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

FORMULA 1 LENOVO CHINESE GRAND PRIX 2024

The Chinese Grand Prix (Chinese: 中国大奖赛; pinyin: Zhōngguó Dàjiǎngsài) is a round of the Formula One World Championship. The event was held every year from 2004 until 2019 and is contracted to be held until 2025.[1] The event was contracted to take place from 2020 to 2023, but was cancelled each of those years as a consequence of the COVID-19 pandemic in China.

It is currently held at the Shanghai International Circuit, Jiading, Shanghai. Designed by Hermann Tilke and opened in 2004, the US240 million Shanghai course was the most expensive Formula One circuit facility[2] until the $6 billion Abu Dhabi course opened five years later.[3] The 5.451 km (3.387 mi) track features one of the trickiest corner combinations on the Formula One calendar: Turn 1 and 2, a demanding 270-degree, right-handed corner combination whose radius decreases as the corner progresses. Source: Wikipedia

Obtain session information

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

Out[2]:

	session_key	session_name	date_start	date_end	gmt_offset
0	9663	Practice 1	2024-04-19T03:30:00+00:00	2024-04-19T04:30:00+00:00	08:00:00
1	9668	Sprint Qualifying	2024-04-19T07:30:00+00:00	2024-04-19T08:14:00+00:00	08:00:00
2	9672	Sprint	2024-04-20T03:00:00+00:00	2024-04-20T03:30:00+00:00	08:00:00
3	9664	Qualifying	2024-04-20T07:00:00+00:00	2024-04-20T08:00:00+00:00	08:00:00
4	9673	Race	2024-04-21T07:00:00+00:00	2024-04-21T09:00:00+00:00	08:00:00

Free Practice

Obtain setup

In [3]:
```
practice = libraryDataF1.obtain_information('laps',session_key=9663)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9
drivers = libraryDataF1.obtain_information('drivers',session_key=9663)
```

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

Out[4]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed

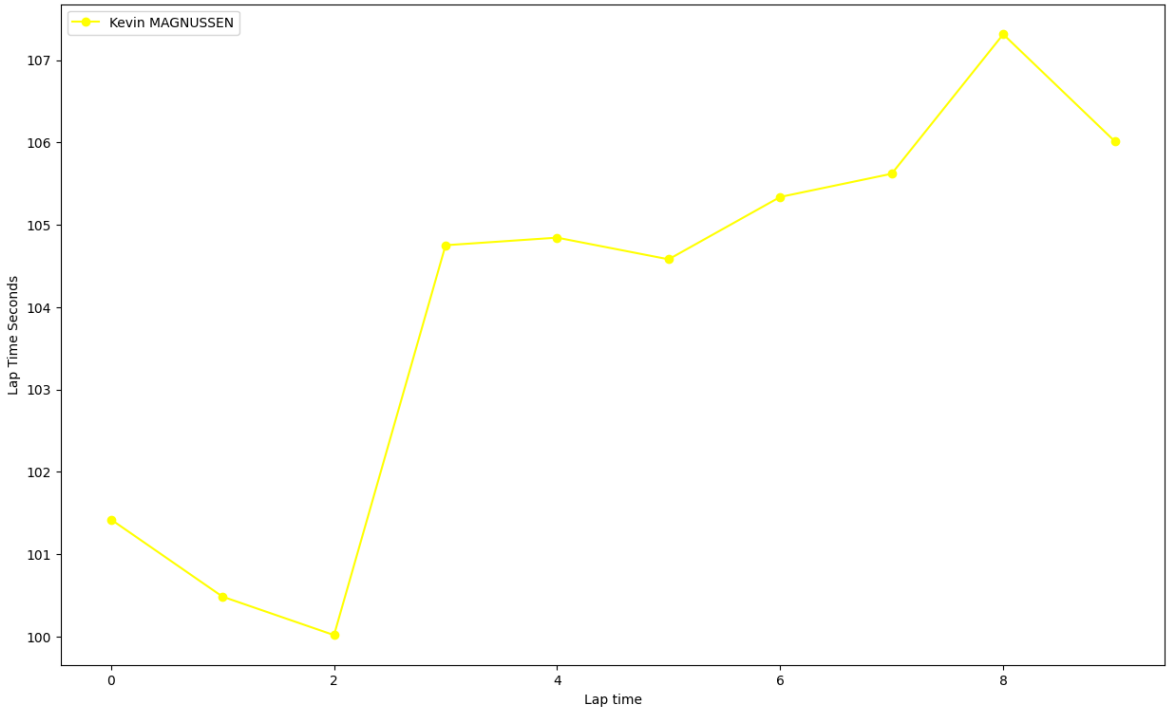
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
0	1233	9663	31	232.0	240.0	284.0	2024-04-19T03:30:
1	1233	9663	27	207.0	235.0	276.0	2024-04-19T03:30:
2	1233	9663	20	225.0	255.0	295.0	2024-04-19T03:30:
3	1233	9663	24	239.0	224.0	283.0	2024-04-19T03:30:
4	1233	9663	77	256.0	241.0	208.0	2024-04-19T03:30:
...	...	...	...	...	...	...	
448	1233	9663	24	279.0	153.0	227.0	2024-04-19T04:33:
449	1233	9663	4	159.0	210.0	234.0	2024-04-19T04:33:
450	1233	9663	2	202.0	94.0	239.0	2024-04-19T04:34:
451	1233	9663	63	275.0	264.0	228.0	2024-04-19T04:34:
452	1233	9663	55	281.0	207.0	286.0	2024-04-19T04:34:

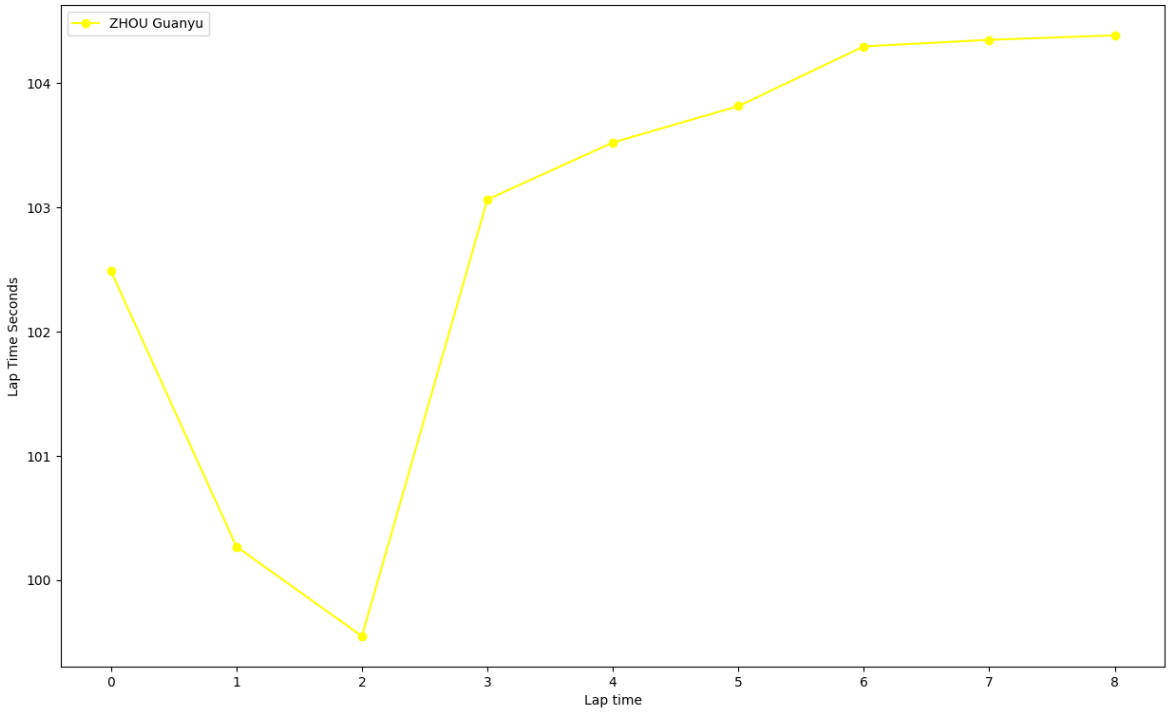
453 rows × 30 columns

See race pace by means of the charts

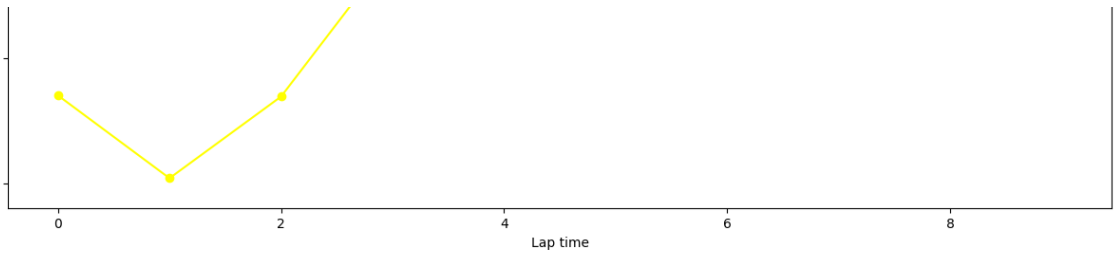
Medium tyres

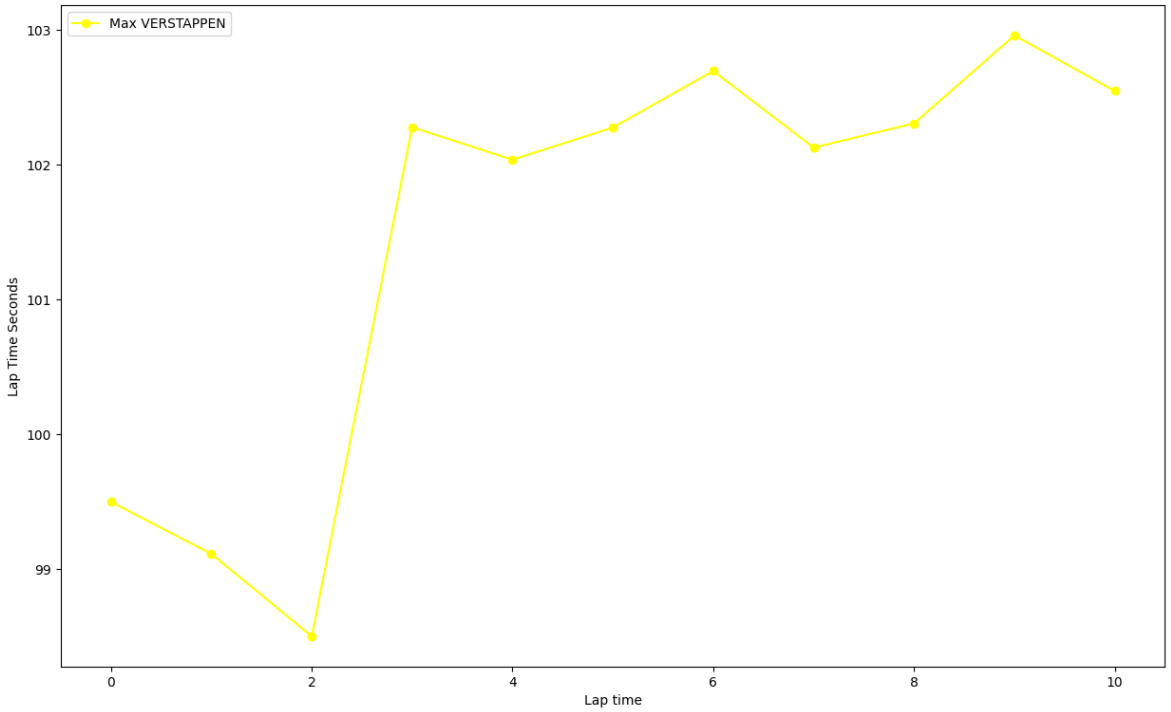
In [5]:
```
libraryDataF1.obtain_data_tyres(jointables2,"MEDIUM",110)
```

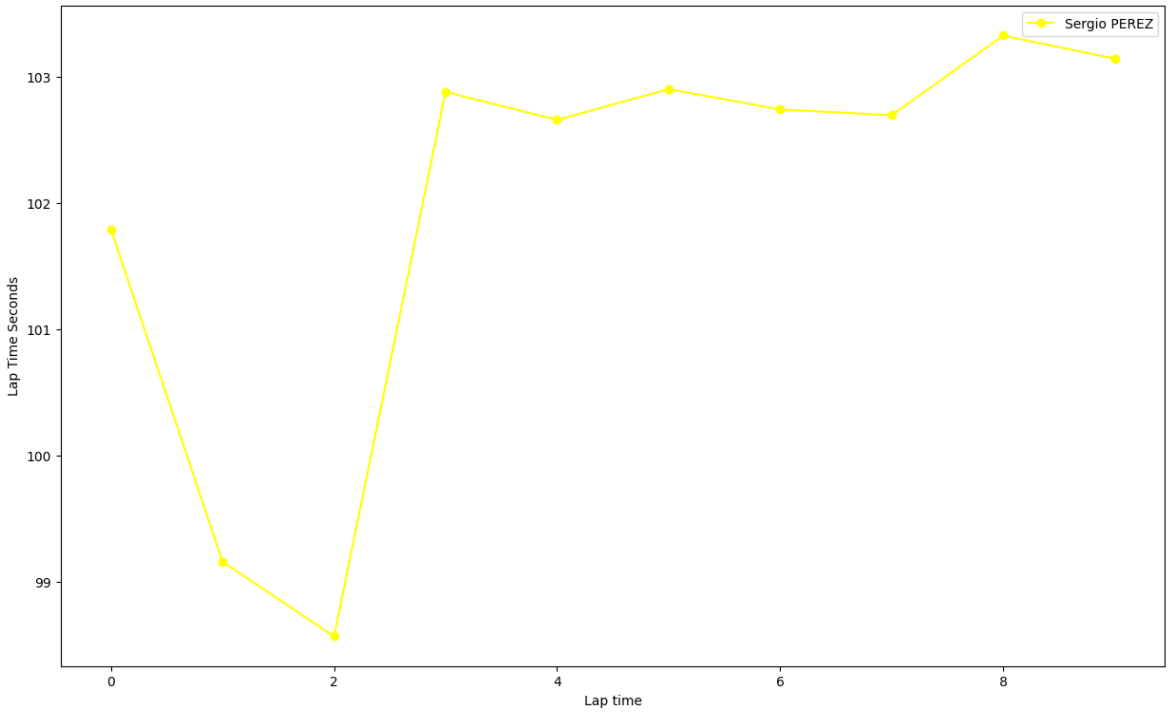

Kevin MAGNUSSEN
Lap Time Seconds
Lap time
100
101
102
103
104
105
106
107
0
2
4
6
8


