pierre GASLY	SOFT	2024-02-29T15:02:54.357000+00:00	2	29.712	29.712
78	Pierre GASLY	SOFT	2024-02-29T15:08:50.134000+00:00	5	29.733	29.733
181	Pierre GASLY	SOFT	2024-02-29T15:27:37.847000+00:00	8	29.615	29.615
212	Pierre GASLY	SOFT	2024-02-29T15:33:47.540000+00:00	11	29.879	29.879
309	Pierre GASLY	SOFT	2024-02-29T15:46:38.429000+00:00	15	31.446	31.446

	full_name	compound	date_start	lap_number	duration_sector_1	du
329	Pierre GASLY	SOFT	2024-02-29T15:48:15.815000+00:00	16	31.607	
349	Pierre GASLY	SOFT	2024-02-29T15:49:53.661000+00:00	17	31.511	
369	Pierre GASLY	SOFT	2024-02-29T15:51:31+00:00	18	31.523	
389	Pierre GASLY	SOFT	2024-02-29T15:53:09.082000+00:00	19	31.537	
409	Pierre GASLY	SOFT	2024-02-29T15:54:47.970000+00:00	20	31.864	
428	Pierre GASLY	SOFT	2024-02-29T15:56:26.083000+00:00	21	31.645	
446	Pierre GASLY	SOFT	2024-02-29T15:58:04.153000+00:00	22	31.658	

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	du
19	Alexander ALBON	MEDIUM	2024-02-29T15:02:16.179000+00:00	2	29.741	
115	Alexander ALBON	SOFT	2024-02-29T15:16:45.848000+00:00	5	29.610	
142	Alexander ALBON	SOFT	2024-02-29T15:22:43.117000+00:00	8	29.631	
198	Alexander ALBON	SOFT	2024-02-29T15:30:15.824000+00:00	11	29.341	
252	Alexander ALBON	SOFT	2024-02-29T15:41:38.027000+00:00	14	31.354	
270	Alexander ALBON	SOFT	2024-02-29T15:43:15.405000+00:00	15	31.407	
289	Alexander ALBON	SOFT	2024-02-29T15:44:53.025000+00:00	16	31.458	
307	Alexander ALBON	SOFT	2024-02-29T15:46:30.999000+00:00	17	31.609	
327	Alexander ALBON	SOFT	2024-02-29T15:48:09.038000+00:00	18	31.417	
347	Alexander ALBON	SOFT	2024-02-29T15:49:46.996000+00:00	19	31.471	
387	Alexander ALBON	SOFT	2024-02-29T15:53:05.073000+00:00	21	31.485	
407	Alexander ALBON	SOFT	2024-02-29T15:54:43.216000+00:00	22	31.658	

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

Out[82]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
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	full_name	compound	date_start	lap_number	duration_sector_1
28	Logan SARGEANT	MEDIUM	2024-02-29T15:03:23.594000+00:00	2	29.875
63	Logan SARGEANT	MEDIUM	2024-02-29T15:07:02.425000+00:00	4	29.689
116	Logan SARGEANT	SOFT	2024-02-29T15:16:52.912000+00:00	7	29.471
145	Logan SARGEANT	SOFT	2024-02-29T15:23:07.316000+00:00	10	29.523
214	Logan SARGEANT	SOFT	2024-02-29T15:34:16.674000+00:00	14	29.480
330	Logan SARGEANT	SOFT	2024-02-29T15:48:24.831000+00:00	18	31.026
350	Logan SARGEANT	SOFT	2024-02-29T15:50:01.135000+00:00	19	31.195
370	Logan SARGEANT	SOFT	2024-02-29T15:51:38.062000+00:00	20	31.112
390	Logan SARGEANT	SOFT	2024-02-29T15:53:15.181000+00:00	21	31.151
410	Logan SARGEANT	SOFT	2024-02-29T15:54:52.236000+00:00	22	31.201
429	Logan SARGEANT	SOFT	2024-02-29T15:56:29.278000+00:00	23	31.256
447	Logan SARGEANT	SOFT	2024-02-29T15:58:07.326000+00:00	24	31.614

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	di
18	ZHOU Guanyu	MEDIUM	2024-02-29T15:02:10.641000+00:00	2	30.541	
54	ZHOU Guanyu	MEDIUM	2024-02-29T15:06:03.730000+00:00	4	30.073	
127	ZHOU Guanyu	SOFT	2024-02-29T15:20:22.613000+00:00	8	29.664	
174	ZHOU Guanyu	SOFT	2024-02-29T15:26:52.930000+00:00	11	29.755	
250	ZHOU Guanyu	SOFT	2024-02-29T15:41:32.678000+00:00	15	31.562	
288	ZHOU Guanyu	SOFT	2024-02-29T15:44:49.858000+00:00	17	31.479	
306	ZHOU Guanyu	SOFT	2024-02-29T15:46:28.005000+00:00	18	31.597	
326	ZHOU Guanyu	SOFT	2024-02-29T15:48:06.431000+00:00	19	31.482	
346	ZHOU Guanyu	SOFT	2024-02-29T15:49:44.440000+00:00	20	31.413	

	full_name	compound	date_start	lap_number	duration_sector_1	di
366	ZHOU Guanyu	SOFT	2024-02-29T15:51:22.313000+00:00	21	31.472	
386	ZHOU Guanyu	SOFT	2024-02-29T15:53:00.553000+00:00	22	31.842	
406	ZHOU Guanyu	SOFT	2024-02-29T15:54:39.143000+00:00	23	31.753	
425	ZHOU Guanyu	SOFT	2024-02-29T15:56:17.795000+00:00	24	31.732	
445	ZHOU Guanyu	SOFT	2024-02-29T15:57:56.431000+00:00	25	31.711	

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

Out[84]:

	full_name	compound	date_start	lap_number	duration_sector_1	di
15	Valtteri BOTTAS	MEDIUM	2024-02-29T15:01:52.703000+00:00	2	29.966	
51	Valtteri BOTTAS	MEDIUM	2024-02-29T15:05:36.385000+00:00	4	29.919	
123	Valtteri BOTTAS	SOFT	2024-02-29T15:18:35.033000+00:00	7	29.612	
161	Valtteri BOTTAS	SOFT	2024-02-29T15:25:02.610000+00:00	10	29.622	
276	Valtteri BOTTAS	SOFT	2024-02-29T15:44:00.665000+00:00	14	30.984	
296	Valtteri BOTTAS	SOFT	2024-02-29T15:45:37.911000+00:00	15	31.087	
316	Valtteri BOTTAS	SOFT	2024-02-29T15:47:15.117000+00:00	16	31.195	
336	Valtteri BOTTAS	SOFT	2024-02-29T15:48:52.477000+00:00	17	31.249	
356	Valtteri BOTTAS	SOFT	2024-02-29T15:50:29.754000+00:00	18	31.135	
376	Valtteri BOTTAS	SOFT	2024-02-29T15:52:07.195000+00:00	19	31.301	
396	Valtteri BOTTAS	SOFT	2024-02-29T15:53:44.770000+00:00	20	31.460	
416	Valtteri BOTTAS	SOFT	2024-02-29T15:55:22.939000+00:00	21	31.539	
435	Valtteri BOTTAS	SOFT	2024-02-29T15:57:01.608000+00:00	22	31.503	
455	Valtteri BOTTAS	SOFT	2024-02-29T15:58:39.655000+00:00	23	31.685	

Free Practice 3

Obtain setup

```
In [85]: practice = libraryDataF1.obtain_information('laps',session_key=9467)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9467)
drivers = libraryDataF1.obtain_information('drivers',session_key=9467)
```

```
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	1229	9467	44	182.0	217	157.0	2024-03-01T12:36:00.0000000
1	1229	9467	44	241.0	269	309.0	2024-03-01T12:37:00.0000000
2	1229	9467	44	223.0	180	174.0	2024-03-01T12:39:00.0000000
3	1229	9467	55	200.0	201	184.0	2024-03-01T12:41:00.0000000
4	1229	9467	16	199.0	218	184.0	2024-03-01T12:42:00.0000000
...
315	1229	9467	16	211.0	206	269.0	2024-03-01T13:33:00.0000000
316	1229	9467	2	212.0	151	268.0	2024-03-01T13:33:00.0000000
317	1229	9467	44	233.0	256	251.0	2024-03-01T13:33:00.0000000
318	1229	9467	31	169.0	186	254.0	2024-03-01T13:33:00.0000000
319	1229	9467	63	228.0	247	246.0	2024-03-01T13:34:00.0000000

320 rows × 20 columns

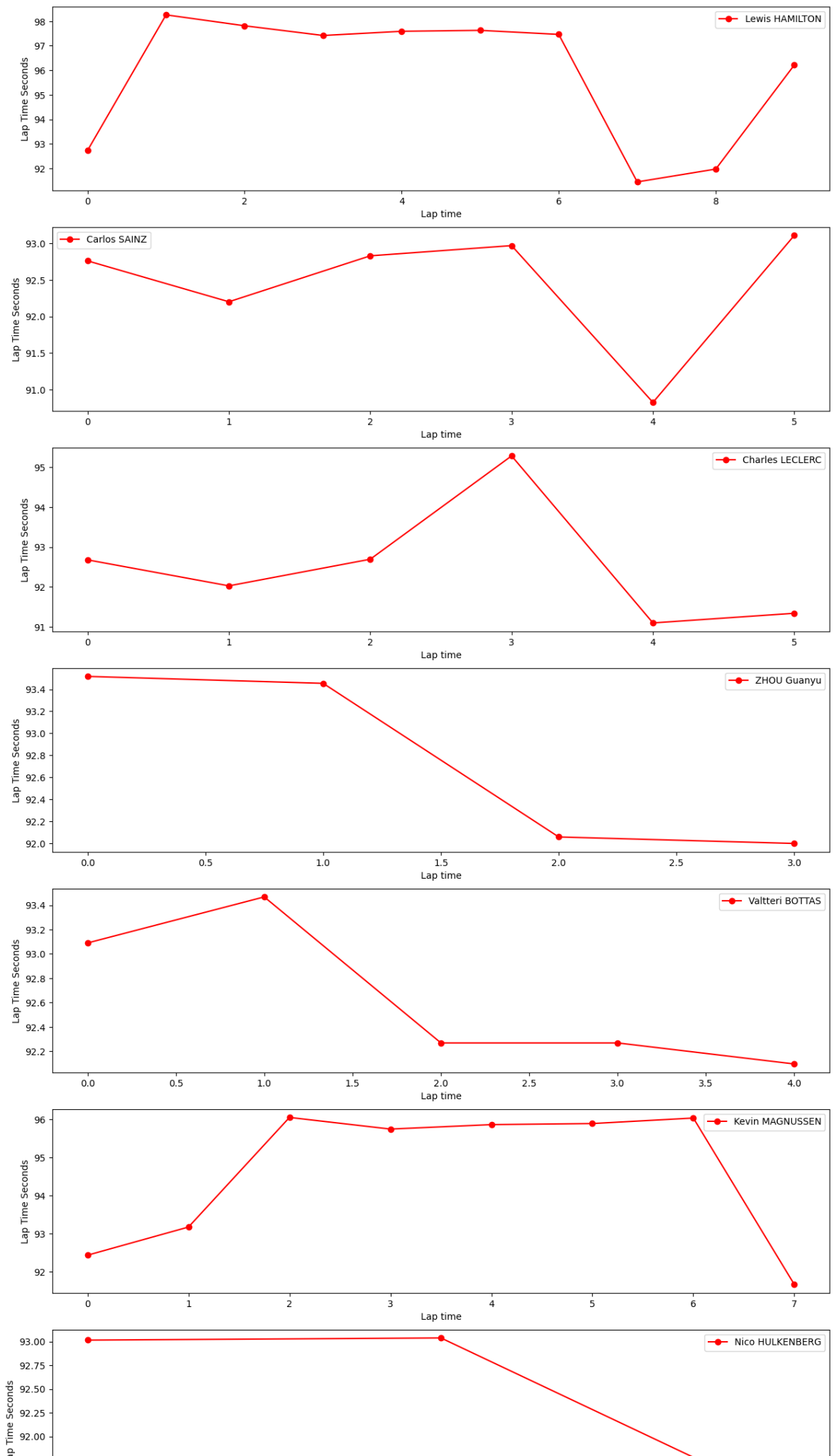
See race pace by means of the charts

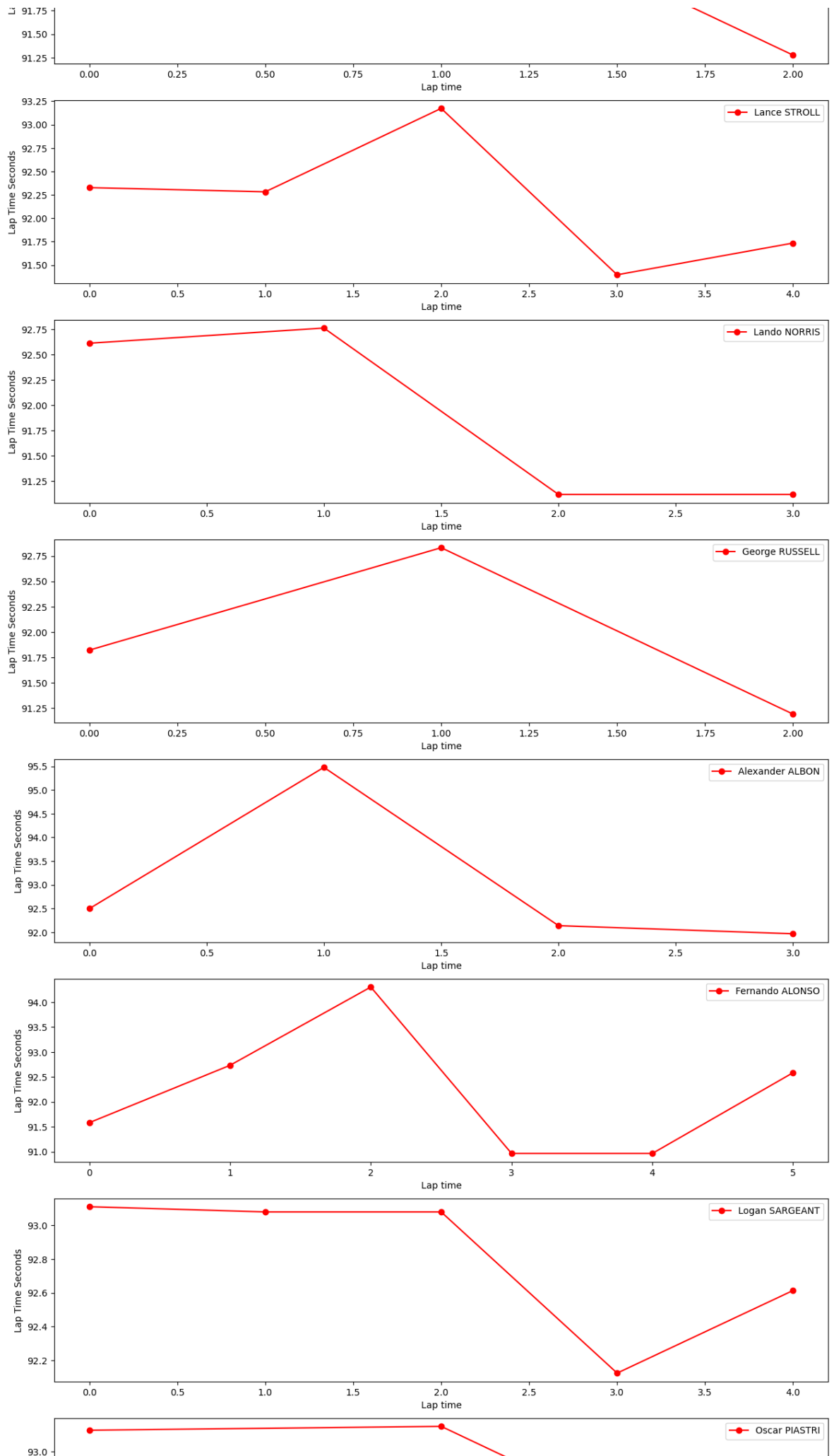
Medium tyres

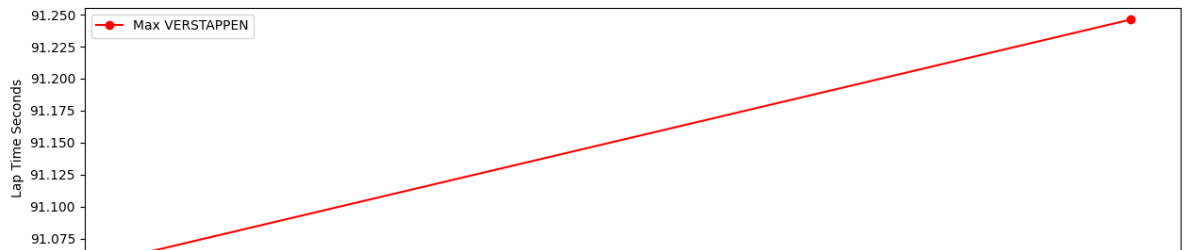
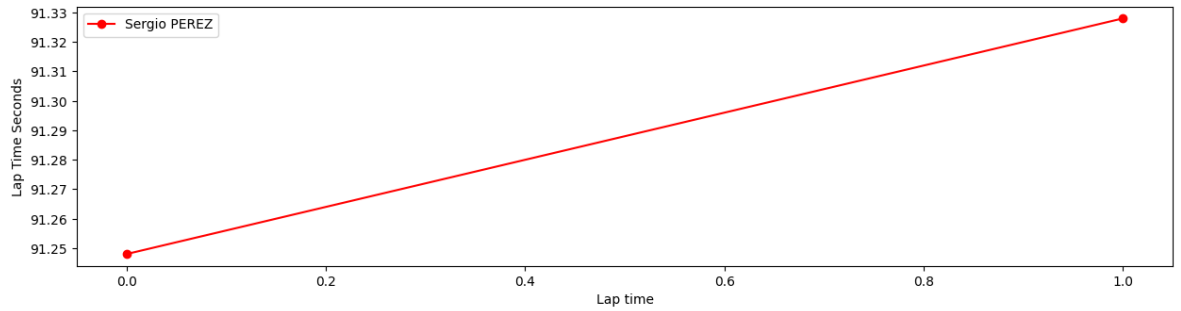
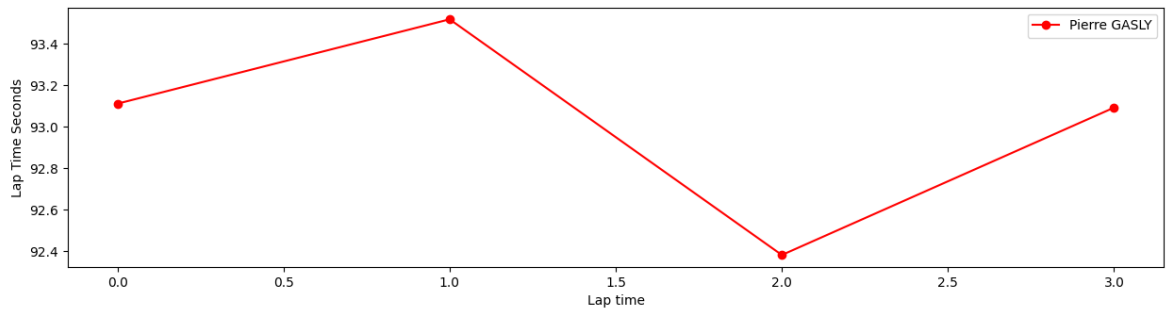
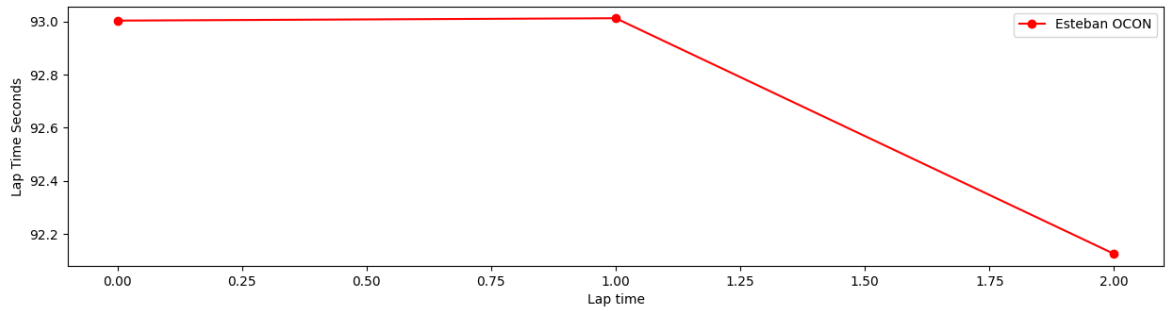
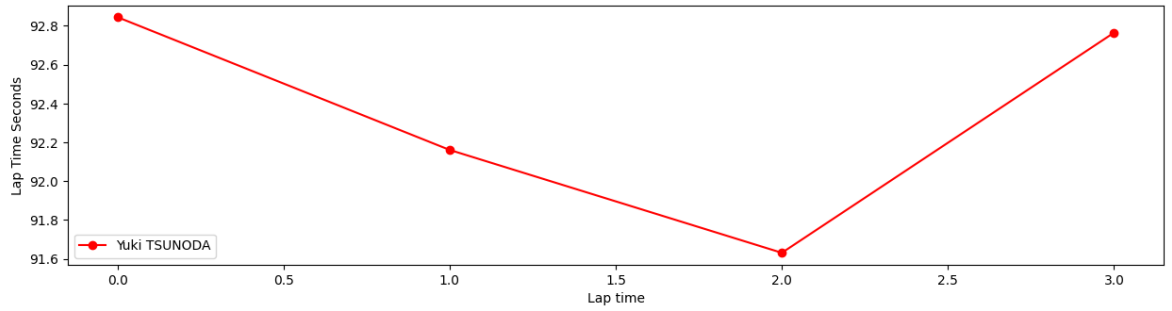
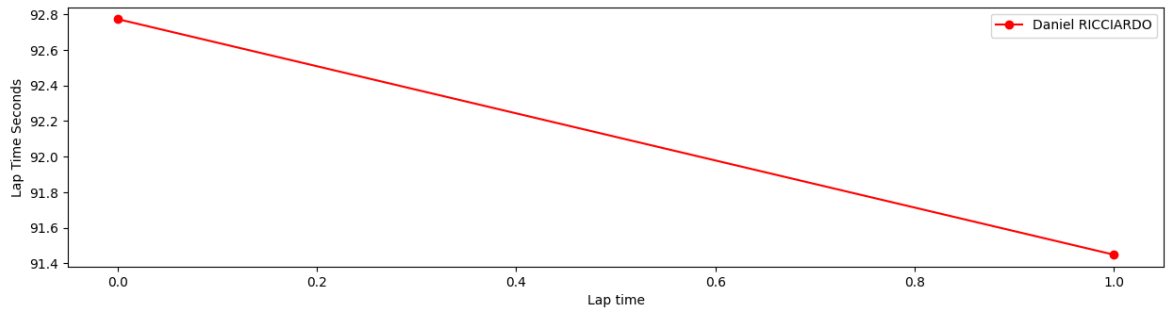
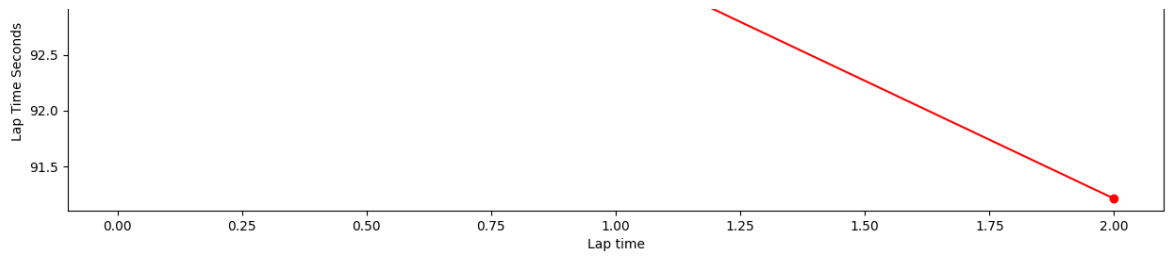
```
In [87]: #libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",99)
```

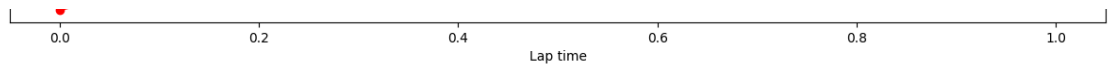
Soft tyres