ZHOU Guanyu
Lap Time Seconds
Lap time
100
101
102
103
104
0
1
2
3
4
5
6
7
8

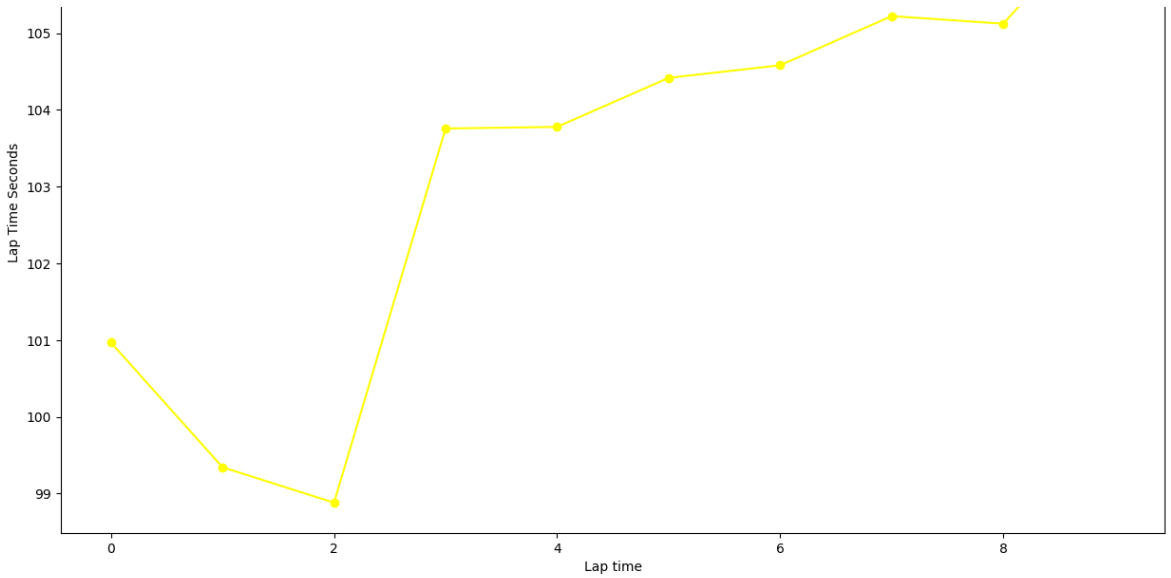

Valtteri BOTTAS
Lap Time Seconds
102
103
104
105

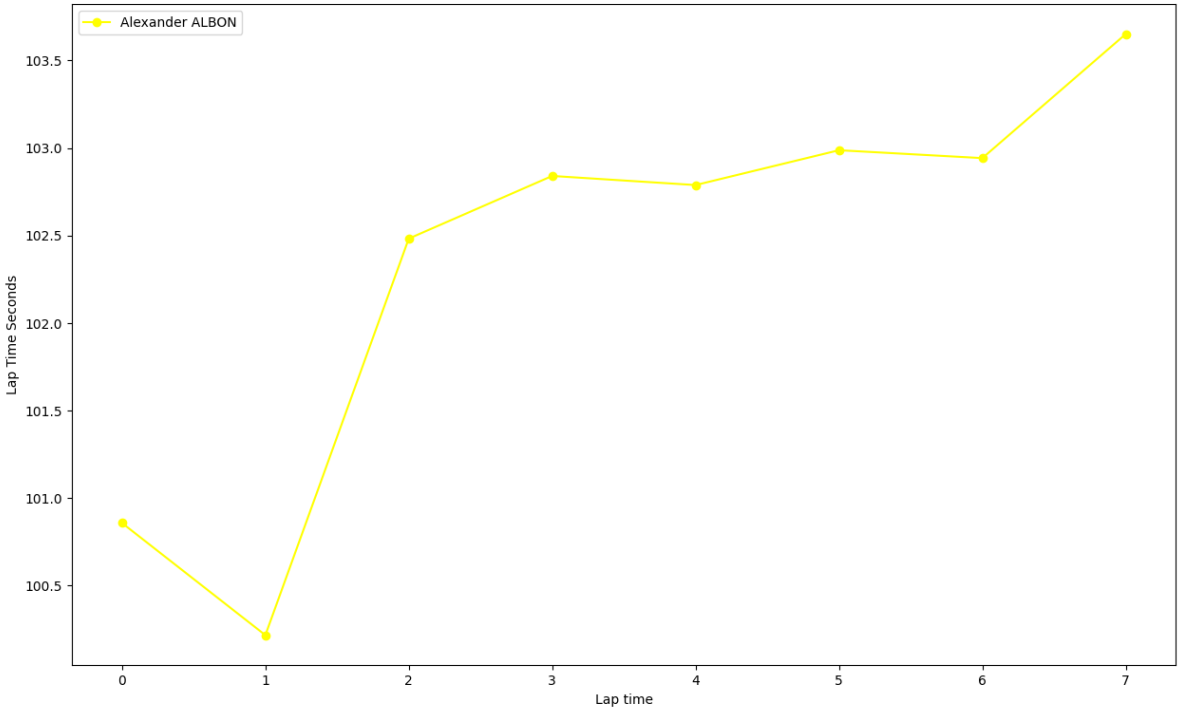

101
100
0
2
4
6
8
Lap time

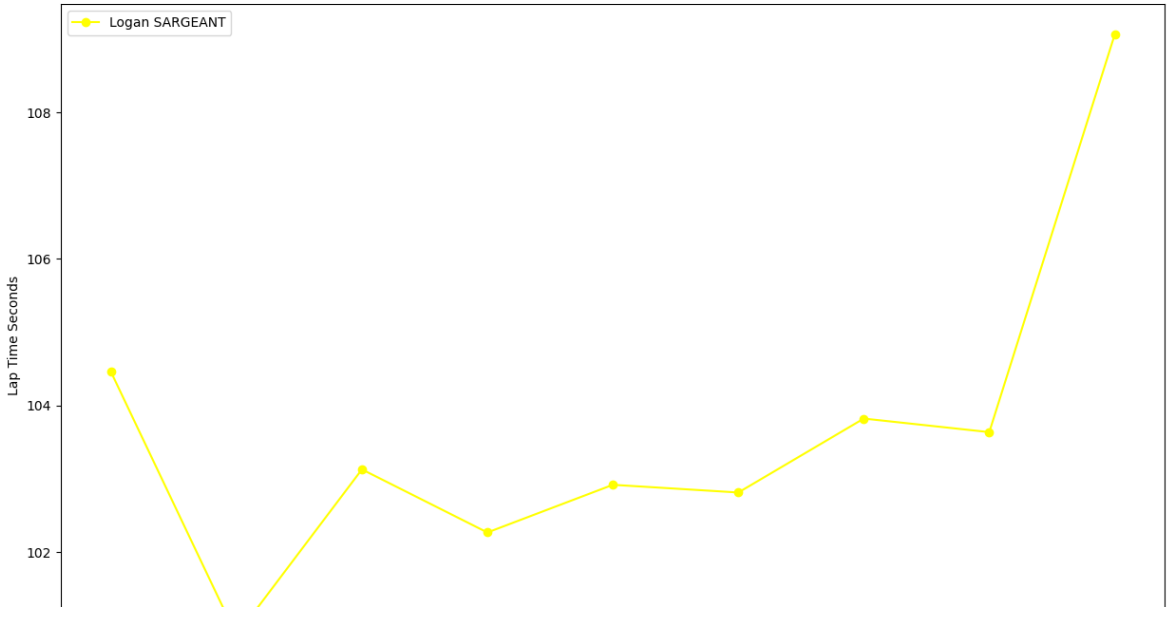

Max VERSTAPPEN
103
102
101
100
99
Lap Time Seconds
0
2
4
6
8
10
Lap time


Sergio PEREZ
103
102
101
100
99
Lap Time Seconds
0
2
4
6
8
Lap time


Nico HULKENBERG
107
106


Lap Time Seconds
105
104
103
102
101
100
99
0
2
4
6
8
Lap time

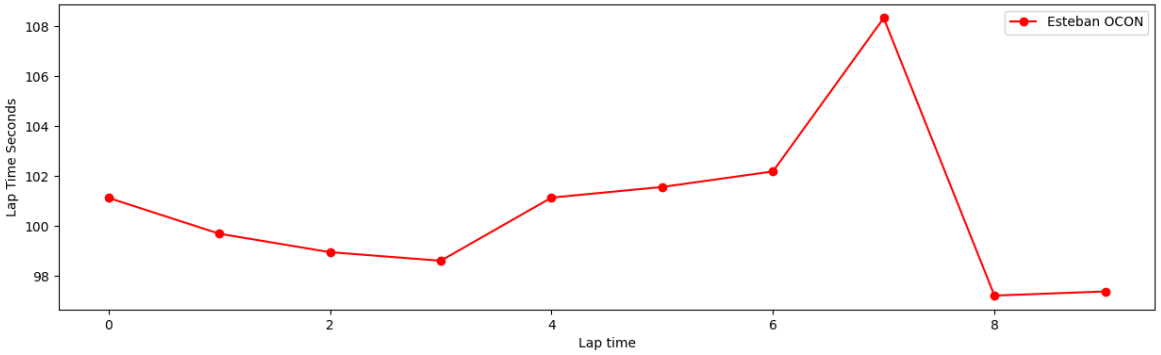

Alexander ALBON
Lap Time Seconds
103.5
103.0
102.5
102.0
101.5
101.0
100.5
0
1
2
3
4
5
6
7
Lap time

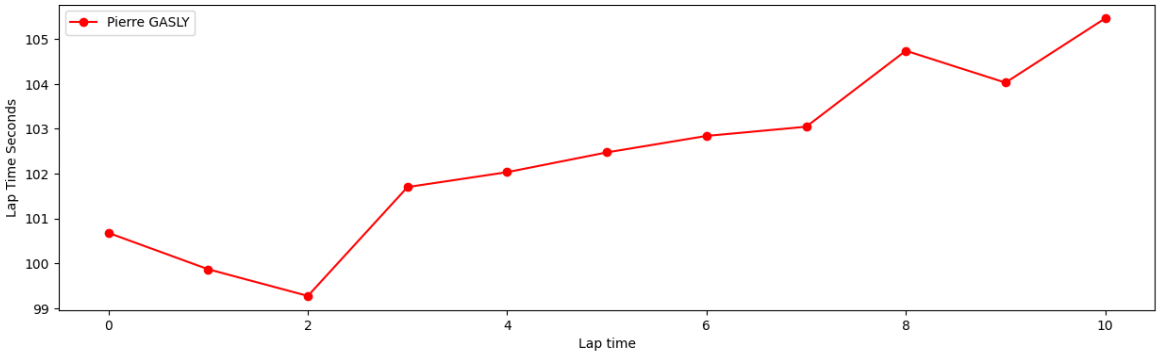

Logan SARGEANT
Lap Time Seconds
108
106
104
102

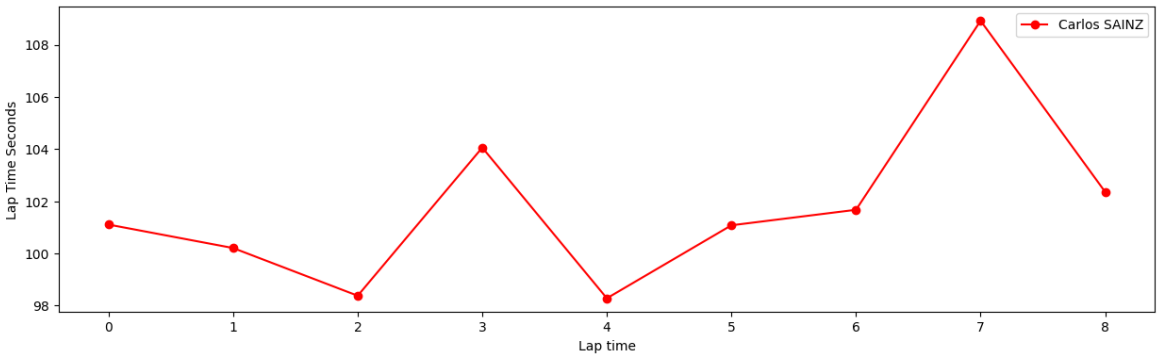
Soft tyres

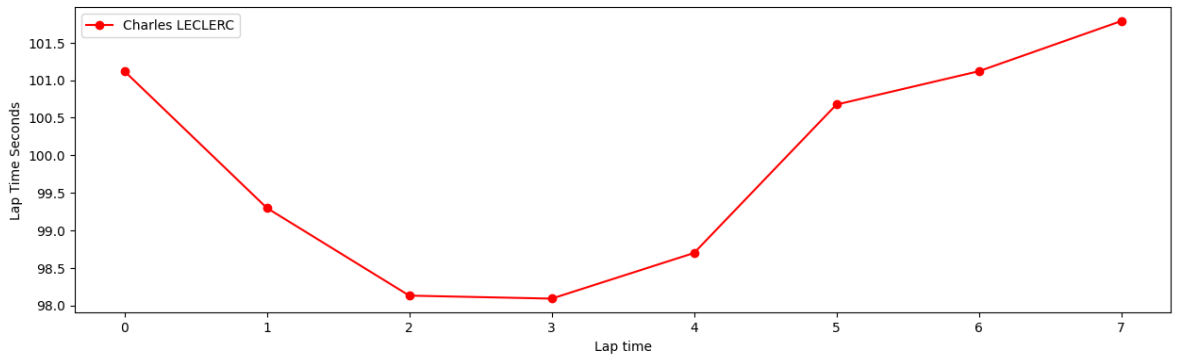
In [6]:

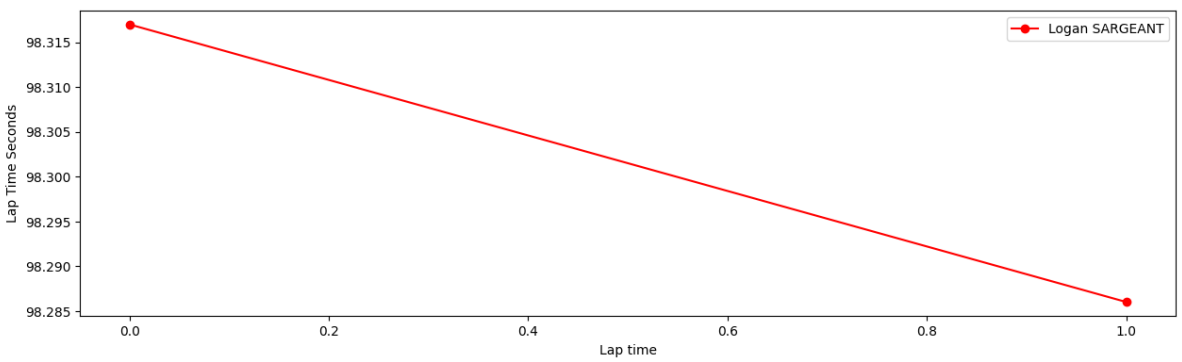
```
libraryDataF1.obtain_data_tyres(jointables2,"SOFT",110)
```

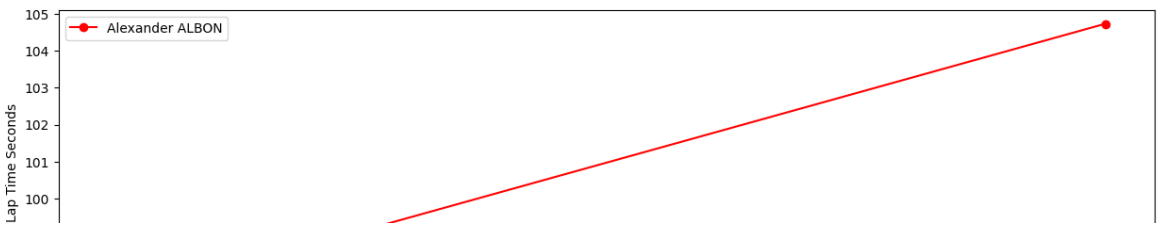

Esteban OCON
Lap Time Seconds
Lap time

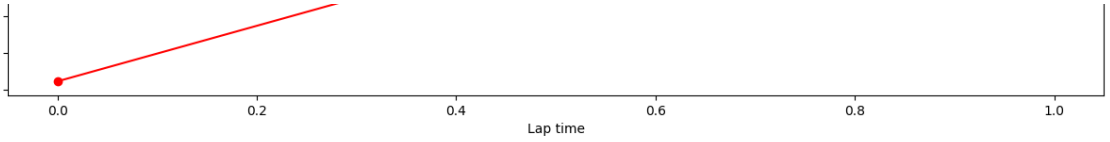

Pierre GASLY
Lap Time Seconds
Lap time

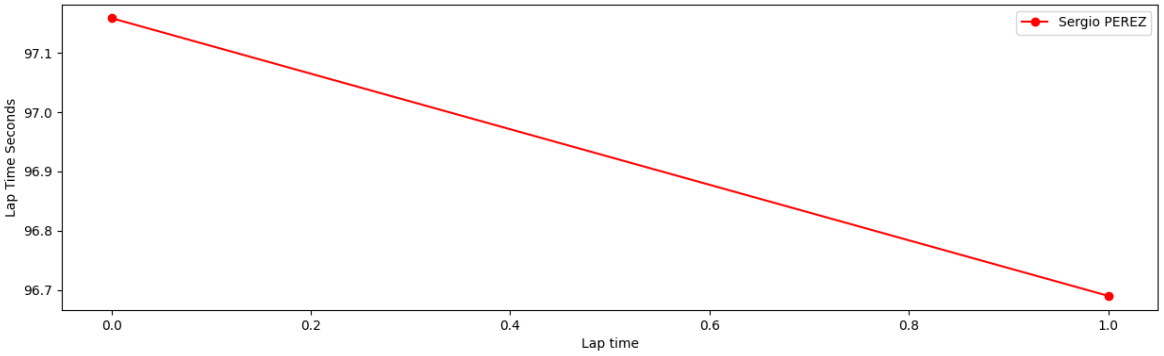

Carlos SAINZ
Lap Time Seconds
Lap time

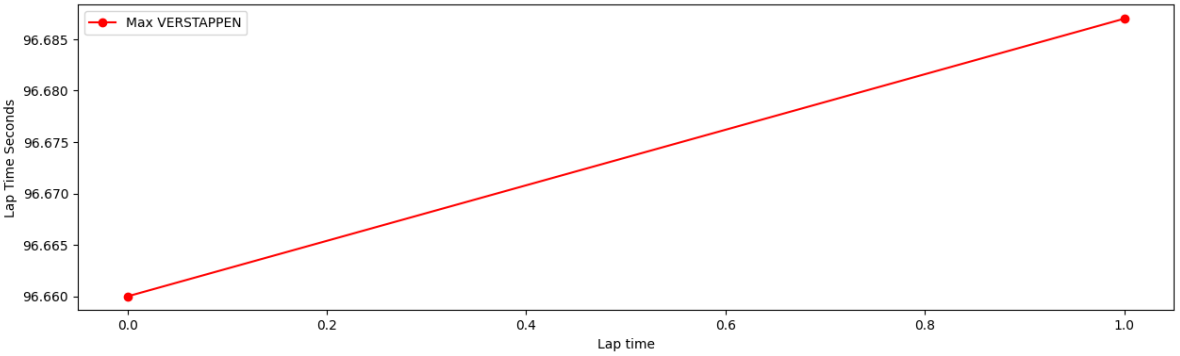

Charles LECLERC
Lap Time Seconds
Lap time

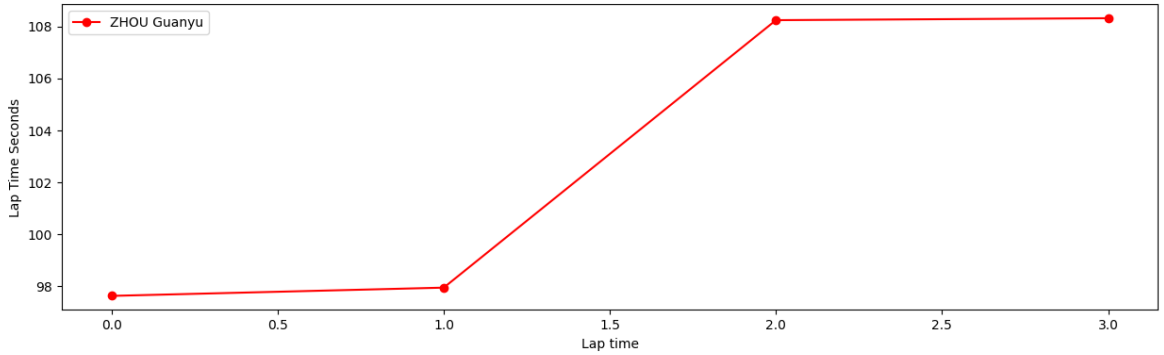

Logan SARGEANT
Lap Time Seconds
Lap time

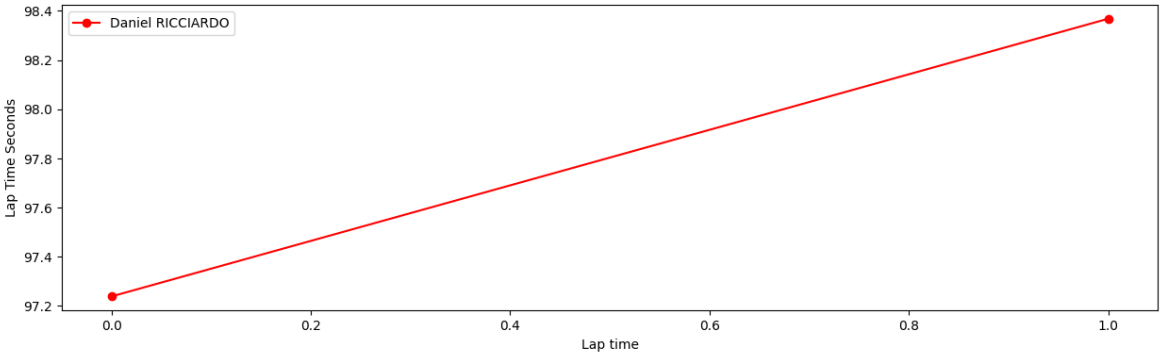

Alexander ALBON
Lap Time Seconds

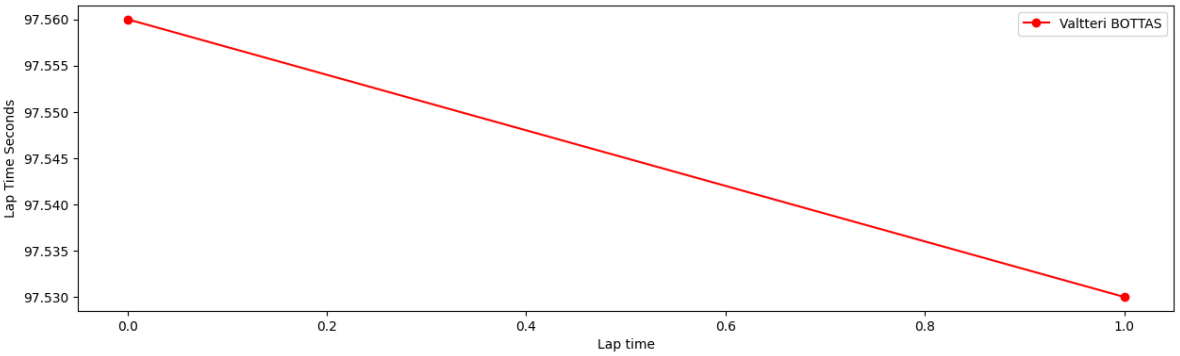

99
98
97
0.0
0.2
0.4
0.6
0.8
1.0
Lap time


Sergio PEREZ
97.1
97.0
96.9
96.8
96.7
Lap Time Seconds
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

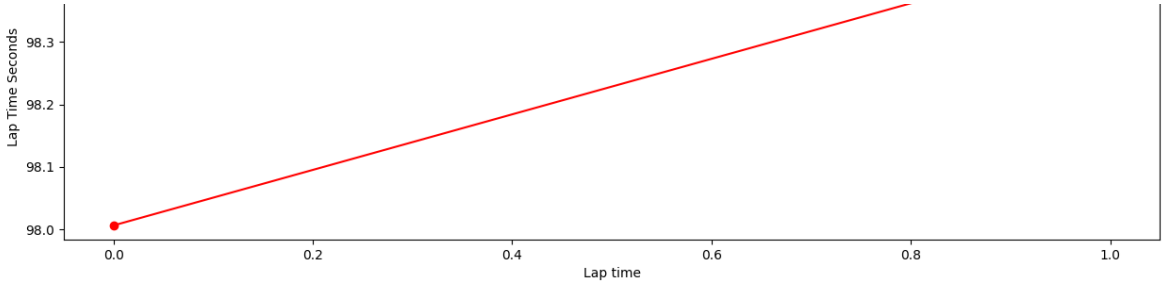

Max VERSTAPPEN
96.685
96.680
96.675
96.670
96.665
96.660
Lap Time Seconds
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

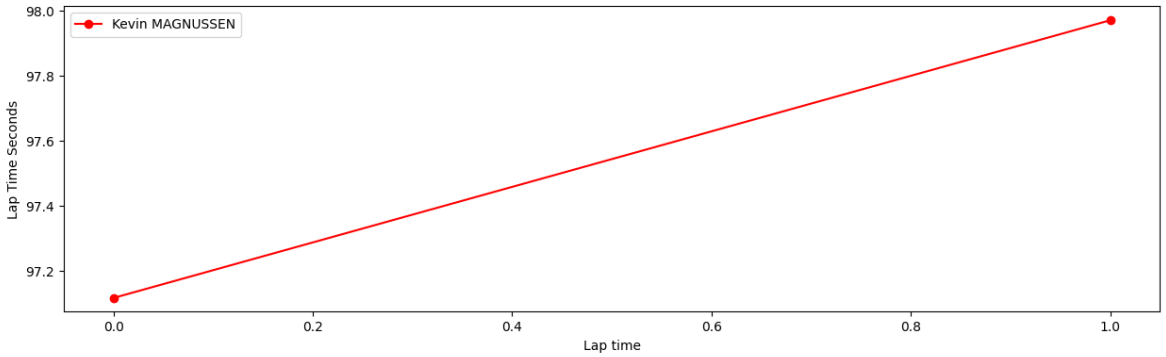

ZHOU Guanyu
108
106
104
102
100
98
Lap Time Seconds
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Lap time

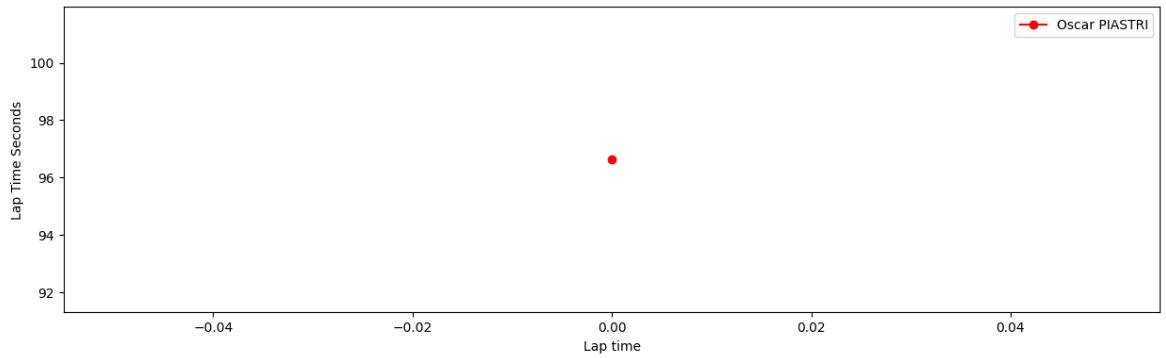

Daniel RICCIARDO
98.4
98.2
98.0
97.8
97.6
97.4
97.2
Lap Time Seconds
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

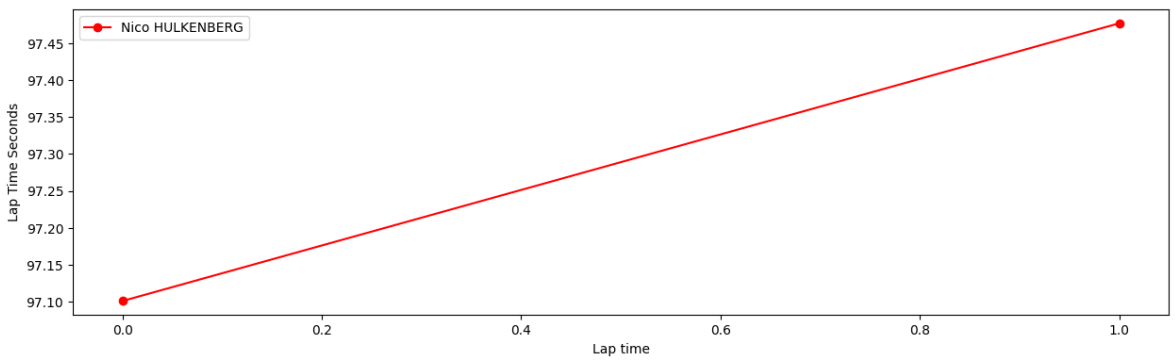

Valtteri BOTTAS
97.560
97.555
97.550
97.545
97.540
97.535
97.530
Lap Time Seconds
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

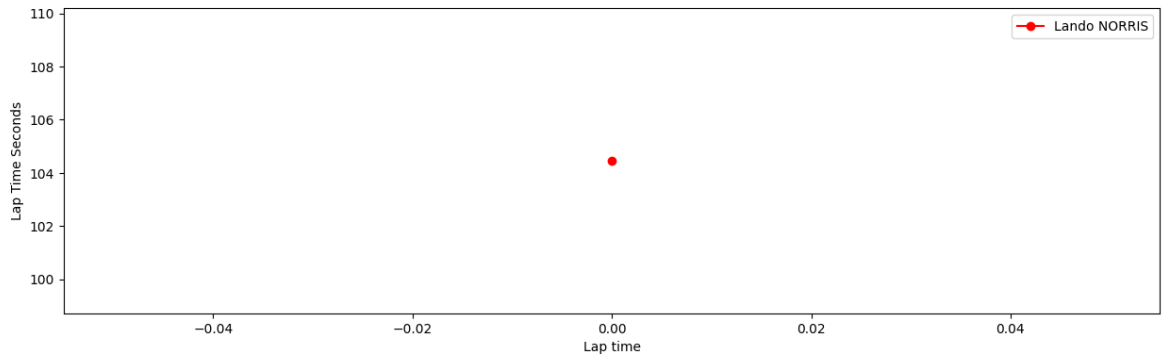

Yuki TSUNODA
98.4

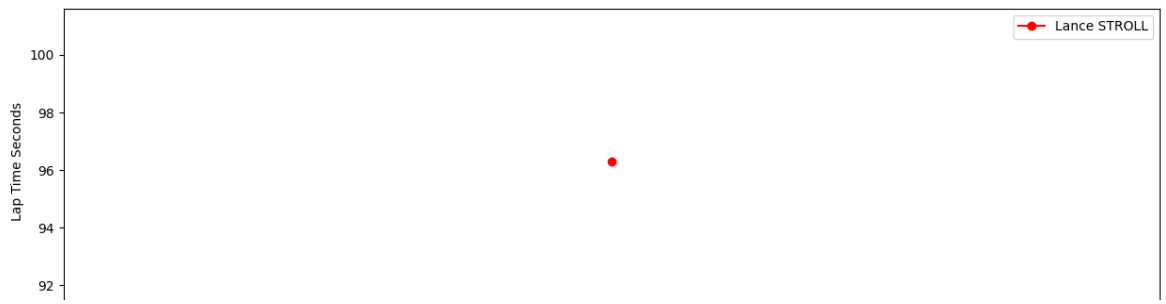

Lap Time Seconds
98.3
98.2
98.1
98.0
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

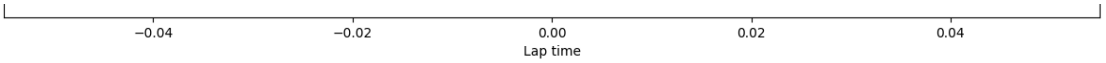

Kevin MAGNUSSEN
Lap Time Seconds
98.0
97.8
97.6
97.4
97.2
0.0
0.2
0.4
0.6
0.8
1.0
Lap time


Oscar PIASTRI
Lap Time Seconds
100
98
96
94
92
−0.04
−0.02
0.00
0.02
0.04
Lap time


Nico HULKENBERG
Lap Time Seconds
97.45
97.40
97.35
97.30
97.25
97.20
97.15
97.10
0.0
0.2
0.4
0.6
0.8
1.0
Lap time

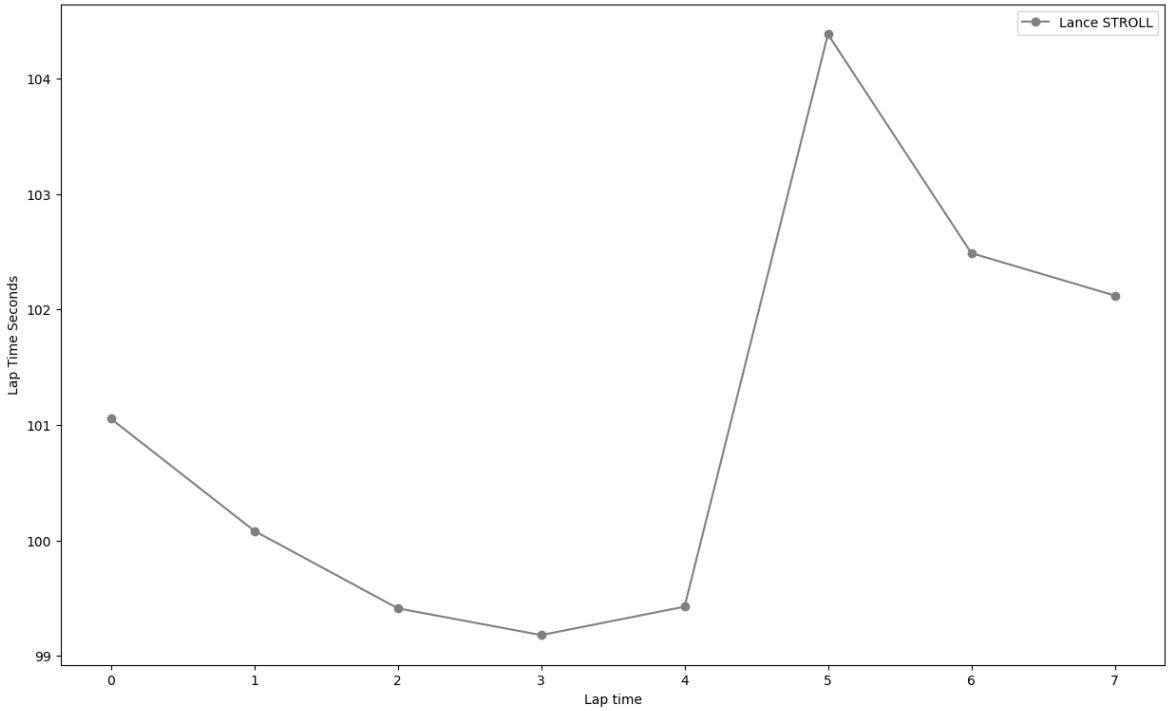

Lando NORRIS
Lap Time Seconds
110
108
106
104
102
100
−0.04
−0.02
0.00
0.02
0.04
Lap time

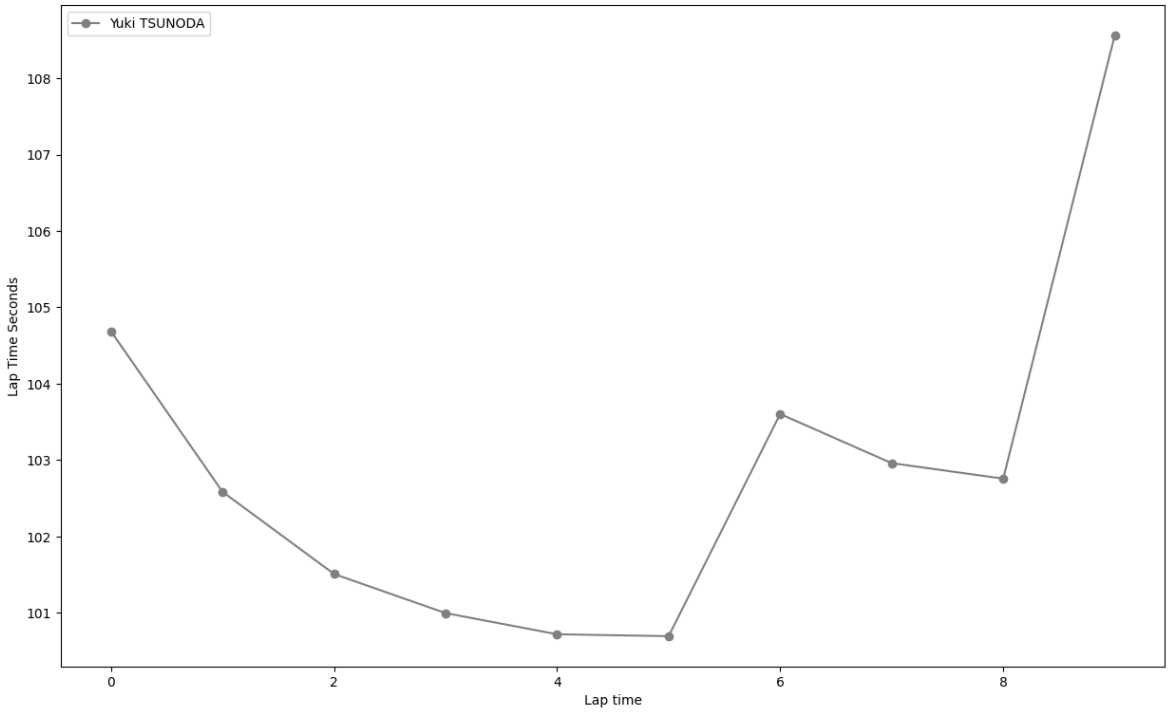

Lance STROLL
Lap Time Seconds
100
98
96
94
92

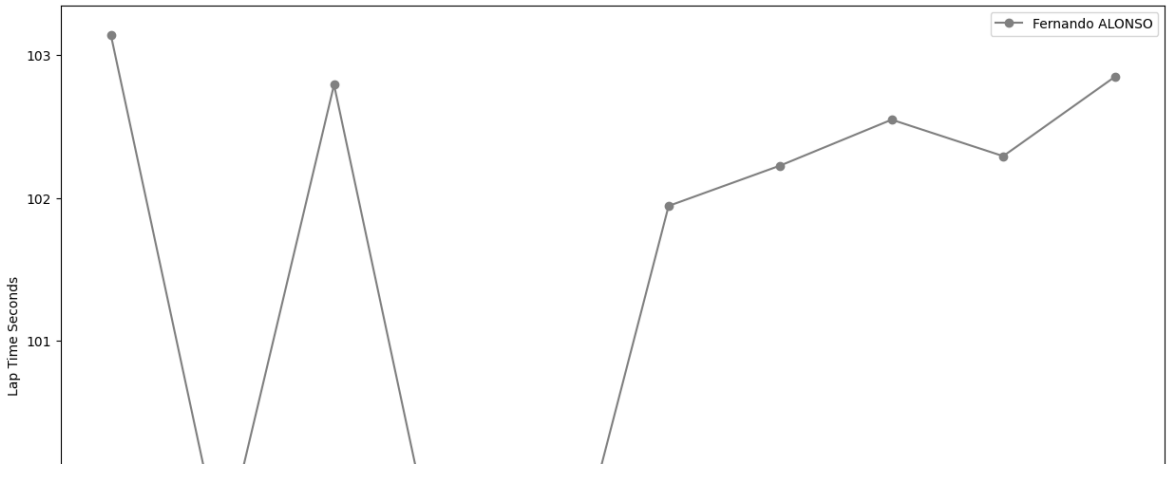


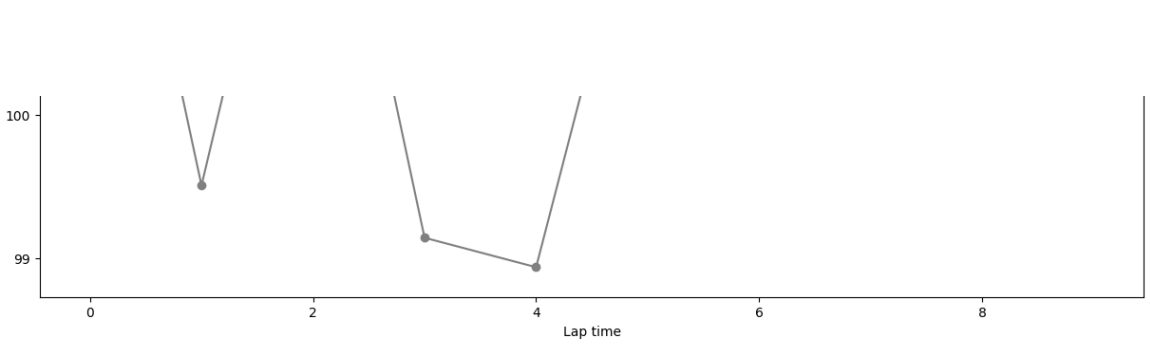
Hard tyres

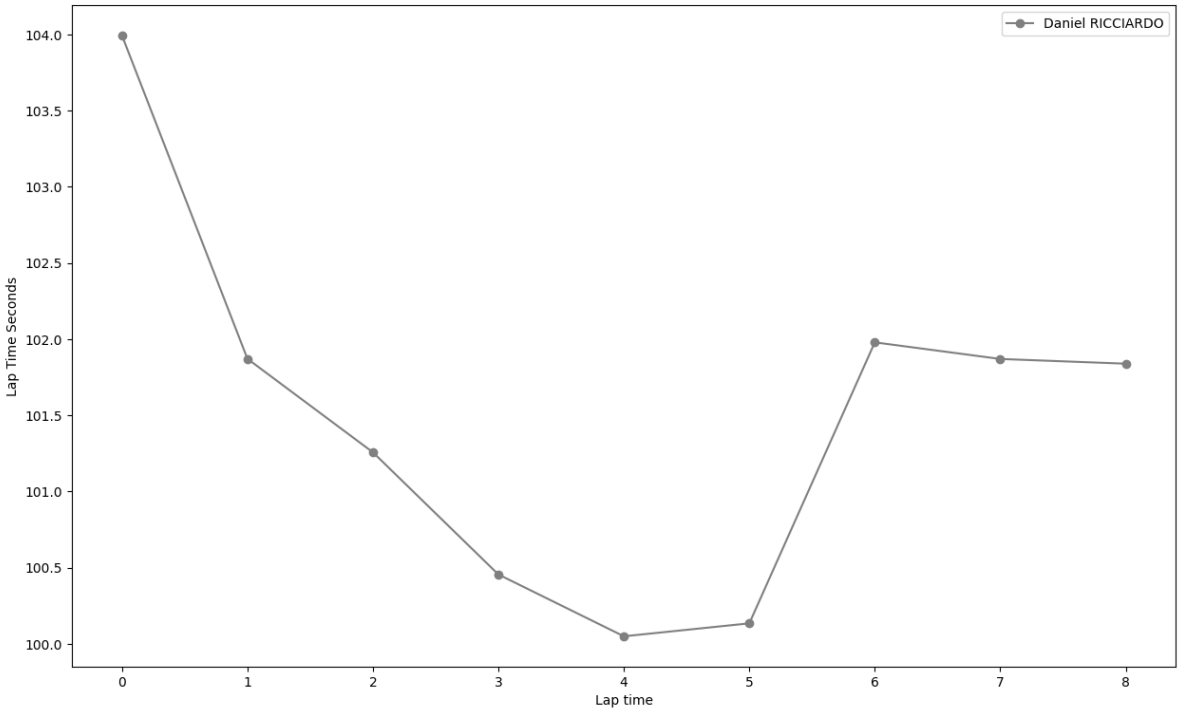
In [7]:
```
libraryDataF1.obtain_data_tyres(jointables2,"HARD",110)
```