```
In [88]: libraryDataF1.obtain_data_tyres(jointables2,"SOFT",99)
```

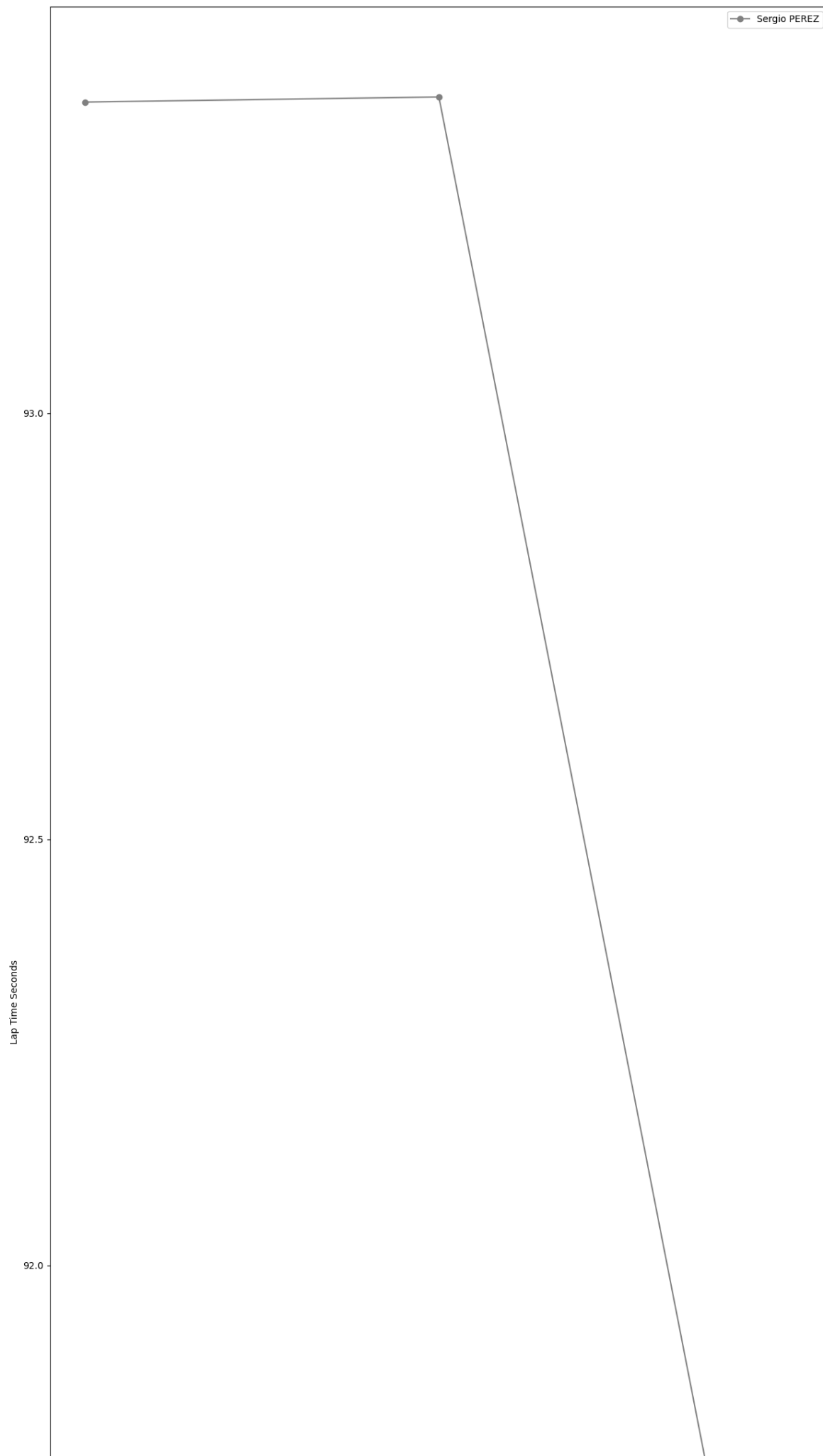


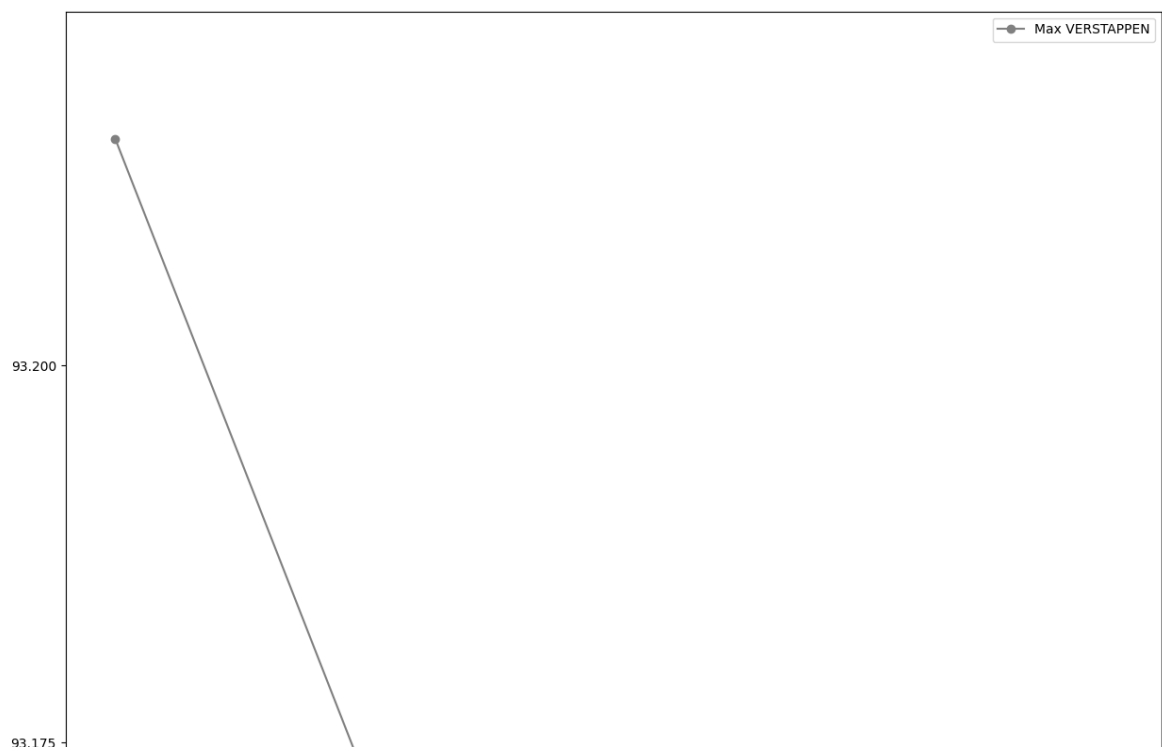
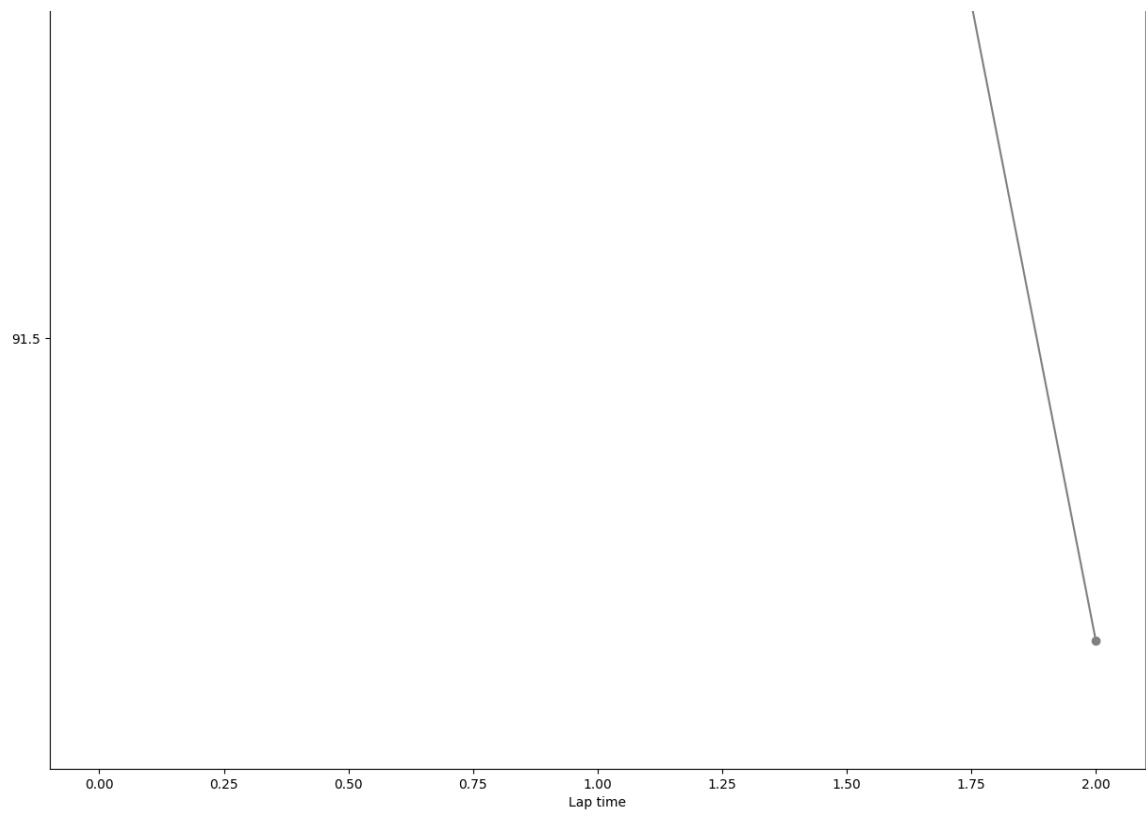




Hard tyres

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





Lap Time Seconds

93.150

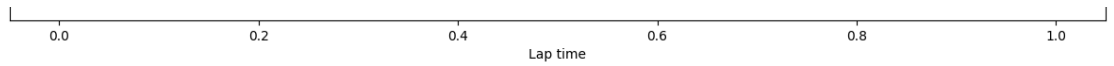
93.125

93.100

93.075

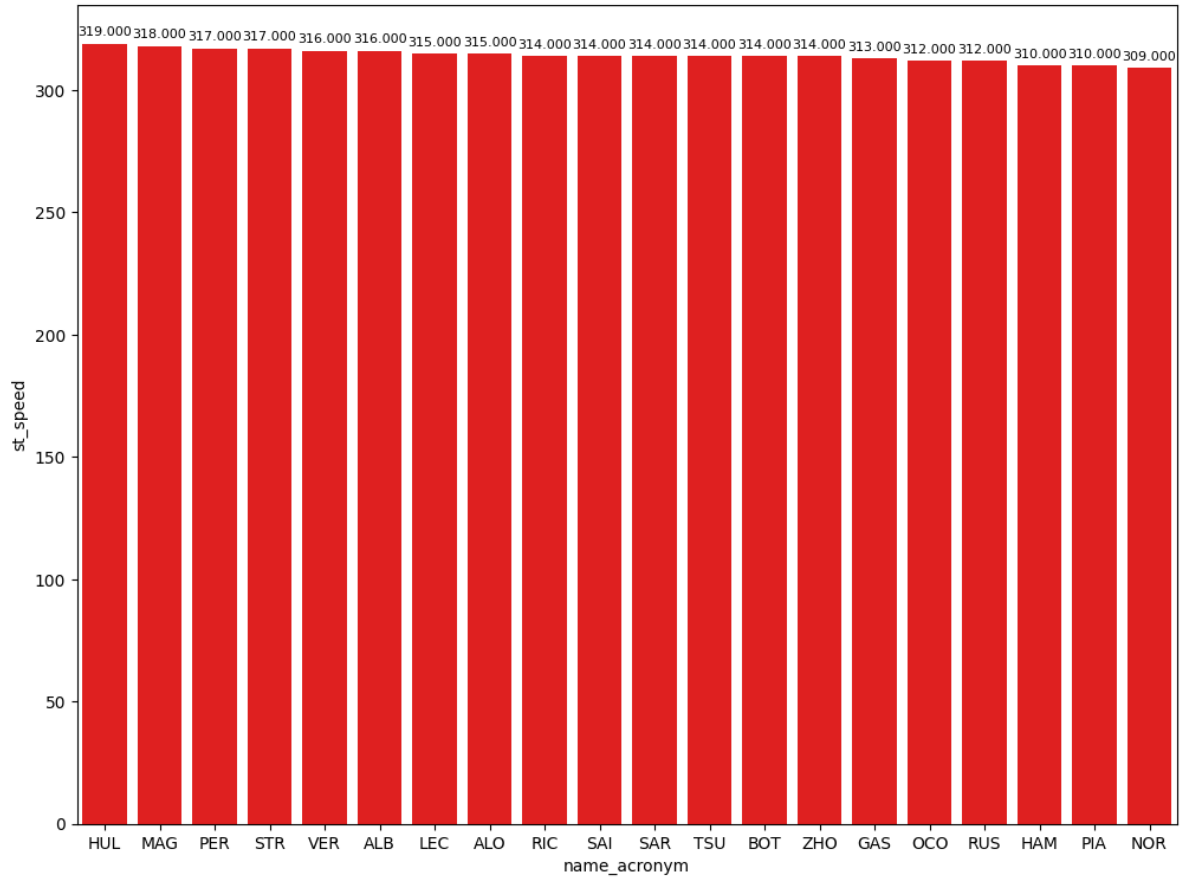
93.050



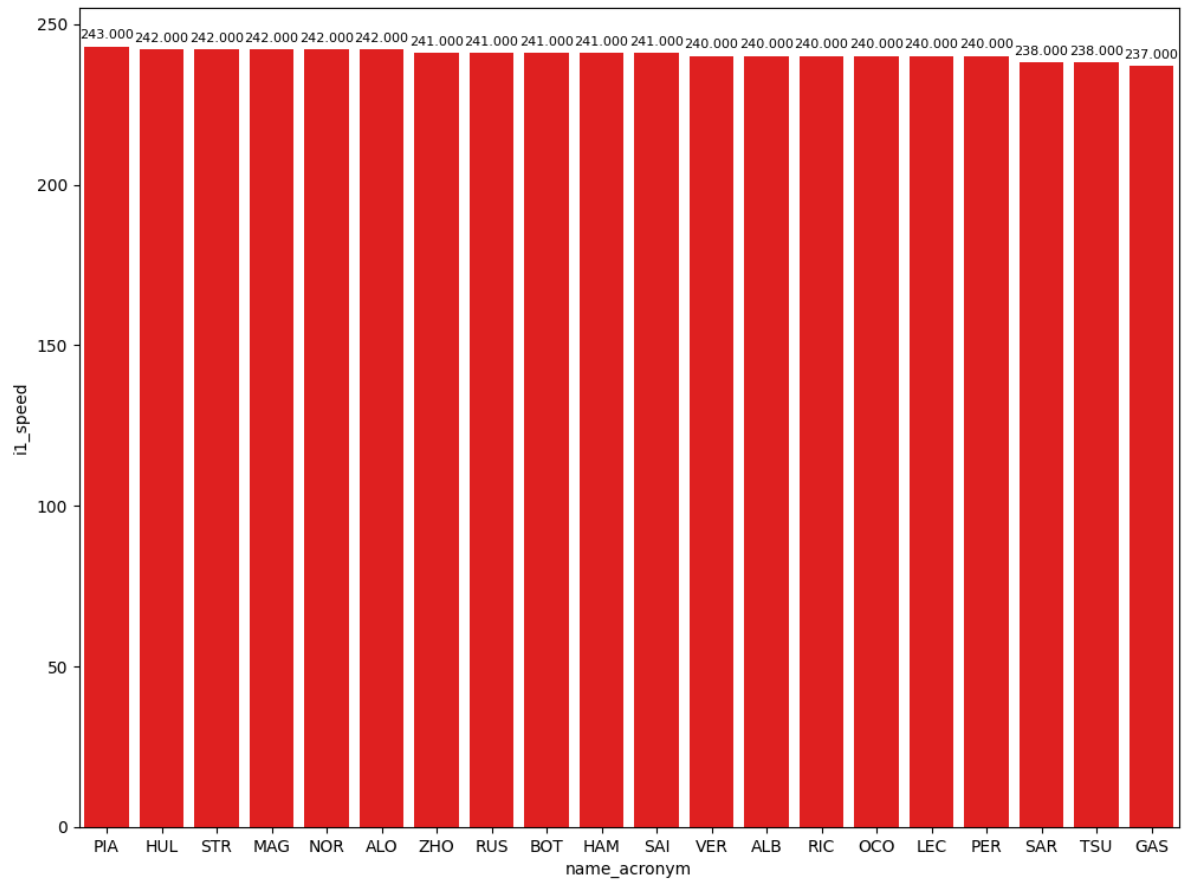


Speed trap

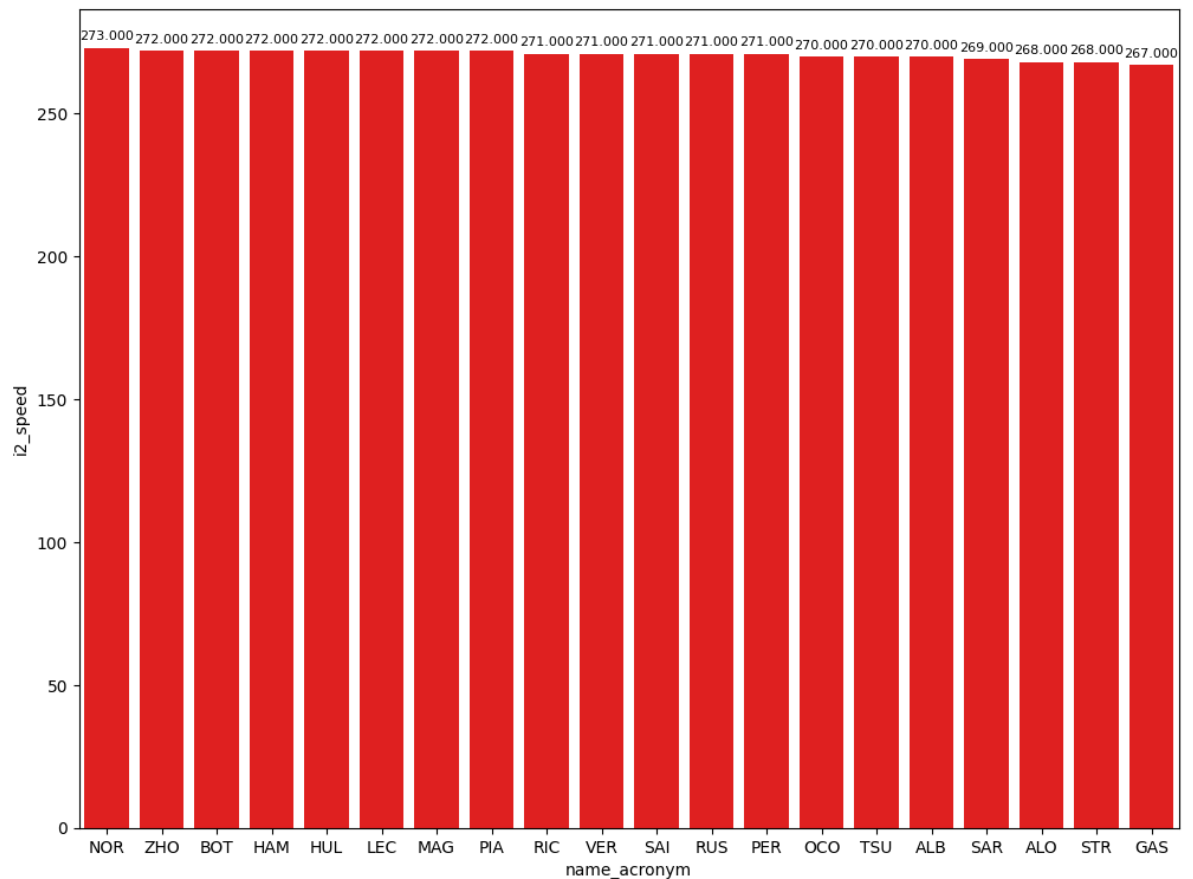
```
In [90]: top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['st_speed']]
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



```
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().idxmax()]
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
162	Sergio PEREZ	HARD	29.159	39.259	22.830	91.24
48	Alexander ALBON	MEDIUM	29.513	39.879	23.103	92.49
234	Carlos SAINZ	SOFT	29.138	39.046	22.640	90.82

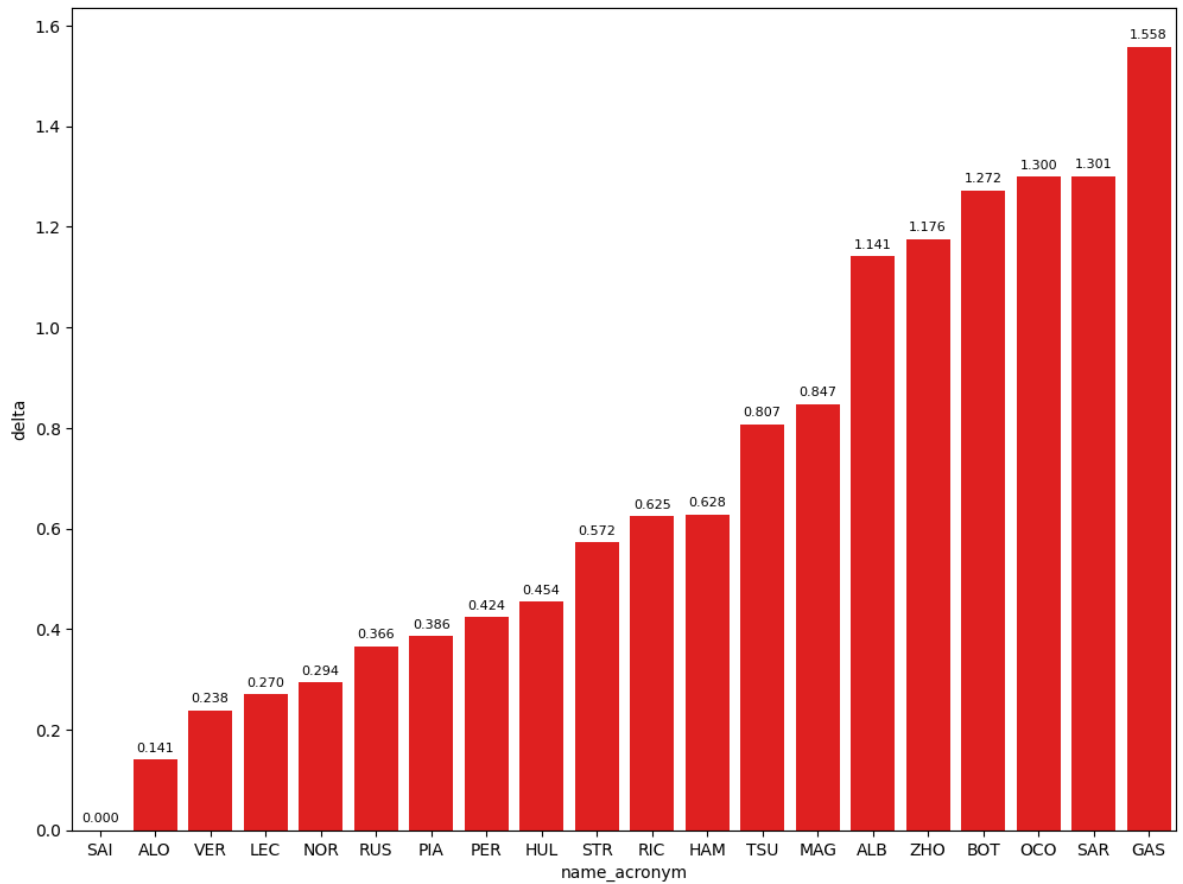
Deltas

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
169	29.054	Max VERSTAPPEN	SOFT	91.062	8
187	29.063	Lando NORRIS	SOFT	91.118	8
232	29.091	Yuki TSUNODA	SOFT	91.631	9
181	29.095	Lance STROLL	SOFT	91.396	10
184	29.111	Fernando ALONSO	SOFT	90.965	11
234	29.138	Carlos SAINZ	SOFT	90.824	13
197	29.141	Lewis HAMILTON	SOFT	91.452	13
190	29.153	Oscar PIASTRI	SOFT	91.210	9
162	29.159	Sergio PEREZ	HARD	91.248	9
227	29.173	Nico HULKENBERG	SOFT	91.278	8
231	29.191	Daniel RICCIARDO	SOFT	91.449	8
164	29.293	Alexander ALBON	SOFT	92.137	9
229	29.302	Kevin MAGNUSSEN	SOFT	106.509	15
170	29.308	Logan SARGEANT	SOFT	92.125	9

	duration_sector_1	full_name	compound	lap_duration	lap_number
201	29.349	George RUSSELL	SOFT	91.190	8
246	29.437	Charles LECLERC	SOFT	91.094	13
258	29.471	Esteban OCON	SOFT	92.124	8
203	29.482	ZHOU Guanyu	SOFT	92.000	12
166	29.489	Valtteri BOTTAS	SOFT	92.269	9

In [97]: `sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_2', 'full_name', 'compound', 'lap_duration', 'lap_number']`

Out[97]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
187	38.855	Lando NORRIS	SOFT	91.118	8
246	38.930	Charles LECLERC	SOFT	91.094	13
208	39.019	Max VERSTAPPEN	SOFT	91.246	11
234	39.046	Carlos SAINZ	SOFT	90.824	13
184	39.157	Fernando ALONSO	SOFT	90.965	11
201	39.206	George RUSSELL	SOFT	91.190	8
227	39.237	Nico HULKENBERG	SOFT	91.278	8
190	39.240	Oscar PIASTRI	SOFT	91.210	9
162	39.259	Sergio PEREZ	HARD	91.248	9
181	39.271	Lance STROLL	SOFT	91.396	10
197	39.315	Lewis HAMILTON	SOFT	91.452	13
231	39.386	Daniel RICCIARDO	SOFT	91.449	8
253	39.491	Kevin MAGNUSSEN	SOFT	91.671	17
118	39.493	Yuki TSUNODA	SOFT	92.161	5
203	39.506	ZHOU Guanyu	SOFT	92.000	12
204	39.531	Valtteri BOTTAS	SOFT	92.096	12
202	39.603	Alexander ALBON	SOFT	91.965	12
224	39.623	Pierre GASLY	SOFT	92.382	8
258	39.635	Esteban OCON	SOFT	92.124	8
170	39.741	Logan SARGEANT	SOFT	92.125	9

In [98]: `sectorPace = jointables2.loc[jointables2.groupby(['driver_number'])['duration_sector_3', 'full_name', 'compound', 'lap_duration', 'lap_number']`

Out[98]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
201	22.635	George RUSSELL	SOFT	91.190	8
234	22.640	Carlos SAINZ	SOFT	90.824	13
184	22.697	Fernando ALONSO	SOFT	90.965	11
246	22.727	Charles LECLERC	SOFT	91.094	13
200	22.776	Sergio PEREZ	SOFT	91.328	12

	duration_sector_3	full_name	compound	lap_duration	lap_number
190	22.817	Oscar PIASTRI	SOFT	91.210	9
253	22.853	Kevin MAGNUSSEN	SOFT	91.671	17
169	22.857	Max VERSTAPPEN	SOFT	91.062	8
225	22.866	Lance STROLL	SOFT	91.735	13
227	22.868	Nico HULKENBERG	SOFT	91.278	8
231	22.872	Daniel RICCIARDO	SOFT	91.449	8
243	22.891	Lewis HAMILTON	SOFT	91.975	16
232	22.960	Yuki TSUNODA	SOFT	91.631	9
165	23.001	ZHOU Guanyu	SOFT	92.059	9
258	23.018	Esteban OCON	SOFT	92.124	8
204	23.027	Valtteri BOTTAS	SOFT	92.096	12
202	23.030	Alexander ALBON	SOFT	91.965	12
170	23.076	Logan SARGEANT	SOFT	92.125	9
30	23.156	Lando NORRIS	SOFT	92.611	2

Mean pace with the different compound used on the session

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

Out[99]:

	lap_duration
compound	
SOFT	92.32248
MEDIUM	92.49500
HARD	92.84900

Long runs

In [100... `MINIMUM_SECONDS = 90
MAXIMUM_SECONDS = 99`

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
3	1229	9467	1	11	1	4	HARD	
15	1229	9467	1	1	1	7	HARD	
24	1229	9467	2	11	5	7	HARD	
40	1229	9467	3	11	8	9	HARD	
47	1229	9467	2	1	8	14	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
58	1229	9467	4	11	9	15	SOFT	
73	1229	9467	3	1	15	17	SOFT	

In [102... `libraryDataF1.getinfo(longruns(jointables2,1,'Red Bull Racing',MINIMUM_SECONDS,`

Out[102...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
43	Max VERSTAPPEN	HARD	2024-03-01T12:50:13.798000+00:00	2	30.106	
94	Max VERSTAPPEN	HARD	2024-03-01T12:56:20.673000+00:00	5	29.976	
169	Max VERSTAPPEN	SOFT	2024-03-01T13:13:27.823000+00:00	8	29.054	
208	Max VERSTAPPEN	SOFT	2024-03-01T13:19:43.823000+00:00	11	29.294	

In [103... `libraryDataF1.getinfo(longruns(jointables2,11,'Red Bull Racing',MINIMUM_SECONDS,`

Out[103...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
23	Sergio PEREZ	HARD	2024-03-01T12:47:36.626000+00:00	2	29.813	
76	Sergio PEREZ	HARD	2024-03-01T12:54:17.529000+00:00	5	29.969	
162	Sergio PEREZ	HARD	2024-03-01T13:12:07.651000+00:00	9	29.159	
163	Sergio PEREZ	SOFT	2024-03-01T13:12:07.651000+00:00	9	29.159	
200	Sergio PEREZ	SOFT	2024-03-01T13:18:35.765000+00:00	12	29.223	

Ferrari

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

Out[104...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
9	Charles LECLERC	SOFT	2024-03-01T12:44:25.449000+00:00	2	29.931	
45	Charles LECLERC	SOFT	2024-03-01T12:50:52.542000+00:00	5	29.579	
147	Charles LECLERC	SOFT	2024-03-01T13:07:44.784000+00:00	8	29.782	
168	Charles LECLERC	SOFT	2024-03-01T13:13:23.710000+00:00	11	29.686	
246	Charles LECLERC	SOFT	2024-03-01T13:25:37.962000+00:00	13	29.437	
277	Charles LECLERC	SOFT	2024-03-01T13:29:33.252000+00:00	15	29.447	

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

	full_name	compound	date_start	lap_number	duration_sector_1	du
	6	Carlos SAINZ	SOFT	2024-03-01T12:43:47.723000+00:00	2	29.835
	44	Carlos SAINZ	SOFT	2024-03-01T12:50:21.524000+00:00	5	29.696
	141	Carlos SAINZ	SOFT	2024-03-01T13:05:29.214000+00:00	8	29.817
	151	Carlos SAINZ	SOFT	2024-03-01T13:09:37.311000+00:00	10	29.925
	234	Carlos SAINZ	SOFT	2024-03-01T13:23:10.306000+00:00	13	29.138
	270	Carlos SAINZ	SOFT	2024-03-01T13:29:02.798000+00:00	16	29.436

Mercedes

```
In [106... stintInformation.query('driver_number == 63 or driver_number == 44')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	8	1229	9467	1	44	1	4	SOFT
	10	1229	9467	1	63	1	4	SOFT
	30	1229	9467	2	63	5	7	SOFT
	33	1229	9467	2	44	5	12	SOFT
	43	1229	9467	3	63	8	10	SOFT
	63	1229	9467	4	63	11	13	SOFT
	69	1229	9467	3	44	13	15	SOFT
	81	1229	9467	4	44	16	18	SOFT
	83	1229	9467	5	44	19	21	SOFT

```
In [107... libraryDataF1.getinfo(longruns(jointables2,44,'Mercedes',MINIMUM_SECONDS,MA...
```

	full_name	compound	date_start	lap_number	duration_sector_1	d
	1	Lewis HAMILTON	SOFT	2024-03-01T12:37:59.162000+00:00	2	29.483
	36	Lewis HAMILTON	SOFT	2024-03-01T12:49:33.218000+00:00	5	31.220
	51	Lewis HAMILTON	SOFT	2024-03-01T12:51:11.528000+00:00	6	31.245
	65	Lewis HAMILTON	SOFT	2024-03-01T12:52:49.287000+00:00	7	31.094
	78	Lewis HAMILTON	SOFT	2024-03-01T12:54:26.719000+00:00	8	31.061
	91	Lewis HAMILTON	SOFT	2024-03-01T12:56:04.374000+00:00	9	31.158

	full_name	compound	date_start	lap_number	duration_sector_1	d
101	Lewis HAMILTON	SOFT	2024-03-01T12:57:42.001000+00:00	10	31.179	
197	Lewis HAMILTON	SOFT	2024-03-01T13:17:50.767000+00:00	13	29.141	
243	Lewis HAMILTON	SOFT	2024-03-01T13:24:32.170000+00:00	16	29.568	
244	Lewis	SOFT	2024-03-01T13:26:04.140000+00:00	17	30.748	

In [108... `libraryDataF1.getinfo(longruns(jointables2,63,'Mercedes',MINIMUM_SECONDS,MAXI`

Out[108...

	full_name	compound	date_start	lap_number	duration_sector_1	dr
38	George RUSSELL	SOFT	2024-03-01T12:49:45.579000+00:00	2	29.451	
140	George RUSSELL	SOFT	2024-03-01T13:05:22.433000+00:00	5	29.966	
201	George RUSSELL	SOFT	2024-03-01T13:18:42.053000+00:00	8	29.349	

McLaren

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

Out[109...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
1	1229	9467	1	4	1	4	SOFT	
14	1229	9467	1	81	1	5	SOFT	
32	1229	9467	2	4	5	8	SOFT	
35	1229	9467	2	81	6	8	SOFT	
42	1229	9467	3	4	8	10	SOFT	
56	1229	9467	3	81	9	12	SOFT	
62	1229	9467	4	4	11	13	SOFT	
68	1229	9467	4	81	12	14	SOFT	

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

Out[110...

	full_name	compound	date_start	lap_number	duration_sector_1	dr
30	Lando NORRIS	SOFT	2024-03-01T12:48:31.306000+00:00	2	29.721	
132	Lando NORRIS	SOFT	2024-03-01T13:03:30.907000+00:00	5	29.788	
187	Lando NORRIS	SOFT	2024-03-01T13:16:37.652000+00:00	8	29.063	
188	Lando NORRIS	SOFT	2024-03-01T13:16:37.652000+00:00	8	29.063	


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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
67	Oscar PIASTRI	SOFT	2024-03-01T12:53:08.050000+00:00	3	30.037	30.037
143	Oscar PIASTRI	SOFT	2024-03-01T13:06:15.394000+00:00	6	29.954	29.954
190	Oscar PIASTRI	SOFT	2024-03-01T13:16:49.653000+00:00	9	29.153	29.153

Aston Martin

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
17	1229	9467	1	18	1	8	SOFT	
19	1229	9467	1	14	1	9	SOFT	
52	1229	9467	2	18	9	9	SOFT	
60	1229	9467	2	14	10	11	SOFT	
61	1229	9467	3	18	10	15	SOFT	
64	1229	9467	3	14	11	16	SOFT	
79	1229	9467	4	18	16	18	SOFT	
82	1229	9467	4	14	17	19	SOFT	

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
56	Fernando ALONSO	SOFT	2024-03-01T12:51:55.391000+00:00	2	29.273	29.273
104	Fernando ALONSO	SOFT	2024-03-01T12:58:00.066000+00:00	5	29.518	29.518
123	Fernando ALONSO	SOFT	2024-03-01T13:01:24.932000+00:00	7	30.422	30.422
184	Fernando ALONSO	SOFT	2024-03-01T13:16:14.568000+00:00	11	29.111	29.111
185	Fernando ALONSO	SOFT	2024-03-01T13:16:14.568000+00:00	11	29.111	29.111
226	Fernando ALONSO	SOFT	2024-03-01T13:22:06.325000+00:00	14	29.677	29.677

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

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
26	Lance STROLL	SOFT	2024-03-01T12:48:02.594000+00:00	2	29.543	29.543

	full_name	compound	date_start	lap_number	duration_sector_1	di
57	Lance STROLL	SOFT	2024-03-01T12:52:02.729000+00:00	4	29.298	
92	Lance STROLL	SOFT	2024-03-01T12:56:09.420000+00:00	6	29.940	
181	Lance STROLL	SOFT	2024-03-01T13:15:46.559000+00:00	10	29.095	
	Lance					

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
13	1229	9467	1	3	1	5	SOFT	
18	1229	9467	1	22	1	8	SOFT	
21	1229	9467	2	3	5	6	SOFT	
36	1229	9467	3	3	7	7	SOFT	
38	1229	9467	2	22	8	8	SOFT	
48	1229	9467	4	3	8	14	SOFT	
59	1229	9467	3	22	9	15	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
77	Daniel RICCIARDO	SOFT	2024-03-01T12:54:22.867000+00:00	2	29.645	
231	Daniel RICCIARDO	SOFT	2024-03-01T13:22:29.775000+00:00	8	29.191	

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
81	Yuki TSUNODA	SOFT	2024-03-01T12:54:37.529000+00:00	2	29.601	
118	Yuki TSUNODA	SOFT	2024-03-01T13:00:56.976000+00:00	5	29.440	
232	Yuki TSUNODA	SOFT	2024-03-01T13:22:37.886000+00:00	9	29.091	
272	Yuki TSUNODA	SOFT	2024-03-01T13:29:10.658000+00:00	12	29.673	

Haas

In [118...

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

Out[118...

	full_name	compound	date_start	lap_number	duration_sector_1	d
--	-----------	----------	------------	------------	-------------------	---

	full_name	compound	date_start	lap_number	duration_sector_1
19	Kevin MAGNUSSEN	SOFT	2024-03-01T12:46:33.444000+00:00	2	29.354
68	Kevin MAGNUSSEN	SOFT	2024-03-01T12:53:16.767000+00:00	5	29.454
108	Kevin MAGNUSSEN	SOFT	2024-03-01T12:58:48.753000+00:00	8	30.839
116	Kevin MAGNUSSEN	SOFT	2024-03-01T13:00:24.759000+00:00	9	30.697
124	Kevin MAGNUSSEN	SOFT	2024-03-01T13:02:00.569000+00:00	10	30.826
133	Kevin MAGNUSSEN	SOFT	2024-03-01T13:03:36.315000+00:00	11	30.640
138	Kevin MAGNUSSEN	SOFT	2024-03-01T13:05:12.333000+00:00	12	30.887
253	Kevin MAGNUSSEN	SOFT	2024-03-01T13:26:47.614000+00:00	17	29.327

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

	full_name	compound	date_start	lap_number	duration_sector_1
22	Nico HULKENBERG	SOFT	2024-03-01T12:47:31.967000+00:00	2	29.736
71	Nico HULKENBERG	SOFT	2024-03-01T12:53:38.150000+00:00	5	29.711
227	Nico HULKENBERG	SOFT	2024-03-01T13:22:12.333000+00:00	8	29.171

Alpine

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

	full_name	compound	date_start	lap_number	duration_sector_1
86	Esteban OCON	SOFT	2024-03-01T12:55:47.509000+00:00	2	29.803
152	Esteban OCON	SOFT	2024-03-01T13:09:49.061000+00:00	5	29.785
258	Esteban OCON	SOFT	2024-03-01T13:27:45.801000+00:00	8	29.471

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

	full_name	compound	date_start	lap_number	duration_sector_1
96	Pierre GASLY	SOFT	2024-03-01T12:56:29.731000+00:00	2	29.771
128	Pierre GASLY	SOFT	2024-03-01T13:03:06.151000+00:00	5	29.978
224	Pierre GASLY	SOFT	2024-03-01T13:21:25.867000+00:00	8	29.603

full_name compound date_start lap_number duration_sector_1 dt

Williams

```
In [122... libraryDataF1.getinfo(longruns(jointables2,23,'Williams',MINIMUM_SECONDS,MAX))
```

	full_name	compound	date_start	lap_number	duration_sector_1	dt
48	Alexander ALBON	MEDIUM	2024-03-01T12:51:06.544000+00:00	3	29.513	
49	Alexander ALBON	SOFT	2024-03-01T12:51:06.544000+00:00	3	29.513	
100	Alexander ALBON	SOFT	2024-03-01T12:57:33.815000+00:00	6	29.642	
164	Alexander ALBON	SOFT	2024-03-01T13:12:17.129000+00:00	9	29.293	
202	Alexander ALBON	SOFT	2024-03-01T13:18:47.337000+00:00	12	29.332	

```
In [123... libraryDataF1.getinfo(longruns(jointables2,2,'Williams',MINIMUM_SECONDS,MAX))
```

	full_name	compound	date_start	lap_number	duration_sector_1	dt
66	Logan SARGEANT	SOFT	2024-03-01T12:52:59.656000+00:00	2	29.683	
111	Logan SARGEANT	SOFT	2024-03-01T12:59:11.736000+00:00	5	29.691	
112	Logan SARGEANT	SOFT	2024-03-01T12:59:11.736000+00:00	5	29.691	
170	Logan SARGEANT	SOFT	2024-03-01T13:13:34.724000+00:00	9	29.308	
209	Logan SARGEANT	SOFT	2024-03-01T13:19:51.457000+00:00	12	29.615	

Kick Sauber

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

	full_name	compound	date_start	lap_number	duration_sector_1	dt
12	ZHOU Guanyu	SOFT	2024-03-01T12:45:36.775000+00:00	2	29.991	
62	ZHOU Guanyu	SOFT	2024-03-01T12:52:30.985000+00:00	5	29.915	
165	ZHOU Guanyu	SOFT	2024-03-01T13:12:34.648000+00:00	9	29.499	
203	ZHOU Guanyu	SOFT	2024-03-01T13:19:07.840000+00:00	12	29.482	

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

Out [125...

	full_name	compound	date_start	lap_number	duration_sector_1	di
14	Valtteri BOTTAS	SOFT	2024-03-01T12:45:49.726000+00:00	2	29.912	
59	Valtteri BOTTAS	SOFT	2024-03-01T12:52:15.803000+00:00	5	29.982	
166	Valtteri BOTTAS	SOFT	2024-03-01T13:12:44.405000+00:00	9	29.489	
167	Valtteri BOTTAS	SOFT	2024-03-01T13:12:44.405000+00:00	9	29.489	
204	Valtteri BOTTAS	SOFT	2024-03-01T13:19:11.372000+00:00	12	29.538	

Qualyfin

Set up

First of all, it is neccesary 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=9468)
```

Out [126...

	session_key	meeting_key	date	category	flag	lap_number
0	9468	1229	2024-03-01T16:00:00+00:00	Flag	GREEN	None
1	9468	1229	2024-03-01T16:04:42+00:00	Other	None	None
2	9468	1229	2024-03-01T16:18:00+00:00	Flag	CHEQUERED	None
3	9468	1229	2024-03-01T16:18:13+00:00	Other	None	None
4	9468	1229	2024-03-01T16:22:07+00:00	Other	None	None
5	9468	1229	2024-03-01T16:25:00+00:00	Flag	GREEN	None
6	9468	1229	2024-03-01T16:30:24+00:00	Other	None	None

	session_key	meeting_key	date	category	flag	lap_number
7	9468	1229	2024-03-01T16:32:19+00:00	Other	None	None
8	9468	1229	2024-03-01T16:40:01+00:00	Flag	CHEQUERED	None
9	9468	1229	2024-03-01T16:40:12+00:00	Other	None	None
10	9468	1229	2024-03-01T16:48:00+00:00	Flag	GREEN	None
11	9468	1229	2024-03-01T17:00:01+00:00	Flag	CHEQUERED	None
12	9468	1229	2024-03-01T17:00:27+00:00	Other	None	None
13	9468	1229	2024-03-01T17:03:23+00:00	Other	None	None

Obtain setup

In [127...