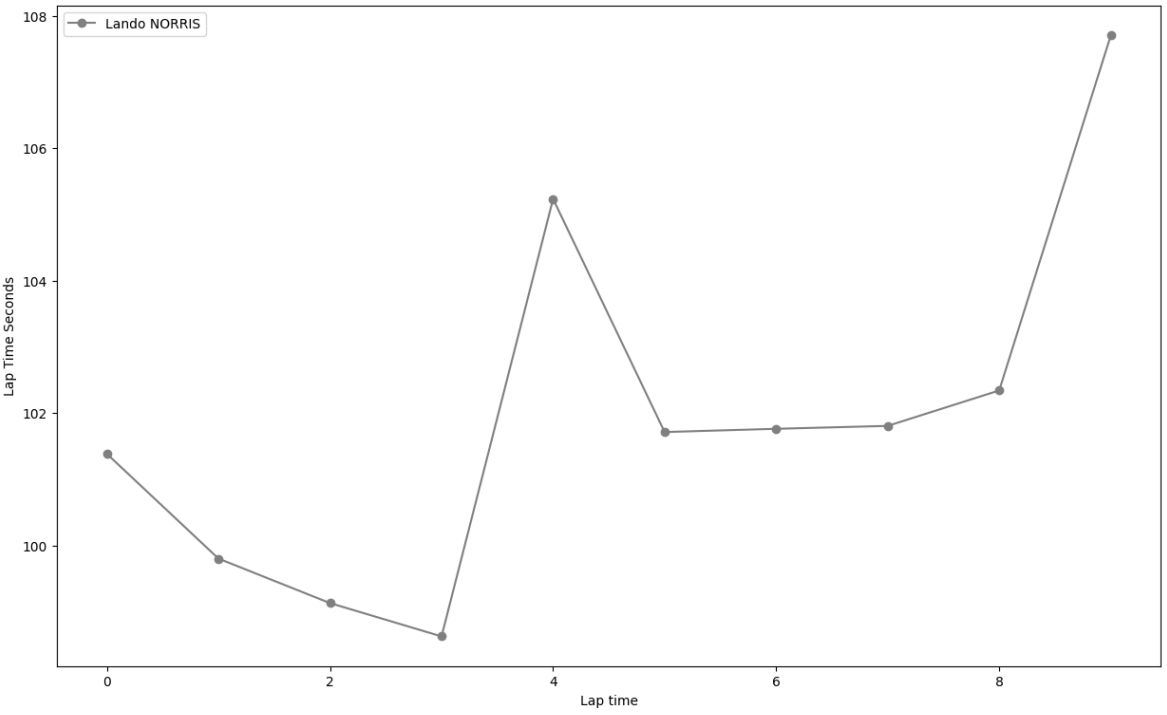

Lance STROLL
Lap Time Seconds
Lap time
104
103
102
101
100
99
0
1
2
3
4
5
6
7

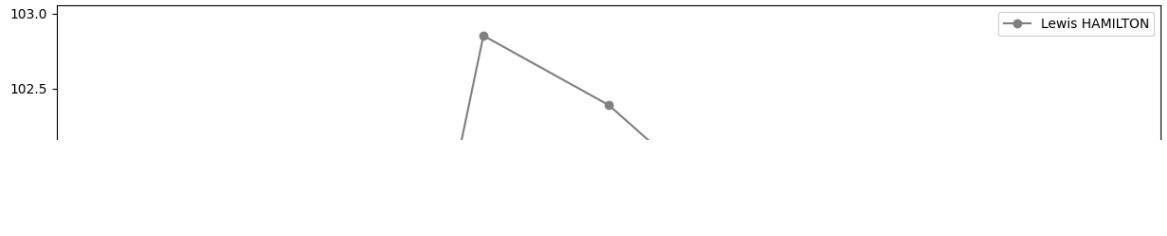

Yuki TSUNODA
Lap Time Seconds
Lap time
108
107
106
105
104
103
102
101
0
2
4
6
8

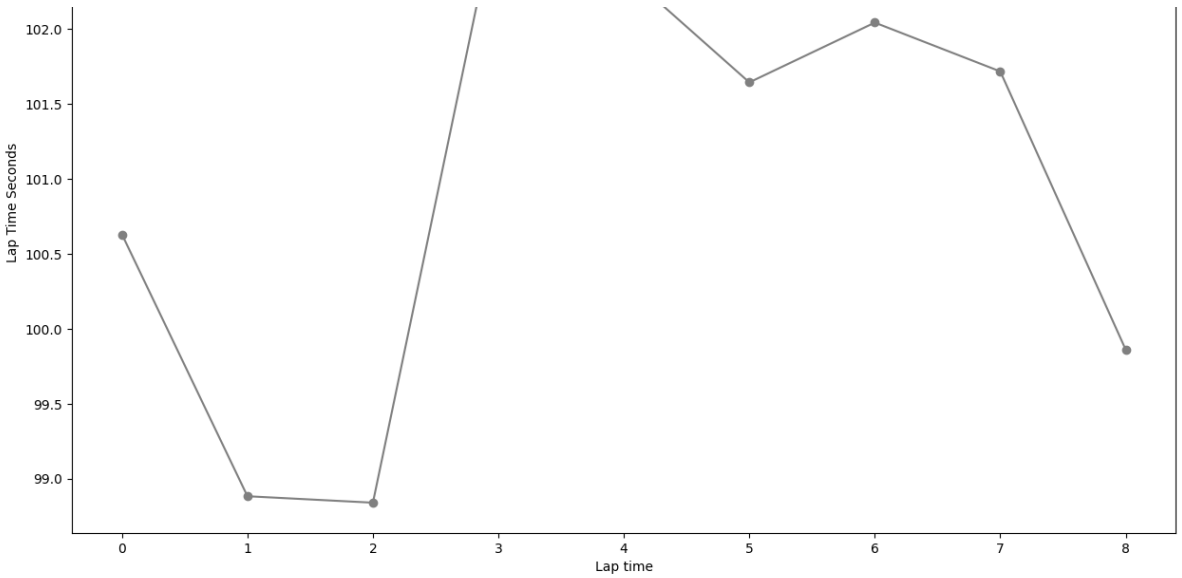

Fernando ALONSO
Lap Time Seconds
103
102
101

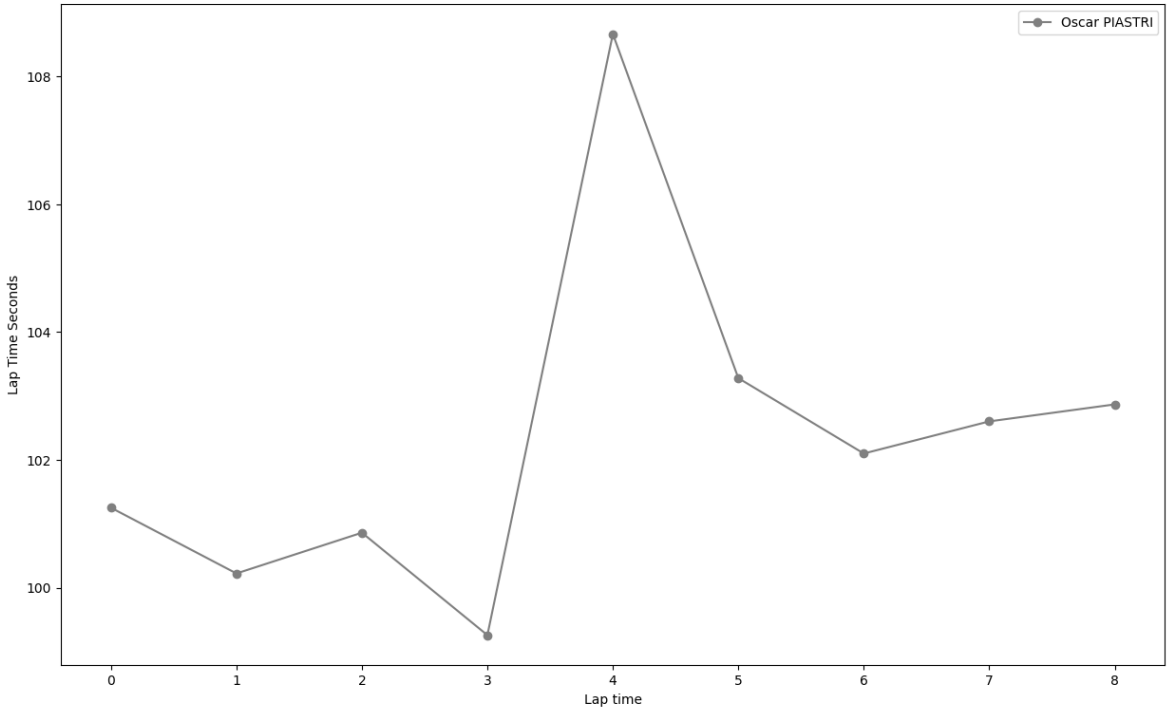

100
99
0
2
4
6
8
Lap time

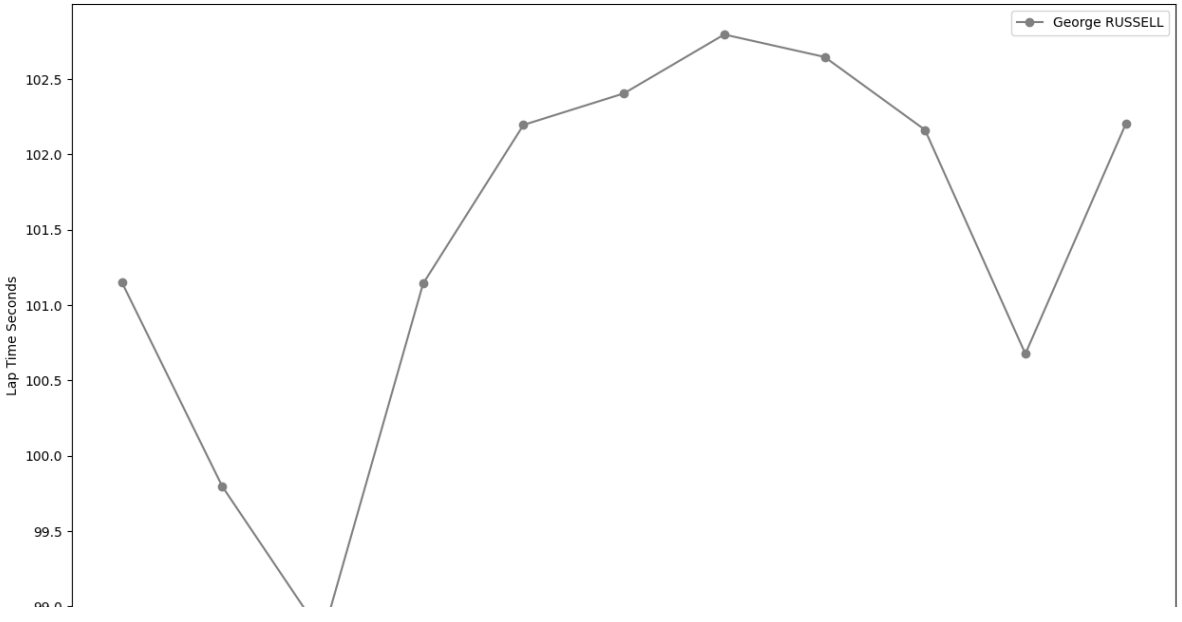

Daniel RICCIARDO
104.0
103.5
103.0
102.5
102.0
101.5
101.0
100.5
100.0
Lap Time Seconds
0
1
2
3
4
5
6
7
8
Lap time

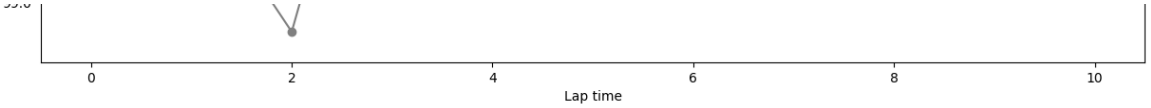

Lando NORRIS
108
106
104
102
100
Lap Time Seconds
0
2
4
6
8
Lap time


Lewis HAMILTON
103.0
102.5


Lap Time Seconds
102.0
101.5
101.0
100.5
100.0
99.5
99.0
0
1
2
3
4
5
6
7
8
Lap time

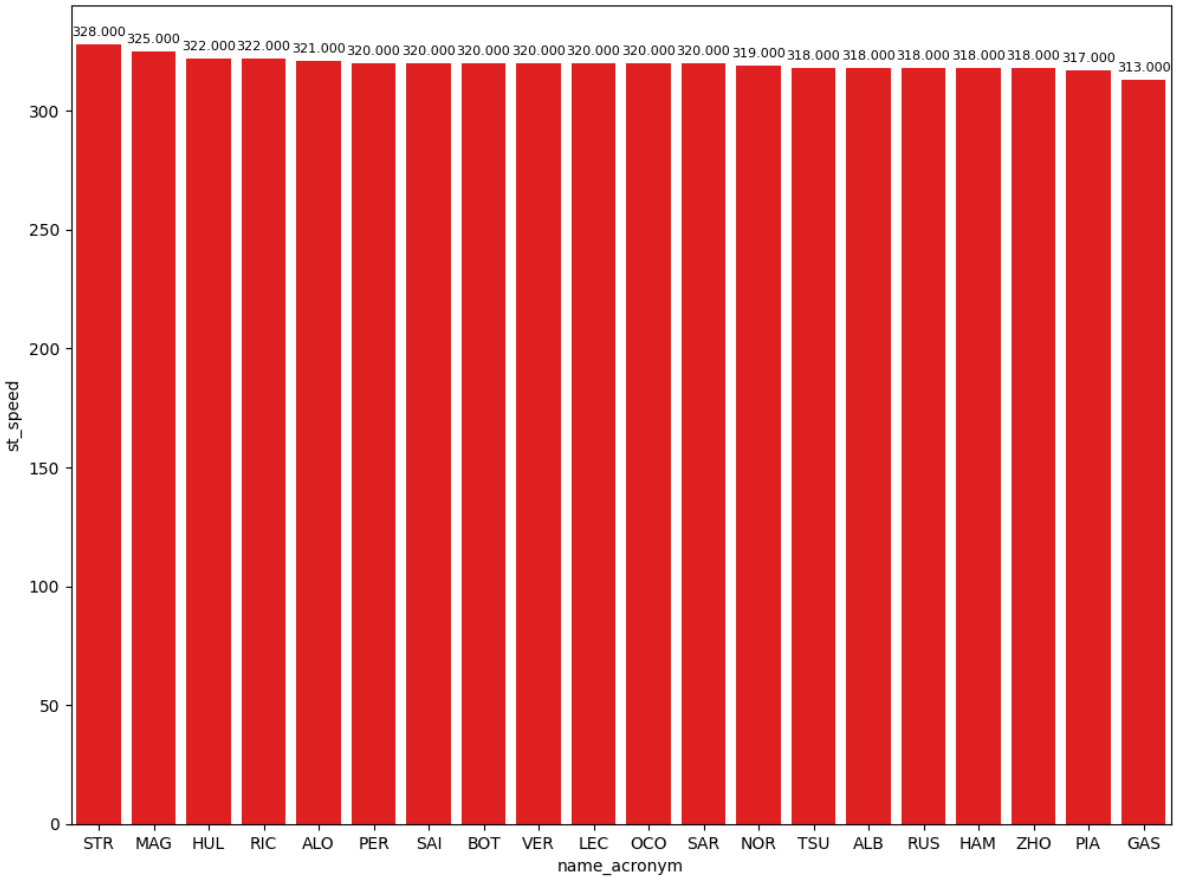

Oscar PIASTRI
Lap Time Seconds
108
106
104
102
100
0
1
2
3
4
5
6
7
8
Lap time


George RUSSELL
Lap Time Seconds
102.5
102.0
101.5
101.0
100.5
100.0
99.5

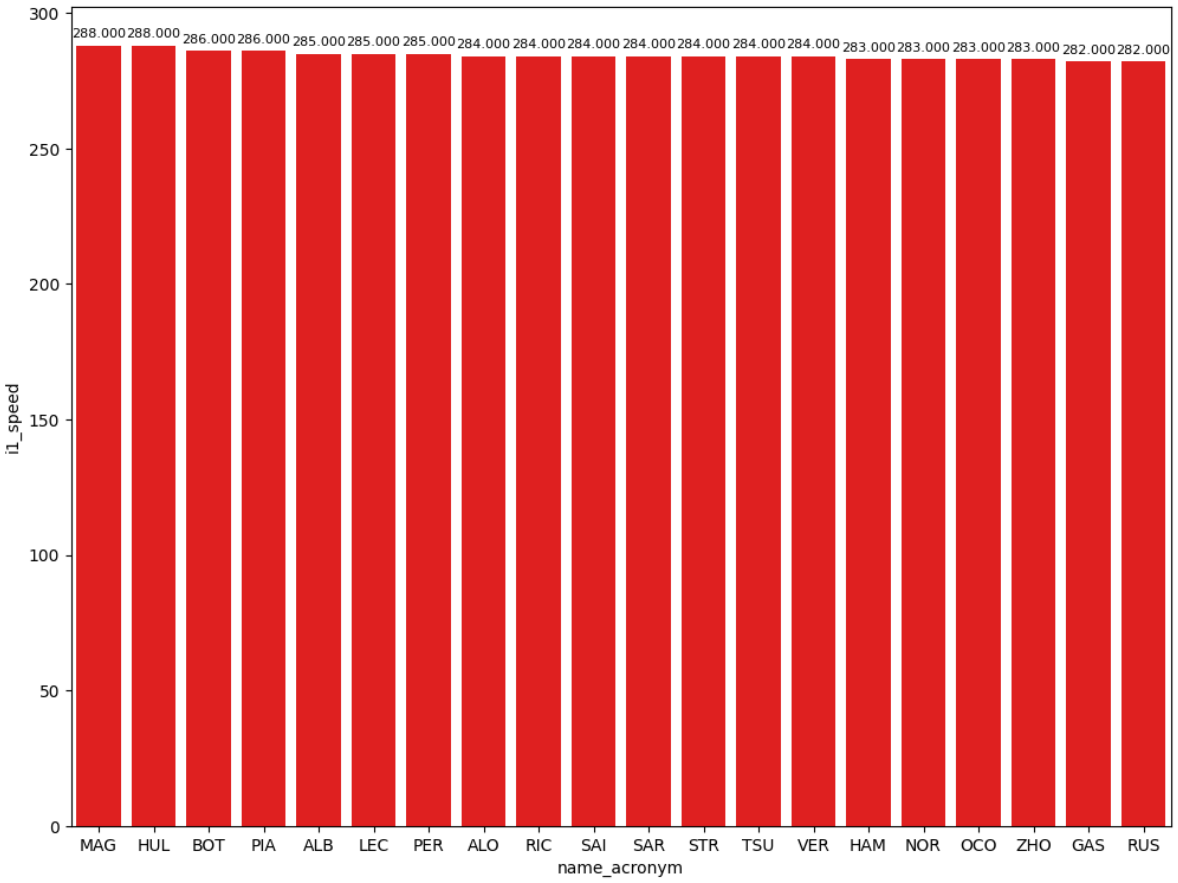


Speed trap

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

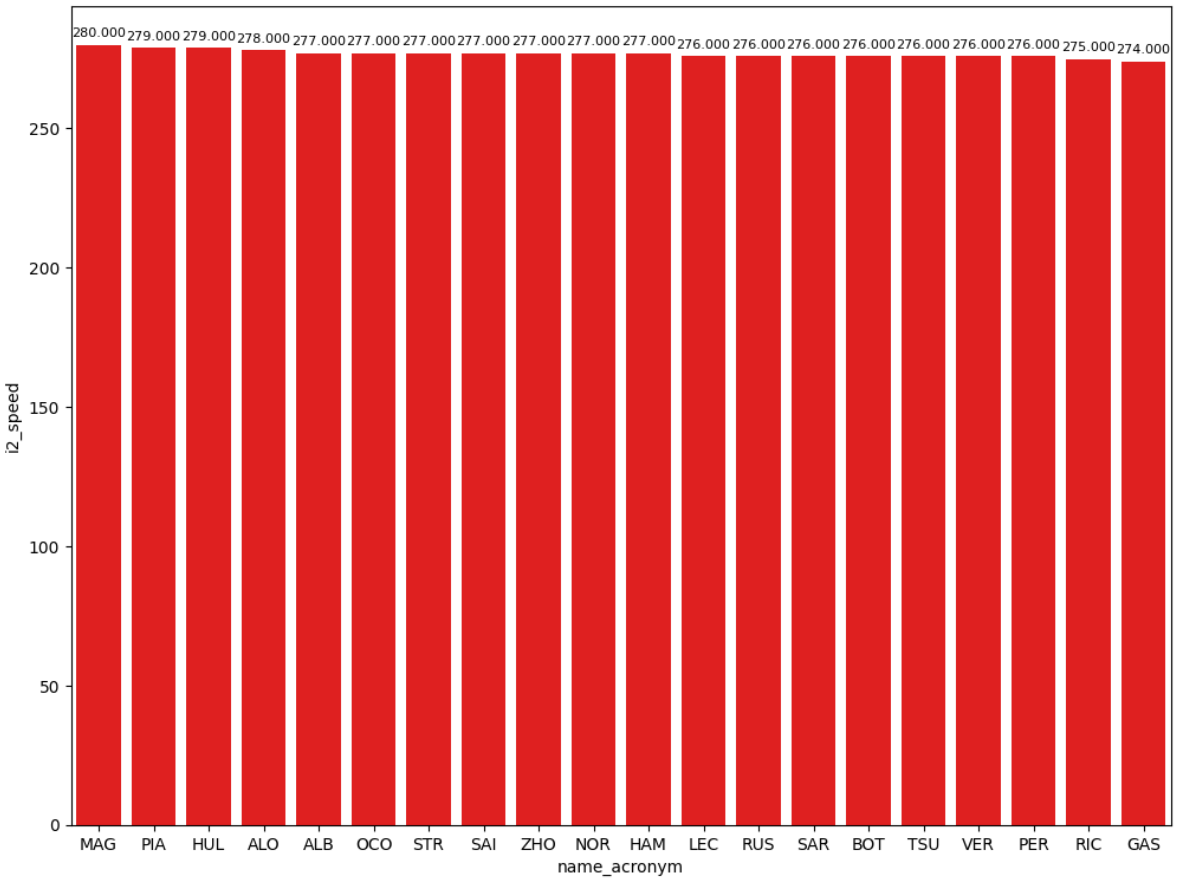


In [9]:
```
top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i1_speed
libraryDataF1.obtainchart("name_acronym","i1_speed",top_speed)
```



In [10]:

```
top_speed = jointables2.loc[jointables2.groupby(['name_acronym'])['i2_speed
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_dura
compoundsPace[['full_name','compound','duration_sector_1','duration_sector_
```

Out[11]:

	full_name	compound	duration_sector_1	duration_sector_2	duration_sector_3	lap_dur
214	Lando NORRIS	HARD	25.789	29.404	43.437	9
94	Max VERSTAPPEN	MEDIUM	25.688	29.218	43.592	9
391	Lance STROLL	SOFT	25.091	28.534	42.677	9

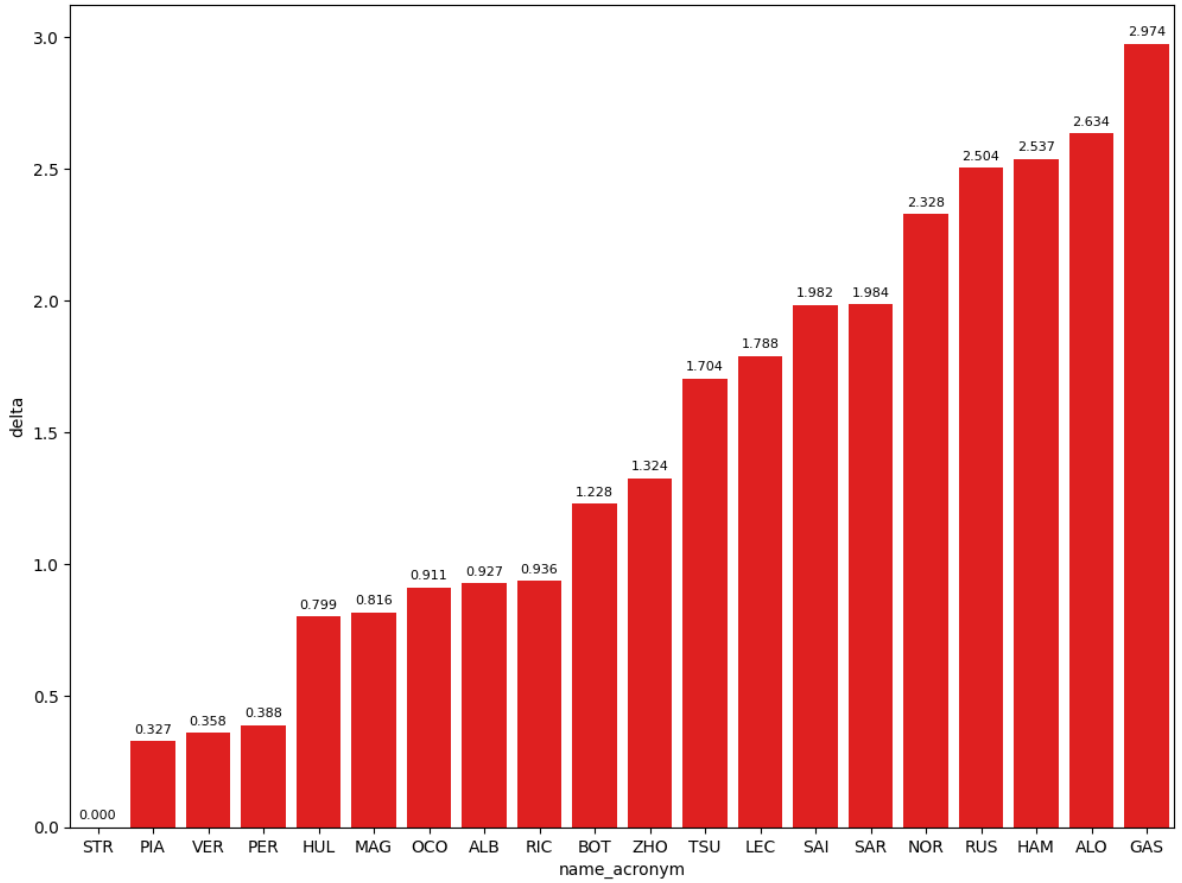
Deltas

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

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

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'])['durat
sectorPace[['duration_sector_1','full_name','compound','lap_duration','lap
```

Out[14]:

	duration_sector_1	full_name	compound	lap_duration	lap_number
373	24.759	Lando NORRIS	SOFT	104.460	18
360	24.970	Oscar PIASTRI	SOFT	96.629	20
391	25.091	Lance STROLL	SOFT	96.302	18
330	25.180	Max VERSTAPPEN	SOFT	96.660	19
408	25.270	Esteban OCON	SOFT	97.378	21
385	25.286	Sergio PEREZ	SOFT	96.690	21
363	25.295	Nico HULKENBERG	SOFT	97.101	19
334	25.328	Daniel RICCIARDO	SOFT	97.238	19
316	25.367	Alexander ALBON	SOFT	97.229	16
336	25.382	Valtteri BOTTAS	SOFT	97.560	18
358	25.383	Kevin MAGNUSSEN	SOFT	97.118	18
331	25.430	ZHOU Guanyu	SOFT	97.626	17
339	25.453	Yuki TSUNODA	SOFT	98.006	21
108	25.619	Fernando ALONSO	HARD	NaN	6

	duration_sector_1	full_name	compound	lap_duration	lap_number
307	25.715	Logan SARGEANT	SOFT	98.317	16
236	25.766	Lewis HAMILTON	HARD	98.882	11
227	25.768	Charles LECLERC	SOFT	98.090	10
333	25.780	Carlos SAINZ	SOFT	98.284	12
212	25.885	George RUSSELL	HARD	98.806	8

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

Out[15]:

	duration_sector_2	full_name	compound	lap_duration	lap_number
391	28.534	Lance STROLL	SOFT	96.302	18
387	28.652	Max VERSTAPPEN	SOFT	96.687	22
385	28.699	Sergio PEREZ	SOFT	96.690	21
408	28.745	Esteban OCON	SOFT	97.378	21
373	28.779	Lando NORRIS	SOFT	104.460	18
380	28.826	ZHOU Guanyu	SOFT	97.944	20
400	28.897	Nico HULKENBERG	SOFT	97.477	21
358	28.931	Kevin MAGNUSSEN	SOFT	97.118	18
360	29.018	Oscar PIASTRI	SOFT	96.629	20
388	29.037	Valtteri BOTTAS	SOFT	97.530	21
316	29.060	Alexander ALBON	SOFT	97.229	16
386	29.068	Daniel RICCIARDO	SOFT	98.368	22
227	29.132	Charles LECLERC	SOFT	98.090	10
155	29.188	Carlos SAINZ	SOFT	98.382	7
339	29.290	Yuki TSUNODA	SOFT	98.006	21
275	29.290	Lewis HAMILTON	HARD	98.839	13
338	29.361	Logan SARGEANT	SOFT	98.286	19
108	29.403	Fernando ALONSO	HARD	NaN	6
185	29.485	Pierre GASLY	SOFT	99.276	9
212	29.491	George RUSSELL	HARD	98.806	8

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

Out[16]:

	duration_sector_3	full_name	compound	lap_duration	lap_number
329	42.536	Sergio PEREZ	SOFT	97.158	18
330	42.576	Max VERSTAPPEN	SOFT	96.660	19
360	42.641	Oscar PIASTRI	SOFT	96.629	20
391	42.677	Lance STROLL	SOFT	96.302	18
334	42.758	Daniel RICCIARDO	SOFT	97.238	19

	duration_sector_3	full_name	compound	lap_duration	lap_number
316	42.802	Alexander ALBON	SOFT	97.229	16
358	42.804	Kevin MAGNUSSEN	SOFT	97.118	18
356	42.824	Esteban OCON	SOFT	97.213	18
363	42.887	Nico HULKENBERG	SOFT	97.101	19
336	42.910	Valtteri BOTTAS	SOFT	97.560	18
325	43.079	Charles LECLERC	SOFT	98.698	13
338	43.097	Logan SARGEANT	SOFT	98.286	19
333	43.133	Carlos SAINZ	SOFT	98.284	12
331	43.206	ZHOU Guanyu	SOFT	97.626	17
339	43.263	Yuki TSUNODA	SOFT	98.006	21
212	43.430	George RUSSELL	HARD	98.806	8
214	43.437	Lando NORRIS	HARD	98.630	10
274	43.636	Fernando ALONSO	HARD	98.936	13
236	43.711	Lewis HAMILTON	HARD	98.882	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 la
race_pace
```

Out[17]:

compound	lap_duration
SOFT	99.657379
HARD	101.407833
MEDIUM	102.366391

Long runs

In [18]:
```
MINIMUN_SECONDS = 90
MAXIMUM_SECONDS = 110
```

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
11	1233	9663	1	1	1	8	MEDIUM	
13	1233	9663	1	11	1	8	MEDIUM	
36	1233	9663	2	11	9	17	MEDIUM	
41	1233	9663	2	1	9	18	MEDIUM	
54	1233	9663	3	11	18	20	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
60	1233	9663	3	1	19	21	SOFT	
65	1233	9663	4	11	21	25	SOFT	

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

Out[20]:

	full_name	compound	date_start	lap_number	duration_sector_1
22	Max VERSTAPPEN	MEDIUM	2024-04-19T03:33:46.508000+00:00	2	25.865
57	Max VERSTAPPEN	MEDIUM	2024-04-19T03:37:48.010000+00:00	4	25.781
94	Max VERSTAPPEN	MEDIUM	2024-04-19T03:42:00.194000+00:00	6	25.688
149	Max VERSTAPPEN	MEDIUM	2024-04-19T03:54:49.054000+00:00	9	27.002
162	Max VERSTAPPEN	MEDIUM	2024-04-19T03:56:30.783000+00:00	10	26.881
180	Max VERSTAPPEN	MEDIUM	2024-04-19T03:58:12.886000+00:00	11	26.951
195	Max VERSTAPPEN	MEDIUM	2024-04-19T03:59:55.085000+00:00	12	27.221
213	Max VERSTAPPEN	MEDIUM	2024-04-19T04:01:37.739000+00:00	13	26.967
229	Max VERSTAPPEN	MEDIUM	2024-04-19T04:03:19.878000+00:00	14	27.006
247	Max VERSTAPPEN	MEDIUM	2024-04-19T04:05:02.190000+00:00	15	27.034
262	Max VERSTAPPEN	MEDIUM	2024-04-19T04:06:45.199000+00:00	16	27.013
330	Max VERSTAPPEN	SOFT	2024-04-19T04:20:12.411000+00:00	19	25.180
387	Max VERSTAPPEN	SOFT	2024-04-19T04:27:16.054000+00:00	22	25.190

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

Out[21]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
23	Sergio PEREZ	MEDIUM	2024-04-19T03:34:00.527000+00:00	2	25.868	
60	Sergio PEREZ	MEDIUM	2024-04-19T03:38:19.154000+00:00	4	25.930	
99	Sergio PEREZ	MEDIUM	2024-04-19T03:42:29.784000+00:00	6	25.681	
145	Sergio PEREZ	MEDIUM	2024-04-19T03:54:15.910000+00:00	9	27.237	
157	Sergio PEREZ	MEDIUM	2024-04-19T03:55:58.863000+00:00	10	27.201	
174	Sergio PEREZ	MEDIUM	2024-04-19T03:57:41.491000+00:00	11	27.309	

	full_name	compound	date_start	lap_number	duration_sector_1	du
190	Sergio PEREZ	MEDIUM	2024-04-19T03:59:24.362000+00:00	12	27.233	
207	Sergio PEREZ	MEDIUM	2024-04-19T04:01:07.076000+00:00	13	27.116	
225	Sergio PEREZ	MEDIUM	2024-04-19T04:02:49.793000+00:00	14	27.230	
243	Sergio PEREZ	MEDIUM	2024-04-19T04:04:33.645000+00:00	15	27.326	
329	Sergio PEREZ	SOFT	2024-04-19T04:20:01.259000+00:00	18	25.304	
385	Sergio	SOFT	2024-04-19T04:27:02.215000+00:00	21	25.286	

Ferrari

In [22]:
```
libraryDataF1.getinfolongruns(jointables2,16,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[22]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
93	Charles LECLERC	SOFT	2024-04-19T03:41:52.771000+00:00	2	26.561	
133	Charles LECLERC	SOFT	2024-04-19T03:52:25.887000+00:00	5	26.162	
161	Charles LECLERC	SOFT	2024-04-19T03:56:25.071000+00:00	7	25.820	
227	Charles LECLERC	SOFT	2024-04-19T04:03:05.080000+00:00	10	25.768	
325	Charles LECLERC	SOFT	2024-04-19T04:19:11.783000+00:00	13	25.872	
370	Charles LECLERC	SOFT	2024-04-19T04:25:06.410000+00:00	16	26.502	
383	Charles LECLERC	SOFT	2024-04-19T04:26:47.458000+00:00	17	26.766	
398	Charles LECLERC	SOFT	2024-04-19T04:28:28.098000+00:00	18	26.755	

In [23]:
```
libraryDataF1.getinfolongruns(jointables2,55,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[23]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
92	Carlos SAINZ	SOFT	2024-04-19T03:41:41.756000+00:00	2	26.574	
126	Carlos SAINZ	SOFT	2024-04-19T03:51:17.322000+00:00	5	26.464	
155	Carlos SAINZ	SOFT	2024-04-19T03:55:46.855000+00:00	7	26.013	
198	Carlos SAINZ	SOFT	2024-04-19T04:00:17.376000+00:00	9	25.816	
333	Carlos SAINZ	SOFT	2024-04-19T04:20:40.716000+00:00	12	25.780	
364	Carlos SAINZ	SOFT	2024-04-19T04:24:46.920000+00:00	14	26.868	

	full_name	compound	date_start	lap_number	duration_sector_1	du
381	Carlos SAINZ	SOFT	2024-04-19T04:26:28.048000+00:00	15	26.652	
396	Carlos SAINZ	SOFT	2024-04-19T04:28:09.748000+00:00	16	26.938	
415	Carlos	SOFT	2024-04-19T04:29:58.717000+00:00	17	26.890	

Mercedes

In [24]:
```
libraryDataF1.getinfolongruns(jointables2,44,'Mercedes',MINIMUN_SECONDS,MA
```

Out[24]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
56	Lewis HAMILTON	HARD	2024-04-19T03:37:34.745000+00:00	3	26.121	
236	Lewis HAMILTON	HARD	2024-04-19T04:03:59.413000+00:00	11	25.766	
275	Lewis HAMILTON	HARD	2024-04-19T04:08:24.048000+00:00	13	25.837	
296	Lewis HAMILTON	HARD	2024-04-19T04:11:53.007000+00:00	15	26.707	
304	Lewis HAMILTON	HARD	2024-04-19T04:13:35.786000+00:00	16	26.661	
309	Lewis HAMILTON	HARD	2024-04-19T04:15:18.156000+00:00	17	26.755	
314	Lewis HAMILTON	HARD	2024-04-19T04:16:59.860000+00:00	18	26.754	
323	Lewis HAMILTON	HARD	2024-04-19T04:18:41.889000+00:00	19	26.883	
406	Lewis HAMILTON	HARD	2024-04-19T04:29:17.135000+00:00	22	26.213	