```
qualyfing = libraryDataF1.obtain_information('laps',session_key=9468)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9468)
drivers = libraryDataF1.obtain_information('drivers',session_key=9468)
```

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

In [128...

```
qualyfing = qualyfing.drop(7)
qualyfing = qualyfing.drop(137)
```

In [129...

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

Out[129...

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
192	1229	9468	16	243	274	317	2024-03-01T16:38:

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	
4	1229	9468	55	238	273	311	2024-03-01T16:02:...
5	1229	9468	16	240	273	313	2024-03-01T16:02:...
6	1229	9468	31	239	269	311	2024-03-01T16:02:...
27	1229	9468	23	242	270	315	2024-03-01T16:07:...
28	1229	9468	3	242	270	310	2024-03-01T16:07:...
...	
253	1229	9468	44	242	270	315	2024-03-01T16:58:...
255	1229	9468	1	242	271	320	2024-03-01T16:59:...
257	1229	9468	16	242	273	316	2024-03-01T16:59:...
259	1229	9468	55	242	273	320	2024-03-01T16:59:...
260	1229	9468	11	241	271	320	2024-03-01T16:59:...

83 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...

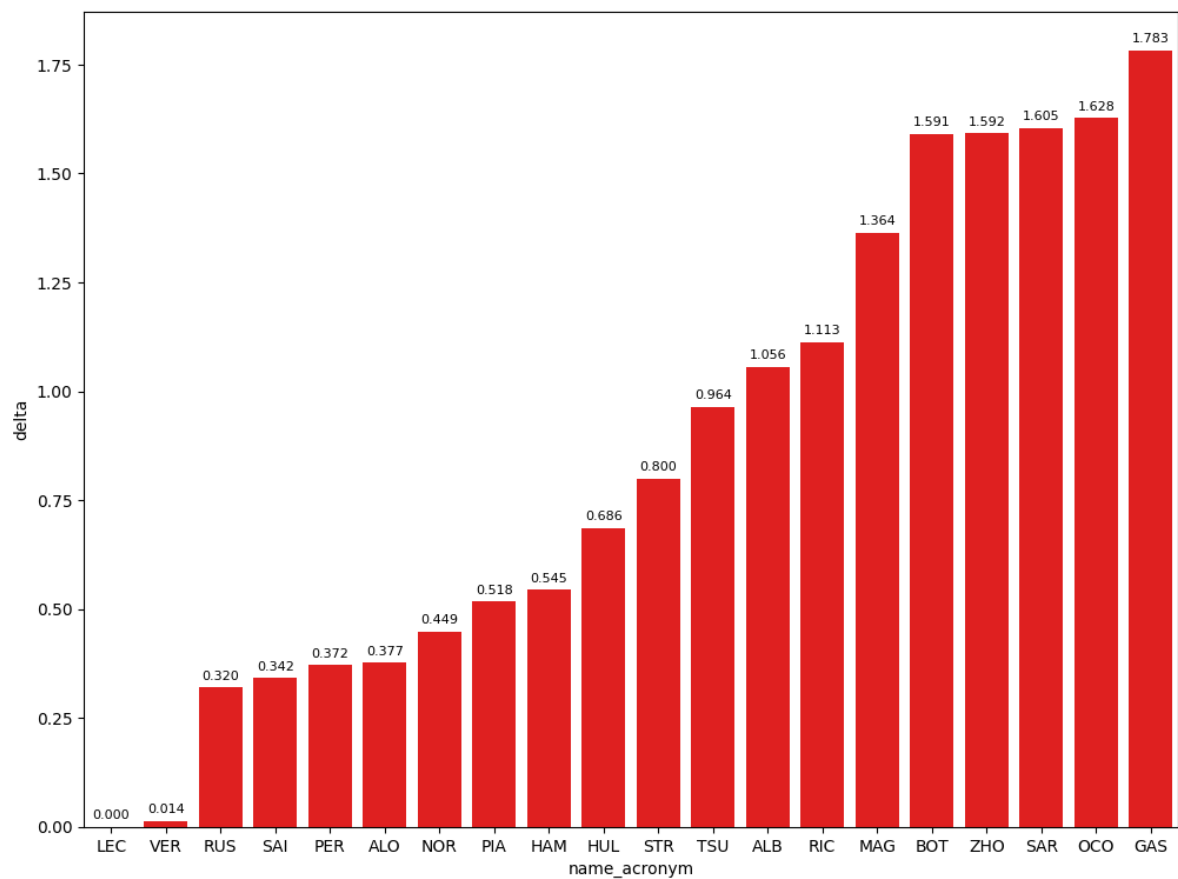
	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
1	16	89.165	0.000	313	240	272	9468	1229
15	1	89.179	0.014	316	241	270	9468	1229
16	63	89.485	0.320	311	240	269	9468	1229

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
0	55	89.507	0.342	311	238	273	9468	1229
18	11	89.537	0.372	317	240	270	9468	1229
14	14	89.542	0.377	313	242	267	9468	1229
13	4	89.614	0.449	309	242	273	9468	1229
11	81	89.683	0.518	311	240	271	9468	1229
17	44	89.710	0.545	310	241	269	9468	1229
5	27	89.851	0.686	314	242	273	9468	1229
12	18	89.965	0.800	313	242	267	9468	1229
7	22	90.129	0.964	310	240	269	9468	1229
3	23	90.221	1.056	315	241	270	9468	1229
4	3	90.278	1.113	310	240	270	9468	1229
9	20	90.529	1.364	316	242	273	9468	1229
10	77	90.756	1.591	314	243	272	9468	1229
8	24	90.757	1.592	312	242	272	9468	1229
6	2	90.770	1.605	318	238	270	9468	1229
2	31	90.793	1.628	311	238	269	9468	1229

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:`

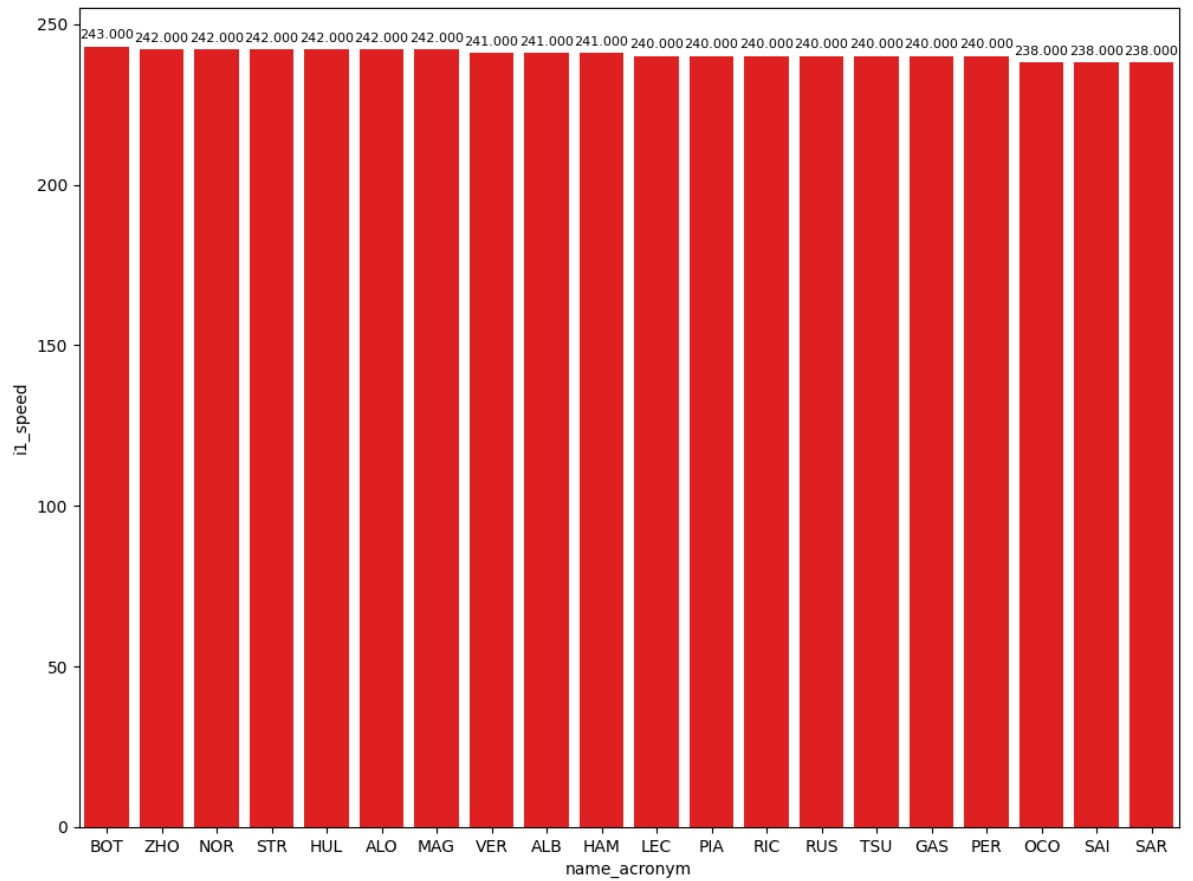


Speed trap

Maximum speed per drivers

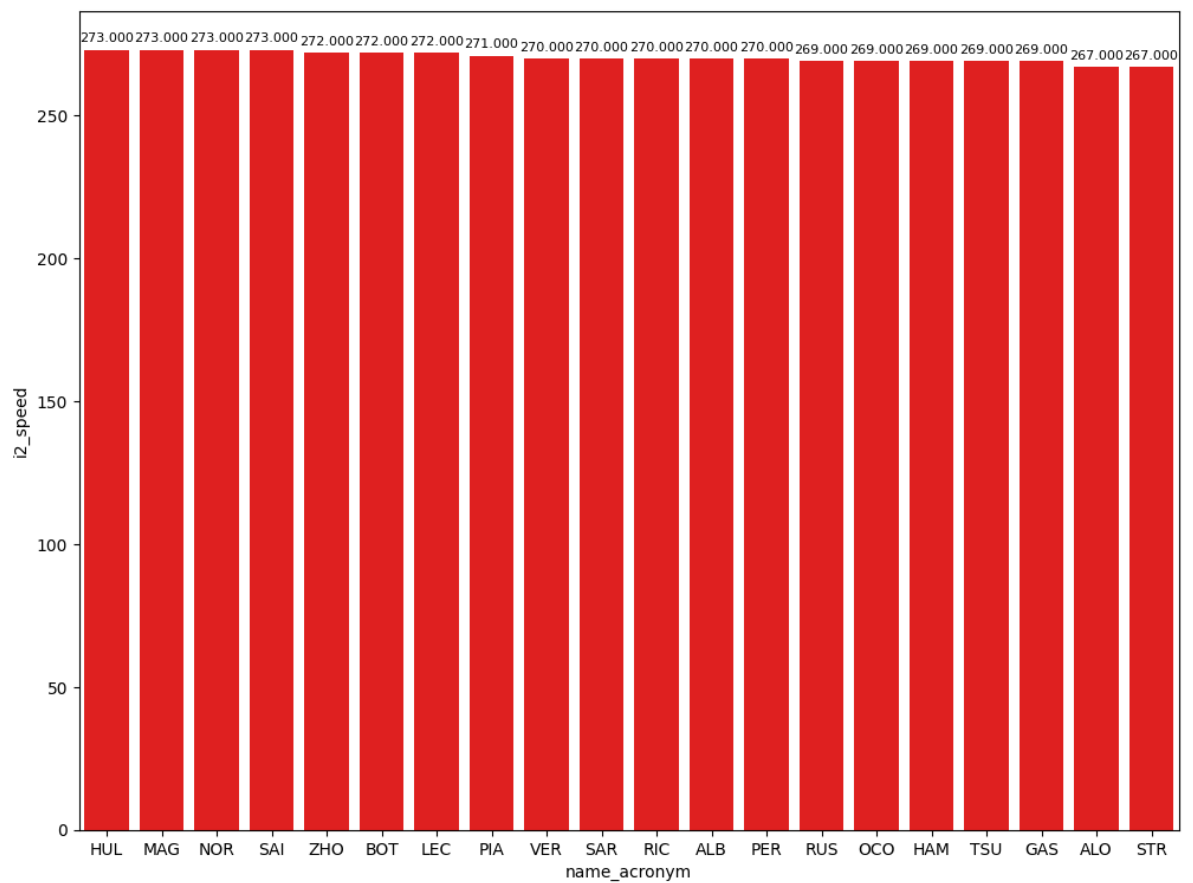
In [133...

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



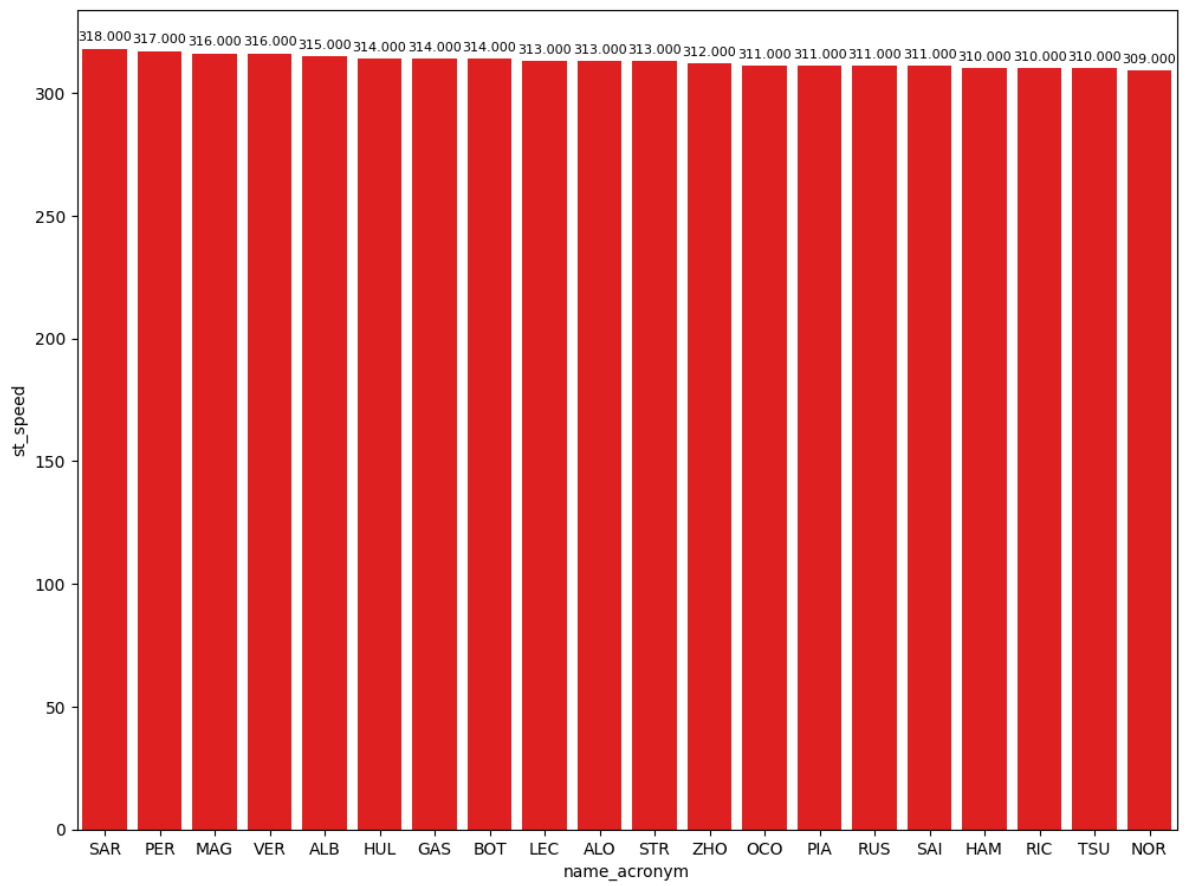
In [134...

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



In [135...

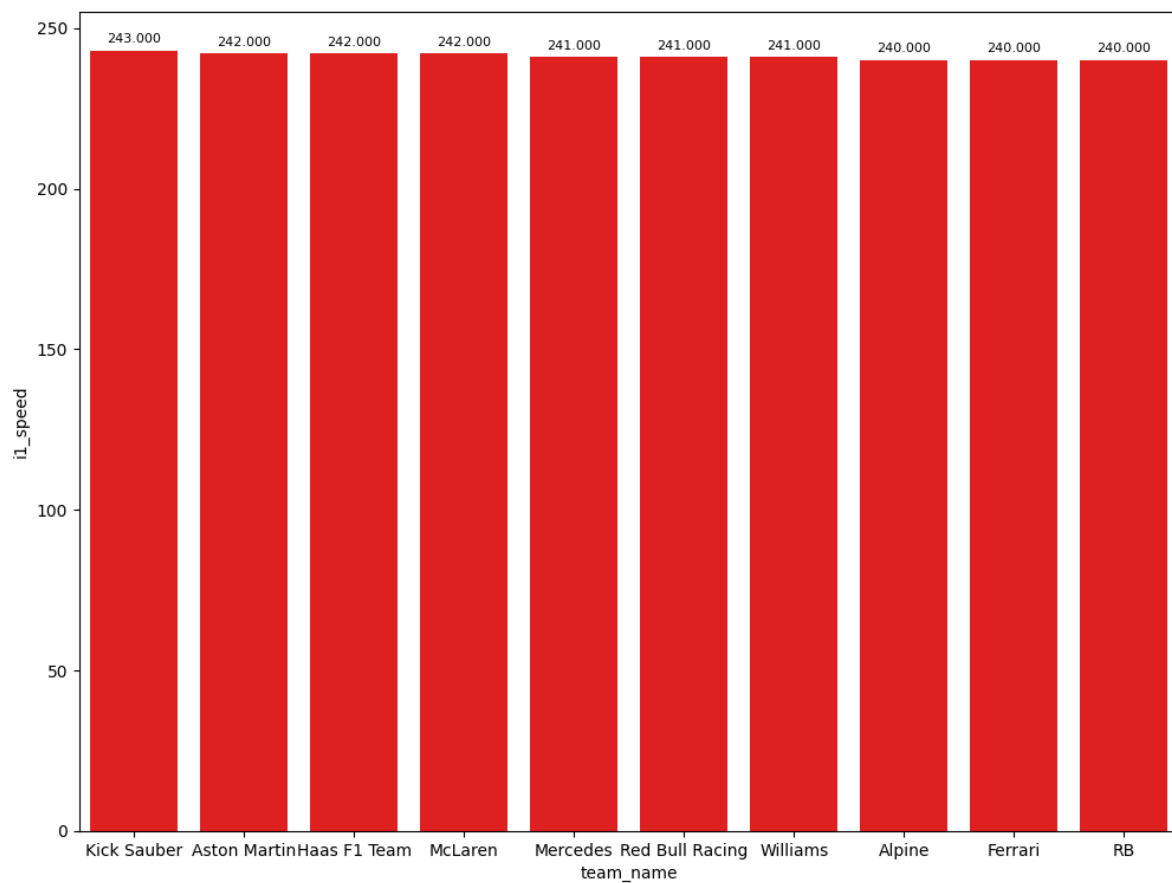
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['st_speed']  
libraryDataFl.obtainchart("name_acronym","st_speed",top_speed)
```



Maximum speed per teams

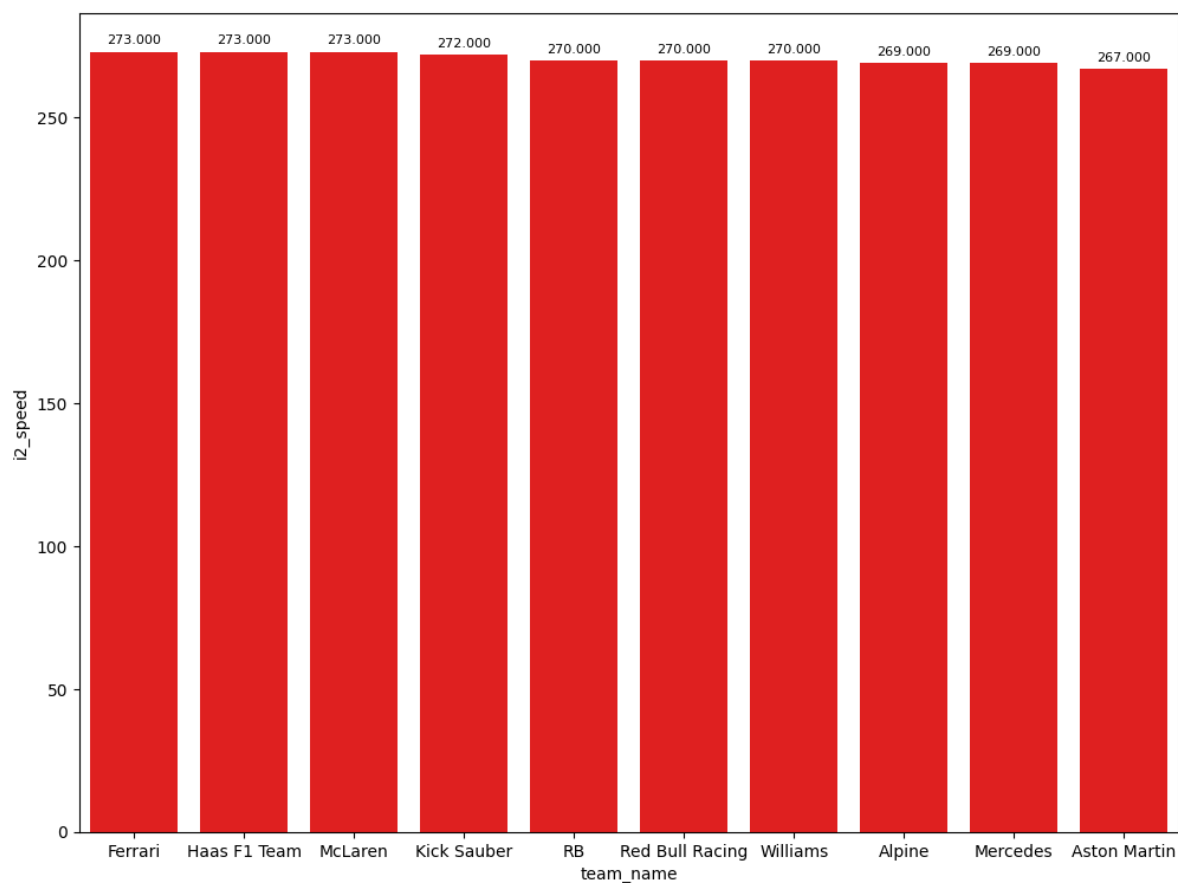
In [136...

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

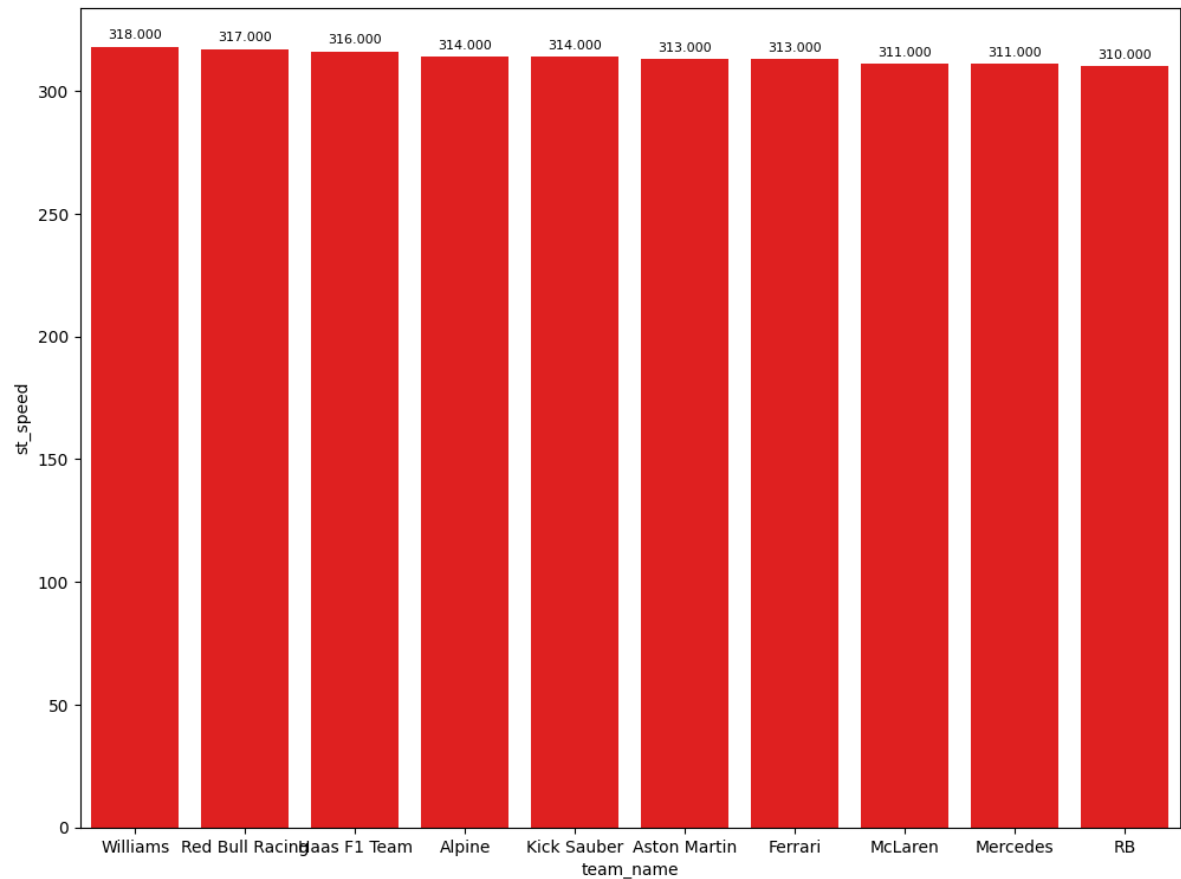


In [137...

```
top_speed = jointables.loc[jointables.groupby(['team_name'])['i2_speed'].i2_speed  
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	1229	9468	55	238	273	311 2024-03-01T16
1	1229	9468	55	242	273	314 2024-03-01T16
2	1229	9468	55	242	273	317 2024-03-01T16
3	1229	9468	55	242	273	316 2024-03-01T16
4	1229	9468	55	242	273	315 2024-03-01T16
...
78	1229	9468	11	241	271	321 2024-03-01T16
79	1229	9468	11	241	271	320 2024-03-01T16
80	1229	9468	11	241	271	320 2024-03-01T16
81	1229	9468	10	241	269	314 2024-03-01T16

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
82	1229	9468	10	240	270	316	2024-03-01T16

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

In [140]...

```
maximumDateQ1 = "date_start <'2024-03-01T16:25:00+00:00'"
maximumDateQ2 = "date_start <'2024-03-01T16:48:00+00:00' and date_start >'"
maximumDateQ3 = "date_start >'2024-03-01T16:48:00+00:00'"
```

Qualyfyng 1

In this session, I did not see any surprise with the favourites qualyfyng to Q2. As we can in testing, we knew that Alpine was the worst team and that was constasted in qualyfyng 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	
1	1229	9468	55	242	273	314	2024-03-01T16
49	1229	9468	18	243	268	318	2024-03-01T16
60	1229	9468	1	242	270	316	2024-03-01T16
52	1229	9468	4	243	273	309	2024-03-01T16
56	1229	9468	14	243	267	313	2024-03-01T16
76	1229	9468	11	241	271	317	2024-03-01T16
7	1229	9468	16	243	272	316	2024-03-01T16
65	1229	9468	63	242	269	311	2024-03-01T16
16	1229	9468	23	241	271	321	2024-03-01T16
71	1229	9468	44	242	269	312	2024-03-01T16
32	1229	9468	22	240	271	313	2024-03-01T16
43	1229	9468	81	241	273	311	2024-03-01T16
20	1229	9468	3	241	271	314	2024-03-01T16
24	1229	9468	27	242	273	319	2024-03-01T16

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
38	1229	9468	20	242	274	319	2024-03-01T16
41	1229	9468	77	243	273	318	2024-03-01T16
36	1229	9468	24	242	272	312	2024-03-01T16
29	1229	9468	2	241	270	318	2024-03-01T16
14	1229	9468	31	241	270	315	2024-03-01T16
82	1229	9468	10	240	270	316	2024-03-01T16

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	
38	1229	9468	20	242	274	319	2024-03-01T16

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: 29.037 Sector 2: 38.952 Sector 3: 22.657

In [144...

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

Out[144...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
41	1229	9468	77	243	273	318	2024-03-01T16
36	1229	9468	24	242	272	312	2024-03-01T16
29	1229	9468	2	241	270	318	2024-03-01T16
14	1229	9468	31	241	270	315	2024-03-01T16
82	1229	9468	10	240	270	316	2024-03-01T16

5 rows × 28 columns

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

In the first sector we can see that none of the eliminated drivers, except Sargeant, were faster than Magnussen. In the second sector, Sargeant lost his chances to make it through to Q2 in this sector losing 1.67 tenths. Although Zhou and Ocon improved, their improvement was not enough to pass to Q2. Finally, in the third sector none of them improved.

```
In [145... newdataset2 = pd.DataFrame()
for index,row in q1Data[15:].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P15
newdataset2
```

```
Out[145... driver_number lap_duration difference_sector_1 difference_sector_2 difference_sector_3 na
0          77          0.110           0.026           0.073           0.011
1          24          0.111           0.117          -0.008           0.002
2           2          0.124          -0.046           0.167           0.003
3          31          0.147           0.105          -0.018           0.060
4          10          0.302           0.111           0.019           0.172
```

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

I bring this section in order to know where the driver at risk lost his chances to improve in the qualifying. In general, the unique driver that was at risk if Magnussen had improved his second sector it would have been Ricciardo because his first and third sector were worse than the Danish driver. Another case that I would like to stand out is Piastri's case. Aussie was 2 tenth underneath Magnussen in the first sector and he would have been out of Q1 if he did not improved in the following sectors.