In [25]:
```
libraryDataF1.getinfolongruns(jointables2,63,'Mercedes',MINIMUN_SECONDS,MA
```

Out[25]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
139	George RUSSELL	HARD	2024-04-19T03:53:16.940000+00:00	4	26.453	
169	George RUSSELL	HARD	2024-04-19T03:57:19.526000+00:00	6	26.093	
212	George RUSSELL	HARD	2024-04-19T04:01:34.321000+00:00	8	25.885	
250	George RUSSELL	HARD	2024-04-19T04:05:22.836000+00:00	10	26.373	
266	George RUSSELL	HARD	2024-04-19T04:07:03.942000+00:00	11	26.831	
279	George RUSSELL	HARD	2024-04-19T04:08:46.154000+00:00	12	26.914	
292	George RUSSELL	HARD	2024-04-19T04:10:28.575000+00:00	13	27.074	
299	George RUSSELL	HARD	2024-04-19T04:12:11.274000+00:00	14	27.062	

	full_name	compound	date_start	lap_number	duration_sector_1	du
306	George RUSSELL	HARD	2024-04-19T04:13:53.939000+00:00	15	27.018	
393	George RUSSELL	HARD	2024-04-19T04:28:02.291000+00:00	18	25.966	
410	George [illegible]	HARD	2024-04-19T04:29:43.044000+00:00	19	26.980	

McLaren

In [26]:
```
libraryDataF1.getinfolongruns(jointables2,4,'McLaren',MINIMUN_SECONDS,MAXI
```

Out[26]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
55	Lando NORRIS	HARD	2024-04-19T03:37:29.117000+00:00	3	26.554	
91	Lando NORRIS	HARD	2024-04-19T03:41:33.695000+00:00	5	25.836	
172	Lando NORRIS	HARD	2024-04-19T03:57:33.192000+00:00	8	25.639	
214	Lando NORRIS	HARD	2024-04-19T04:01:42.814000+00:00	10	25.789	
230	Lando NORRIS	HARD	2024-04-19T04:03:21.361000+00:00	11	28.377	
248	Lando NORRIS	HARD	2024-04-19T04:05:06.697000+00:00	12	26.716	
263	Lando NORRIS	HARD	2024-04-19T04:06:48.469000+00:00	13	26.695	
277	Lando NORRIS	HARD	2024-04-19T04:08:30.261000+00:00	14	26.582	
290	Lando NORRIS	HARD	2024-04-19T04:10:12.010000+00:00	15	26.922	
297	Lando NORRIS	HARD	2024-04-19T04:11:54.433000+00:00	16	27.152	
373	Lando NORRIS	SOFT	2024-04-19T04:25:20.108000+00:00	18	24.759	

In [27]:
```
libraryDataF1.getinfolongruns(jointables2,81,'McLaren',MINIMUN_SECONDS,MAX
```

Out[27]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
70	Oscar PIASTRI	HARD	2024-04-19T03:39:04.149000+00:00	3	26.092	
134	Oscar PIASTRI	HARD	2024-04-19T03:52:32.276000+00:00	7	26.061	
163	Oscar PIASTRI	HARD	2024-04-19T03:56:32.744000+00:00	9	26.084	
224	Oscar PIASTRI	HARD	2024-04-19T04:02:44.926000+00:00	12	25.833	
242	Oscar PIASTRI	HARD	2024-04-19T04:04:24.166000+00:00	13	28.380	
259	Oscar PIASTRI	HARD	2024-04-19T04:06:12.859000+00:00	14	26.764	

	full_name	compound	date_start	lap_number	duration_sector_1	du
272	Oscar PIASTRI	HARD	2024-04-19T04:07:56.162000+00:00	15	26.641	
285	Oscar PIASTRI	HARD	2024-04-19T04:09:38.271000+00:00	16	26.796	
294	Oscar PIASTRI	HARD	2024-04-19T04:11:20.877000+00:00	17	27.010	
360	Oscar PIASTRI	SOFT	2024-04-19T04:24:15.720000+00:00	20	24.970	

Aston Martin

In [28]:
```
libraryDataF1.getinfolongruns(jointables2,14,'Aston Martin',MINIMUN_SECONDS
```

Out[28]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
38	Fernando ALONSO	HARD	2024-04-19T03:35:28.553000+00:00	2	27.026	
51	Fernando ALONSO	HARD	2024-04-19T03:37:11.608000+00:00	3	25.786	
199	Fernando ALONSO	HARD	2024-04-19T04:00:26.014000+00:00	9	26.007	
239	Fernando ALONSO	HARD	2024-04-19T04:04:11.389000+00:00	11	25.788	
274	Fernando ALONSO	HARD	2024-04-19T04:08:16.648000+00:00	13	25.848	
341	Fernando ALONSO	HARD	2024-04-19T04:21:34.721000+00:00	16	26.779	
357	Fernando ALONSO	HARD	2024-04-19T04:23:16.652000+00:00	17	26.813	
368	Fernando ALONSO	HARD	2024-04-19T04:24:58.985000+00:00	18	26.889	
382	Fernando ALONSO	HARD	2024-04-19T04:26:41.490000+00:00	19	26.846	
397	Fernando ALONSO	HARD	2024-04-19T04:28:23.745000+00:00	20	26.911	

In [29]:
```
libraryDataF1.getinfolongruns(jointables2,18,'Aston Martin',MINIMUN_SECONDS
```

Out[29]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
16	Lance STROLL	HARD	2024-04-19T03:32:57.154000+00:00	2	26.509	
45	Lance STROLL	HARD	2024-04-19T03:36:41.258000+00:00	4	25.956	
79	Lance STROLL	HARD	2024-04-19T03:40:30.715000+00:00	6	26.022	
221	Lance STROLL	HARD	2024-04-19T04:02:26.161000+00:00	9	26.300	
257	Lance STROLL	HARD	2024-04-19T04:06:07.331000+00:00	11	26.061	

	full_name	compound	date_start	lap_number	duration_sector_1	du
286	Lance STROLL	HARD	2024-04-19T04:09:47.983000+00:00	13	26.049	
295	Lance STROLL	HARD	2024-04-19T04:11:32.357000+00:00	14	27.032	
303	Lance STROLL	HARD	2024-04-19T04:13:14.765000+00:00	15	26.725	

RB

In [30]:
```
libraryDataF1.getinfolongruns(jointables2,3,'RB',MINIMUN_SECONDS,MAXIMUM_SI
```

Out[30]:

	full_name	compound	date_start	lap_number	duration_sector_1
40	Daniel RICCIARDO	HARD	2024-04-19T03:35:35.258000+00:00	2	26.636
53	Daniel RICCIARDO	HARD	2024-04-19T03:37:19.153000+00:00	3	26.500
90	Daniel RICCIARDO	HARD	2024-04-19T03:41:27.548000+00:00	5	26.328
129	Daniel RICCIARDO	HARD	2024-04-19T03:51:52.134000+00:00	8	26.310
156	Daniel RICCIARDO	HARD	2024-04-19T03:55:54.194000+00:00	10	26.257
197	Daniel RICCIARDO	HARD	2024-04-19T04:00:09.838000+00:00	12	26.256
234	Daniel RICCIARDO	HARD	2024-04-19T04:03:42.573000+00:00	14	26.869
251	Daniel RICCIARDO	HARD	2024-04-19T04:05:24.444000+00:00	15	26.813
267	Daniel RICCIARDO	HARD	2024-04-19T04:07:06.330000+00:00	16	26.864
334	Daniel RICCIARDO	SOFT	2024-04-19T04:20:48.181000+00:00	19	25.328
386	Daniel RICCIARDO	SOFT	2024-04-19T04:27:07.661000+00:00	22	25.495

In [31]:
```
libraryDataF1.getinfolongruns(jointables2,22,'RB',MINIMUN_SECONDS,MAXIMUM_S
```

Out[31]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
32	Yuki TSUNODA	HARD	2024-04-19T03:34:49.180000+00:00	2	28.393	
44	Yuki TSUNODA	HARD	2024-04-19T03:36:33.743000+00:00	3	27.143	
80	Yuki TSUNODA	HARD	2024-04-19T03:40:37.436000+00:00	5	26.729	
127	Yuki TSUNODA	HARD	2024-04-19T03:51:25.417000+00:00	8	26.252	
152	Yuki TSUNODA	HARD	2024-04-19T03:55:33.017000+00:00	10	26.305	

	full_name	compound	date_start	lap_number	duration_sector_1	d
235	Yuki TSUNODA	HARD	2024-04-19T04:03:52.824000+00:00	14	26.368	
268	Yuki TSUNODA	HARD	2024-04-19T04:07:25.218000+00:00	16	27.409	
282	Yuki TSUNODA	HARD	2024-04-19T04:09:08.721000+00:00	17	27.210	
293	Yuki TSUNODA	HARD	2024-04-19T04:10:51.702000+00:00	18	26.929	
300	Yuki TSUNODA	HARD	2024-04-19T04:12:34.511000+00:00	19	26.999	
339	Yuki TSUNODA	SOFT	2024-04-19T04:21:18.978000+00:00	21	25.453	

Haas

In [32]:
```
libraryDataF1.getinfolongruns(jointables2,20,'Haas F1 Team',MINIMUN_SECONDS
```

Out[32]:

	full_name	compound	date_start	lap_number	duration_sector_1
9	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:32:25.022000+00:00	2	26.246
43	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:36:28.014000+00:00	4	26.165
81	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:40:42.649000+00:00	6	26.080
141	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:53:51.061000+00:00	9	27.388
153	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:55:35.785000+00:00	10	27.529
170	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:57:20.562000+00:00	11	27.717
188	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:59:05.149000+00:00	12	27.850
206	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:00:50.542000+00:00	13	27.878
223	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:02:36.058000+00:00	14	28.056
241	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:04:23.442000+00:00	15	28.286
358	Kevin MAGNUSSEN	SOFT	2024-04-19T04:23:38.757000+00:00	18	25.383
412	Kevin MAGNUSSEN	SOFT	2024-04-19T04:29:50.735000+00:00	21	25.660

In [33]:
```
libraryDataF1.getinfolongruns(jointables2,27,'Haas F1 Team',MINIMUN_SECONDS
```

Out[33]:

	full_name	compound	date_start	lap_number	duration_sector_1
27	Nico HULKENBERG	MEDIUM	2024-04-19T03:34:25.959000+00:00	3	26.24

	full_name	compound	date_start	lap_number	duration_sector_1
62	Nico HULKENBERG	MEDIUM	2024-04-19T03:38:24.512000+00:00	5	25.996
101	Nico HULKENBERG	MEDIUM	2024-04-19T03:42:34.841000+00:00	7	25.810
164	Nico HULKENBERG	MEDIUM	2024-04-19T03:56:33.671000+00:00	10	27.212
182	Nico HULKENBERG	MEDIUM	2024-04-19T03:58:17.757000+00:00	11	27.376
196	Nico HULKENBERG	MEDIUM	2024-04-19T04:00:01.368000+00:00	12	27.691
215	Nico HULKENBERG	MEDIUM	2024-04-19T04:01:45.633000+00:00	13	27.578
233	Nico HULKENBERG	MEDIUM	2024-04-19T04:03:30.220000+00:00	14	27.745
249	Nico HULKENBERG	MEDIUM	2024-04-19T04:05:15.430000+00:00	15	27.838
265	Nico HULKENBERG	MEDIUM	2024-04-19T04:07:00.558000+00:00	16	28.017
363	Nico HULKENBERG	SOFT	2024-04-19T04:24:39.314000+00:00	19	25.295

Alpine

In [34]:
```
libraryDataF1.getinfolongruns(jointables2,31,'Alpine',MINIMUN_SECONDS,MAXI
```

Out[34]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
10	Esteban OCON	SOFT	2024-04-19T03:32:33.212000+00:00	2	26.384	
46	Esteban OCON	SOFT	2024-04-19T03:36:47.746000+00:00	4	25.840	
201	Esteban OCON	SOFT	2024-04-19T04:00:33.190000+00:00	9	25.627	
264	Esteban OCON	SOFT	2024-04-19T04:06:58.661000+00:00	12	25.694	
278	Esteban OCON	SOFT	2024-04-19T04:08:37.238000+00:00	13	26.385	
291	Esteban OCON	SOFT	2024-04-19T04:10:18.404000+00:00	14	26.573	
298	Esteban OCON	SOFT	2024-04-19T04:12:00.032000+00:00	15	26.769	
305	Esteban OCON	SOFT	2024-04-19T04:13:42.224000+00:00	16	26.869	
356	Esteban OCON	SOFT	2024-04-19T04:23:12.795000+00:00	18	25.363	
408	Esteban OCON	SOFT	2024-04-19T04:29:38.815000+00:00	21	25.270	

In [35]:
```
libraryDataF1.getinfolongruns(jointables2,10,'Alpine',MINIMUN_SECONDS,MAXI
```

Out[35]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
17	Pierre GASLY	SOFT	2024-04-19T03:33:11.926000+00:00	2	26.144	
75	Pierre GASLY	SOFT	2024-04-19T03:39:39.173000+00:00	5	26.008	
185	Pierre GASLY	SOFT	2024-04-19T03:58:58.571000+00:00	9	25.978	
202	Pierre GASLY	SOFT	2024-04-19T04:00:37.848000+00:00	10	26.663	
220	Pierre GASLY	SOFT	2024-04-19T04:02:19.588000+00:00	11	26.748	
237	Pierre GASLY	SOFT	2024-04-19T04:04:01.543000+00:00	12	26.772	
254	Pierre GASLY	SOFT	2024-04-19T04:05:44.003000+00:00	13	26.942	
269	Pierre GASLY	SOFT	2024-04-19T04:07:26.874000+00:00	14	27.012	
359	Pierre GASLY	SOFT	2024-04-19T04:23:53.155000+00:00	17	27.344	
375	Pierre GASLY	SOFT	2024-04-19T04:25:37.831000+00:00	18	27.570	
389	Pierre GASLY	SOFT	2024-04-19T04:27:21.993000+00:00	19	26.778	

Williams

In [36]:

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

Out[36]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
48	Alexander ALBON	MEDIUM	2024-04-19T03:36:57.998000+00:00	2	26.209	
85	Alexander ALBON	MEDIUM	2024-04-19T03:41:02.851000+00:00	4	25.963	
124	Alexander ALBON	MEDIUM	2024-04-19T03:50:55.434000+00:00	7	26.619	
135	Alexander ALBON	MEDIUM	2024-04-19T03:52:37.930000+00:00	8	26.772	
146	Alexander ALBON	MEDIUM	2024-04-19T03:54:20.757000+00:00	9	26.862	
158	Alexander ALBON	MEDIUM	2024-04-19T03:56:03.551000+00:00	10	26.967	
176	Alexander ALBON	MEDIUM	2024-04-19T03:57:46.430000+00:00	11	27.012	
192	Alexander ALBON	MEDIUM	2024-04-19T03:59:29.549000+00:00	12	27.119	
316	Alexander ALBON	SOFT	2024-04-19T04:17:50.820000+00:00	16	25.367	
362	Alexander ALBON	SOFT	2024-04-19T04:24:32.427000+00:00	19	25.662	

In [37]:
```
libraryDataF1.getinfolongruns(jointables2,2,'Williams',MINIMUN_SECONDS,MAX
```

Out[37]:

	full_name	compound	date_start	lap_number	duration_sector_1
52	Logan SARGEANT	MEDIUM	2024-04-19T03:37:14.333000+00:00	2	28.067
87	Logan SARGEANT	MEDIUM	2024-04-19T03:41:13.133000+00:00	4	26.295
125	Logan SARGEANT	MEDIUM	2024-04-19T03:51:04.290000+00:00	7	26.730
136	Logan SARGEANT	MEDIUM	2024-04-19T03:52:47.389000+00:00	8	26.671
147	Logan SARGEANT	MEDIUM	2024-04-19T03:54:29.734000+00:00	9	26.804
159	Logan SARGEANT	MEDIUM	2024-04-19T03:56:12.575000+00:00	10	27.005
177	Logan SARGEANT	MEDIUM	2024-04-19T03:57:55.355000+00:00	11	27.103
193	Logan SARGEANT	MEDIUM	2024-04-19T03:59:39.236000+00:00	12	27.073
210	Logan SARGEANT	MEDIUM	2024-04-19T04:01:22.808000+00:00	13	27.337
307	Logan SARGEANT	SOFT	2024-04-19T04:14:39.483000+00:00	16	25.715
338	Logan SARGEANT	SOFT	2024-04-19T04:21:00.146000+00:00	19	25.828

Kick Sauber

In [38]:
```
libraryDataF1.getinfolongruns(jointables2,24,'Kick Sauber',MINIMUN_SECONDS
```

Out[38]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
12	ZHOU Guanyu	MEDIUM	2024-04-19T03:32:41.980000+00:00	2	26.851	
47	ZHOU Guanyu	MEDIUM	2024-04-19T03:36:53.031000+00:00	4	26.035	
83	ZHOU Guanyu	MEDIUM	2024-04-19T03:40:54.355000+00:00	6	25.778	
187	ZHOU Guanyu	MEDIUM	2024-04-19T03:59:03.399000+00:00	9	26.942	
204	ZHOU Guanyu	MEDIUM	2024-04-19T04:00:46.551000+00:00	10	27.212	
222	ZHOU Guanyu	MEDIUM	2024-04-19T04:02:29.929000+00:00	11	27.166	
240	ZHOU Guanyu	MEDIUM	2024-04-19T04:04:13.762000+00:00	12	27.234	
256	ZHOU Guanyu	MEDIUM	2024-04-19T04:05:58.070000+00:00	13	27.303	
270	ZHOU Guanyu	MEDIUM	2024-04-19T04:07:42.460000+00:00	14	27.367	

	full_name	compound	date_start	lap_number	duration_sector_1	du
331	ZHOU Guanyu	SOFT	2024-04-19T04:20:21.887000+00:00	17	25.430	
380	ZHOU Guanyu	SOFT	2024-04-19T04:26:26.056000+00:00	20	25.491	
394	ZHOU Guanyu	SOFT	2024-04-19T04:28:04.086000+00:00	21	27.993	

In [39]:
```
libraryDataF1.getinfolongruns(jointables2,77,'Kick Sauber',MINIMUN_SECONDS
```

Out[39]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
13	Valtteri BOTTAS	MEDIUM	2024-04-19T03:32:46.054000+00:00	2	26.160	
49	Valtteri BOTTAS	MEDIUM	2024-04-19T03:37:02.393000+00:00	4	25.820	
86	Valtteri BOTTAS	MEDIUM	2024-04-19T03:41:06.901000+00:00	6	26.250	
175	Valtteri BOTTAS	MEDIUM	2024-04-19T03:57:44.883000+00:00	9	26.457	
191	Valtteri BOTTAS	MEDIUM	2024-04-19T03:59:26.686000+00:00	10	26.870	
208	Valtteri BOTTAS	MEDIUM	2024-04-19T04:01:09.818000+00:00	11	27.119	
226	Valtteri BOTTAS	MEDIUM	2024-04-19T04:02:53.057000+00:00	12	27.120	
244	Valtteri BOTTAS	MEDIUM	2024-04-19T04:04:36.641000+00:00	13	27.307	
261	Valtteri BOTTAS	MEDIUM	2024-04-19T04:06:20.916000+00:00	14	27.464	
273	Valtteri BOTTAS	MEDIUM	2024-04-19T04:08:05.744000+00:00	15	27.518	
336	Valtteri BOTTAS	SOFT	2024-04-19T04:20:52.940000+00:00	18	25.382	
388	Valtteri BOTTAS	SOFT	2024-04-19T04:27:19.260000+00:00	21	25.440	

Sprint Qualyfing

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 as well.