```
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          -0.737          -0.029          -0.543          -0.165
1          18          -0.681          -0.386          -0.343           0.048
2           1          -0.615          -0.250          -0.372           0.007
3           4          -0.503          -0.054          -0.376          -0.073
4          14          -0.467          -0.148          -0.255          -0.064
5          11          -0.425          -0.098          -0.354           0.027
6          16          -0.403           0.030          -0.363          -0.070
7          63          -0.296           0.065          -0.225          -0.136
```


	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	n
	8	23	-0.249	-0.179	-0.077	0.007
	9	44	-0.195	-0.018	-0.058	-0.119
	10	22	-0.165	-0.096	-0.077	0.008
	11	81	-0.115	0.206	-0.161	-0.160
	12	2	0.084	0.027	0.145	0.024

Best sector per driver

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

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

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

	duration_sector_1
name_acronym	
STR	28.651
VER	28.787
HUL	28.838
ALB	28.858
ALO	28.889
PER	28.939
TSU	28.941
NOR	28.983
SAR	28.991
SAI	29.008
HAM	29.019
MAG	29.037
BOT	29.063
LEC	29.067
RIC	29.074
RUS	29.102
OCO	29.142
GAS	29.148
ZHO	29.154
PIA	29.243

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

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

	duration_sector_2
name_acronym	
SAI	38.409
NOR	38.576

	duration_sector_2
name_acronym	
VER	38.580
LEC	38.589
PER	38.598
STR	38.609
ALO	38.697
RUS	38.727
PIA	38.791
RIC	38.807
ALB	38.875
TSU	38.875
HAM	38.894
OCO	38.934
ZHO	38.944
MAG	38.952
GAS	38.971
BOT	39.025

In [149...

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

Out[149...

	duration_sector_3
name_acronym	
SAI	22.492
PIA	22.497
RUS	22.521
HAM	22.538
NOR	22.584
HUL	22.585
LEC	22.587
ALO	22.593
MAG	22.657
ZHO	22.659
SAR	22.660
ALB	22.664
VER	22.664
TSU	22.665
BOT	22.668
RIC	22.681
PER	22.684

	duration_sector_3
name_acronym	
STR	22.705
CCC	22.717

Qualyfining 2

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

In [150...

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

Out[150...

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
9	1229	9468	16	243	274	317	2024-03-01T16
62	1229	9468	1	242	271	327	2024-03-01T16
3	1229	9468	55	242	273	316	2024-03-01T16
73	1229	9468	44	241	272	316	2024-03-01T16
58	1229	9468	14	243	267	319	2024-03-01T16
26	1229	9468	27	243	274	317	2024-03-01T16
67	1229	9468	63	242	270	316	2024-03-01T16
78	1229	9468	11	241	271	321	2024-03-01T16
53	1229	9468	4	242	273	313	2024-03-01T16
45	1229	9468	81	242	273	314	2024-03-01T16
34	1229	9468	22	241	271	316	2024-03-01T16
51	1229	9468	18	243	267	317	2024-03-01T16
18	1229	9468	23	241	271	321	2024-03-01T16
22	1229	9468	3	241	271	316	2024-03-01T16
39	1229	9468	20	243	274	319	2024-03-01T16

15 rows × 28 columns

Comparaison with driver at risk

In this section with the fastest lap done for each driver (laptimes deleted will not be taken into

account to do this analysis) it will be a comparison 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: Oscar PIASTRI Sector 1: 28.955 Sector 2: 38.692 Sector 3: 22.475

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

In the first sector we can see that everyone was faster than Piastri, being Stroll strong chances to make it through Q3. In the second sector and third sector, Piastri was the fastest improving enough in the third sector to pass to Q3.

In [152...

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

newdataset2
```

Out[152...

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	22	0.007	-0.134	0.035	0.106	
1	18	0.078	-0.305	0.164	0.219	
2	23	0.099	-0.089	0.110	0.078	
3	3	0.156	-0.071	0.110	0.117	
4	20	0.407	-0.071	0.284	0.194	

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

I bring this section in order to know where the driver at risk lost his chances to improve in the qualifying. In general, nobody was at risk compared to Piastri

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	16	-0.957	-0.112	-0.633	-0.212	
1	1	-0.748	-0.446	-0.305	0.003	
2	55	-0.549	-0.065	-0.346	-0.138	
3	44	-0.404	-0.152	-0.146	-0.106	
4	14	-0.321	-0.046	-0.174	-0.101	
5	27	-0.271	-0.121	-0.056	-0.094	

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
6	63	-0.200	-0.001	-0.082	-0.117	
7	11	-0.190	-0.217	-0.039	0.066	

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	
VER	28.509
STR	28.650
PER	28.738
HAM	28.803
TSU	28.821
HUL	28.834
NOR	28.836
LEC	28.843
ALB	28.866
MAG	28.884
RIC	28.884
SAI	28.890
ALO	28.909
RUS	28.954
PIA	28.955

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

Out[155... **duration_sector_2**

name_acronym	
LEC	38.059
SAI	38.346
VER	38.387
ALO	38.518
HAM	38.546
NOR	38.585
RUS	38.610
HUL	38.636
PER	38.653

	duration_sector_2
name_acronym	
PIA	38.692
TSU	38.727
ALB	38.802
RIC	38.802

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

Out[156...

	duration_sector_3
name_acronym	
LEC	22.263
SAI	22.337
RUS	22.358
HAM	22.369
ALO	22.374
HUL	22.381
PIA	22.475
VER	22.478
NOR	22.520
PER	22.541
ALB	22.553
TSU	22.581
RIC	22.592
MAG	22.669
STR	22.694

Qualyfin 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	
64	1229	9468	1	242	271	320	2024-03-01T16
11	1229	9468	16	242	273	316	2024-03-01T16
69	1229	9468	63	243	271	311	2024-03-01T16
5	1229	9468	55	242	273	320	2024-03-01T16
80	1229	9468	11	241	271	320	2024-03-01T16

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
59	1229	9468	14	243	268	314	2024-03-01T16
55	1229	9468	4	242	273	312	2024-03-01T16
47	1229	9468	81	243	274	312	2024-03-01T16
75	1229	9468	44	242	270	315	2024-03-01T16
27	1229	9468	27	243	273	317	2024-03-01T16

Comparaison with poleman

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

In [158...

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

Driver: Max VERSTAPPEN Sector 1: 28.535 Sector 2: 38.269 Sector 3: 22.375

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

The unique driver that would have been fighting the pole, it would have been Leclerc because his best time in Q2 it would have been valid to take the pole. Also, if Leclerc would have equalized his first sector with Verstappen's laptime he would have been able to fight for 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	16	0.228	0.227	0.007	-0.006	
1	63	0.306	0.265	0.152	-0.111	
2	55	0.328	0.315	0.029	-0.016	
3	11	0.358	0.269	0.054	0.035	
4	14	0.363	0.295	-0.033	0.101	
5	4	0.435	0.510	-0.062	-0.013	
6	81	0.504	0.366	0.074	0.064	
7	44	0.531	0.346	0.153	0.032	

driver_number lap_duration difference_sector_1 difference_sector_2 difference_sector_3 na

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	
VER	28.535
LEC	28.762
RUS	28.800
PER	28.804
ALO	28.830
SAI	28.850
HAM	28.881
PIA	28.901
HUL	29.028
NOR	29.045

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

Out[161...

duration_sector_2	
name_acronym	
NOR	38.207
ALO	38.236
VER	38.269
LEC	38.276
SAI	38.298
PER	38.323
PIA	38.343
RUS	38.421
HAM	38.422
HUL	38.891

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

Out[162...

duration_sector_1	
name_acronym	
VER	28.535

	duration_sector_1
name_acronym	
LEC	28.762
RUS	28.800
PER	28.804
ALO	28.830
SAI	28.850
HAM	28.881
PIA	28.901

Best sector per driver of the session (in general)

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

	duration_sector_1
name_acronym	
VER	28.509
STR	28.650
PER	28.738
LEC	28.762
RUS	28.800
HAM	28.803
TSU	28.821
ALO	28.830
HUL	28.834
NOR	28.836
SAI	28.850
ALB	28.858
MAG	28.884
RIC	28.884
PIA	28.901
SAR	28.991
BOT	29.063
OCO	29.142
GAS	29.148
ZHO	29.154

```
In [164... pd.DataFrame(mergequaly.groupby("name_acronym")['duration_sector_2'].min())
```

	duration_sector_2
name_acronym	

	duration_sector_2
name_acronym	
LEC	38.059
NOR	38.207
ALO	38.236
VER	38.269
SAI	38.298
PER	38.323
PIA	38.343
RUS	38.421
HAM	38.422
STR	38.609
HUL	38.636
TSU	38.727
ALB	38.750
RIC	38.802
GAS	38.857
OCO	38.934
ZHO	38.944
MAG	38.952

In [165...

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

Out[165...

	duration_sector_3
name_acronym	
LEC	22.263
RUS	22.264
SAI	22.337
NOR	22.362
HAM	22.369
ALO	22.374
VER	22.374
HUL	22.381
PER	22.410
PIA	22.439
ALB	22.553
TSU	22.581
RIC	22.592
MAG	22.657
ZHO	22.658

	duration_sector_3
name_acronym	
SAR	22.660
BOT	22.668
STR	22.694

Race

Obtain setup

```
In [166... race = libraryDataF1.obtain_information('laps',session_key=9472)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9472)
drivers = libraryDataF1.obtain_information('drivers',session_key=9472)
```

```
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

General case

HARD

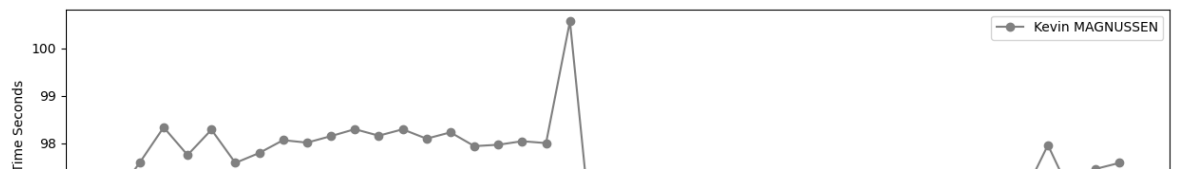
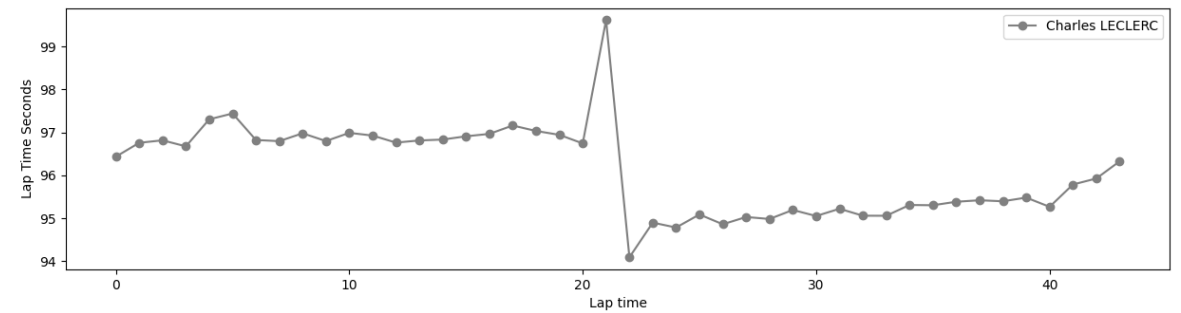
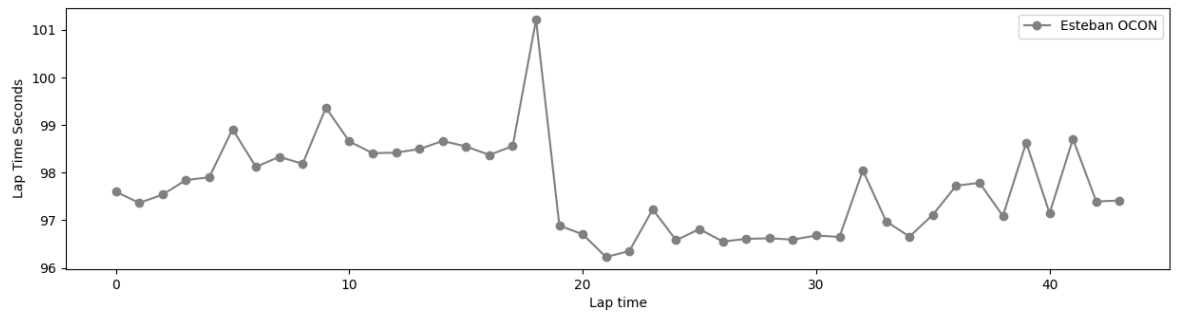
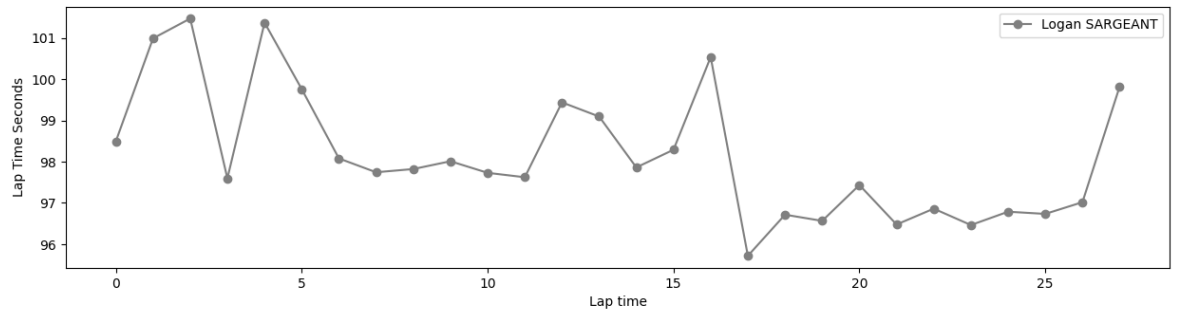
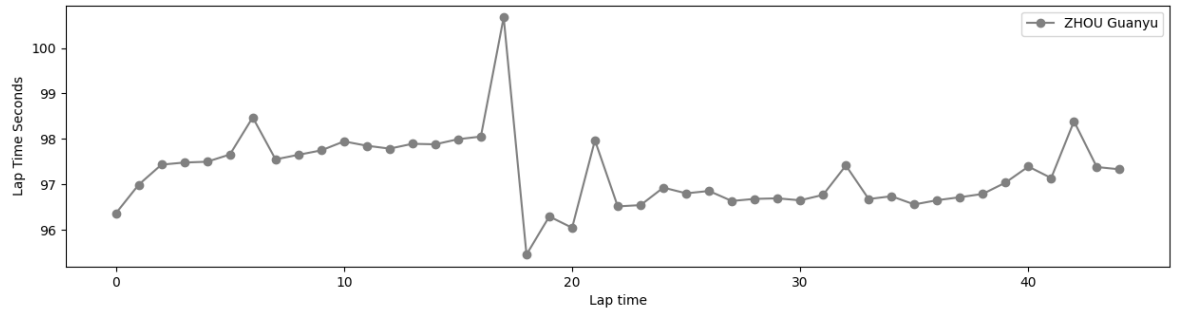
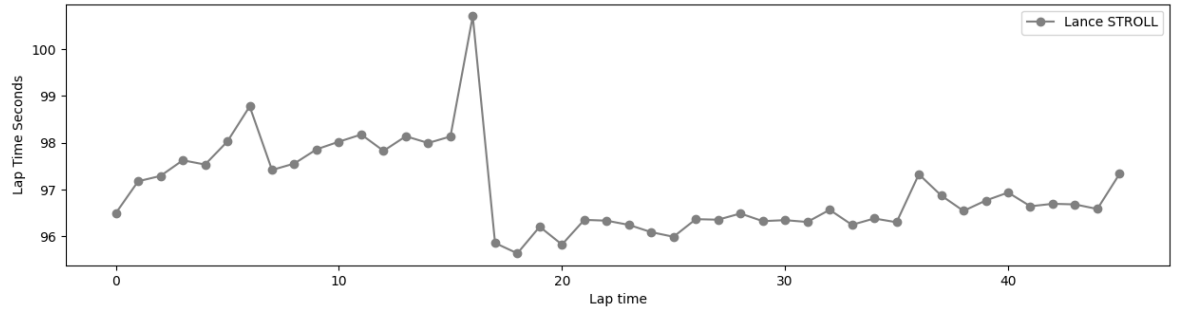
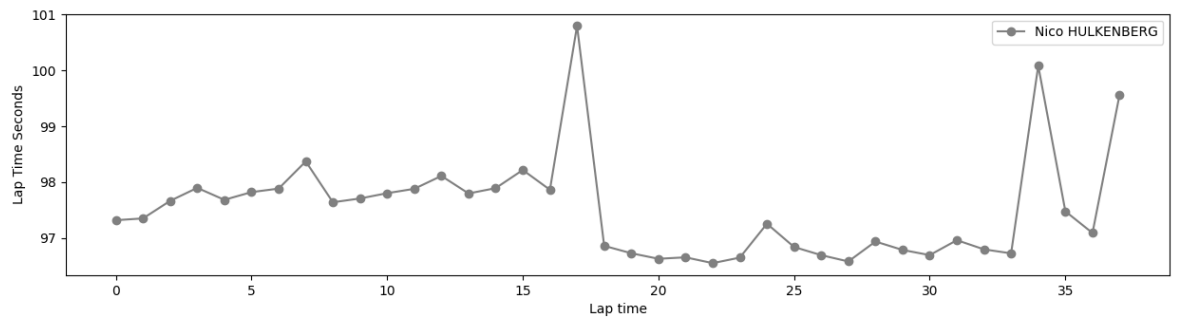
MEDIUM

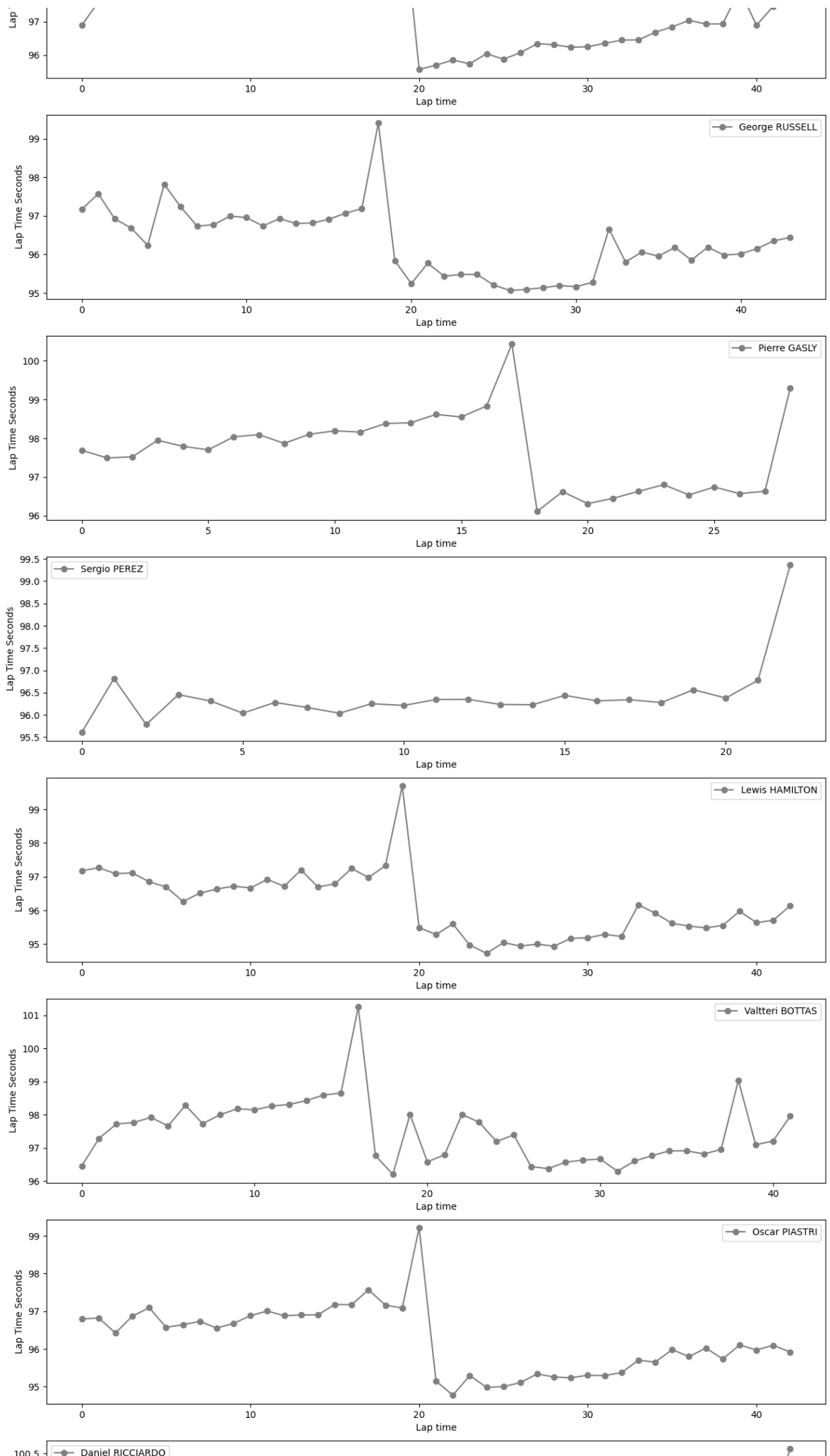
SOFT

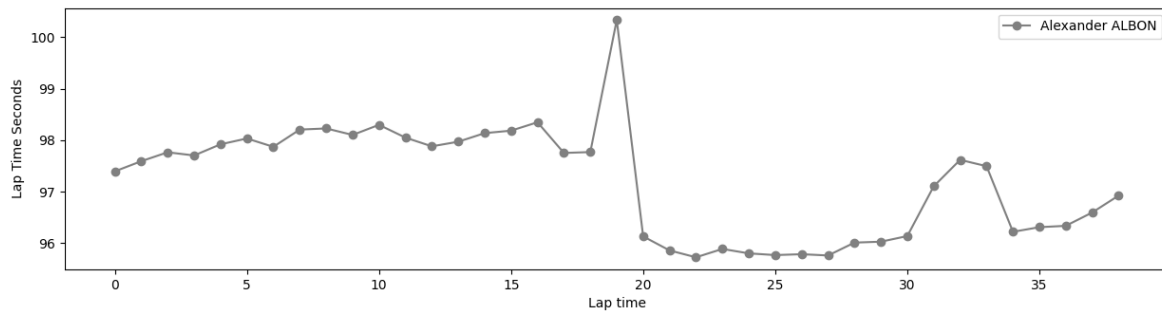
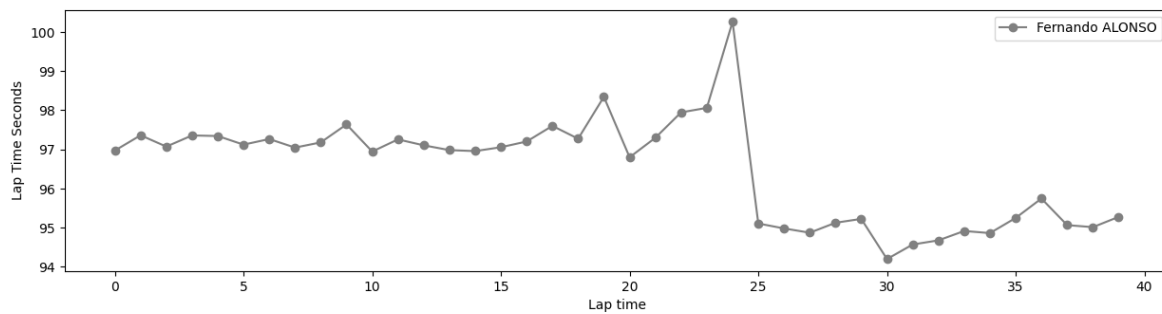
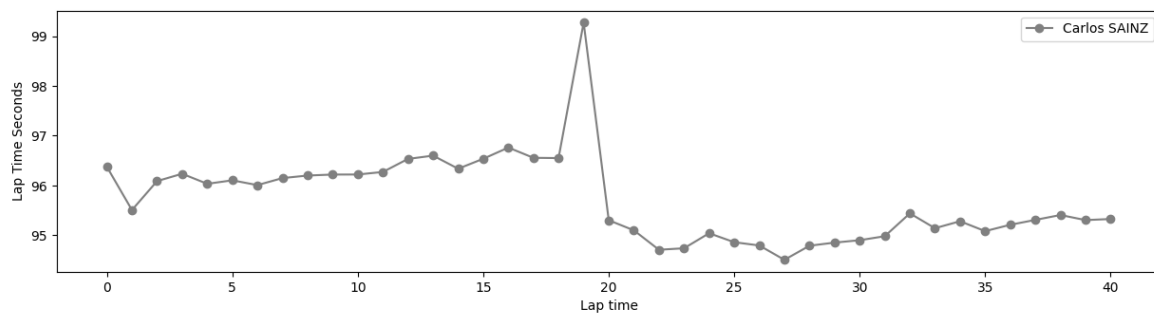
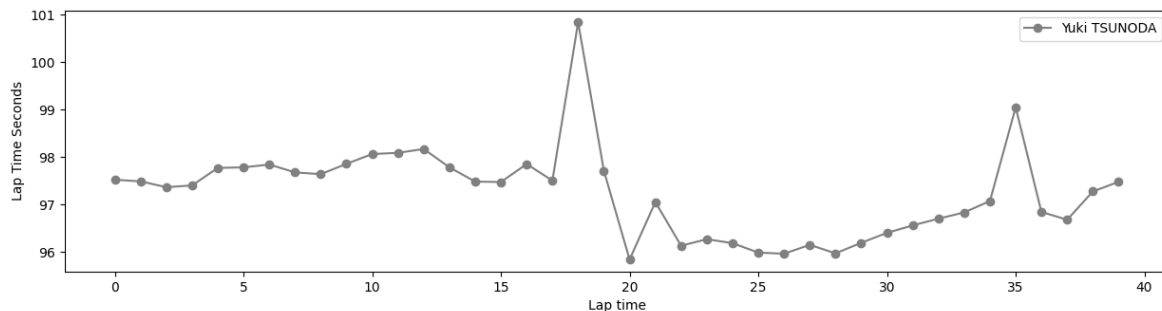
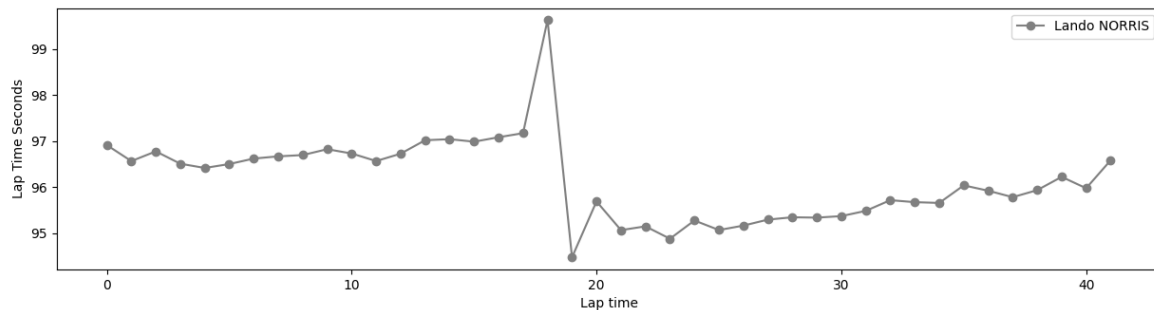
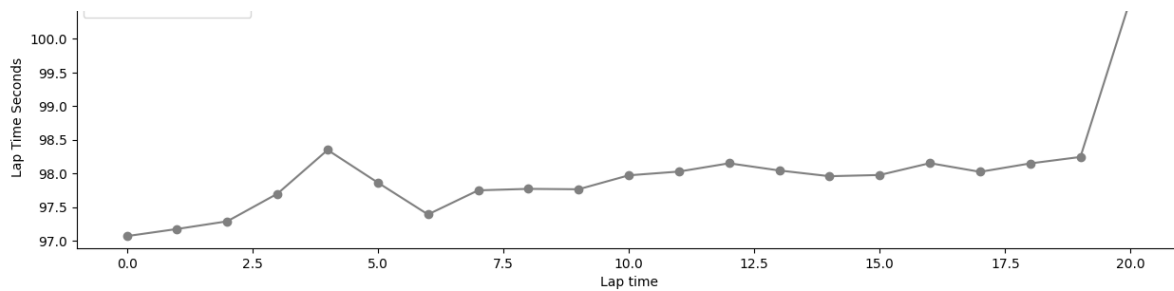
Hard tyres

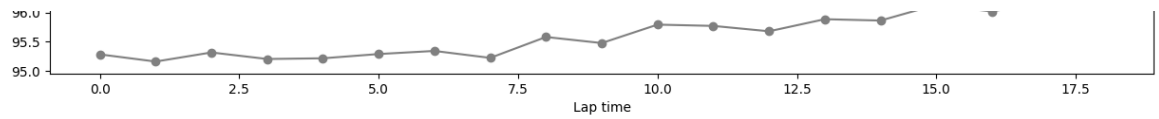
For this grand prix, due to the abrasion of the circuit, Pirelli decided to bring their hardest compounds (C1,C2 and C3). It can observe that the most of the drivers decided to used two hard tyres making their stop among the laps 15-20.

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









Medium tyres

This tyre was not used in the session

In [170...

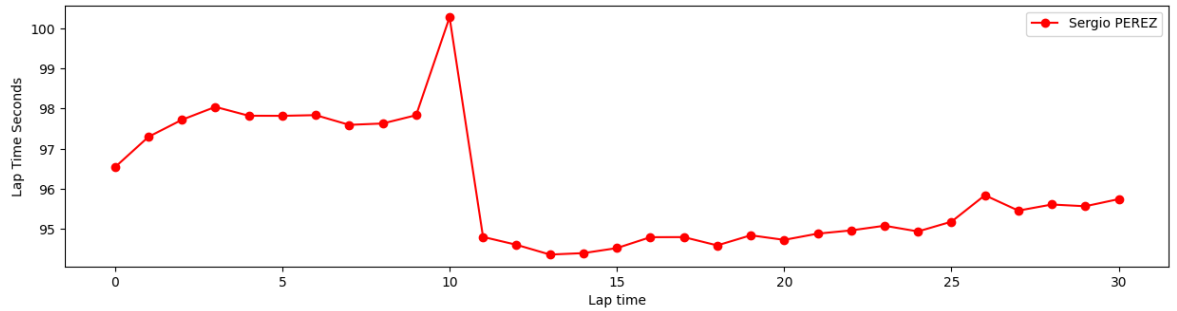
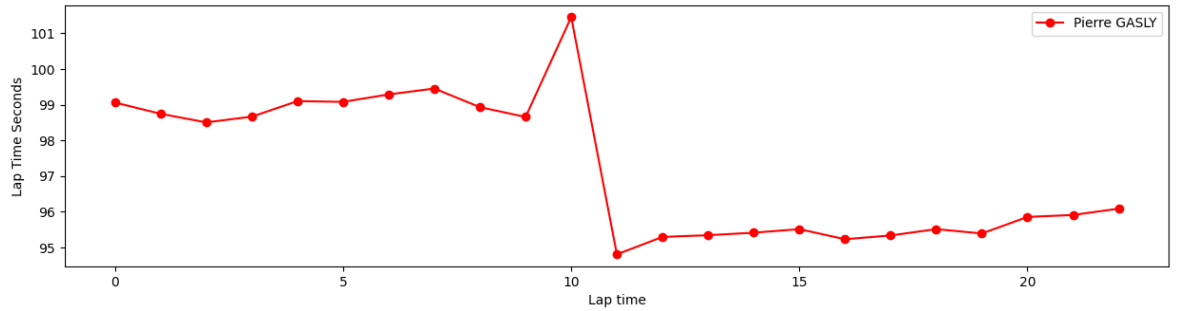
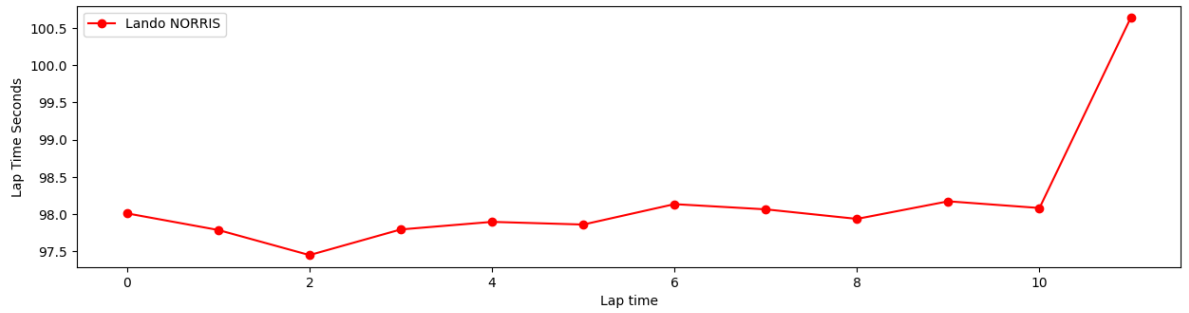
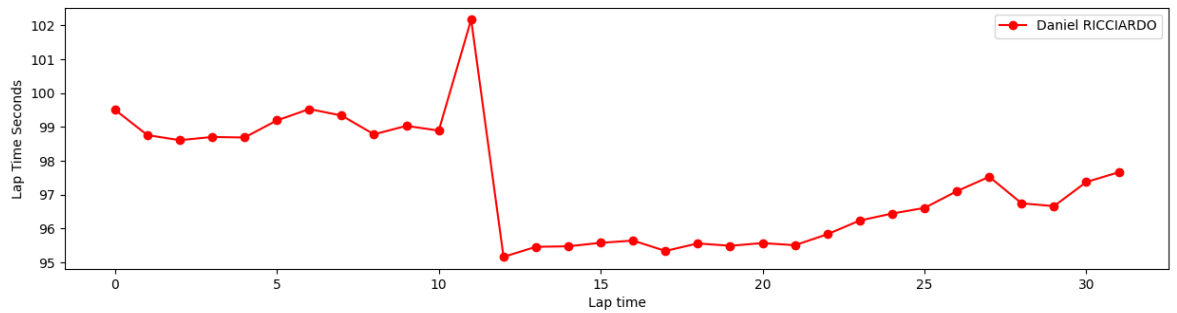
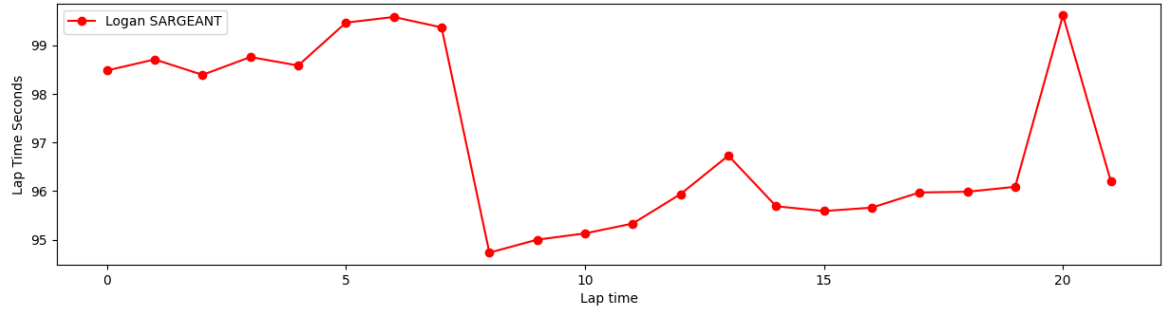
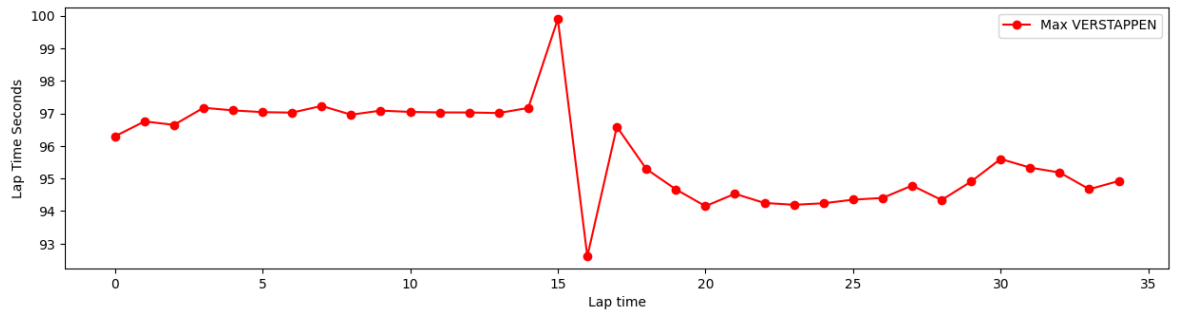
```
#libraryDataF1.obtain_data_tyres(jointables,'MEDIUM',103)
```

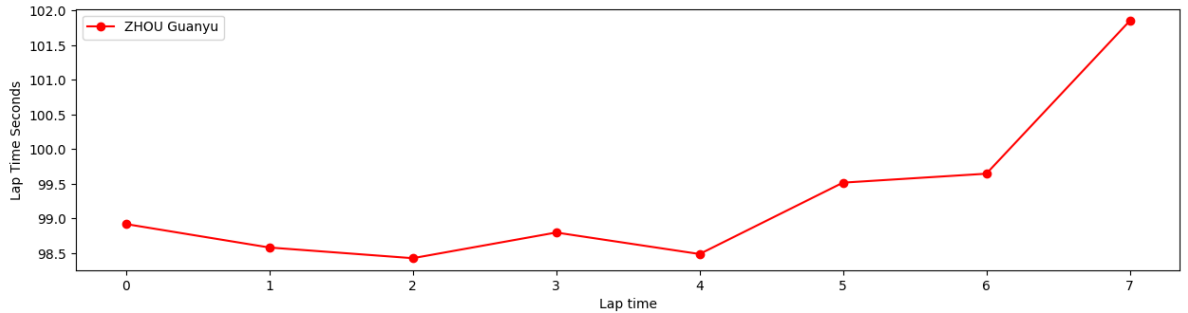
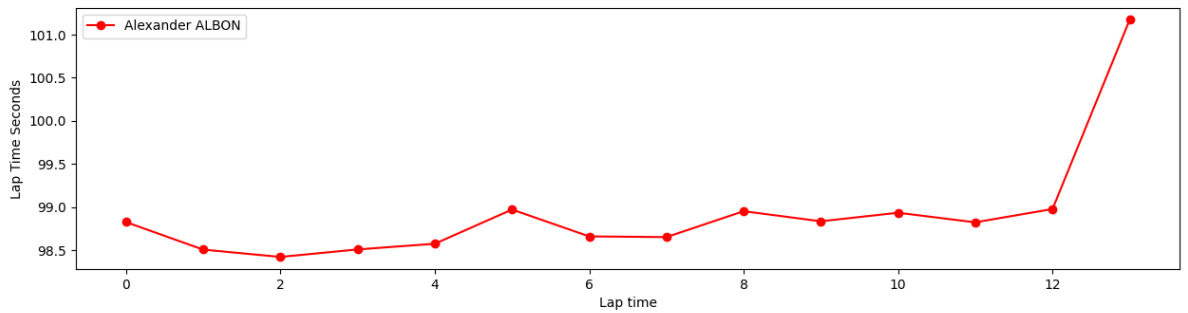
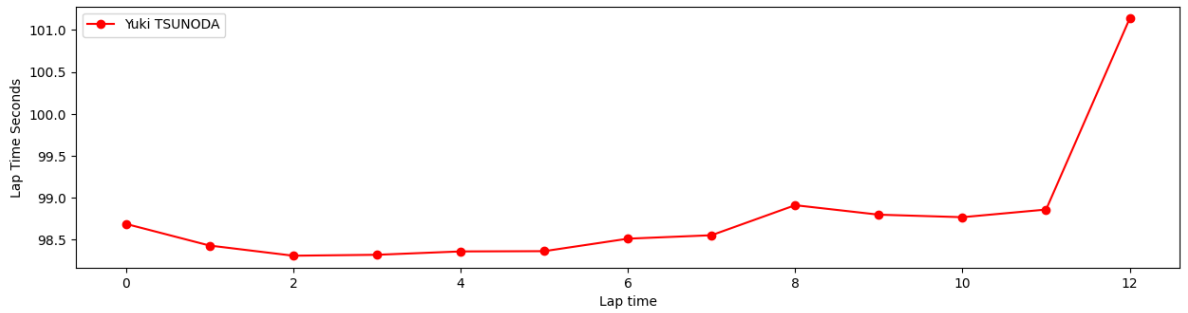
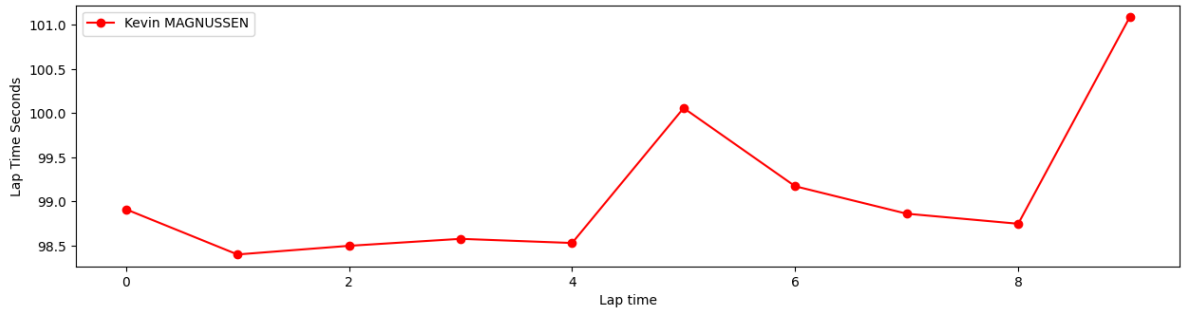
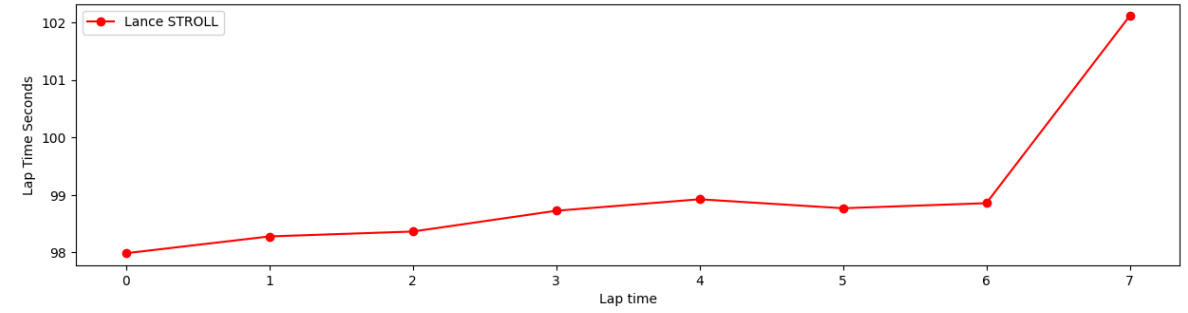
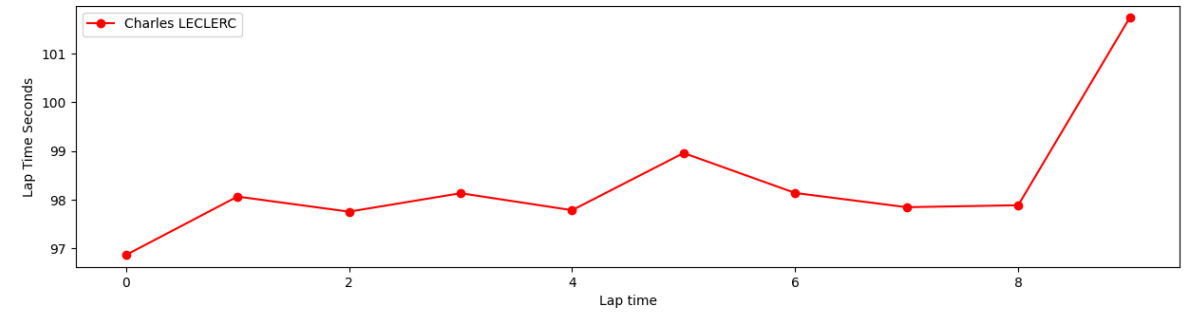
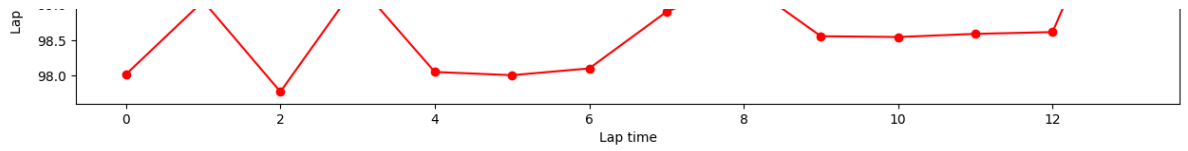
Soft tyres

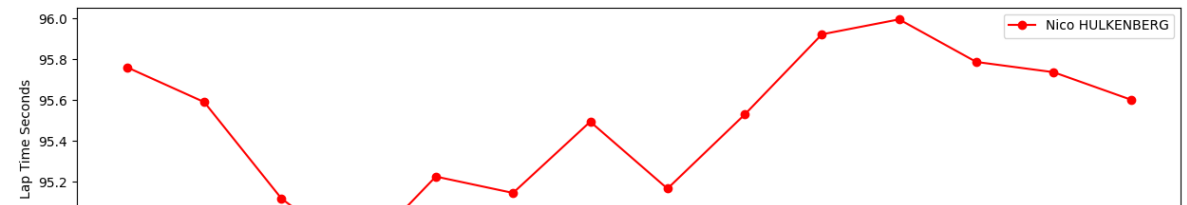
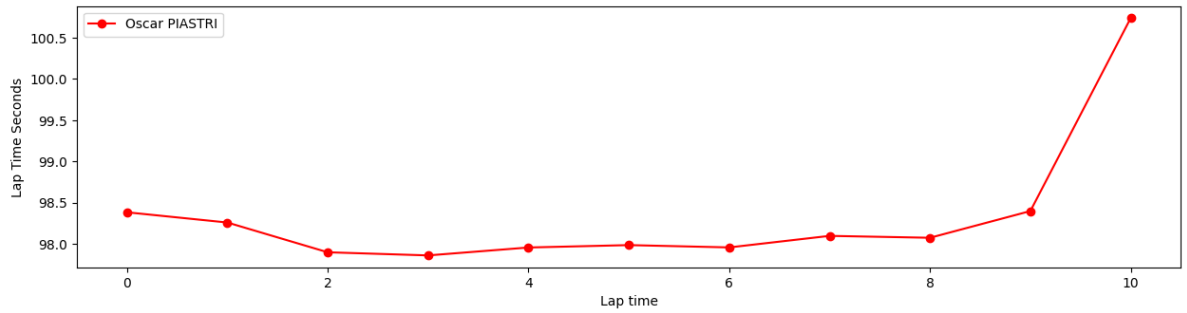
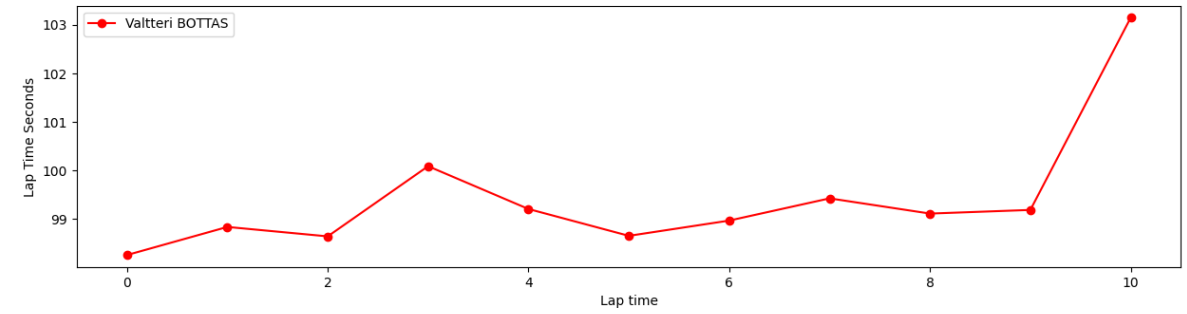
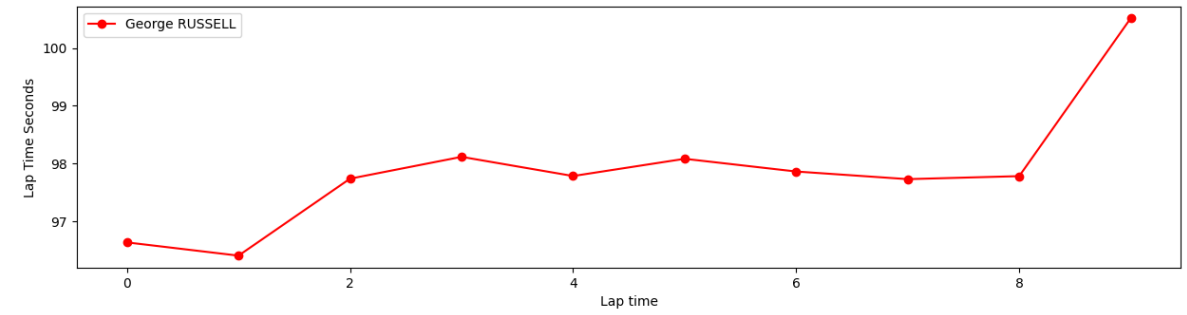
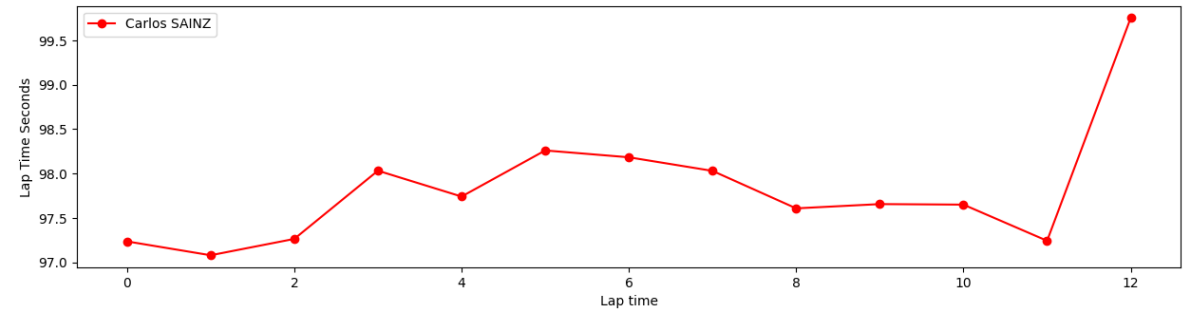
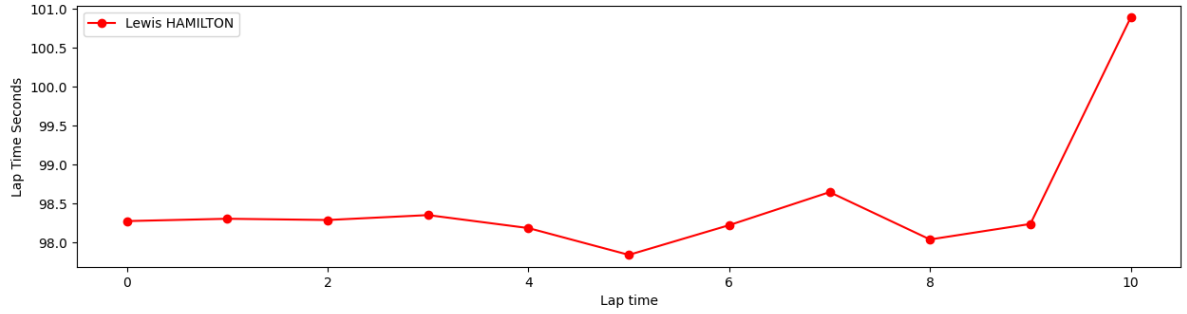
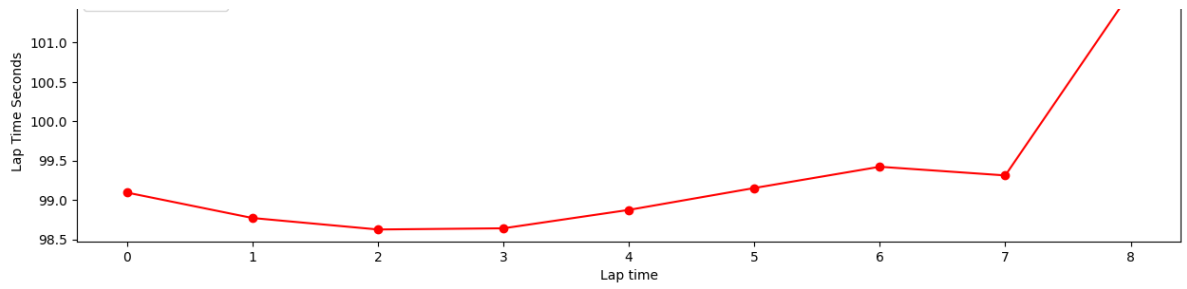
C3 was used principally in their first stint making their stop among 13-15 lap. In the second stints some of the drivers made 20 laps with these tyres.

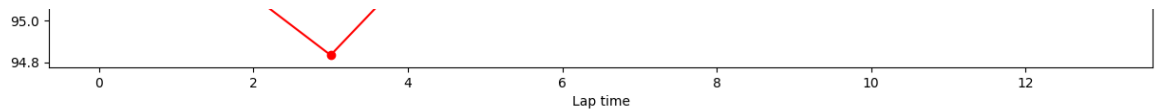
In [171...

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









Mean pace with the different compound used on the session

In [172...

```
race_pace = pd.DataFrame(jointables2.query("is_pit_out_lap == False and l  
race_pace
```

Out[172...

lap_duration	
compound	
MEDIUM	92.495000
HARD	92.849000
SOFT	92.939398

Race pace

General explanation Explanation per teams

In [173...

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

Out[173...

lap_duration	
team_name	
Red Bull Racing	96.036305
Ferrari	96.458354
McLaren	96.566759
Mercedes	96.627000
Haas F1 Team	97.289365
Aston Martin	97.317885
RB	97.609435
Alpine	97.682108
Kick Sauber	97.783712
Williams	97.801740

Mean race pace per sector

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

Sector 1

General explanation

In [174...

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

Out[174...

duration_sector_1	
team_name	
Red Bull Racing	30.683102
Ferrari	30.802954
Mercedes	30.812284
McLaren	30.838000
Haas F1 Team	30.883937
Aston Martin	30.942180
RB	31.000710
Kick Sauber	31.105258
Williams	31.141329
Alpine	31.211708

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	41.571305
McLaren	41.818017
Ferrari	41.879538
Mercedes	42.022000
Haas F1 Team	42.276683
Alpine	42.279831
Aston Martin	42.290000
RB	42.379261
Williams	42.424370
Kick Sauber	42.487803

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	23.775862

duration_sector_3	
team_name	
Red Bull Racing	23.781898
Mercedes	23.792716
McLaren	23.910741
Aston Martin	24.085705
Haas F1 Team	24.128746
Alpine	24.190569
Kick Sauber	24.190652

In [177...

jointables

Out[177...

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1229	9472	1	234.0	250	251.0	
1	1229	9472	2	230.0	249	231.0	
2	1229	9472	3	233.0	241	257.0	
3	1229	9472	4	233.0	247	237.0	
4	1229	9472	10	231.0	246	272.0	
...	
1081	1229	9472	18	235.0	253	NaN	2024-03-02T16:34
1082	1229	9472	44	236.0	264	NaN	2024-03-02T16:34
1083	1229	9472	55	239.0	269	305.0	2024-03-02T16:34
1084	1229	9472	63	235.0	261	300.0	2024-03-02T16:34
1085	1229	9472	81	238.0	271	303.0	2024-03-02T16:34

1086 rows × 20 columns

Comparaison beetween drivers

General explanation

Red Bull Racing

```
In [178... race.query("driver_number== 1 and lap_duration <=110 and lap_duration > 94")
Out[178... 95.85945283018869
```

```
In [179... race.query("driver_number== 11 and lap_duration <=110 and lap_duration > 94")
Out[179... 96.179888888888888
```

Ferrari

```
In [180... race.query("driver_number== 16 and lap_duration <=110 and lap_duration > 94")
Out[180... 96.52783333333333
```

```
In [181... race.query("driver_number== 55 and lap_duration <=110 and lap_duration > 94")
Out[181... 96.22938888888889
```

McLaren

```
In [182... race.query("driver_number== 4 and lap_duration <=110 and lap_duration > 94")
Out[182... 96.59933333333332
```

```
In [183... race.query("driver_number== 81 and lap_duration <=110 and lap_duration > 94")
Out[183... 96.66498148148149
```

Mercedes

```
In [184... race.query("driver_number== 44 and lap_duration <=110 and lap_duration > 94")
Out[184... 96.63564814814815
```

```
In [185... race.query("driver_number== 63 and lap_duration <=110 and lap_duration > 94")
Out[185... 96.60324074074073
```

Aston Martin

```
In [186... race.query("driver_number== 14 and lap_duration <=110 and lap_duration > 94")
Out[186... 97.07846296296294
```

```
In [187... race.query("driver_number== 18 and lap_duration <=110 and lap_duration > 94")
Out[187... 97.28312962962966
```

Haas F1 Team

```
In [188... race.query("driver_number== 20 and lap_duration <=110 and lap_duration > 94")
Out[188... 97.59192452830189
```

```
In [189... race.query("driver_number== 27 and lap_duration <=110 and lap_duration > 94")
Out[189... 96.98271153846153
```

RB

```
In [190... race.query("driver_number== 3 and lap_duration <=110 and lap_duration > 94")
Out[190... 97.57790566037735
```

```
In [191... race.query("driver_number== 22 and lap_duration <=110 and lap_duration > 94")
Out[191... 97.61762264150944
```

Williams

```
In [192... race.query("driver_number== 2 and lap_duration <=110 and lap_duration > 94")
Out[192... 97.66909999999999
```

```
In [193... race.query("driver_number== 23 and lap_duration <=110 and lap_duration > 94")
Out[193... 97.65598113207545
```

Alpine

```
In [194... race.query("driver_number== 10 and lap_duration <=110 and lap_duration > 94")
Out[194... 97.48275000000002
```

```
In [195... race.query("driver_number== 31 and lap_duration <=110 and lap_duration > 94")
Out[195... 97.94715094339624
```

Kick Sauber

```
In [196... race.query("driver_number== 24 and lap_duration <=110 and lap_duration > 94")
Out[196... 97.55275471698114
```

In [197... race.query("driver_number== 77 and lap_duration <=110 and lap_duration > 94.5")

Out[197... 97.88847169811321

Race pace

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

Red Bull Racing

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

Out[199...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
	9	1229	9472	1	11	1	12	SOFT
	19	1229	9472	1	1	1	17	SOFT
	32	1229	9472	2	11	13	36	HARD
	39	1229	9472	2	1	18	37	HARD
	57	1229	9472	3	11	37	58	SOFT
	58	1229	9472	3	1	38	58	SOFT

In [200... libraryDataF1.getinfo(longruns(jointables,1,'Red Bull Racing',MINIMUM_SECONDS))

Out[200...

	full_name	compound	date_start	lap_number	duration_sector_1
20	Max VERSTAPPEN	SOFT	2024-03-02T15:05:20.099000+00:00	2	30.91
39	Max VERSTAPPEN	SOFT	2024-03-02T15:06:56.378000+00:00	3	30.99
59	Max VERSTAPPEN	SOFT	2024-03-02T15:08:33.130000+00:00	4	30.93
79	Max VERSTAPPEN	SOFT	2024-03-02T15:10:09.704000+00:00	5	31.25
99	Max VERSTAPPEN	SOFT	2024-03-02T15:11:46.978000+00:00	6	31.04
119	Max VERSTAPPEN	SOFT	2024-03-02T15:13:24.080000+00:00	7	31.01
139	Max VERSTAPPEN	SOFT	2024-03-02T15:15:01.132000+00:00	8	31.04
159	Max VERSTAPPEN	SOFT	2024-03-02T15:16:38.044000+00:00	9	31.10
179	Max VERSTAPPEN	SOFT	2024-03-02T15:18:15.404000+00:00	10	30.98
197	Max VERSTAPPEN	SOFT	2024-03-02T15:19:52.275000+00:00	11	30.97
215	Max VERSTAPPEN	SOFT	2024-03-02T15:21:29.336000+00:00	12	30.96

	full_name	compound	date_start	lap_number	duration_sector_
232	Max VERSTAPPEN	SOFT	2024-03-02T15:23:06.399000+00:00	13	30.96
247	Max VERSTAPPEN	SOFT	2024-03-02T15:24:43.393000+00:00	14	30.93
265	Max VERSTAPPEN	SOFT	2024-03-02T15:26:20.469000+00:00	15	30.88
283	Max VERSTAPPEN	SOFT	2024-03-02T15:27:57.507000+00:00	16	31.04
301	Max VERSTAPPEN	SOFT	2024-03-02T15:29:34.687000+00:00	17	31.00
340	Max VERSTAPPEN	HARD	2024-03-02T15:33:12.478000+00:00	19	30.62
360	Max VERSTAPPEN	HARD	2024-03-02T15:34:47.658000+00:00	20	30.58
380	Max VERSTAPPEN	HARD	2024-03-02T15:36:22.851000+00:00	21	30.57
399	Max VERSTAPPEN	HARD	2024-03-02T15:37:58.157000+00:00	22	30.56
419	Max VERSTAPPEN	HARD	2024-03-02T15:39:33.340000+00:00	23	30.55
439	Max VERSTAPPEN	HARD	2024-03-02T15:41:08.681000+00:00	24	30.54
459	Max VERSTAPPEN	HARD	2024-03-02T15:42:43.916000+00:00	25	30.51
479	Max VERSTAPPEN	HARD	2024-03-02T15:44:19.229000+00:00	26	30.52
499	Max VERSTAPPEN	HARD	2024-03-02T15:45:54.455000+00:00	27	30.64
519	Max VERSTAPPEN	HARD	2024-03-02T15:47:29.971000+00:00	28	30.58
538	Max VERSTAPPEN	HARD	2024-03-02T15:49:05.560000+00:00	29	30.67
556	Max VERSTAPPEN	HARD	2024-03-02T15:50:41.350000+00:00	30	30.65
576	Max VERSTAPPEN	HARD	2024-03-02T15:52:17.140000+00:00	31	30.63
594	Max VERSTAPPEN	HARD	2024-03-02T15:53:52.829000+00:00	32	30.66
612	Max VERSTAPPEN	HARD	2024-03-02T15:55:28.580000+00:00	33	30.69
631	Max VERSTAPPEN	HARD	2024-03-02T15:57:04.451000+00:00	34	30.68
649	Max VERSTAPPEN	HARD	2024-03-02T15:58:40.909000+00:00	35	30.72
666	Max VERSTAPPEN	HARD	2024-03-02T16:00:16.699000+00:00	36	30.79
684	Max VERSTAPPEN	HARD	2024-03-02T16:01:52.940000+00:00	37	30.87
721	Max VERSTAPPEN	SOFT	2024-03-02T16:05:28.544000+00:00	39	29.74

	full_name	compound	date_start	lap_number	duration_sector_1
741	Max VERSTAPPEN	SOFT	2024-03-02T16:07:01.342000+00:00	40	31.01
761	Max VERSTAPPEN	SOFT	2024-03-02T16:08:37.813000+00:00	41	30.69
780	Max VERSTAPPEN	SOFT	2024-03-02T16:10:13.056000+00:00	42	30.47
798	Max VERSTAPPEN	SOFT	2024-03-02T16:11:47.752000+00:00	43	30.13
818	Max VERSTAPPEN	SOFT	2024-03-02T16:13:21.891000+00:00	44	30.34
837	Max VERSTAPPEN	SOFT	2024-03-02T16:14:56.406000+00:00	45	30.18
857	Max VERSTAPPEN	SOFT	2024-03-02T16:16:30.705000+00:00	46	30.30
877	Max VERSTAPPEN	SOFT	2024-03-02T16:18:04.873000+00:00	47	30.26
897	Max VERSTAPPEN	SOFT	2024-03-02T16:19:39.113000+00:00	48	30.24
917	Max VERSTAPPEN	SOFT	2024-03-02T16:21:13.504000+00:00	49	30.24
937	Max VERSTAPPEN	SOFT	2024-03-02T16:22:47.788000+00:00	50	30.22
957	Max VERSTAPPEN	SOFT	2024-03-02T16:24:22.630000+00:00	51	30.00
977	Max VERSTAPPEN	SOFT	2024-03-02T16:25:57.029000+00:00	52	30.33
997	Max VERSTAPPEN	SOFT	2024-03-02T16:27:31.849000+00:00	53	30.52
1017	Max VERSTAPPEN	SOFT	2024-03-02T16:29:07.484000+00:00	54	30.42
1037	Max VERSTAPPEN	SOFT	2024-03-02T16:30:42.853000+00:00	55	30.49
1057	Max VERSTAPPEN	SOFT	2024-03-02T16:32:18.038000+00:00	56	30.25

In [201...