In [40]:
```
libraryDataF1.obtain_information('race_control',session_key=9668)
```

Out[40]:

	session_key	meeting_key	date	category	flag	lap_number
0	9668	1233	2024-04-19T07:30:00+00:00	Flag	GREEN	None

	session_key	meeting_key	date	category	flag	lap_number
1	9668	1233	2024-04-19T07:42:00+00:00	Flag	CHEQUERED	None
2	9668	1233	2024-04-19T07:42:23+00:00	Other	None	None
3	9668	1233	2024-04-19T07:44:15+00:00	Flag	YELLOW	None
4	9668	1233	2024-04-19T07:44:30+00:00	Flag	DOUBLE YELLOW	None
...	...	...	...	...	...	...
57	9668	1233	2024-04-19T08:22:50+00:00	Other	None	None
58	9668	1233	2024-04-19T08:25:00+00:00	Other	None	None
59	9668	1233	2024-04-19T08:26:43+00:00	Other	None	None
60	9668	1233	2024-04-19T08:27:17+00:00	Other	None	None
61	9668	1233	2024-04-19T08:27:20+00:00	Other	None	None

Obtain setup

In [41]:

```
qualyfing = libraryDataF1.obtain_information('laps',session_key=9668)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9
drivers = libraryDataF1.obtain_information('drivers',session_key=9668)
```

In race control dataset, I can see a lot of laptimes deleted, principally for track limits. Those laps deleted were deleted from dataset in order to obtain only the valid laps for the analysis.

In [42]:
```
qualyfing = qualyfing.drop(122)
qualyfing = qualyfing.drop(183)
qualyfing = qualyfing.drop(181)
qualyfing = qualyfing.drop(196)
qualyfing = qualyfing.drop(199)
qualyfing = qualyfing.drop(193)
qualyfing = qualyfing.drop(191)
qualyfing = qualyfing.drop(204)
```

In [43]:
```
bestlap_dry = qualyfing.loc[qualyfing.groupby(['driver_number'])['lap_dura
bestlap_dry[0:1]
```

Out[43]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
146	1233	9668	1	283	279	318	2024-04-19T07:57:

In [44]:
```
bestlap_wet = qualyfing.query("date_start>='2024-04-19T08:11:00'").loc[qua
bestlap_wet[0:1]
```

Out[44]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
203	1233	9668	4	275	260	290	2024-04-19T08:17:

In this case, the fastest lap in dry conditions is 95.606 seconds (1.35.606= so that to obtain the competitve laps the fastest lap will be multiplied by 1.07 (102.298 seconds) due to, according to the rules all the drivers have to do unless one lap within this gap.

In [45]:
```
competitiveLaps_dry = qualyfing.query("is_pit_out_lap == False and lap_dura
competitiveLaps_dry
```

Out[45]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
13	1233	9668	23	283	275	317	2024-04-19T07:32:
15	1233	9668	2	281	276	317	2024-04-19T07:32:
17	1233	9668	24	282	277	317	2024-04-19T07:32:
18	1233	9668	77	282	277	316	2024-04-19T07:32:
21	1233	9668	44	283	278	315	2024-04-19T07:33:
23	1233	9668	63	285	278	314	2024-04-19T07:33:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
25	1233	9668	55	285	279	313	2024-04-19T07:33:
27	1233	9668	16	286	277	313	2024-04-19T07:33:
28	1233	9668	81	284	278	311	2024-04-19T07:33:
29	1233	9668	31	282	277	305	2024-04-19T07:33:
30	1233	9668	4	283	279	308	2024-04-19T07:34:
34	1233	9668	10	281	276	305	2024-04-19T07:34:
36	1233	9668	22	282	277	271	2024-04-19T07:34:
37	1233	9668	14	284	279	317	2024-04-19T07:34:
39	1233	9668	18	284	277	318	2024-04-19T07:34:
41	1233	9668	1	284	278	319	2024-04-19T07:34:
43	1233	9668	3	283	276	315	2024-04-19T07:35:
45	1233	9668	11	284	277	317	2024-04-19T07:35:
47	1233	9668	27	287	279	317	2024-04-19T07:35:
48	1233	9668	20	287	278	320	2024-04-19T07:35:
55	1233	9668	24	281	277	312	2024-04-19T07:36:
57	1233	9668	77	283	276	316	2024-04-19T07:36:
62	1233	9668	55	284	277	319	2024-04-19T07:37:
63	1233	9668	16	284	278	316	2024-04-19T07:37:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
66	1233	9668	4	283	278	312	2024-04-19T07:37:
74	1233	9668	18	285	278	320	2024-04-19T07:38:
86	1233	9668	31	283	276	310	2024-04-19T07:39:
87	1233	9668	24	284	276	310	2024-04-19T07:40:
88	1233	9668	77	284	276	313	2024-04-19T07:40:
90	1233	9668	23	284	278	314	2024-04-19T07:40:
91	1233	9668	10	281	275	308	2024-04-19T07:40:
92	1233	9668	2	282	277	315	2024-04-19T07:40:
93	1233	9668	14	283	278	316	2024-04-19T07:40:
94	1233	9668	22	281	277	315	2024-04-19T07:40:
96	1233	9668	3	282	278	316	2024-04-19T07:41:
98	1233	9668	27	286	281	318	2024-04-19T07:41:
99	1233	9668	63	282	279	314	2024-04-19T07:41:
100	1233	9668	44	283	279	315	2024-04-19T07:41:
102	1233	9668	20	284	280	318	2024-04-19T07:41:
103	1233	9668	81	282	280	313	2024-04-19T07:41:
132	1233	9668	4	282	279	310	2024-04-19T07:56:
133	1233	9668	81	282	280	312	2024-04-19T07:56:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
134	1233	9668	20	285	280	319	2024-04-19T07:56:
135	1233	9668	18	283	280	318	2024-04-19T07:56:
136	1233	9668	55	284	279	317	2024-04-19T07:56:
137	1233	9668	14	282	279	318	2024-04-19T07:56:
138	1233	9668	27	287	281	320	2024-04-19T07:56:
139	1233	9668	16	284	279	314	2024-04-19T07:56:
140	1233	9668	24	284	279	314	2024-04-19T07:57:
141	1233	9668	3	284	280	318	2024-04-19T07:57:
142	1233	9668	77	283	280	316	2024-04-19
143	1233	9668	63	282	279	315	2024-04-19T07:57:

In this case, the fastest lap in wet conditions is 117.94 seconds (1.57.94= so that to obtain the competitve laps the fastest lap will be multiplied by 1.07 (126.195 seconds) due to, according to the rules all the drivers have to do unless one lap within this gap.

In [46]:
```
competitiveLaps_wet = qualyfing.query("date_start>='2024-04-19T08:11:00' a
competitiveLaps_wet
```

Out[46]:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
180	1233	9668	81	272	258	287	2024-04-19T08:13:
182	1233	9668	55	254	249	287	2024-04-19T08:13:
184	1233	9668	11	260	239	289	2024-04-19T08:13:
185	1233	9668	14	274	233	288	2024-04-19T08:13:
187	1233	9668	77	257	254	289	2024-04-19T08:14:

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
190	1233	9668	81	271	259	285	2024-04-19T08:15:
192	1233	9668	55	270	253	286	2024-04-19T08:15:
194	1233	9668	11	269	255	257	2024-04-19T08:15:
195	1233	9668	14	268	254	287	2024-04-19T08:15:
198	1233	9668	16	269	252	286	2024-04-19T08:16:
200	1233	9668	81	272	258	286	2024-04-19T08:17:
201	1233	9668	1	272	257	289	2024-04-19T08:17:
202	1233	9668	55	267	256	289	2024-04-19T08:17:
203	1233	9668	4	275	260	290	2024-04-19T08:17:
205	1233	9668	14	271	239	288	2024-04-19T08:17:
206	1233	9668	24	242	245	286	2024-04-19T08:18:
207	1233	9668	16	268	258	291	2024-04-19T08:18:
208	1233	9668	77	272	254	288	2024-04-19T08:18:
209	1233	9668	44	276	260	291	2024-04-19T08:18:

In [47]:

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

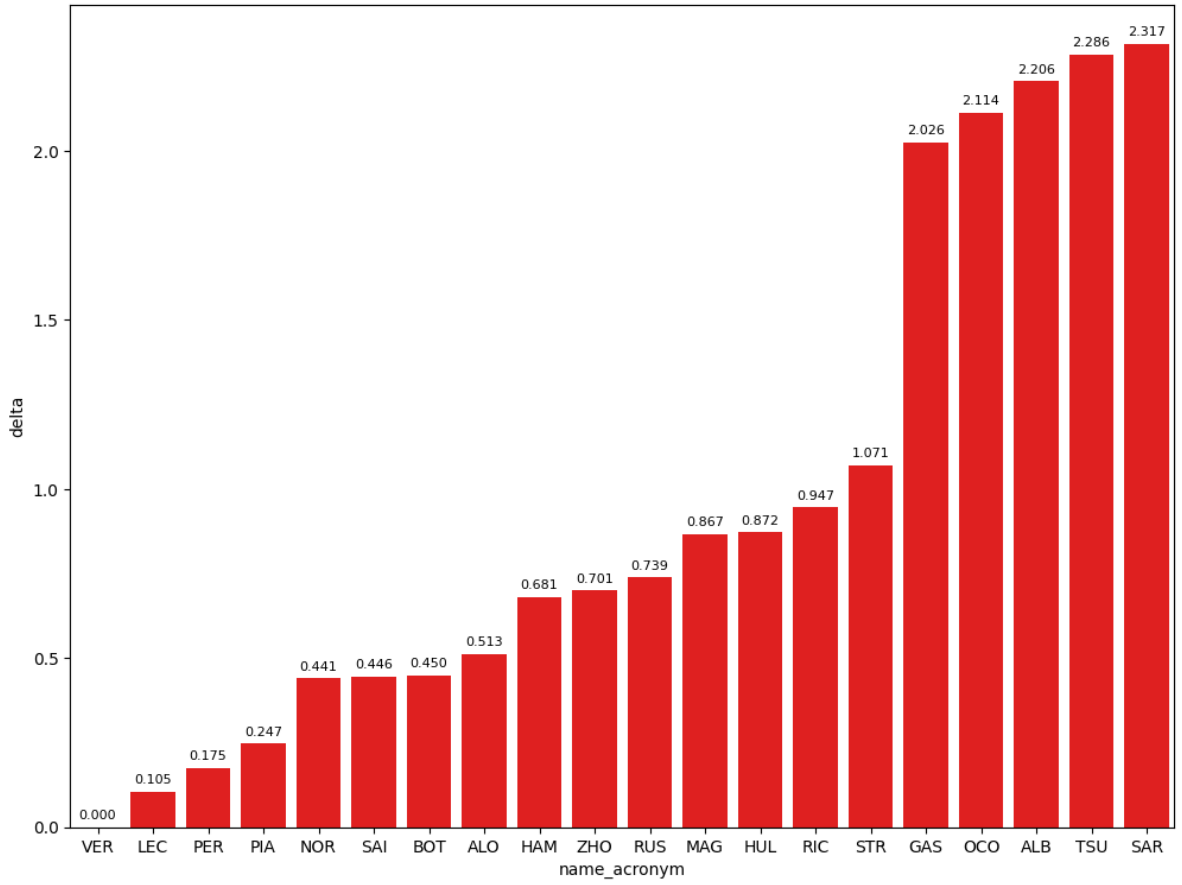
Out[47]:

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
15	1	95.606	0.000	318	283	278	9668	1233
7	16	95.711	0.105	313	284	277	9668	1233

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
17	11	95.781	0.175	317	284	277	9668	1233
8	81	95.853	0.247	311	282	278	9668	1233
10	4	96.047	0.441	308	282	278	9668	1233
6	55	96.052	0.446	313	284	277	9668	1233
3	77	96.056	0.450	313	282	276	9668	1233
13	14	96.119	0.513	316	282	278	9668	1233
4	44	96.287	0.681	315	283	278	9668	1233
2	24	96.307	0.701	310	281	276	9668	1233
5	63	96.345	0.739	314	282	278	9668	1233
19	20	96.473	0.867	318	284	278	9668	1233
18	27	96.478	0.872	317	286	279	9668	1233
16	3	96.553	0.947	315	282	276	9668	1233
14	18	96.677	1.071	318	283	277	9668	1233
11	10	97.632	2.026	305	281	275	9668	1233
9	31	97.720	2.114	305	282	276	9668	1233
0	23	97.812	2.206	314	283	275	9668	1233
12	22	97.892	2.286	271	281	277	9668	1233

Best lap per driver compared with the best lap of the session in dry conditions

In [48]:
```
libraryDataF1.obtainchart("name_acronym","delta",jointables.sort_values(by=
```



In [49]:

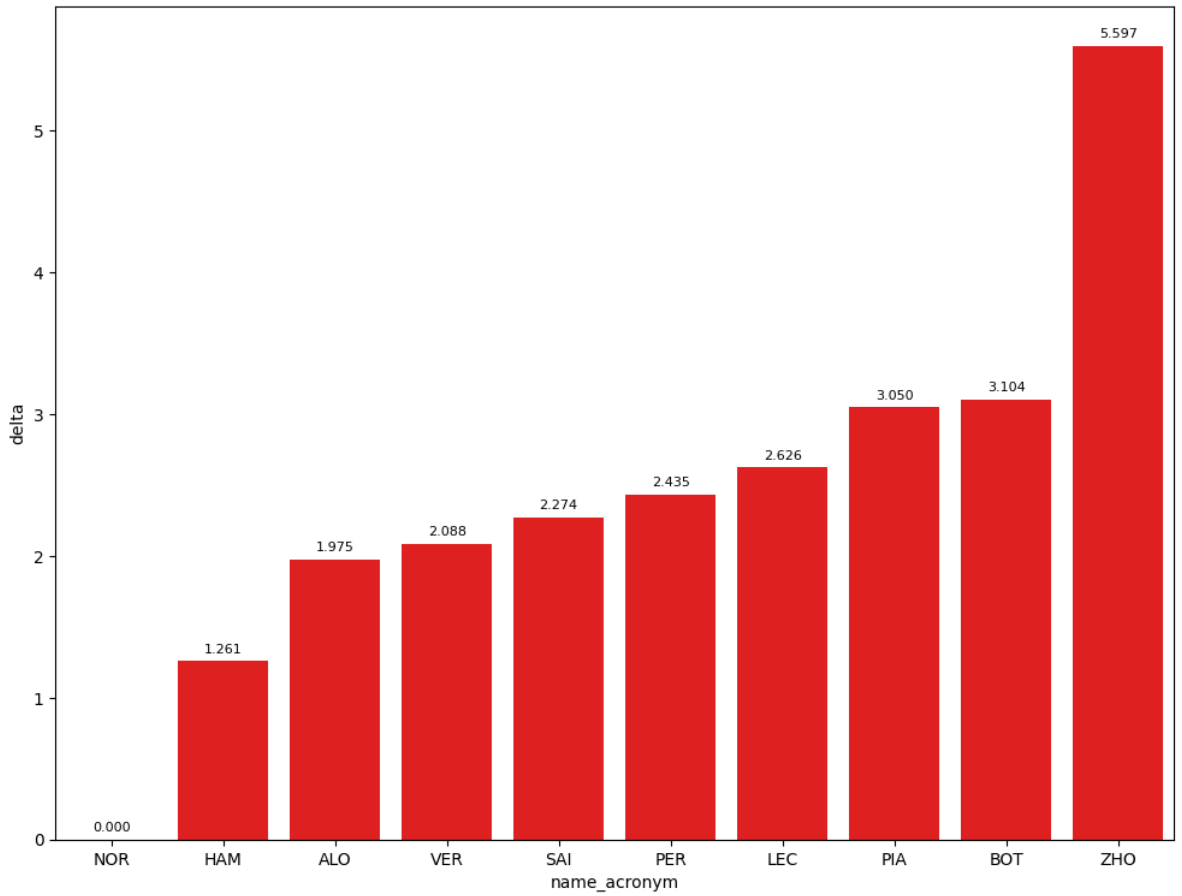
```
drivers_list = list(competitiveLaps_wet['driver_number'].unique())
newdataset = pd.DataFrame()
for driver in drivers_list:
    newdataset =libraryDataF1.obtain_information_qualy(driver,competitiveLa
jointables = pd.merge(newdataset,drivers,on=['driver_number'])
jointables.sort_values(by=['fastest_lap'],ascending=True)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

Out[49]:

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
7	4	117.940	0.000	290	275	260	9668	1233
9	44	119.201	1.261	291	276	260	9668	1233
3	14	119.915	1.975	287	268	233	9668	1233
6	1	120.028	2.088	289	272	257	9668	1233
1	55	120.214	2.274	286	254	249	9668	1233
2	11	120.375	2.435	257	260	239	9668	1233
5	16	120.566	2.626	286	268	252	9668	1233
0	81	120.990	3.050	285	271	258	9668	1233
4	77	121.044	3.104	288	257	254	9668	1233
8	24	123.537	5.597	286	242	245	9668	1233

Best lap per driver compared with the best lap of the session in wet conditions

In [50]:
```
libraryDataF1.obtainchart("name_acronym","delta",jointables.sort_values(by=
```



In [51]:
```
mergequaly_dry = pd.merge(competitiveLaps_dry,drivers,on=['driver_number']
mergequaly_wet = pd.merge(competitiveLaps_wet,drivers,on=['driver_number']
```

In [52]:
```
# In order to know when each session finished, race control dataset will be
maximumDateQ1 = "date_start <'2024-04-19T07:54:00'"
maximumDateQ2 = "date_start <'2024-04-19T08:11:00' and date_start >='2024-(
maximumDateQ3 = "date_start >'2024-04-19T08:11:00'"
```

Sprint Qualyfing 1

In [53]:
```
q1Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly_dry,maximumDa
q1Data
```

Out[53]:

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
47	1233	9668	11	284	277	317	2024-04-19T07
30	1233	9668	4	283	278	312	2024-04-19T07
42	1233	9668	1	284	278	319	2024-04-19T07

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
22	1233	9668	16	284	278	316	2024-04-19T07
25	1233	9668	81	282	280	313	2024-04-19T07
19	1233	9668	55	284	277	319	2024-04-19T07
36	1233	9668	14	284	279	317	2024-04-19T07
49	1233	9668	27	287	279	317	2024-04-19T07
39	1233	9668	18	284	277	318	2024-04-19T07
53	1233	9668	20	284	280	318	2024-04-19T07
9	1233	9668	77	283	276	316	2024-04-19T07
13	1233	9668	44	283	279	315	2024-04-19T07
16	1233	9668	63	282	279	314	2024-04-19T07
44	1233	9668	3	283	276	315	2024-04-19T07
5	1233	9668	24	281	277	312	2024-04-19T07
32	1233	9668	10	281	276	305	2024-04-19T07
28	1233	9668	31	283	276	310	2024-04-19T07
1	1233	9668	23	284	278	314	2024-04-19T07
35	1233	9668	22	281	277	315	2024-04-19T07
3	1233	9668	2	282	277	315	2024-04-19T07

Comparaison with driver at risk

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

In [54]:
```
#Reference
P15 = q1Data[14:15]
P15
```

Out[54]:

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
5	1233	9668	24	281	277	312	2024-04-19T07:3

1 rows × 28 columns

In [55]:
```
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: ZHOU Guanyu Sector 1:  25.593 Sector 2:  28.847 Sector 3:  43.104
```

In [56]:
```
newdataset2 = pd.DataFrame()
for index,row in q1Data[15::].iterrows():
    newdataset2 =  libraryDataF1.obtain_difference_regard_reference(row,P1
newdataset2
```

Out[56]:

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	10	0.088	-0.256	0.129	0.215	
1	31	0.176	-0.222	0.261	0.137	
2	23	0.268	-0.098	0.395	-0.029	
3	22	0.348	-0.054	0.188	0.214	
4	2	0.379	0.010	0.367	0.002	

Best sector per driver

In [57]:
```
pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_1'].min().sor
```

Out[57]:

name_acronym	duration_sector_1
ALO	25.104
PIA	25.143
PER	25.193
NOR	25.195
STR	25.262
HUL	25.287
VER	25.288
GAS	25.337
MAG	25.357
SAI	25.358
OCO	25.371
RIC	25.390
BOT	25.392
HAM	25.469
ALB	25.495
LEC	25.514

name_acronym	duration_sector_1
TSU	25.539
RUS	25.554

In [58]:
```
pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[58]:

name_acronym	duration_sector_2
VER	28.369
PER	28.495
LEC	28.540
HAM	28.568
SAI	28.607
NOR	28.641
PIA	28.663
MAG	28.679
HUL	28.685
STR	28.697
ALO	28.698
ZHO	28.847
RUS	28.850
RIC	28.934
GAS	28.976
BOT	29.000
TSU	29.035
OCO	29.108
SAR	29.214
ALB	29.242