```
libraryDataF1.getinfo(longruns(jointables,11,'Red Bull Racing',MINIMUM_SECONDS_REQUIRED))
```

Out[201...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2
25	Sergio PEREZ	SOFT	2024-03-02T15:05:22.877000+00:00	2	30.678	
44	Sergio PEREZ	SOFT	2024-03-02T15:06:59.421000+00:00	3	30.596	
64	Sergio PEREZ	SOFT	2024-03-02T15:08:36.682000+00:00	4	30.716	
84	Sergio PEREZ	SOFT	2024-03-02T15:10:14.415000+00:00	5	30.997	
104	Sergio PEREZ	SOFT	2024-03-02T15:11:52.420000+00:00	6	30.843	
124	Sergio PEREZ	SOFT	2024-03-02T15:13:30.334000+00:00	7	31.013	

	full_name	compound	date_start	lap_number	duration_sector_1	c
144	Sergio PEREZ	SOFT	2024-03-02T15:15:08.075000+00:00	8	31.305	
164	Sergio PEREZ	SOFT	2024-03-02T15:16:45.853000+00:00	9	31.145	
184	Sergio PEREZ	SOFT	2024-03-02T15:18:23.551000+00:00	10	31.178	
201	Sergio PEREZ	SOFT	2024-03-02T15:20:01.190000+00:00	11	31.054	
220	Sergio PEREZ	SOFT	2024-03-02T15:21:38.999000+00:00	12	30.891	
250	Sergio PEREZ	HARD	2024-03-02T15:25:16.864000+00:00	14	30.063	
270	Sergio PEREZ	HARD	2024-03-02T15:26:52.469000+00:00	15	30.785	
288	Sergio PEREZ	HARD	2024-03-02T15:28:29.313000+00:00	16	30.569	
306	Sergio PEREZ	HARD	2024-03-02T15:30:05.086000+00:00	17	30.922	
325	Sergio PEREZ	HARD	2024-03-02T15:31:41.574000+00:00	18	30.803	
345	Sergio PEREZ	HARD	2024-03-02T15:33:17.856000+00:00	19	30.702	
365	Sergio PEREZ	HARD	2024-03-02T15:34:53.893000+00:00	20	30.918	
385	Sergio PEREZ	HARD	2024-03-02T15:36:30.284000+00:00	21	30.849	
404	Sergio PEREZ	HARD	2024-03-02T15:38:06.392000+00:00	22	30.824	
424	Sergio PEREZ	HARD	2024-03-02T15:39:42.375000+00:00	23	30.840	
444	Sergio PEREZ	HARD	2024-03-02T15:41:18.571000+00:00	24	30.792	
464	Sergio PEREZ	HARD	2024-03-02T15:42:54.823000+00:00	25	30.878	
484	Sergio PEREZ	HARD	2024-03-02T15:44:31.226000+00:00	26	30.938	
504	Sergio PEREZ	HARD	2024-03-02T15:46:07.575000+00:00	27	30.853	
524	Sergio PEREZ	HARD	2024-03-02T15:47:43.763000+00:00	28	30.929	
542	Sergio PEREZ	HARD	2024-03-02T15:49:19.924000+00:00	29	30.926	
561	Sergio PEREZ	HARD	2024-03-02T15:50:56.483000+00:00	30	30.916	
581	Sergio PEREZ	HARD	2024-03-02T15:52:32.773000+00:00	31	30.843	
598	Sergio PEREZ	HARD	2024-03-02T15:54:09.049000+00:00	32	30.856	
617	Sergio PEREZ	HARD	2024-03-02T15:55:45.441000+00:00	33	30.907	

	full_name	compound	date_start	lap_number	duration_sector_1	c
635	Sergio PEREZ	HARD	2024-03-02T15:57:21.887000+00:00	34	30.840	
654	Sergio PEREZ	HARD	2024-03-02T15:58:58.323000+00:00	35	30.938	
670	Sergio PEREZ	HARD	2024-03-02T16:00:35.159000+00:00	36	31.014	
706	Sergio PEREZ	SOFT	2024-03-02T16:04:10.206000+00:00	38	30.581	
726	Sergio PEREZ	SOFT	2024-03-02T16:05:45.051000+00:00	39	30.563	
746	Sergio PEREZ	SOFT	2024-03-02T16:07:19.721000+00:00	40	30.400	
765	Sergio PEREZ	SOFT	2024-03-02T16:08:54.055000+00:00	41	30.351	
785	Sergio PEREZ	SOFT	2024-03-02T16:10:28.404000+00:00	42	30.299	
803	Sergio PEREZ	SOFT	2024-03-02T16:12:02.963000+00:00	43	30.403	
822	Sergio PEREZ	SOFT	2024-03-02T16:13:37.816000+00:00	44	30.389	
842	Sergio PEREZ	SOFT	2024-03-02T16:15:12.575000+00:00	45	30.338	
862	Sergio PEREZ	SOFT	2024-03-02T16:16:47.132000+00:00	46	30.410	
882	Sergio PEREZ	SOFT	2024-03-02T16:18:22.055000+00:00	47	30.281	
902	Sergio PEREZ	SOFT	2024-03-02T16:19:56.684000+00:00	48	30.358	
922	Sergio PEREZ	SOFT	2024-03-02T16:21:31.559000+00:00	49	30.400	
942	Sergio PEREZ	SOFT	2024-03-02T16:23:06.552000+00:00	50	30.366	
962	Sergio PEREZ	SOFT	2024-03-02T16:24:41.763000+00:00	51	30.360	
982	Sergio PEREZ	SOFT	2024-03-02T16:26:16.533000+00:00	52	30.577	
1002	Sergio PEREZ	SOFT	2024-03-02T16:27:51.749000+00:00	53	30.638	
1022	Sergio PEREZ	SOFT	2024-03-02T16:29:27.599000+00:00	54	30.578	
1042	Sergio PEREZ	SOFT	2024-03-02T16:31:03.063000+00:00	55	30.683	
1061	Sergio PEREZ	SOFT	2024-03-02T16:32:38.657000+00:00	56	30.539	

Ferrari

In [202...

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

Out[202...

meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
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	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	5	1229	9472	1	16	1	11	SOFT
	16	1229	9472	1	55	1	14	SOFT
	27	1229	9472	2	16	12	34	HARD
	36	1229	9472	2	55	15	35	HARD
	52	1229	9472	3	16	35	58	HARD

In [203...

```
libraryDataF1.getinfo(longruns(jointables,16,'Ferrari',MINIMUM_SECONDS,MAXI
```

Out[203...

	full_name	compound	date_start	lap_number	duration_sector_1	c
27	Charles LECLERC	SOFT	2024-03-02T15:05:21.019000+00:00	2	31.166	
46	Charles LECLERC	SOFT	2024-03-02T15:06:57.933000+00:00	3	31.223	
66	Charles LECLERC	SOFT	2024-03-02T15:08:36.013000+00:00	4	30.958	
86	Charles LECLERC	SOFT	2024-03-02T15:10:13.780000+00:00	5	31.192	
106	Charles LECLERC	SOFT	2024-03-02T15:11:51.804000+00:00	6	30.936	
126	Charles LECLERC	SOFT	2024-03-02T15:13:29.724000+00:00	7	31.008	
146	Charles LECLERC	SOFT	2024-03-02T15:15:08.572000+00:00	8	31.200	
166	Charles LECLERC	SOFT	2024-03-02T15:16:46.813000+00:00	9	31.147	
186	Charles LECLERC	SOFT	2024-03-02T15:18:24.582000+00:00	10	30.988	
203	Charles LECLERC	SOFT	2024-03-02T15:20:02.545000+00:00	11	32.241	
237	Charles LECLERC	HARD	2024-03-02T15:23:41.713000+00:00	13	30.580	
252	Charles LECLERC	HARD	2024-03-02T15:25:18.300000+00:00	14	30.787	
272	Charles LECLERC	HARD	2024-03-02T15:26:54.922000+00:00	15	30.831	
289	Charles LECLERC	HARD	2024-03-02T15:28:31.703000+00:00	16	30.606	
308	Charles LECLERC	HARD	2024-03-02T15:30:08.227000+00:00	17	31.109	
327	Charles LECLERC	HARD	2024-03-02T15:31:45.651000+00:00	18	31.180	
347	Charles LECLERC	HARD	2024-03-02T15:33:23.136000+00:00	19	30.986	
367	Charles LECLERC	HARD	2024-03-02T15:34:59.925000+00:00	20	30.839	
387	Charles LECLERC	HARD	2024-03-02T15:36:36.698000+00:00	21	31.089	

	full_name	compound	date_start	lap_number	duration_sector_1	c
406	Charles LECLERC	HARD	2024-03-02T15:38:13.647000+00:00	22	30.994	
426	Charles LECLERC	HARD	2024-03-02T15:39:50.476000+00:00	23	31.131	
446	Charles LECLERC	HARD	2024-03-02T15:41:27.495000+00:00	24	31.083	
466	Charles LECLERC	HARD	2024-03-02T15:43:04.442000+00:00	25	31.059	
486	Charles LECLERC	HARD	2024-03-02T15:44:41.174000+00:00	26	30.991	
506	Charles LECLERC	HARD	2024-03-02T15:46:18.033000+00:00	27	31.081	
526	Charles LECLERC	HARD	2024-03-02T15:47:54.787000+00:00	28	31.019	
544	Charles LECLERC	HARD	2024-03-02T15:49:31.662000+00:00	29	30.974	
563	Charles LECLERC	HARD	2024-03-02T15:51:08.688000+00:00	30	31.134	
583	Charles LECLERC	HARD	2024-03-02T15:52:45.777000+00:00	31	30.999	
600	Charles LECLERC	HARD	2024-03-02T15:54:22.697000+00:00	32	31.153	
619	Charles LECLERC	HARD	2024-03-02T15:55:59.834000+00:00	33	30.990	
637	Charles LECLERC	HARD	2024-03-02T15:57:36.511000+00:00	34	31.219	
672	Charles LECLERC	HARD	2024-03-02T16:01:12.318000+00:00	36	30.063	
690	Charles LECLERC	HARD	2024-03-02T16:02:46.475000+00:00	37	30.611	
708	Charles LECLERC	HARD	2024-03-02T16:04:21.318000+00:00	38	30.550	
728	Charles LECLERC	HARD	2024-03-02T16:05:56.155000+00:00	39	30.604	
748	Charles LECLERC	HARD	2024-03-02T16:07:31.234000+00:00	40	30.507	
767	Charles LECLERC	HARD	2024-03-02T16:09:05.969000+00:00	41	30.539	
786	Charles LECLERC	HARD	2024-03-02T16:10:41.023000+00:00	42	30.413	
805	Charles LECLERC	HARD	2024-03-02T16:12:16.114000+00:00	43	30.286	
824	Charles LECLERC	HARD	2024-03-02T16:13:51.222000+00:00	44	30.468	
844	Charles LECLERC	HARD	2024-03-02T16:15:26.233000+00:00	45	30.355	
864	Charles LECLERC	HARD	2024-03-02T16:17:01.499000+00:00	46	30.238	
884	Charles LECLERC	HARD	2024-03-02T16:18:36.521000+00:00	47	30.577	

	full_name	compound	date_start	lap_number	duration_sector_1	c
904	Charles LECLERC	HARD	2024-03-02T16:20:11.619000+00:00	48	30.640	
924	Charles LECLERC	HARD	2024-03-02T16:21:47.040000+00:00	49	30.689	
944	Charles LECLERC	HARD	2024-03-02T16:23:22.246000+00:00	50	30.639	
964	Charles LECLERC	HARD	2024-03-02T16:24:57.621000+00:00	51	30.721	
984	Charles LECLERC	HARD	2024-03-02T16:26:33.105000+00:00	52	30.693	
1004	Charles LECLERC	HARD	2024-03-02T16:28:08.474000+00:00	53	30.777	
1024	Charles LECLERC	HARD	2024-03-02T16:29:43.963000+00:00	54	30.700	
1044	Charles LECLERC	HARD	2024-03-02T16:31:19.188000+00:00	55	30.857	
	Charles					

In [204...

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

Out[204...

	full_name	compound	date_start	lap_number	duration_sector_1	c
35	Carlos SAINZ	SOFT	2024-03-02T15:05:23.374000+00:00	2	30.974	
55	Carlos SAINZ	SOFT	2024-03-02T15:07:00.599000+00:00	3	31.049	
75	Carlos SAINZ	SOFT	2024-03-02T15:08:37.735000+00:00	4	30.957	
95	Carlos SAINZ	SOFT	2024-03-02T15:10:14.948000+00:00	5	30.967	
115	Carlos SAINZ	SOFT	2024-03-02T15:11:53.110000+00:00	6	30.879	
135	Carlos SAINZ	SOFT	2024-03-02T15:13:30.813000+00:00	7	30.847	
155	Carlos SAINZ	SOFT	2024-03-02T15:15:09.048000+00:00	8	31.341	
175	Carlos SAINZ	SOFT	2024-03-02T15:16:47.231000+00:00	9	30.990	
193	Carlos SAINZ	SOFT	2024-03-02T15:18:25.188000+00:00	10	30.819	
211	Carlos SAINZ	SOFT	2024-03-02T15:20:02.878000+00:00	11	31.266	
229	Carlos SAINZ	SOFT	2024-03-02T15:21:40.496000+00:00	12	31.089	
245	Carlos SAINZ	SOFT	2024-03-02T15:23:18.127000+00:00	13	31.025	
261	Carlos SAINZ	SOFT	2024-03-02T15:24:55.375000+00:00	14	31.011	
297	Carlos SAINZ	HARD	2024-03-02T15:28:32.415000+00:00	16	30.412	

	full_name	compound	date_start	lap_number	duration_sector_1	c
317	Carlos SAINZ	HARD	2024-03-02T15:30:08.672000+00:00	17	30.202	
336	Carlos SAINZ	HARD	2024-03-02T15:31:44.184000+00:00	18	30.590	
356	Carlos SAINZ	HARD	2024-03-02T15:33:20.251000+00:00	19	30.805	
376	Carlos SAINZ	HARD	2024-03-02T15:34:56.624000+00:00	20	30.786	
395	Carlos SAINZ	HARD	2024-03-02T15:36:32.579000+00:00	21	30.796	
415	Carlos SAINZ	HARD	2024-03-02T15:38:08.718000+00:00	22	30.686	
435	Carlos SAINZ	HARD	2024-03-02T15:39:44.773000+00:00	23	30.738	
455	Carlos SAINZ	HARD	2024-03-02T15:41:20.891000+00:00	24	30.698	
475	Carlos SAINZ	HARD	2024-03-02T15:42:57.074000+00:00	25	30.724	
495	Carlos SAINZ	HARD	2024-03-02T15:44:33.258000+00:00	26	30.714	
515	Carlos SAINZ	HARD	2024-03-02T15:46:09.627000+00:00	27	30.807	
534	Carlos SAINZ	HARD	2024-03-02T15:47:45.755000+00:00	28	30.901	
552	Carlos SAINZ	HARD	2024-03-02T15:49:22.302000+00:00	29	30.852	
572	Carlos SAINZ	HARD	2024-03-02T15:50:58.869000+00:00	30	30.746	
591	Carlos SAINZ	HARD	2024-03-02T15:52:35.311000+00:00	31	30.851	
609	Carlos SAINZ	HARD	2024-03-02T15:54:11.818000+00:00	32	30.873	
627	Carlos SAINZ	HARD	2024-03-02T15:55:48.562000+00:00	33	30.833	
645	Carlos SAINZ	HARD	2024-03-02T15:57:25.132000+00:00	34	30.858	
663	Carlos SAINZ	HARD	2024-03-02T15:59:01.692000+00:00	35	30.872	
698	Carlos SAINZ	HARD	2024-03-02T16:02:36.585000+00:00	37	30.695	
717	Carlos SAINZ	HARD	2024-03-02T16:04:11.792000+00:00	38	30.631	
737	Carlos SAINZ	HARD	2024-03-02T16:05:46.917000+00:00	39	30.481	
757	Carlos SAINZ	HARD	2024-03-02T16:07:21.661000+00:00	40	30.382	
776	Carlos SAINZ	HARD	2024-03-02T16:08:56.441000+00:00	41	30.638	
794	Carlos SAINZ	HARD	2024-03-02T16:10:31.440000+00:00	42	30.448	

	full_name	compound	date_start	lap_number	duration_sector_1	c
814	Carlos SAINZ	HARD	2024-03-02T16:12:06.345000+00:00	43	30.387	
833	Carlos SAINZ	HARD	2024-03-02T16:13:41.129000+00:00	44	30.350	
853	Carlos SAINZ	HARD	2024-03-02T16:15:15.714000+00:00	45	30.398	
873	Carlos SAINZ	HARD	2024-03-02T16:16:50.393000+00:00	46	30.466	
893	Carlos SAINZ	HARD	2024-03-02T16:18:25.312000+00:00	47	30.455	
913	Carlos SAINZ	HARD	2024-03-02T16:20:00.228000+00:00	48	30.602	
933	Carlos SAINZ	HARD	2024-03-02T16:21:35.199000+00:00	49	30.499	
953	Carlos SAINZ	HARD	2024-03-02T16:23:10.557000+00:00	50	30.468	
973	Carlos SAINZ	HARD	2024-03-02T16:24:45.766000+00:00	51	30.502	
993	Carlos SAINZ	HARD	2024-03-02T16:26:20.950000+00:00	52	30.522	
1013	Carlos SAINZ	HARD	2024-03-02T16:27:56.175000+00:00	53	30.491	
1033	Carlos SAINZ	HARD	2024-03-02T16:29:31.299000+00:00	54	30.555	
1053	Carlos SAINZ	HARD	2024-03-02T16:31:06.647000+00:00	55	30.699	
1073	Carlos	HARD	2024-03-02T16:32:41.680000+00:00	56	30.502	

Mercedes

In [205...

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

Out[205...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
7	1229	9472	1	63	1	11	SOFT	
10	1229	9472	1	44	1	12	SOFT	
25	1229	9472	2	63	12	31	HARD	
30	1229	9472	2	44	13	33	HARD	
47	1229	9472	3	63	32	58	HARD	
50	1229	9472	3	44	34	58	HARD	

In [206...

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

Out[206...

	full_name	compound	date_start	lap_number	duration_sector_1
34	Lewis HAMILTON	SOFT	2024-03-02T15:05:25.792000+00:00	2	31.287
54	Lewis HAMILTON	SOFT	2024-03-02T15:07:04.200000+00:00	3	31.062

	full_name	compound	date_start	lap_number	duration_sector_1
74	Lewis HAMILTON	SOFT	2024-03-02T15:08:42.487000+00:00	4	30.983
94	Lewis HAMILTON	SOFT	2024-03-02T15:10:20.703000+00:00	5	31.140
114	Lewis HAMILTON	SOFT	2024-03-02T15:11:59.143000+00:00	6	31.124
134	Lewis HAMILTON	SOFT	2024-03-02T15:13:37.347000+00:00	7	30.829
154	Lewis HAMILTON	SOFT	2024-03-02T15:15:15.137000+00:00	8	31.079
174	Lewis HAMILTON	SOFT	2024-03-02T15:16:53.452000+00:00	9	31.088
192	Lewis HAMILTON	SOFT	2024-03-02T15:18:32.076000+00:00	10	30.931
210	Lewis HAMILTON	SOFT	2024-03-02T15:20:09.948000+00:00	11	31.279
228	Lewis HAMILTON	SOFT	2024-03-02T15:21:48.265000+00:00	12	31.206
260	Lewis HAMILTON	HARD	2024-03-02T15:25:27.851000+00:00	14	31.073
279	Lewis HAMILTON	HARD	2024-03-02T15:27:04.916000+00:00	15	31.095
296	Lewis HAMILTON	HARD	2024-03-02T15:28:42.195000+00:00	16	31.165
316	Lewis HAMILTON	HARD	2024-03-02T15:30:19.310000+00:00	17	30.738
335	Lewis HAMILTON	HARD	2024-03-02T15:31:56.534000+00:00	18	30.825
355	Lewis HAMILTON	HARD	2024-03-02T15:33:33.304000+00:00	19	30.848
375	Lewis HAMILTON	HARD	2024-03-02T15:35:10.110000+00:00	20	30.768
394	Lewis HAMILTON	HARD	2024-03-02T15:36:46.273000+00:00	21	30.757
414	Lewis HAMILTON	HARD	2024-03-02T15:38:22.863000+00:00	22	30.733
434	Lewis HAMILTON	HARD	2024-03-02T15:39:59.469000+00:00	23	30.884
454	Lewis HAMILTON	HARD	2024-03-02T15:41:36.136000+00:00	24	30.826
474	Lewis HAMILTON	HARD	2024-03-02T15:43:12.785000+00:00	25	31.037
494	Lewis HAMILTON	HARD	2024-03-02T15:44:49.842000+00:00	26	30.847
514	Lewis HAMILTON	HARD	2024-03-02T15:46:26.503000+00:00	27	30.891
533	Lewis HAMILTON	HARD	2024-03-02T15:48:03.649000+00:00	28	30.907
551	Lewis HAMILTON	HARD	2024-03-02T15:49:40.397000+00:00	29	30.897

	full_name	compound	date_start	lap_number	duration_sector_1
571	Lewis HAMILTON	HARD	2024-03-02T15:51:17.081000+00:00	30	30.945
590	Lewis HAMILTON	HARD	2024-03-02T15:52:54.392000+00:00	31	30.837
608	Lewis HAMILTON	HARD	2024-03-02T15:54:31.271000+00:00	32	31.076
626	Lewis HAMILTON	HARD	2024-03-02T15:56:08.561000+00:00	33	30.937
662	Lewis HAMILTON	HARD	2024-03-02T15:59:43.463000+00:00	35	30.776
680	Lewis HAMILTON	HARD	2024-03-02T16:01:18.768000+00:00	36	30.303
697	Lewis HAMILTON	HARD	2024-03-02T16:02:54.111000+00:00	37	30.384
716	Lewis HAMILTON	HARD	2024-03-02T16:04:29.729000+00:00	38	30.060
736	Lewis HAMILTON	HARD	2024-03-02T16:06:04.688000+00:00	39	30.170
756	Lewis HAMILTON	HARD	2024-03-02T16:07:39.415000+00:00	40	30.443
775	Lewis HAMILTON	HARD	2024-03-02T16:09:14.712000+00:00	41	30.463
793	Lewis HAMILTON	HARD	2024-03-02T16:10:49.383000+00:00	42	30.426
813	Lewis HAMILTON	HARD	2024-03-02T16:12:24.321000+00:00	43	30.437
832	Lewis HAMILTON	HARD	2024-03-02T16:13:59.266000+00:00	44	30.494
852	Lewis HAMILTON	HARD	2024-03-02T16:15:34.413000+00:00	45	30.483
872	Lewis HAMILTON	HARD	2024-03-02T16:17:09.643000+00:00	46	30.569
892	Lewis HAMILTON	HARD	2024-03-02T16:18:44.938000+00:00	47	30.514
912	Lewis HAMILTON	HARD	2024-03-02T16:20:20.234000+00:00	48	30.691
932	Lewis HAMILTON	HARD	2024-03-02T16:21:56.388000+00:00	49	30.616
952	Lewis HAMILTON	HARD	2024-03-02T16:23:32.313000+00:00	50	30.655
972	Lewis HAMILTON	HARD	2024-03-02T16:25:07.925000+00:00	51	30.597
992	Lewis HAMILTON	HARD	2024-03-02T16:26:43.435000+00:00	52	30.578
1012	Lewis HAMILTON	HARD	2024-03-02T16:28:18.918000+00:00	53	30.643
1032	Lewis HAMILTON	HARD	2024-03-02T16:29:54.421000+00:00	54	30.792
1052	Lewis HAMILTON	HARD	2024-03-02T16:31:30.458000+00:00	55	30.602

```
full_name compound date_start lap_number duration_sector_1

In [207... libraryDataFl.getinfo(longruns(jointables,63,'Mercedes',MINIMUM_SECONDS,MAX...
```

	full_name	compound	date_start	lap_number	duration_sector_1	c
	36	George RUSSELL	SOFT 2024-03-02T15:05:22.022000+00:00	2	30.829	
	56	George RUSSELL	SOFT 2024-03-02T15:06:58.696000+00:00	3	30.367	
	76	George RUSSELL	SOFT 2024-03-02T15:08:35.058000+00:00	4	31.135	
	96	George RUSSELL	SOFT 2024-03-02T15:10:12.768000+00:00	5	31.636	
	116	George RUSSELL	SOFT 2024-03-02T15:11:50.877000+00:00	6	31.360	
	136	George RUSSELL	SOFT 2024-03-02T15:13:28.623000+00:00	7	31.480	
	156	George RUSSELL	SOFT 2024-03-02T15:15:06.812000+00:00	8	31.238	
	176	George RUSSELL	SOFT 2024-03-02T15:16:44.698000+00:00	9	31.120	
	194	George RUSSELL	SOFT 2024-03-02T15:18:22.380000+00:00	10	31.247	
	212	George RUSSELL	SOFT 2024-03-02T15:20:00.058000+00:00	11	31.392	
	246	George RUSSELL	HARD 2024-03-02T15:23:39.099000+00:00	13	30.759	
	262	George RUSSELL	HARD 2024-03-02T15:25:16.275000+00:00	14	30.851	
	280	George RUSSELL	HARD 2024-03-02T15:26:53.936000+00:00	15	31.038	
	298	George RUSSELL	HARD 2024-03-02T15:28:30.769000+00:00	16	31.030	
	318	George RUSSELL	HARD 2024-03-02T15:30:07.342000+00:00	17	30.747	
	337	George RUSSELL	HARD 2024-03-02T15:31:43.804000+00:00	18	31.462	
	357	George RUSSELL	HARD 2024-03-02T15:33:21.541000+00:00	19	31.101	
	377	George RUSSELL	HARD 2024-03-02T15:34:58.739000+00:00	20	30.862	
	396	George RUSSELL	HARD 2024-03-02T15:36:35.429000+00:00	21	30.870	
	416	George RUSSELL	HARD 2024-03-02T15:38:12.188000+00:00	22	30.840	
	436	George RUSSELL	HARD 2024-03-02T15:39:49.229000+00:00	23	31.043	
	456	George RUSSELL	HARD 2024-03-02T15:41:26.181000+00:00	24	30.867	

	full_name	compound	date_start	lap_number	duration_sector_1	c
476	George RUSSELL	HARD	2024-03-02T15:43:02.968000+00:00	25	30.941	
496	George RUSSELL	HARD	2024-03-02T15:44:39.865000+00:00	26	30.867	
516	George RUSSELL	HARD	2024-03-02T15:46:16.674000+00:00	27	30.930	
535	George RUSSELL	HARD	2024-03-02T15:47:53.442000+00:00	28	30.980	
553	George RUSSELL	HARD	2024-03-02T15:49:30.401000+00:00	29	30.993	
573	George RUSSELL	HARD	2024-03-02T15:51:07.487000+00:00	30	31.030	
592	George RUSSELL	HARD	2024-03-02T15:52:44.710000+00:00	31	31.061	
628	George RUSSELL	HARD	2024-03-02T15:56:21.332000+00:00	33	30.638	
646	George RUSSELL	HARD	2024-03-02T15:57:57.242000+00:00	34	30.286	
664	George RUSSELL	HARD	2024-03-02T15:59:32.340000+00:00	35	30.587	
681	George RUSSELL	HARD	2024-03-02T16:01:08.133000+00:00	36	30.608	
699	George RUSSELL	HARD	2024-03-02T16:02:43.566000+00:00	37	30.566	
718	George RUSSELL	HARD	2024-03-02T16:04:19.070000+00:00	38	30.600	
738	George RUSSELL	HARD	2024-03-02T16:05:54.624000+00:00	39	30.547	
758	George RUSSELL	HARD	2024-03-02T16:07:29.749000+00:00	40	30.390	
777	George RUSSELL	HARD	2024-03-02T16:09:04.828000+00:00	41	30.541	
795	George RUSSELL	HARD	2024-03-02T16:10:39.923000+00:00	42	30.570	
815	George RUSSELL	HARD	2024-03-02T16:12:15.140000+00:00	43	30.626	
834	George RUSSELL	HARD	2024-03-02T16:13:50.330000+00:00	44	30.573	
854	George RUSSELL	HARD	2024-03-02T16:15:25.457000+00:00	45	30.599	
874	George RUSSELL	HARD	2024-03-02T16:17:00.856000+00:00	46	30.649	
894	George RUSSELL	HARD	2024-03-02T16:18:37.350000+00:00	47	30.525	
914	George RUSSELL	HARD	2024-03-02T16:20:13.148000+00:00	48	30.794	
934	George RUSSELL	HARD	2024-03-02T16:21:49.305000+00:00	49	30.723	
954	George RUSSELL	HARD	2024-03-02T16:23:25.188000+00:00	50	30.691	

	full_name	compound	date_start	lap_number	duration_sector_1	c
974	George RUSSELL	HARD	2024-03-02T16:25:01.400000+00:00	51	30.639	
994	George RUSSELL	HARD	2024-03-02T16:26:37.299000+00:00	52	30.678	
1014	George RUSSELL	HARD	2024-03-02T16:28:13.377000+00:00	53	30.752	
1034	George RUSSELL	HARD	2024-03-02T16:29:49.387000+00:00	54	30.744	
1054	George RUSSELL	HARD	2024-03-02T16:31:25.398000+00:00	55	30.818	

Aston Martin

In [208...

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

Out[208...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
1	1229	9472	1	18	1	9	SOFT	
17	1229	9472	1	14	1	15	SOFT	
21	1229	9472	2	18	10	27	HARD	
38	1229	9472	2	14	16	41	HARD	
41	1229	9472	3	18	28	58	HARD	
61	1229	9472	3	14	42	58	HARD	

In [209...

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

Out[209...

	full_name	compound	date_start	lap_number	duration_sector_1	c
26	Fernando ALONSO	SOFT	2024-03-02T15:05:24.398000+00:00	2	31.203	
45	Fernando ALONSO	SOFT	2024-03-02T15:07:02.457000+00:00	3	32.068	
65	Fernando ALONSO	SOFT	2024-03-02T15:08:41.450000+00:00	4	30.951	
85	Fernando ALONSO	SOFT	2024-03-02T15:10:19.284000+00:00	5	32.063	
105	Fernando ALONSO	SOFT	2024-03-02T15:11:58.534000+00:00	6	31.076	
125	Fernando ALONSO	SOFT	2024-03-02T15:13:36.615000+00:00	7	30.905	
145	Fernando ALONSO	SOFT	2024-03-02T15:15:14.725000+00:00	8	31.024	
165	Fernando ALONSO	SOFT	2024-03-02T15:16:52.794000+00:00	9	31.464	
185	Fernando ALONSO	SOFT	2024-03-02T15:18:31.590000+00:00	10	31.635	
202	Fernando ALONSO	SOFT	2024-03-02T15:20:11.035000+00:00	11	31.043	

	full_name	compound	date_start	lap_number	duration_sector_1	c
221	Fernando ALONSO	SOFT	2024-03-02T15:21:49.570000+00:00	12	30.932	
236	Fernando ALONSO	SOFT	2024-03-02T15:23:28.001000+00:00	13	31.446	
251	Fernando ALONSO	SOFT	2024-03-02T15:25:06.699000+00:00	14	31.516	
271	Fernando ALONSO	SOFT	2024-03-02T15:26:45.326000+00:00	15	31.480	
307	Fernando ALONSO	HARD	2024-03-02T15:30:25.266000+00:00	17	30.546	
326	Fernando ALONSO	HARD	2024-03-02T15:32:02.084000+00:00	18	31.136	
346	Fernando ALONSO	HARD	2024-03-02T15:33:39.664000+00:00	19	30.967	
366	Fernando ALONSO	HARD	2024-03-02T15:35:16.631000+00:00	20	31.080	
386	Fernando ALONSO	HARD	2024-03-02T15:36:54.028000+00:00	21	30.978	
405	Fernando ALONSO	HARD	2024-03-02T15:38:31.461000+00:00	22	30.882	
425	Fernando ALONSO	HARD	2024-03-02T15:40:08.472000+00:00	23	30.946	
445	Fernando ALONSO	HARD	2024-03-02T15:41:45.663000+00:00	24	30.836	
465	Fernando ALONSO	HARD	2024-03-02T15:43:22.750000+00:00	25	30.925	
485	Fernando ALONSO	HARD	2024-03-02T15:44:59.944000+00:00	26	31.295	
505	Fernando ALONSO	HARD	2024-03-02T15:46:37.575000+00:00	27	31.000	
525	Fernando ALONSO	HARD	2024-03-02T15:48:14.504000+00:00	28	31.091	
543	Fernando ALONSO	HARD	2024-03-02T15:49:51.727000+00:00	29	30.948	
562	Fernando ALONSO	HARD	2024-03-02T15:51:28.922000+00:00	30	30.976	
582	Fernando ALONSO	HARD	2024-03-02T15:53:05.945000+00:00	31	30.866	
599	Fernando ALONSO	HARD	2024-03-02T15:54:42.778000+00:00	32	31.023	
618	Fernando ALONSO	HARD	2024-03-02T15:56:19.912000+00:00	33	31.106	
636	Fernando ALONSO	HARD	2024-03-02T15:57:57.190000+00:00	34	31.211	
655	Fernando ALONSO	HARD	2024-03-02T15:59:34.685000+00:00	35	31.078	
671	Fernando ALONSO	HARD	2024-03-02T16:01:11.896000+00:00	36	31.245	
689	Fernando ALONSO	HARD	2024-03-02T16:02:50.254000+00:00	37	30.500	

	full_name	compound	date_start	lap_number	duration_sector_1	c
707	Fernando ALONSO	HARD	2024-03-02T16:04:27.131000+00:00	38	30.952	
727	Fernando ALONSO	HARD	2024-03-02T16:06:04.374000+00:00	39	31.253	
747	Fernando ALONSO	HARD	2024-03-02T16:07:42.391000+00:00	40	31.525	
766	Fernando ALONSO	HARD	2024-03-02T16:09:20.379000+00:00	41	31.046	
804	Fernando ALONSO	HARD	2024-03-02T16:12:57.493000+00:00	43	30.517	
823	Fernando ALONSO	HARD	2024-03-02T16:14:32.650000+00:00	44	30.334	
843	Fernando ALONSO	HARD	2024-03-02T16:16:07.645000+00:00	45	30.536	
863	Fernando ALONSO	HARD	2024-03-02T16:17:42.564000+00:00	46	30.468	
883	Fernando ALONSO	HARD	2024-03-02T16:19:17.628000+00:00	47	30.596	
903	Fernando ALONSO	HARD	2024-03-02T16:20:52.842000+00:00	48	30.046	
923	Fernando ALONSO	HARD	2024-03-02T16:22:27.126000+00:00	49	30.400	
943	Fernando ALONSO	HARD	2024-03-02T16:24:01.674000+00:00	50	30.453	
963	Fernando ALONSO	HARD	2024-03-02T16:25:36.310000+00:00	51	30.543	
983	Fernando ALONSO	HARD	2024-03-02T16:27:11.199000+00:00	52	30.447	
1003	Fernando ALONSO	HARD	2024-03-02T16:28:46.072000+00:00	53	30.498	
1023	Fernando ALONSO	HARD	2024-03-02T16:30:21.317000+00:00	54	30.701	
1043	Fernando ALONSO	HARD	2024-03-02T16:31:57.067000+00:00	55	30.478	
1063	Fernando	HARD	2024-03-02T16:33:33.161000+00:00	56	30.485	

In [210...

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

Out[210...

	full_name	compound	date_start	lap_number	duration_sector_1	c
28	Lance STROLL	SOFT	2024-03-02T15:05:32.877000+00:00	2	31.319	
47	Lance STROLL	SOFT	2024-03-02T15:07:11.091000+00:00	3	31.279	
67	Lance STROLL	SOFT	2024-03-02T15:08:49.291000+00:00	4	30.944	
87	Lance STROLL	SOFT	2024-03-02T15:10:27.632000+00:00	5	30.987	
107	Lance STROLL	SOFT	2024-03-02T15:12:06.338000+00:00	6	31.554	

	full_name	compound	date_start	lap_number	duration_sector_1	c
127	Lance STROLL	SOFT	2024-03-02T15:13:45.354000+00:00	7	31.302	
147	Lance STROLL	SOFT	2024-03-02T15:15:24.026000+00:00	8	30.963	
167	Lance STROLL	SOFT	2024-03-02T15:17:02.856000+00:00	9	31.431	
204	Lance STROLL	HARD	2024-03-02T15:20:42.802000+00:00	11	30.684	
222	Lance STROLL	HARD	2024-03-02T15:22:19.385000+00:00	12	30.961	
238	Lance STROLL	HARD	2024-03-02T15:23:56.497000+00:00	13	30.988	
253	Lance STROLL	HARD	2024-03-02T15:25:33.710000+00:00	14	31.039	
273	Lance STROLL	HARD	2024-03-02T15:27:11.408000+00:00	15	30.928	
290	Lance STROLL	HARD	2024-03-02T15:28:48.848000+00:00	16	31.238	
309	Lance STROLL	HARD	2024-03-02T15:30:26.910000+00:00	17	31.663	
328	Lance STROLL	HARD	2024-03-02T15:32:05.759000+00:00	18	30.775	
348	Lance STROLL	HARD	2024-03-02T15:33:43.194000+00:00	19	30.774	
368	Lance STROLL	HARD	2024-03-02T15:35:20.751000+00:00	20	31.219	
388	Lance STROLL	HARD	2024-03-02T15:36:58.630000+00:00	21	31.191	
407	Lance STROLL	HARD	2024-03-02T15:38:36.600000+00:00	22	31.109	
427	Lance STROLL	HARD	2024-03-02T15:40:14.803000+00:00	23	31.057	
447	Lance STROLL	HARD	2024-03-02T15:41:52.539000+00:00	24	31.071	
467	Lance STROLL	HARD	2024-03-02T15:43:30.785000+00:00	25	31.105	
487	Lance STROLL	HARD	2024-03-02T15:45:08.677000+00:00	26	31.156	
507	Lance STROLL	HARD	2024-03-02T15:46:46.827000+00:00	27	31.196	
545	Lance STROLL	HARD	2024-03-02T15:50:24.326000+00:00	29	30.749	
564	Lance STROLL	HARD	2024-03-02T15:52:00.091000+00:00	30	30.429	
584	Lance STROLL	HARD	2024-03-02T15:53:35.670000+00:00	31	30.622	
601	Lance STROLL	HARD	2024-03-02T15:55:11.861000+00:00	32	30.248	
620	Lance STROLL	HARD	2024-03-02T15:56:47.793000+00:00	33	30.607	

	full_name	compound	date_start	lap_number	duration_sector_1	c
638	Lance STROLL	HARD	2024-03-02T15:58:24.160000+00:00	34	30.969	
656	Lance STROLL	HARD	2024-03-02T16:00:00.516000+00:00	35	30.837	
673	Lance STROLL	HARD	2024-03-02T16:01:36.672000+00:00	36	30.694	
691	Lance STROLL	HARD	2024-03-02T16:03:12.668000+00:00	37	30.676	
709	Lance STROLL	HARD	2024-03-02T16:04:48.629000+00:00	38	30.776	
729	Lance STROLL	HARD	2024-03-02T16:06:25.202000+00:00	39	30.792	
749	Lance STROLL	HARD	2024-03-02T16:08:01.510000+00:00	40	30.896	
768	Lance STROLL	HARD	2024-03-02T16:09:37.899000+00:00	41	30.877	
787	Lance STROLL	HARD	2024-03-02T16:11:14.251000+00:00	42	30.774	
806	Lance STROLL	HARD	2024-03-02T16:12:50.652000+00:00	43	30.843	
825	Lance STROLL	HARD	2024-03-02T16:14:26.942000+00:00	44	30.788	
845	Lance STROLL	HARD	2024-03-02T16:16:03.464000+00:00	45	30.712	
865	Lance STROLL	HARD	2024-03-02T16:17:39.703000+00:00	46	30.808	
885	Lance STROLL	HARD	2024-03-02T16:19:16.194000+00:00	47	30.835	
905	Lance STROLL	HARD	2024-03-02T16:20:52.403000+00:00	48	31.346	
925	Lance STROLL	HARD	2024-03-02T16:22:29.797000+00:00	49	30.920	
945	Lance STROLL	HARD	2024-03-02T16:24:06.637000+00:00	50	30.808	
965	Lance STROLL	HARD	2024-03-02T16:25:43.121000+00:00	51	30.882	
985	Lance STROLL	HARD	2024-03-02T16:27:19.882000+00:00	52	31.144	
1005	Lance STROLL	HARD	2024-03-02T16:28:56.868000+00:00	53	30.894	
1025	Lance STROLL	HARD	2024-03-02T16:30:33.541000+00:00	54	30.938	
1045	Lance STROLL	HARD	2024-03-02T16:32:10.179000+00:00	55	30.920	
1064	Lance	HARD	2024-03-02T16:33:46.830000+00:00	56	30.870	

McLaren

In [211...]

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

Out[211...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
	12	1229	9472	1	81	1	12	SOFT
	14	1229	9472	1	4	1	13	SOFT
	31	1229	9472	2	81	13	34	HARD
	33	1229	9472	2	4	14	33	HARD
	49	1229	9472	3	4	34	58	HARD
	53	1229	9472	3	81	35	58	HARD

In [212...

libraryDataF1.getinfo(longruns(jointables,4,'McLaren',MINIMUM_SECONDS,MAXIMUM_SECONDS))

Out[212...

	full_name	compound	date_start	lap_number	duration_sector_1	c
23	Lando NORRIS	SOFT	2024-03-02T15:05:24.936000+00:00	2	31.353	
42	Lando NORRIS	SOFT	2024-03-02T15:07:02.960000+00:00	3	31.112	
62	Lando NORRIS	SOFT	2024-03-02T15:08:40.628000+00:00	4	31.115	
82	Lando NORRIS	SOFT	2024-03-02T15:10:18.228000+00:00	5	31.258	
102	Lando NORRIS	SOFT	2024-03-02T15:11:55.985000+00:00	6	31.027	
122	Lando NORRIS	SOFT	2024-03-02T15:13:33.929000+00:00	7	31.074	
142	Lando NORRIS	SOFT	2024-03-02T15:15:11.730000+00:00	8	31.171	
162	Lando NORRIS	SOFT	2024-03-02T15:16:49.846000+00:00	9	31.051	
182	Lando NORRIS	SOFT	2024-03-02T15:18:27.948000+00:00	10	31.019	
199	Lando NORRIS	SOFT	2024-03-02T15:20:05.925000+00:00	11	31.163	
218	Lando NORRIS	SOFT	2024-03-02T15:21:44.002000+00:00	12	31.232	
235	Lando NORRIS	SOFT	2024-03-02T15:23:22.125000+00:00	13	31.225	
268	Lando NORRIS	HARD	2024-03-02T15:27:00.555000+00:00	15	31.011	
286	Lando NORRIS	HARD	2024-03-02T15:28:37.388000+00:00	16	30.716	
304	Lando NORRIS	HARD	2024-03-02T15:30:13.916000+00:00	17	31.049	
323	Lando NORRIS	HARD	2024-03-02T15:31:50.859000+00:00	18	30.803	
343	Lando NORRIS	HARD	2024-03-02T15:33:27.355000+00:00	19	30.870	
363	Lando NORRIS	HARD	2024-03-02T15:35:03.732000+00:00	20	30.817	

	full_name	compound	date_start	lap_number	duration_sector_1	c
383	Lando NORRIS	HARD	2024-03-02T15:36:40.343000+00:00	21	30.889	
402	Lando NORRIS	HARD	2024-03-02T15:38:16.778000+00:00	22	30.839	
422	Lando NORRIS	HARD	2024-03-02T15:39:53.580000+00:00	23	30.920	
442	Lando NORRIS	HARD	2024-03-02T15:41:30.241000+00:00	24	30.890	
462	Lando NORRIS	HARD	2024-03-02T15:43:07.105000+00:00	25	30.923	
482	Lando NORRIS	HARD	2024-03-02T15:44:43.799000+00:00	26	30.845	
502	Lando NORRIS	HARD	2024-03-02T15:46:20.396000+00:00	27	30.873	
522	Lando NORRIS	HARD	2024-03-02T15:47:57.155000+00:00	28	30.980	
540	Lando NORRIS	HARD	2024-03-02T15:49:34.073000+00:00	29	30.879	
559	Lando NORRIS	HARD	2024-03-02T15:51:11.080000+00:00	30	30.946	
579	Lando NORRIS	HARD	2024-03-02T15:52:48.038000+00:00	31	30.944	
597	Lando NORRIS	HARD	2024-03-02T15:54:25.231000+00:00	32	30.994	
615	Lando NORRIS	HARD	2024-03-02T15:56:02.409000+00:00	33	31.223	
652	Lando NORRIS	HARD	2024-03-02T15:59:38.849000+00:00	35	30.320	
668	Lando NORRIS	HARD	2024-03-02T16:01:13.329000+00:00	36	30.162	
687	Lando NORRIS	HARD	2024-03-02T16:02:48.969000+00:00	37	30.355	
704	Lando NORRIS	HARD	2024-03-02T16:04:24.164000+00:00	38	30.480	
724	Lando NORRIS	HARD	2024-03-02T16:05:59.266000+00:00	39	30.350	
744	Lando NORRIS	HARD	2024-03-02T16:07:34.085000+00:00	40	30.366	
763	Lando NORRIS	HARD	2024-03-02T16:09:09.505000+00:00	41	30.318	
783	Lando NORRIS	HARD	2024-03-02T16:10:44.570000+00:00	42	30.402	
801	Lando NORRIS	HARD	2024-03-02T16:12:19.712000+00:00	43	30.462	
821	Lando NORRIS	HARD	2024-03-02T16:13:54.953000+00:00	44	30.488	
840	Lando NORRIS	HARD	2024-03-02T16:15:30.301000+00:00	45	30.468	
860	Lando NORRIS	HARD	2024-03-02T16:17:05.675000+00:00	46	30.485	

	full_name	compound	date_start	lap_number	duration_sector_1	c
880	Lando NORRIS	HARD	2024-03-02T16:18:41.051000+00:00	47	30.546	
900	Lando NORRIS	HARD	2024-03-02T16:20:16.464000+00:00	48	30.638	
920	Lando NORRIS	HARD	2024-03-02T16:21:52.235000+00:00	49	30.640	
940	Lando NORRIS	HARD	2024-03-02T16:23:28.003000+00:00	50	30.563	
960	Lando NORRIS	HARD	2024-03-02T16:25:03.574000+00:00	51	30.786	
980	Lando NORRIS	HARD	2024-03-02T16:26:39.548000+00:00	52	30.655	
1000	Lando NORRIS	HARD	2024-03-02T16:28:15.586000+00:00	53	30.666	
1020	Lando NORRIS	HARD	2024-03-02T16:29:51.390000+00:00	54	30.672	
1040	Lando NORRIS	HARD	2024-03-02T16:31:27.363000+00:00	55	31.035	
	Lando					

In [213...

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

Out[213...

	full_name	compound	date_start	lap_number	duration_sector_1	c
38	Oscar PIASTR	SOFT	2024-03-02T15:05:25.300000+00:00	2	31.429	
58	Oscar PIASTR	SOFT	2024-03-02T15:07:03.737000+00:00	3	31.147	
78	Oscar PIASTR	SOFT	2024-03-02T15:08:42.010000+00:00	4	31.113	
98	Oscar PIASTR	SOFT	2024-03-02T15:10:19.912000+00:00	5	30.894	
118	Oscar PIASTR	SOFT	2024-03-02T15:11:57.638000+00:00	6	31.412	
138	Oscar PIASTR	SOFT	2024-03-02T15:13:35.738000+00:00	7	31.164	
158	Oscar PIASTR	SOFT	2024-03-02T15:15:13.609000+00:00	8	31.179	
178	Oscar PIASTR	SOFT	2024-03-02T15:16:51.643000+00:00	9	31.211	
196	Oscar PIASTR	SOFT	2024-03-02T15:18:29.706000+00:00	10	31.294	
214	Oscar PIASTR	SOFT	2024-03-02T15:20:07.846000+00:00	11	31.276	
231	Oscar PIASTR	SOFT	2024-03-02T15:21:46.243000+00:00	12	31.364	
264	Oscar PIASTR	HARD	2024-03-02T15:25:25.542000+00:00	14	30.920	
282	Oscar PIASTR	HARD	2024-03-02T15:27:02.452000+00:00	15	31.008	

	full_name	compound	date_start	lap_number	duration_sector_1	c
300	Oscar PIASTRI	HARD	2024-03-02T15:28:39.182000+00:00	16	30.706	
320	Oscar PIASTRI	HARD	2024-03-02T15:30:15.550000+00:00	17	30.863	
339	Oscar PIASTRI	HARD	2024-03-02T15:31:52.578000+00:00	18	30.958	
359	Oscar PIASTRI	HARD	2024-03-02T15:33:29.643000+00:00	19	30.840	
379	Oscar PIASTRI	HARD	2024-03-02T15:35:06.210000+00:00	20	30.982	
398	Oscar PIASTRI	HARD	2024-03-02T15:36:42.834000+00:00	21	30.904	
418	Oscar PIASTRI	HARD	2024-03-02T15:38:19.659000+00:00	22	30.870	
438	Oscar PIASTRI	HARD	2024-03-02T15:39:56.149000+00:00	23	30.953	
458	Oscar PIASTRI	HARD	2024-03-02T15:41:32.778000+00:00	24	31.104	
478	Oscar PIASTRI	HARD	2024-03-02T15:43:09.734000+00:00	25	31.017	
498	Oscar PIASTRI	HARD	2024-03-02T15:44:46.723000+00:00	26	30.940	
518	Oscar PIASTRI	HARD	2024-03-02T15:46:23.673000+00:00	27	31.034	
537	Oscar PIASTRI	HARD	2024-03-02T15:48:00.491000+00:00	28	31.028	
555	Oscar PIASTRI	HARD	2024-03-02T15:49:37.484000+00:00	29	31.070	
575	Oscar PIASTRI	HARD	2024-03-02T15:51:14.548000+00:00	30	31.020	
593	Oscar PIASTRI	HARD	2024-03-02T15:52:51.800000+00:00	31	30.979	
611	Oscar PIASTRI	HARD	2024-03-02T15:54:29.304000+00:00	32	30.956	
630	Oscar PIASTRI	HARD	2024-03-02T15:56:06.542000+00:00	33	31.023	
648	Oscar PIASTRI	HARD	2024-03-02T15:57:43.519000+00:00	34	30.933	
683	Oscar PIASTRI	HARD	2024-03-02T16:01:22.454000+00:00	36	30.577	
701	Oscar PIASTRI	HARD	2024-03-02T16:02:57.644000+00:00	37	30.469	
720	Oscar PIASTRI	HARD	2024-03-02T16:04:32.414000+00:00	38	30.613	
740	Oscar PIASTRI	HARD	2024-03-02T16:06:07.770000+00:00	39	30.196	
760	Oscar PIASTRI	HARD	2024-03-02T16:07:42.787000+00:00	40	30.329	
779	Oscar PIASTRI	HARD	2024-03-02T16:09:17.635000+00:00	41	30.504	

	full_name	compound	date_start	lap_number	duration_sector_1	c
797	Oscar PIASTRI	HARD	2024-03-02T16:10:52.836000+00:00	42	30.605	
817	Oscar PIASTRI	HARD	2024-03-02T16:12:28.242000+00:00	43	30.520	
836	Oscar PIASTRI	HARD	2024-03-02T16:14:03.437000+00:00	44	30.489	
856	Oscar PIASTRI	HARD	2024-03-02T16:15:38.674000+00:00	45	30.589	
876	Oscar PIASTRI	HARD	2024-03-02T16:17:13.949000+00:00	46	30.594	
896	Oscar PIASTRI	HARD	2024-03-02T16:18:49.248000+00:00	47	30.504	
916	Oscar PIASTRI	HARD	2024-03-02T16:20:24.634000+00:00	48	30.651	
936	Oscar PIASTRI	HARD	2024-03-02T16:22:00.340000+00:00	49	30.619	
956	Oscar PIASTRI	HARD	2024-03-02T16:23:35.926000+00:00	50	30.790	
976	Oscar PIASTRI	HARD	2024-03-02T16:25:11.951000+00:00	51	30.740	
996	Oscar PIASTRI	HARD	2024-03-02T16:26:47.817000+00:00	52	30.765	
1016	Oscar PIASTRI	HARD	2024-03-02T16:28:23.925000+00:00	53	30.770	
1036	Oscar PIASTRI	HARD	2024-03-02T16:29:59.604000+00:00	54	30.976	
1056	Oscar PIASTRI	HARD	2024-03-02T16:31:35.612000+00:00	55	30.879	
----	Oscar	-----	-----	--	-----	

RB

In [214...

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

Out[214...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
13	1229	9472	1	3	1	13	SOFT	
15	1229	9472	1	22	1	14	SOFT	
34	1229	9472	2	3	14	35	HARD	
35	1229	9472	2	22	15	34	HARD	
51	1229	9472	3	22	35	57	HARD	
54	1229	9472	3	3	36	57	SOFT	

In [215...

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

Out[215...

	full_name	compound	date_start	lap_number	duration_sector_1	c
22	Daniel RICCIARDO	SOFT	2024-03-02T15:05:28.518000+00:00	2	31.662	

	full_name	compound	date_start	lap_number	duration_sector_1
41	Daniel RICCIARDO	SOFT	2024-03-02T15:07:07.994000+00:00	3	30.965
61	Daniel RICCIARDO	SOFT	2024-03-02T15:08:46.663000+00:00	4	30.922
81	Daniel RICCIARDO	SOFT	2024-03-02T15:10:25.323000+00:00	5	30.980
101	Daniel RICCIARDO	SOFT	2024-03-02T15:12:03.968000+00:00	6	31.046
121	Daniel RICCIARDO	SOFT	2024-03-02T15:13:42.734000+00:00	7	31.372
141	Daniel RICCIARDO	SOFT	2024-03-02T15:15:21.929000+00:00	8	31.254
161	Daniel RICCIARDO	SOFT	2024-03-02T15:17:01.403000+00:00	9	31.173
181	Daniel RICCIARDO	SOFT	2024-03-02T15:18:40.795000+00:00	10	31.211
198	Daniel RICCIARDO	SOFT	2024-03-02T15:20:19.592000+00:00	11	31.472
217	Daniel RICCIARDO	SOFT	2024-03-02T15:21:58.583000+00:00	12	31.451
234	Daniel RICCIARDO	SOFT	2024-03-02T15:23:37.402000+00:00	13	31.460
267	Daniel RICCIARDO	HARD	2024-03-02T15:27:19.085000+00:00	15	31.083
285	Daniel RICCIARDO	HARD	2024-03-02T15:28:56.218000+00:00	16	30.966
303	Daniel RICCIARDO	HARD	2024-03-02T15:30:33.373000+00:00	17	30.789
322	Daniel RICCIARDO	HARD	2024-03-02T15:32:10.639000+00:00	18	30.949
342	Daniel RICCIARDO	HARD	2024-03-02T15:33:48.393000+00:00	19	31.051
362	Daniel RICCIARDO	HARD	2024-03-02T15:35:26.660000+00:00	20	31.036
382	Daniel RICCIARDO	HARD	2024-03-02T15:37:04.616000+00:00	21	30.941
401	Daniel RICCIARDO	HARD	2024-03-02T15:38:41.798000+00:00	22	31.102
421	Daniel RICCIARDO	HARD	2024-03-02T15:40:19.947000+00:00	23	31.019
441	Daniel RICCIARDO	HARD	2024-03-02T15:41:57.409000+00:00	24	30.983
461	Daniel RICCIARDO	HARD	2024-03-02T15:43:35.195000+00:00	25	31.017
481	Daniel RICCIARDO	HARD	2024-03-02T15:45:13.232000+00:00	26	30.982
501	Daniel RICCIARDO	HARD	2024-03-02T15:46:51.249000+00:00	27	31.268
521	Daniel RICCIARDO	HARD	2024-03-02T15:48:29.382000+00:00	28	31.076

	full_name	compound	date_start	lap_number	duration_sector_1
539	Daniel RICCIARDO	HARD	2024-03-02T15:50:07.275000+00:00	29	31.066
558	Daniel RICCIARDO	HARD	2024-03-02T15:51:45.437000+00:00	30	31.075
578	Daniel RICCIARDO	HARD	2024-03-02T15:53:23.390000+00:00	31	31.167
596	Daniel RICCIARDO	HARD	2024-03-02T15:55:01.443000+00:00	32	31.075
614	Daniel RICCIARDO	HARD	2024-03-02T15:56:39.538000+00:00	33	31.113
633	Daniel RICCIARDO	HARD	2024-03-02T15:58:17.784000+00:00	34	31.246
651	Daniel RICCIARDO	HARD	2024-03-02T15:59:55.950000+00:00	35	31.087
686	Daniel RICCIARDO	SOFT	2024-03-02T16:03:33.600000+00:00	37	30.422
703	Daniel RICCIARDO	SOFT	2024-03-02T16:05:08.735000+00:00	38	30.496
723	Daniel RICCIARDO	SOFT	2024-03-02T16:06:44.228000+00:00	39	30.559
743	Daniel RICCIARDO	SOFT	2024-03-02T16:08:19.639000+00:00	40	30.490
762	Daniel RICCIARDO	SOFT	2024-03-02T16:09:55.238000+00:00	41	30.564
782	Daniel RICCIARDO	SOFT	2024-03-02T16:11:30.851000+00:00	42	30.484
800	Daniel RICCIARDO	SOFT	2024-03-02T16:13:06.228000+00:00	43	30.537
820	Daniel RICCIARDO	SOFT	2024-03-02T16:14:41.745000+00:00	44	30.541
839	Daniel RICCIARDO	SOFT	2024-03-02T16:16:17.266000+00:00	45	30.497
859	Daniel RICCIARDO	SOFT	2024-03-02T16:17:52.732000+00:00	46	30.443
879	Daniel RICCIARDO	SOFT	2024-03-02T16:19:28.393000+00:00	47	30.566
899	Daniel RICCIARDO	SOFT	2024-03-02T16:21:04.244000+00:00	48	30.638
919	Daniel RICCIARDO	SOFT	2024-03-02T16:22:40.347000+00:00	49	30.630
939	Daniel RICCIARDO	SOFT	2024-03-02T16:24:16.835000+00:00	50	30.398
959	Daniel RICCIARDO	SOFT	2024-03-02T16:25:53.407000+00:00	51	30.775
979	Daniel RICCIARDO	SOFT	2024-03-02T16:27:30.618000+00:00	52	30.569
999	Daniel RICCIARDO	SOFT	2024-03-02T16:29:07.991000+00:00	53	30.797
1019	Daniel RICCIARDO	SOFT	2024-03-02T16:30:44.871000+00:00	54	30.374

```
full_name compound date_start lap_number duration_sector_1

In [216... libraryDataF1.getinfo(longruns(jointables,22,'RB'),MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

	full_name	compound	date_start	lap_number	duration_sector_1
Out[216...]					
	30	Yuki TSUNODA	SOFT 2024-03-02T15:05:26.188000+00:00	2	31.675
	49	Yuki TSUNODA	SOFT 2024-03-02T15:07:04.993000+00:00	3	30.989
	69	Yuki TSUNODA	SOFT 2024-03-02T15:08:43.327000+00:00	4	31.025
	89	Yuki TSUNODA	SOFT 2024-03-02T15:10:21.674000+00:00	5	31.023
	109	Yuki TSUNODA	SOFT 2024-03-02T15:12:00.082000+00:00	6	31.132
	129	Yuki TSUNODA	SOFT 2024-03-02T15:13:38.399000+00:00	7	31.121
	149	Yuki TSUNODA	SOFT 2024-03-02T15:15:16.764000+00:00	8	31.298
	169	Yuki TSUNODA	SOFT 2024-03-02T15:16:55.234000+00:00	9	31.329
	188	Yuki TSUNODA	SOFT 2024-03-02T15:18:33.869000+00:00	10	31.476
	206	Yuki TSUNODA	SOFT 2024-03-02T15:20:12.682000+00:00	11	31.342
	223	Yuki TSUNODA	SOFT 2024-03-02T15:21:51.504000+00:00	12	31.398
	240	Yuki TSUNODA	SOFT 2024-03-02T15:23:30.182000+00:00	13	31.511
	255	Yuki TSUNODA	SOFT 2024-03-02T15:25:09.093000+00:00	14	31.394
	292	Yuki TSUNODA	HARD 2024-03-02T15:28:49.899000+00:00	16	30.895
	311	Yuki TSUNODA	HARD 2024-03-02T15:30:27.374000+00:00	17	30.908
	330	Yuki TSUNODA	HARD 2024-03-02T15:32:04.756000+00:00	18	30.973
	350	Yuki TSUNODA	HARD 2024-03-02T15:33:42.194000+00:00	19	31.096
	370	Yuki TSUNODA	HARD 2024-03-02T15:35:19.661000+00:00	20	31.229
	390	Yuki TSUNODA	HARD 2024-03-02T15:36:57.391000+00:00	21	31.144
	409	Yuki TSUNODA	HARD 2024-03-02T15:38:35.134000+00:00	22	31.173
	429	Yuki TSUNODA	HARD 2024-03-02T15:40:12.950000+00:00	23	31.096
	449	Yuki TSUNODA	HARD 2024-03-02T15:41:50.721000+00:00	24	31.145

	full_name	compound	date_start	lap_number	duration_sector_1
469	Yuki TSUNODA	HARD	2024-03-02T15:43:28.420000+00:00	25	31.050
489	Yuki TSUNODA	HARD	2024-03-02T15:45:06.152000+00:00	26	31.252
509	Yuki TSUNODA	HARD	2024-03-02T15:46:44.254000+00:00	27	31.195
528	Yuki TSUNODA	HARD	2024-03-02T15:48:22.363000+00:00	28	31.266
547	Yuki TSUNODA	HARD	2024-03-02T15:50:00.438000+00:00	29	31.161
566	Yuki TSUNODA	HARD	2024-03-02T15:51:38.198000+00:00	30	31.158
586	Yuki TSUNODA	HARD	2024-03-02T15:53:15.776000+00:00	31	31.151
603	Yuki TSUNODA	HARD	2024-03-02T15:54:53.228000+00:00	32	31.448
621	Yuki TSUNODA	HARD	2024-03-02T15:56:30.990000+00:00	33	31.221
640	Yuki TSUNODA	HARD	2024-03-02T15:58:08.559000+00:00	34	31.415
675	Yuki TSUNODA	HARD	2024-03-02T16:01:46.840000+00:00	36	31.984
693	Yuki TSUNODA	HARD	2024-03-02T16:03:24.464000+00:00	37	30.480
711	Yuki TSUNODA	HARD	2024-03-02T16:05:00.350000+00:00	38	30.732
731	Yuki TSUNODA	HARD	2024-03-02T16:06:37.398000+00:00	39	30.733
751	Yuki TSUNODA	HARD	2024-03-02T16:08:13.525000+00:00	40	30.886
770	Yuki TSUNODA	HARD	2024-03-02T16:09:49.850000+00:00	41	30.801
789	Yuki TSUNODA	HARD	2024-03-02T16:11:25.885000+00:00	42	30.697
808	Yuki TSUNODA	HARD	2024-03-02T16:13:01.981000+00:00	43	30.713
827	Yuki TSUNODA	HARD	2024-03-02T16:14:37.932000+00:00	44	30.776
847	Yuki TSUNODA	HARD	2024-03-02T16:16:14.062000+00:00	45	30.648
867	Yuki TSUNODA	HARD	2024-03-02T16:17:49.996000+00:00	46	30.807
887	Yuki TSUNODA	HARD	2024-03-02T16:19:26.137000+00:00	47	30.794
907	Yuki TSUNODA	HARD	2024-03-02T16:21:02.671000+00:00	48	30.848
927	Yuki TSUNODA	HARD	2024-03-02T16:22:39.236000+00:00	49	30.670
947	Yuki TSUNODA	HARD	2024-03-02T16:24:15.808000+00:00	50	30.762

	full_name	compound	date_start	lap_number	duration_sector_1
967	Yuki TSUNODA	HARD	2024-03-02T16:25:52.708000+00:00	51	30.949
987	Yuki TSUNODA	HARD	2024-03-02T16:27:29.740000+00:00	52	31.511
1007	Yuki TSUNODA	HARD	2024-03-02T16:29:08.874000+00:00	53	30.739
1027	Yuki TSUNODA	HARD	2024-03-02T16:30:45.648000+00:00	54	30.741

Haas F1 Team

In [217...

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

Out[217...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
0	1229	9472	1	27	1	1	SOFT	
6	1229	9472	1	20	1	11	SOFT	
20	1229	9472	2	27	2	20	HARD	
26	1229	9472	2	20	12	32	HARD	
40	1229	9472	3	27	21	41	HARD	
48	1229	9472	3	20	33	57	HARD	
60	1229	9472	4	27	42	57	SOFT	

In [218...

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

Out[218...

	full_name	compound	date_start	lap_number	duration_sector_1
19	Kevin MAGNUSSEN	SOFT	2024-03-01T12:46:33.444000+00:00	2	29.354
68	Kevin MAGNUSSEN	SOFT	2024-03-01T12:53:16.767000+00:00	5	29.454
108	Kevin MAGNUSSEN	SOFT	2024-03-01T12:58:48.753000+00:00	8	30.839
116	Kevin MAGNUSSEN	SOFT	2024-03-01T13:00:24.759000+00:00	9	30.697
124	Kevin MAGNUSSEN	SOFT	2024-03-01T13:02:00.569000+00:00	10	30.826
133	Kevin MAGNUSSEN	SOFT	2024-03-01T13:03:36.315000+00:00	11	30.640
138	Kevin MAGNUSSEN	SOFT	2024-03-01T13:05:12.333000+00:00	12	30.887
144	Kevin MAGNUSSEN	SOFT	2024-03-01T13:06:48.301000+00:00	13	30.900
229	Kevin MAGNUSSEN	SOFT	2024-03-01T13:22:20.328000+00:00	15	29.302
253	Kevin MAGNUSSEN	SOFT	2024-03-01T13:26:47.614000+00:00	17	29.327

```
In [219... libraryDataF1.getinfo(longruns(jointables2,27,'Haas F1 Team',MINIMUM_SECONDS=
```

	full_name	compound	date_start	lap_number	duration_sector_1	c
22	Nico HULKENBERG	SOFT	2024-03-01T12:47:31.967000+00:00	2	29.736	
71	Nico HULKENBERG	SOFT	2024-03-01T12:53:38.150000+00:00	5	29.711	
84	Nico HULKENBERG	SOFT	2024-03-01T12:55:11.230000+00:00	6	32.291	
227	Nico HULKENBERG	SOFT	2024-03-01T13:22:12.333000+00:00	8	29.171	

Kick Sauber

```
In [220... stintInformation.query('driver_number == 24 or driver_number == 77')
```

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	type
2	1229	9472	1	24	1	9	SOFT	
11	1229	9472	1	77	1	12	SOFT	
22	1229	9472	2	24	10	28	HARD	
28	1229	9472	2	77	13	30	HARD	
43	1229	9472	3	24	29	57	HARD	
45	1229	9472	3	77	31	57	HARD	

```
In [221... libraryDataF1.getinfo(longruns(jointables,24,'Kick Sauber',MINIMUM_SECONDS=
```

	full_name	compound	date_start	lap_number	duration_sector_1	c
32	ZHOU Guanyu	SOFT	2024-03-02T15:05:27.553000+00:00	2	31.452	
51	ZHOU Guanyu	SOFT	2024-03-02T15:07:06.448000+00:00	3	31.044	
71	ZHOU Guanyu	SOFT	2024-03-02T15:08:45.105000+00:00	4	30.977	
91	ZHOU Guanyu	SOFT	2024-03-02T15:10:23.479000+00:00	5	31.116	
111	ZHOU Guanyu	SOFT	2024-03-02T15:12:02.417000+00:00	6	30.860	
131	ZHOU Guanyu	SOFT	2024-03-02T15:13:40.801000+00:00	7	31.488	
151	ZHOU Guanyu	SOFT	2024-03-02T15:15:20.426000+00:00	8	31.786	
171	ZHOU Guanyu	SOFT	2024-03-02T15:16:59.925000+00:00	9	31.330	
208	ZHOU Guanyu	HARD	2024-03-02T15:20:41.091000+00:00	11	30.815	
225	ZHOU Guanyu	HARD	2024-03-02T15:22:17.447000+00:00	12	31.006	

	full_name	compound	date_start	lap_number	duration_sector_1	c
242	ZHOU Guanyu	HARD	2024-03-02T15:23:54.484000+00:00	13	30.982	
257	ZHOU Guanyu	HARD	2024-03-02T15:25:31.903000+00:00	14	31.086	
276	ZHOU Guanyu	HARD	2024-03-02T15:27:09.327000+00:00	15	31.030	
293	ZHOU Guanyu	HARD	2024-03-02T15:28:46.855000+00:00	16	31.166	
313	ZHOU Guanyu	HARD	2024-03-02T15:30:24.608000+00:00	17	31.431	
332	ZHOU Guanyu	HARD	2024-03-02T15:32:03.062000+00:00	18	30.919	
352	ZHOU Guanyu	HARD	2024-03-02T15:33:40.534000+00:00	19	30.887	
372	ZHOU Guanyu	HARD	2024-03-02T15:35:18.352000+00:00	20	31.239	
392	ZHOU Guanyu	HARD	2024-03-02T15:36:56.088000+00:00	21	31.220	
411	ZHOU Guanyu	HARD	2024-03-02T15:38:33.933000+00:00	22	31.171	
431	ZHOU Guanyu	HARD	2024-03-02T15:40:11.864000+00:00	23	31.092	
451	ZHOU Guanyu	HARD	2024-03-02T15:41:49.651000+00:00	24	31.140	
471	ZHOU Guanyu	HARD	2024-03-02T15:43:27.547000+00:00	25	31.246	
491	ZHOU Guanyu	HARD	2024-03-02T15:45:05.392000+00:00	26	31.266	
511	ZHOU Guanyu	HARD	2024-03-02T15:46:43.373000+00:00	27	31.367	
530	ZHOU Guanyu	HARD	2024-03-02T15:48:21.492000+00:00	28	31.279	
568	ZHOU Guanyu	HARD	2024-03-02T15:51:59.185000+00:00	30	30.674	
588	ZHOU Guanyu	HARD	2024-03-02T15:53:34.762000+00:00	31	30.846	
605	ZHOU Guanyu	HARD	2024-03-02T15:55:10.879000+00:00	32	30.646	
623	ZHOU Guanyu	HARD	2024-03-02T15:56:47.028000+00:00	33	31.535	
642	ZHOU Guanyu	HARD	2024-03-02T15:58:24.865000+00:00	34	30.678	
659	ZHOU Guanyu	HARD	2024-03-02T16:00:01.522000+00:00	35	30.612	
677	ZHOU Guanyu	HARD	2024-03-02T16:01:37.947000+00:00	36	31.090	
694	ZHOU Guanyu	HARD	2024-03-02T16:03:15.061000+00:00	37	30.874	
713	ZHOU Guanyu	HARD	2024-03-02T16:04:51.723000+00:00	38	30.915	

	full_name	compound	date_start	lap_number	duration_sector_1	c
733	ZHOU Guanyu	HARD	2024-03-02T16:06:28.541000+00:00	39	30.904	
753	ZHOU Guanyu	HARD	2024-03-02T16:08:05.196000+00:00	40	30.839	
772	ZHOU Guanyu	HARD	2024-03-02T16:09:42.037000+00:00	41	30.827	
791	ZHOU Guanyu	HARD	2024-03-02T16:11:18.659000+00:00	42	31.038	
810	ZHOU Guanyu	HARD	2024-03-02T16:12:55.181000+00:00	43	30.877	
829	ZHOU Guanyu	HARD	2024-03-02T16:14:32.091000+00:00	44	31.361	
849	ZHOU Guanyu	HARD	2024-03-02T16:16:09.411000+00:00	45	30.867	
869	ZHOU Guanyu	HARD	2024-03-02T16:17:46.133000+00:00	46	30.966	
889	ZHOU Guanyu	HARD	2024-03-02T16:19:22.899000+00:00	47	30.934	
909	ZHOU Guanyu	HARD	2024-03-02T16:20:59.445000+00:00	48	30.980	
929	ZHOU Guanyu	HARD	2024-03-02T16:22:36.050000+00:00	49	30.900	
949	ZHOU Guanyu	HARD	2024-03-02T16:24:12.795000+00:00	50	31.035	
969	ZHOU Guanyu	HARD	2024-03-02T16:25:49.619000+00:00	51	31.065	
989	ZHOU Guanyu	HARD	2024-03-02T16:27:26.664000+00:00	52	31.205	
1009	ZHOU Guanyu	HARD	2024-03-02T16:29:04.067000+00:00	53	31.110	
1029	ZHOU Guanyu	HARD	2024-03-02T16:30:41.267000+00:00	54	31.253	
1049	ZHOU Guanyu	HARD	2024-03-02T16:32:19.620000+00:00	55	31.123	

In [222...

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

Out[222...

	full_name	compound	date_start	lap_number	duration_sector_1	c
37	Valtteri BOTTAS	SOFT	2024-03-02T15:05:31.193000+00:00	2	31.351	
57	Valtteri BOTTAS	SOFT	2024-03-02T15:07:09.750000+00:00	3	31.119	
77	Valtteri BOTTAS	SOFT	2024-03-02T15:08:48.424000+00:00	4	31.127	
97	Valtteri BOTTAS	SOFT	2024-03-02T15:10:27.119000+00:00	5	31.083	
117	Valtteri BOTTAS	SOFT	2024-03-02T15:12:07.153000+00:00	6	31.184	

	full_name	compound	date_start	lap_number	duration_sector_1	c
137	Valtteri BOTTAS	SOFT	2024-03-02T15:13:46.456000+00:00	7	31.034	
157	Valtteri BOTTAS	SOFT	2024-03-02T15:15:25.115000+00:00	8	30.959	
177	Valtteri BOTTAS	SOFT	2024-03-02T15:17:04.011000+00:00	9	31.373	
195	Valtteri BOTTAS	SOFT	2024-03-02T15:18:43.373000+00:00	10	31.409	
213	Valtteri BOTTAS	SOFT	2024-03-02T15:20:22.466000+00:00	11	31.524	
230	Valtteri BOTTAS	SOFT	2024-03-02T15:22:01.819000+00:00	12	31.822	
263	Valtteri BOTTAS	HARD	2024-03-02T15:25:45.976000+00:00	14	30.501	
281	Valtteri BOTTAS	HARD	2024-03-02T15:27:22.430000+00:00	15	31.063	
299	Valtteri BOTTAS	HARD	2024-03-02T15:28:59.697000+00:00	16	31.204	
319	Valtteri BOTTAS	HARD	2024-03-02T15:30:37.457000+00:00	17	31.183	
338	Valtteri BOTTAS	HARD	2024-03-02T15:32:15.210000+00:00	18	31.142	
358	Valtteri BOTTAS	HARD	2024-03-02T15:33:53.037000+00:00	19	30.897	
378	Valtteri BOTTAS	HARD	2024-03-02T15:35:30.809000+00:00	20	31.078	
397	Valtteri BOTTAS	HARD	2024-03-02T15:37:09.085000+00:00	21	31.020	
417	Valtteri BOTTAS	HARD	2024-03-02T15:38:46.796000+00:00	22	31.340	
437	Valtteri BOTTAS	HARD	2024-03-02T15:40:24.676000+00:00	23	31.375	
457	Valtteri BOTTAS	HARD	2024-03-02T15:42:03.030000+00:00	24	31.186	
477	Valtteri BOTTAS	HARD	2024-03-02T15:43:41.117000+00:00	25	31.299	
497	Valtteri BOTTAS	HARD	2024-03-02T15:45:19.272000+00:00	26	31.266	
517	Valtteri BOTTAS	HARD	2024-03-02T15:46:57.612000+00:00	27	31.325	
536	Valtteri BOTTAS	HARD	2024-03-02T15:48:36.051000+00:00	28	31.285	
554	Valtteri BOTTAS	HARD	2024-03-02T15:50:14.563000+00:00	29	31.344	
574	Valtteri BOTTAS	HARD	2024-03-02T15:51:53.373000+00:00	30	31.469	
610	Valtteri BOTTAS	HARD	2024-03-02T15:56:24.923000+00:00	32	30.988	
629	Valtteri BOTTAS	HARD	2024-03-02T15:58:01.651000+00:00	33	30.950	

	full_name	compound	date_start	lap_number	duration_sector_1	c
647	Valtteri BOTTAS	HARD	2024-03-02T15:59:37.854000+00:00	34	32.250	
665	Valtteri BOTTAS	HARD	2024-03-02T16:01:15.792000+00:00	35	30.892	
682	Valtteri BOTTAS	HARD	2024-03-02T16:02:52.351000+00:00	36	30.800	
700	Valtteri BOTTAS	HARD	2024-03-02T16:04:29.158000+00:00	37	31.511	
719	Valtteri BOTTAS	HARD	2024-03-02T16:06:07.159000+00:00	38	31.497	
739	Valtteri BOTTAS	HARD	2024-03-02T16:07:44.933000+00:00	39	31.047	
759	Valtteri BOTTAS	HARD	2024-03-02T16:09:22.152000+00:00	40	30.903	
778	Valtteri BOTTAS	HARD	2024-03-02T16:10:59.647000+00:00	41	30.804	
796	Valtteri BOTTAS	HARD	2024-03-02T16:12:36.028000+00:00	42	30.900	
816	Valtteri BOTTAS	HARD	2024-03-02T16:14:12.368000+00:00	43	30.907	
835	Valtteri BOTTAS	HARD	2024-03-02T16:15:48.962000+00:00	44	30.844	
855	Valtteri BOTTAS	HARD	2024-03-02T16:17:25.625000+00:00	45	30.916	
875	Valtteri BOTTAS	HARD	2024-03-02T16:19:02.196000+00:00	46	30.825	
895	Valtteri BOTTAS	HARD	2024-03-02T16:20:38.514000+00:00	47	30.873	
915	Valtteri BOTTAS	HARD	2024-03-02T16:22:15.172000+00:00	48	30.913	
935	Valtteri BOTTAS	HARD	2024-03-02T16:23:51.943000+00:00	49	31.028	
955	Valtteri BOTTAS	HARD	2024-03-02T16:25:28.861000+00:00	50	31.025	
975	Valtteri BOTTAS	HARD	2024-03-02T16:27:05.764000+00:00	51	31.019	
995	Valtteri BOTTAS	HARD	2024-03-02T16:28:42.685000+00:00	52	30.997	
1015	Valtteri BOTTAS	HARD	2024-03-02T16:30:19.418000+00:00	53	30.979	
1035	Valtteri BOTTAS	HARD	2024-03-02T16:31:58.475000+00:00	54	30.705	

Williams

In [223...

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

Out[223...

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1229	9472	1	2	1	10	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
18	1229	9472	1	23	1	15	SOFT	
23	1229	9472	2	2	11	28	HARD	
37	1229	9472	2	23	16	36	HARD	
42	1229	9472	3	2	29	40	HARD	
56	1229	9472	3	23	37	57	HARD	

In [224...

```
libraryDataF1.getinfo(longruns(jointables,23,'Williams',MINIMUM_SECONDS,MAX_SECONDS))
```

Out[224...

	full_name	compound	date_start	lap_number	duration_sector_1	duration_sector_2	duration_sector_3	duration_total
31	Alexander ALBON	SOFT	2024-03-02T15:05:26.586000+00:00	2	31.419	10.000	10.000	51.419
50	Alexander ALBON	SOFT	2024-03-02T15:07:05.531000+00:00	3	31.002	10.000	10.000	51.002
70	Alexander ALBON	SOFT	2024-03-02T15:08:44.072000+00:00	4	31.023	10.000	10.000	51.023
90	Alexander ALBON	SOFT	2024-03-02T15:10:22.387000+00:00	5	31.049	10.000	10.000	51.049
110	Alexander ALBON	SOFT	2024-03-02T15:12:00.934000+00:00	6	31.034	10.000	10.000	51.034
130	Alexander ALBON	SOFT	2024-03-02T15:13:39.536000+00:00	7	31.498	10.000	10.000	51.498
150	Alexander ALBON	SOFT	2024-03-02T15:15:18.421000+00:00	8	31.493	10.000	10.000	51.493
170	Alexander ALBON	SOFT	2024-03-02T15:16:57.147000+00:00	9	31.458	10.000	10.000	51.458
189	Alexander ALBON	SOFT	2024-03-02T15:18:35.817000+00:00	10	31.624	10.000	10.000	51.624
207	Alexander ALBON	SOFT	2024-03-02T15:20:14.778000+00:00	11	31.490	10.000	10.000	51.490
224	Alexander ALBON	SOFT	2024-03-02T15:21:53.603000+00:00	12	31.510	10.000	10.000	51.510
241	Alexander ALBON	SOFT	2024-03-02T15:23:32.467000+00:00	13	31.569	10.000	10.000	51.569
256	Alexander ALBON	SOFT	2024-03-02T15:25:11.288000+00:00	14	31.598	10.000	10.000	51.598
275	Alexander ALBON	SOFT	2024-03-02T15:26:50.290000+00:00	15	31.510	10.000	10.000	51.510
312	Alexander ALBON	HARD	2024-03-02T15:30:30.851000+00:00	17	30.812	10.000	10.000	50.812
331	Alexander ALBON	HARD	2024-03-02T15:32:08.194000+00:00	18	31.214	10.000	10.000	51.214
351	Alexander ALBON	HARD	2024-03-02T15:33:45.833000+00:00	19	31.357	10.000	10.000	51.357
371	Alexander ALBON	HARD	2024-03-02T15:35:23.534000+00:00	20	31.328	10.000	10.000	51.328
391	Alexander ALBON	HARD	2024-03-02T15:37:01.254000+00:00	21	31.227	10.000	10.000	51.227

	full_name	compound	date_start	lap_number	duration_sector_1	c
410	Alexander ALBON	HARD	2024-03-02T15:38:39.203000+00:00	22	31.199	
430	Alexander ALBON	HARD	2024-03-02T15:40:17.198000+00:00	23	31.296	
450	Alexander ALBON	HARD	2024-03-02T15:41:55.045000+00:00	24	31.035	
470	Alexander ALBON	HARD	2024-03-02T15:43:33.298000+00:00	25	31.095	
490	Alexander ALBON	HARD	2024-03-02T15:45:11.637000+00:00	26	31.041	
510	Alexander ALBON	HARD	2024-03-02T15:46:49.675000+00:00	27	31.029	
529	Alexander ALBON	HARD	2024-03-02T15:48:28.047000+00:00	28	31.108	
548	Alexander ALBON	HARD	2024-03-02T15:50:05.928000+00:00	29	31.127	
567	Alexander ALBON	HARD	2024-03-02T15:51:43.826000+00:00	30	31.045	
587	Alexander ALBON	HARD	2024-03-02T15:53:21.851000+00:00	31	31.093	
604	Alexander ALBON	HARD	2024-03-02T15:55:00.293000+00:00	32	31.143	
622	Alexander ALBON	HARD	2024-03-02T15:56:38.088000+00:00	33	31.537	
641	Alexander ALBON	HARD	2024-03-02T15:58:16.540000+00:00	34	31.413	
658	Alexander ALBON	HARD	2024-03-02T15:59:54.284000+00:00	35	31.295	
676	Alexander ALBON	HARD	2024-03-02T16:01:31.930000+00:00	36	31.337	
712	Alexander ALBON	HARD	2024-03-02T16:05:09.985000+00:00	38	30.735	
732	Alexander ALBON	HARD	2024-03-02T16:06:46.091000+00:00	39	30.737	
752	Alexander ALBON	HARD	2024-03-02T16:08:21.965000+00:00	40	30.707	
771	Alexander ALBON	HARD	2024-03-02T16:09:57.693000+00:00	41	30.746	
790	Alexander ALBON	HARD	2024-03-02T16:11:33.585000+00:00	42	30.759	
809	Alexander ALBON	HARD	2024-03-02T16:13:09.368000+00:00	43	30.760	
828	Alexander ALBON	HARD	2024-03-02T16:14:45.111000+00:00	44	30.683	
848	Alexander ALBON	HARD	2024-03-02T16:16:20.966000+00:00	45	30.607	
868	Alexander ALBON	HARD	2024-03-02T16:17:56.678000+00:00	46	30.685	
888	Alexander ALBON	HARD	2024-03-02T16:19:32.749000+00:00	47	30.827	

	full_name	compound	date_start	lap_number	duration_sector_1	c
908	Alexander ALBON	HARD	2024-03-02T16:21:08.670000+00:00	48	30.823	
928	Alexander ALBON	HARD	2024-03-02T16:22:44.876000+00:00	49	30.816	
948	Alexander ALBON	HARD	2024-03-02T16:24:21.942000+00:00	50	31.683	
968	Alexander ALBON	HARD	2024-03-02T16:25:59.611000+00:00	51	30.773	
988	Alexander ALBON	HARD	2024-03-02T16:27:37.083000+00:00	52	30.895	
1008	Alexander ALBON	HARD	2024-03-02T16:29:13.342000+00:00	53	30.817	
1028	Alexander ALBON	HARD	2024-03-02T16:30:49.550000+00:00	54	30.799	
	Alexander					

In [225...

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

Out[225...

	full_name	compound	date_start	lap_number	duration_sector_1	
21	Logan SARGEANT	SOFT	2024-03-02T15:05:28.737000+00:00	2	31.096	
40	Logan SARGEANT	SOFT	2024-03-02T15:07:07.169000+00:00	3	31.105	
60	Logan SARGEANT	SOFT	2024-03-02T15:08:45.974000+00:00	4	31.044	
80	Logan SARGEANT	SOFT	2024-03-02T15:10:24.343000+00:00	5	31.048	
100	Logan SARGEANT	SOFT	2024-03-02T15:12:03.067000+00:00	6	31.037	
120	Logan SARGEANT	SOFT	2024-03-02T15:13:41.625000+00:00	7	31.373	
140	Logan SARGEANT	SOFT	2024-03-02T15:15:21.091000+00:00	8	31.566	
160	Logan SARGEANT	SOFT	2024-03-02T15:17:00.723000+00:00	9	31.398	
216	Logan SARGEANT	HARD	2024-03-02T15:23:34.319000+00:00	12	31.666	
233	Logan SARGEANT	HARD	2024-03-02T15:25:12.827000+00:00	13	31.427	
248	Logan SARGEANT	HARD	2024-03-02T15:26:53.936000+00:00	14	34.301	
266	Logan SARGEANT	HARD	2024-03-02T15:28:35.301000+00:00	15	31.044	
284	Logan SARGEANT	HARD	2024-03-02T15:30:12.933000+00:00	16	34.383	
302	Logan SARGEANT	HARD	2024-03-02T15:31:54.254000+00:00	17	31.181	
321	Logan SARGEANT	HARD	2024-03-02T15:33:34.073000+00:00	18	31.257	

	full_name	compound	date_start	lap_number	duration_sector_1
341	Logan SARGEANT	HARD	2024-03-02T15:35:12.065000+00:00	19	31.201
361	Logan SARGEANT	HARD	2024-03-02T15:36:49.792000+00:00	20	31.110
381	Logan SARGEANT	HARD	2024-03-02T15:38:27.658000+00:00	21	31.167
400	Logan SARGEANT	HARD	2024-03-02T15:40:05.682000+00:00	22	31.115
420	Logan SARGEANT	HARD	2024-03-02T15:41:43.435000+00:00	23	31.065
440	Logan SARGEANT	HARD	2024-03-02T15:43:21.051000+00:00	24	31.076
460	Logan SARGEANT	HARD	2024-03-02T15:45:00.546000+00:00	25	32.025
480	Logan SARGEANT	HARD	2024-03-02T15:46:39.536000+00:00	26	31.152
500	Logan SARGEANT	HARD	2024-03-02T15:48:17.458000+00:00	27	31.178
520	Logan SARGEANT	HARD	2024-03-02T15:49:55.707000+00:00	28	31.128
557	Logan SARGEANT	HARD	2024-03-02T15:53:37.819000+00:00	30	30.623
577	Logan SARGEANT	HARD	2024-03-02T15:55:13.608000+00:00	31	30.539
595	Logan SARGEANT	HARD	2024-03-02T15:56:50.282000+00:00	32	30.820
613	Logan SARGEANT	HARD	2024-03-02T15:58:26.854000+00:00	33	30.732
632	Logan SARGEANT	HARD	2024-03-02T16:00:04.211000+00:00	34	30.708
650	Logan SARGEANT	HARD	2024-03-02T16:01:40.784000+00:00	35	31.015
667	Logan SARGEANT	HARD	2024-03-02T16:03:17.715000+00:00	36	30.805
685	Logan SARGEANT	HARD	2024-03-02T16:04:54.083000+00:00	37	30.826
702	Logan SARGEANT	HARD	2024-03-02T16:06:30.793000+00:00	38	30.786
722	Logan SARGEANT	HARD	2024-03-02T16:08:07.594000+00:00	39	30.987
742	Logan SARGEANT	HARD	2024-03-02T16:09:44.655000+00:00	40	30.760
781	Logan SARGEANT	SOFT	2024-03-02T16:13:24.717000+00:00	42	30.316
799	Logan SARGEANT	SOFT	2024-03-02T16:14:59.489000+00:00	43	30.462
819	Logan SARGEANT	SOFT	2024-03-02T16:16:34.406000+00:00	44	30.599
838	Logan SARGEANT	SOFT	2024-03-02T16:18:09.515000+00:00	45	30.587

	full_name	compound	date_start	lap_number	duration_sector_1
858	Logan SARGEANT	SOFT	2024-03-02T16:19:44.864000+00:00	46	30.872
878	Logan SARGEANT	SOFT	2024-03-02T16:21:20.749000+00:00	47	30.667
898	Logan SARGEANT	SOFT	2024-03-02T16:22:57.609000+00:00	48	30.357
918	Logan SARGEANT	SOFT	2024-03-02T16:24:33.273000+00:00	49	30.638
938	Logan SARGEANT	SOFT	2024-03-02T16:26:08.812000+00:00	50	30.671
958	Logan SARGEANT	SOFT	2024-03-02T16:27:44.498000+00:00	51	30.781
978	Logan SARGEANT	SOFT	2024-03-02T16:29:20.677000+00:00	52	30.775
998	Logan SARGEANT	SOFT	2024-03-02T16:30:56.521000+00:00	53	30.798
	Logan				

Alpine

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

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
4	1229	9472	1	31	1	10	SOFT	
8	1229	9472	1	10	1	12	SOFT	
24	1229	9472	2	31	11	30	HARD	
29	1229	9472	2	10	13	31	HARD	
44	1229	9472	3	31	31	57	HARD	
46	1229	9472	3	10	32	43	HARD	
62	1229	9472	4	10	44	57	SOFT	

```
In [227...] libraryDataF1.getinfo(longruns(jointables,31,'Alpine',MINIMUM_SECONDS,MAXIMUM_SECONDS))
```

	full_name	compound	date_start	lap_number	duration_sector_1	c
33	Esteban OCON	SOFT	2024-03-02T15:05:29.423000+00:00	2	32.005	
53	Esteban OCON	SOFT	2024-03-02T15:07:08.536000+00:00	3	31.255	
73	Esteban OCON	SOFT	2024-03-02T15:08:47.391000+00:00	4	31.246	
93	Esteban OCON	SOFT	2024-03-02T15:10:25.925000+00:00	5	31.171	
113	Esteban OCON	SOFT	2024-03-02T15:12:04.606000+00:00	6	31.245	
133	Esteban OCON	SOFT	2024-03-02T15:13:43.401000+00:00	7	31.404	

	full_name	compound	date_start	lap_number	duration_sector_1	c
153	Esteban OCON	SOFT	2024-03-02T15:15:22.699000+00:00	8	31.252	
173	Esteban OCON	SOFT	2024-03-02T15:17:01.994000+00:00	9	31.189	
191	Esteban OCON	SOFT	2024-03-02T15:18:41.340000+00:00	10	31.308	
227	Esteban OCON	HARD	2024-03-02T15:22:21.966000+00:00	12	31.175	
244	Esteban OCON	HARD	2024-03-02T15:23:59.651000+00:00	13	31.319	
259	Esteban OCON	HARD	2024-03-02T15:25:36.904000+00:00	14	31.174	
278	Esteban OCON	HARD	2024-03-02T15:27:14.411000+00:00	15	31.282	
295	Esteban OCON	HARD	2024-03-02T15:28:52.320000+00:00	16	31.350	
315	Esteban OCON	HARD	2024-03-02T15:30:30.104000+00:00	17	31.653	
334	Esteban OCON	HARD	2024-03-02T15:32:09.135000+00:00	18	31.120	
354	Esteban OCON	HARD	2024-03-02T15:33:47.226000+00:00	19	31.570	
374	Esteban OCON	HARD	2024-03-02T15:35:25.673000+00:00	20	31.445	
393	Esteban OCON	HARD	2024-03-02T15:37:03.773000+00:00	21	31.900	
413	Esteban OCON	HARD	2024-03-02T15:38:43.144000+00:00	22	31.553	
433	Esteban OCON	HARD	2024-03-02T15:40:21.786000+00:00	23	31.490	
453	Esteban OCON	HARD	2024-03-02T15:42:00.215000+00:00	24	31.474	
473	Esteban OCON	HARD	2024-03-02T15:43:38.634000+00:00	25	31.546	
493	Esteban OCON	HARD	2024-03-02T15:45:17.255000+00:00	26	31.521	
513	Esteban OCON	HARD	2024-03-02T15:46:55.750000+00:00	27	31.543	
532	Esteban OCON	HARD	2024-03-02T15:48:34.320000+00:00	28	31.492	
550	Esteban OCON	HARD	2024-03-02T15:50:12.684000+00:00	29	31.562	
570	Esteban OCON	HARD	2024-03-02T15:51:51.294000+00:00	30	31.546	
607	Esteban OCON	HARD	2024-03-02T15:55:31.848000+00:00	32	31.059	
625	Esteban OCON	HARD	2024-03-02T15:57:08.646000+00:00	33	30.989	
644	Esteban OCON	HARD	2024-03-02T15:58:45.414000+00:00	34	30.898	

	full_name	compound	date_start	lap_number	duration_sector_1	c
661	Esteban OCON	HARD	2024-03-02T16:00:21.630000+00:00	35	31.008	
679	Esteban OCON	HARD	2024-03-02T16:01:57.997000+00:00	36	31.212	
696	Esteban OCON	HARD	2024-03-02T16:03:35.199000+00:00	37	31.059	
715	Esteban OCON	HARD	2024-03-02T16:05:11.746000+00:00	38	31.070	
735	Esteban OCON	HARD	2024-03-02T16:06:48.529000+00:00	39	31.088	
755	Esteban OCON	HARD	2024-03-02T16:08:25.243000+00:00	40	31.053	
774	Esteban OCON	HARD	2024-03-02T16:10:01.749000+00:00	41	31.034	
792	Esteban OCON	HARD	2024-03-02T16:11:38.442000+00:00	42	31.025	
812	Esteban OCON	HARD	2024-03-02T16:13:14.889000+00:00	43	31.035	
831	Esteban OCON	HARD	2024-03-02T16:14:51.684000+00:00	44	31.094	
851	Esteban OCON	HARD	2024-03-02T16:16:28.293000+00:00	45	31.188	
871	Esteban OCON	HARD	2024-03-02T16:18:06.358000+00:00	46	31.151	
891	Esteban OCON	HARD	2024-03-02T16:19:43.361000+00:00	47	31.026	
911	Esteban OCON	HARD	2024-03-02T16:21:19.998000+00:00	48	31.177	
931	Esteban OCON	HARD	2024-03-02T16:22:57.091000+00:00	49	31.483	
951	Esteban OCON	HARD	2024-03-02T16:24:34.906000+00:00	50	31.552	
971	Esteban OCON	HARD	2024-03-02T16:26:12.693000+00:00	51	31.083	
991	Esteban OCON	HARD	2024-03-02T16:27:49.828000+00:00	52	31.094	
1011	Esteban OCON	HARD	2024-03-02T16:29:28.346000+00:00	53	31.023	
1031	Esteban OCON	HARD	2024-03-02T16:31:05.424000+00:00	54	32.402	
	Esteban					

In [228...

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

Out[228...

	full_name	compound	date_start	lap_number	duration_sector_1	c
24	Pierre GASLY	SOFT	2024-03-02T15:05:30.020000+00:00	2	31.860	
43	Pierre GASLY	SOFT	2024-03-02T15:07:09.187000+00:00	3	31.254	

	full_name	compound	date_start	lap_number	duration_sector_1	c
63	Pierre GASLY	SOFT	2024-03-02T15:08:47.834000+00:00	4	31.305	
83	Pierre GASLY	SOFT	2024-03-02T15:10:26.498000+00:00	5	31.344	
103	Pierre GASLY	SOFT	2024-03-02T15:12:05.094000+00:00	6	31.457	
123	Pierre GASLY	SOFT	2024-03-02T15:13:44.100000+00:00	7	31.353	
143	Pierre GASLY	SOFT	2024-03-02T15:15:23.253000+00:00	8	31.210	
163	Pierre GASLY	SOFT	2024-03-02T15:17:02.598000+00:00	9	31.400	
183	Pierre GASLY	SOFT	2024-03-02T15:18:42.035000+00:00	10	31.383	
200	Pierre GASLY	SOFT	2024-03-02T15:20:20.748000+00:00	11	31.329	
219	Pierre GASLY	SOFT	2024-03-02T15:21:59.507000+00:00	12	31.328	
249	Pierre GASLY	HARD	2024-03-02T15:25:45.604000+00:00	14	31.440	
269	Pierre GASLY	HARD	2024-03-02T15:27:23.268000+00:00	15	30.978	
287	Pierre GASLY	HARD	2024-03-02T15:29:00.742000+00:00	16	30.874	
305	Pierre GASLY	HARD	2024-03-02T15:30:38.229000+00:00	17	31.153	
324	Pierre GASLY	HARD	2024-03-02T15:32:16.230000+00:00	18	30.980	
344	Pierre GASLY	HARD	2024-03-02T15:33:54.035000+00:00	19	30.968	
364	Pierre GASLY	HARD	2024-03-02T15:35:31.612000+00:00	20	31.193	
384	Pierre GASLY	HARD	2024-03-02T15:37:09.630000+00:00	21	31.173	
403	Pierre GASLY	HARD	2024-03-02T15:38:47.756000+00:00	22	31.145	
423	Pierre GASLY	HARD	2024-03-02T15:40:25.592000+00:00	23	31.195	
443	Pierre GASLY	HARD	2024-03-02T15:42:03.799000+00:00	24	31.232	
463	Pierre GASLY	HARD	2024-03-02T15:43:41.898000+00:00	25	31.096	
483	Pierre GASLY	HARD	2024-03-02T15:45:20.291000+00:00	26	31.256	
503	Pierre GASLY	HARD	2024-03-02T15:46:58.437000+00:00	27	31.171	
523	Pierre GASLY	HARD	2024-03-02T15:48:36.991000+00:00	28	31.351	
541	Pierre GASLY	HARD	2024-03-02T15:50:15.428000+00:00	29	31.301	

	full_name	compound	date_start	lap_number	duration_sector_1	c
560	Pierre GASLY	HARD	2024-03-02T15:51:53.997000+00:00	30	31.368	
580	Pierre GASLY	HARD	2024-03-02T15:53:32.808000+00:00	31	31.182	
616	Pierre GASLY	HARD	2024-03-02T15:57:13.109000+00:00	33	30.887	
634	Pierre GASLY	HARD	2024-03-02T15:58:49.282000+00:00	34	31.142	
653	Pierre GASLY	HARD	2024-03-02T16:00:25.901000+00:00	35	31.058	
669	Pierre GASLY	HARD	2024-03-02T16:02:02.129000+00:00	36	31.034	
688	Pierre GASLY	HARD	2024-03-02T16:03:38.575000+00:00	37	31.148	
705	Pierre GASLY	HARD	2024-03-02T16:05:15.172000+00:00	38	31.122	
725	Pierre GASLY	HARD	2024-03-02T16:06:51.984000+00:00	39	31.022	
745	Pierre GASLY	HARD	2024-03-02T16:08:28.501000+00:00	40	31.023	
764	Pierre GASLY	HARD	2024-03-02T16:10:05.328000+00:00	41	30.968	
784	Pierre GASLY	HARD	2024-03-02T16:11:41.871000+00:00	42	30.980	
802	Pierre GASLY	HARD	2024-03-02T16:13:18.480000+00:00	43	31.165	
841	Pierre GASLY	SOFT	2024-03-02T16:16:54.302000+00:00	45	30.509	
861	Pierre GASLY	SOFT	2024-03-02T16:18:29.135000+00:00	46	30.758	
881	Pierre GASLY	SOFT	2024-03-02T16:20:04.338000+00:00	47	30.735	
901	Pierre GASLY	SOFT	2024-03-02T16:21:39.797000+00:00	48	30.776	
921	Pierre GASLY	SOFT	2024-03-02T16:23:15.213000+00:00	49	30.710	
941	Pierre GASLY	SOFT	2024-03-02T16:24:50.720000+00:00	50	30.647	
961	Pierre GASLY	SOFT	2024-03-02T16:26:25.918000+00:00	51	30.673	
981	Pierre GASLY	SOFT	2024-03-02T16:28:01.555000+00:00	52	30.714	
1001	Pierre GASLY	SOFT	2024-03-02T16:29:36.773000+00:00	53	30.600	
1021	Pierre GASLY	SOFT	2024-03-02T16:31:12.065000+00:00	54	30.833	
	Pierre					

Pits

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

```
In [229... pit = libraryDataF1.obtain_information('pit',session_key=9472)

In [230... jointables = pd.merge(drivers,pit,on=['driver_number']).query("pit_duration
jointables
pit_duration = pd.DataFrame(jointables.groupby('team_name')['pit_duration']
pit_duration
```

Out[230...

pit_duration	
team_name	
Ferrari	24.075
Red Bull Racing	24.550
Mercedes	24.625
Aston Martin	24.675
RB	24.675
McLaren	24.775
Alpine	26.280
Williams	27.040
Haas F1 Team	27.180
Kick Sauber	37.825