In [59]:
```
pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_3'].min().sor
```

Out[59]:

name_acronym	duration_sector_3
PER	42.422
LEC	42.483
NOR	42.548
BOT	42.720
PIA	42.736
SAI	42.754

name_acronym	duration_sector_3
VER	42.799
RUS	42.906
HUL	42.952
MAG	42.997
RIC	42.997
STR	43.002
ALB	43.075
ALO	43.081
ZHO	43.104
SAR	43.106
HAM	43.144
OCO	43.241

Sprint Qualyfing 2

In [60]:
```
q2Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly_dry,maximumDa
q2Data
```

Out[60]:

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
43	1233	9668	1	283	279	318	2024-04-19T07
23	1233	9668	16	284	279	314	2024-04-19T07
48	1233	9668	11	284	278	319	2024-04-19T07
26	1233	9668	81	282	280	312	2024-04-19T07
31	1233	9668	4	282	279	310	2024-04-19T07
20	1233	9668	55	284	279	317	2024-04-19T07
11	1233	9668	77	283	280	316	2024-0
38	1233	9668	14	282	279	318	2024-04-19T07
14	1233	9668	44	283	279	316	2024-04-19T07
7	1233	9668	24	284	279	314	2024-04-19T07
17	1233	9668	63	282	279	315	2024-04-19T07
54	1233	9668	20	285	280	319	2024-04-19T07
51	1233	9668	27	287	281	320	2024-04-19T07

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
46	1233	9668	3	284	280	318	2024-04-19T07
41	1233	9668	18	283	280	318	2024-04-19T07

Comparaison with driver at risk

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

In [61]:
```
#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: ZHOU Guanyu Sector 1:  25.031 Sector 2:  28.506 Sector 3:  42.77
```

In [62]:
```
newdataset2 = pd.DataFrame()
for index,row in q2Data[10::].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P10

newdataset2
```

Out[62]:

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	63	0.038	0.143	0.088	-0.193	
1	20	0.166	0.219	0.003	-0.056	
2	27	0.171	0.238	0.033	-0.100	
3	3	0.246	0.162	0.118	-0.034	
4	18	0.370	0.153	0.097	0.120	

Best sector per driver

In [63]:
```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_1'].min().sor
```

Out[63]:

name_acronym	duration_sector_1
ALO	24.860
NOR	24.885
VER	24.931
PIA	24.949
BOT	24.971
PER	24.985

name_acronym	duration_sector_1
SAI	24.988
ZHO	25.031
LEC	25.090
HAM	25.095
RUS	25.174
STR	25.184
RIC	25.193

In [64]:
```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[64]:

name_acronym	duration_sector_2
VER	28.024
NOR	28.235
LEC	28.277
BOT	28.298
HAM	28.389
ALO	28.395
PIA	28.410
SAI	28.490
ZHO	28.506
MAG	28.509
HUL	28.539
PER	28.549
RUS	28.594
STR	28.603
RIC	28.624

In [65]:
```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_3'].min().sor
```

Out[65]:

name_acronym	duration_sector_3
PER	42.247
LEC	42.344
PIA	42.494
SAI	42.574
RUS	42.577
VER	42.651

name_acronym	duration_sector_3
HUL	42.670
MAG	42.714
RIC	42.736
ZHO	42.770
BOT	42.787
HAM	42.803
ALO	42.864

Sprint Qualyfing 3

In [66]:
```
q3Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly_wet,maximumDa
q3Data
```

Out[66]:

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
16	1233	9668	4	275	260	290	2024-04-19T08
18	1233	9668	44	276	260	291	2024-04-19T08
10	1233	9668	14	271	239	288	2024-04-19T08
15	1233	9668	1	272	257	289	2024-04-19T08
5	1233	9668	55	267	256	289	2024-04-19T08
7	1233	9668	11	269	255	257	2024-04-19T08
13	1233	9668	16	269	252	286	2024-04-19T08
2	1233	9668	81	272	258	286	2024-04-19T08
12	1233	9668	77	272	254	288	2024-04-19T08
17	1233	9668	24	242	245	286	2024-04-19T08

10 rows × 28 columns

In [67]:
```
#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: Lando NORRIS Sector 1:  29.5 Sector 2:  35.825 Sector 3:  52.615
```

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 [68]:
```
newdataset2 = pd.DataFrame()
for index,row in q3Data[1::].iterrows():
    newdataset2 = libraryDataF1.obtain_difference_regard_reference(row,P1,
newdataset2
```

Out[68]:

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	44	1.261	0.211	0.873	0.177	
1	14	1.975	0.218	1.048	0.709	
2	1	2.088	0.802	0.537	0.749	
3	55	2.274	0.354	1.237	0.683	
4	11	2.435	0.150	0.332	1.953	
5	16	2.626	0.712	1.573	0.341	
6	81	3.050	0.652	0.563	1.835	
7	77	3.104	0.219	1.463	1.422	
8	24	5.597	1.378	2.346	1.873	

Best sector per driver

In [69]:
```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_1'].min().sor
```

Out[69]:

name_acronym	duration_sector_1
NOR	29.500
PER	29.650
HAM	29.711
ALO	29.718
BOT	29.719
SAI	29.854
PIA	30.152
LEC	30.212
VER	30.302
ZHO	30.878

In [70]:
```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[70]:

name_acronym	duration_sector_2

name_acronym	duration_sector_2
NOR	35.825
PER	36.157
VER	36.362
PIA	36.388
HAM	36.698
ALO	36.873
SAI	37.062
BOT	37.288

In [71]:
```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_3'].min().sor
```

Out[71]:

name_acronym	duration_sector_3
NOR	52.615
HAM	52.792
LEC	52.956
SAI	53.298
ALO	53.324
VER	53.364
BOT	54.037
PIA	54.450
ZHO	54.488
PER	54.568

Best sector in the session

In [72]:
```
pd.DataFrame(mergequaly_dry.groupby("name_acronym")['duration_sector_1'].m
```

Out[72]:

name_acronym	duration_sector_1
ALO	24.860
NOR	24.885
VER	24.931
PIA	24.949
BOT	24.971
PER	24.985
SAI	24.988
ZHO	25.031

name_acronym	duration_sector_1
LEC	25.090
HAM	25.095
RUS	25.174
STR	25.184
RIC	25.193
MAG	25.250
HUL	25.269
GAS	25.337
OCO	25.371
TSU	25.445

In [73]:
```
pd.DataFrame(mergequaly_dry.groupby("name_acronym")['duration_sector_2'].m
```

Out[73]:

name_acronym	duration_sector_2
VER	28.024
NOR	28.235
LEC	28.277
BOT	28.298
HAM	28.389
ALO	28.395
PIA	28.410
SAI	28.490
PER	28.495
ZHO	28.506
MAG	28.509
HUL	28.539
RUS	28.594
STR	28.603
RIC	28.624
GAS	28.976
TSU	29.035
OCO	29.108
SAR	29.214
ALB	29.242

In [74]:
```
pd.DataFrame(mergequaly_dry.groupby("name_acronym")['duration_sector_3'].m
```

Out[74]:

name_acronym	duration_sector_3
PER	42.247
LEC	42.344
PIA	42.494
NOR	42.548
HUL	42.570
SAI	42.574
RUS	42.577
VER	42.651
MAG	42.714
BOT	42.720
RIC	42.736
ZHO	42.770
HAM	42.803
ALO	42.864
STR	42.890
ALB	43.075
SAR	43.106
OCO	43.241
TSU	43.318
GAS	43.319

Sprint

In [75]:

```
race = libraryDataF1.obtain_information('laps',session_key=9672)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9(
drivers = libraryDataF1.obtain_information('drivers',session_key=9672)
```

In [76]:

```
stintsDataFrame =libraryDataF1.stint_configuration(drivers,stintInformatio
jointables = pd.merge(race,stintsDataFrame,on=['lap_number','driver_number
jointables
```

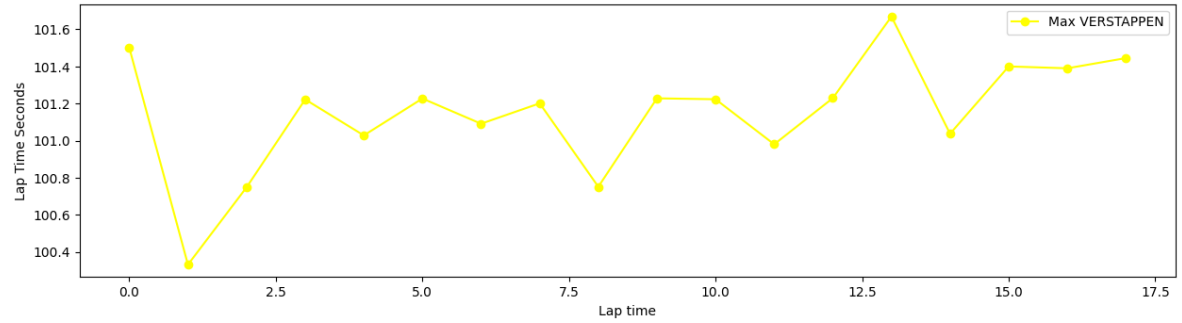
Out[76]:

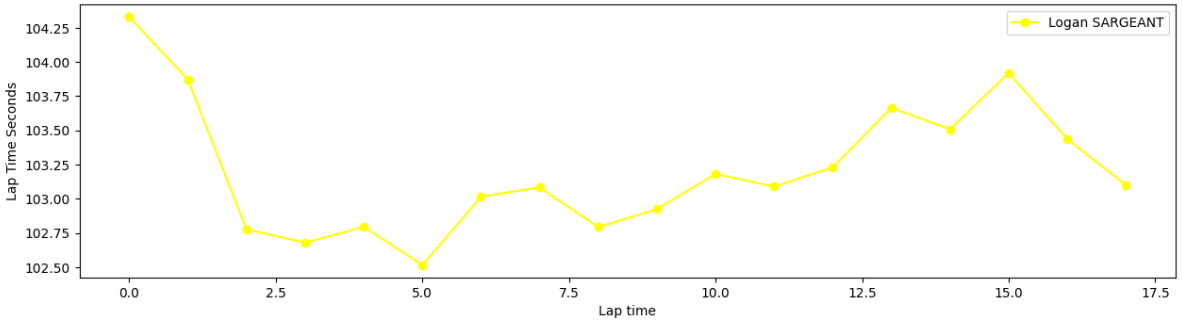
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed
0	1233	9672	1	278.0	271	310
1	1233	9672	2	267.0	270	317
2	1233	9672	3	289.0	269	318

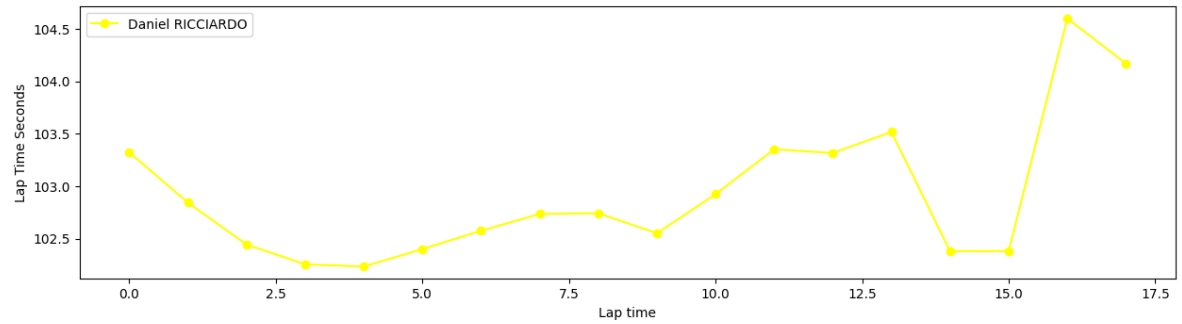
	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
3	1233	9672	4	286.0	271	310	
4	1233	9672	10	281.0	261	317	
...	...	...	...	...	...	...	
373	1233	9672	44	274.0	267	313	2024-04-20T03:34:
374	1233	9672	55	267.0	261	314	2024-04-20T03:34:
375	1233	9672	63	276.0	271	331	2024-04-20T03:34:
376	1233	9672	77	274.0	269	329	2024-04-20T03:35:
377	1233	9672	81	273.0	269	312	2024-04-20T03:34:

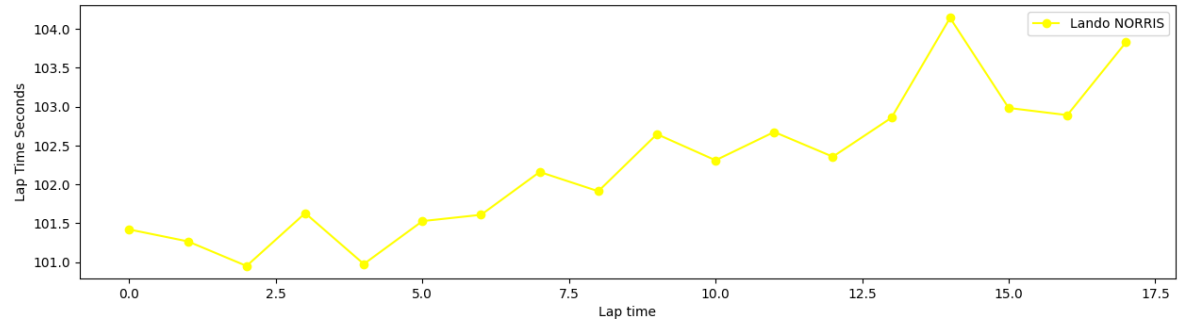
Pace per compound

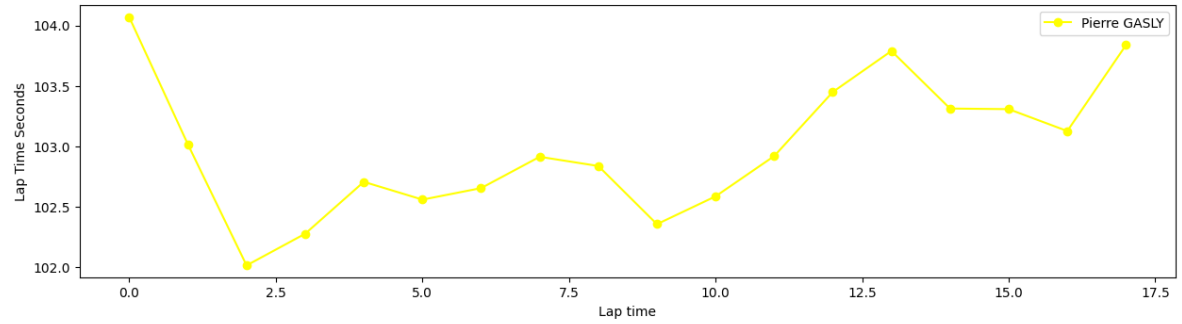
In [77]:
```
libraryDataF1.obtain_data_tyres(jointables,"MEDIUM",110)
```

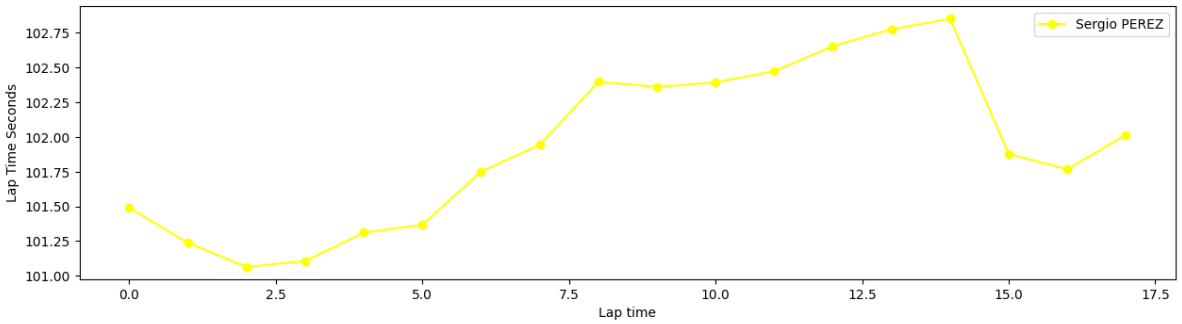

Max VERSTAPPEN
Lap Time Seconds
Lap time


Logan SARGEANT
Lap Time Seconds
Lap time

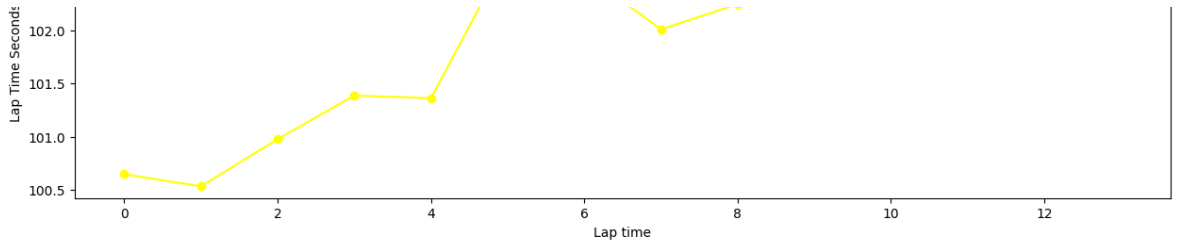

Daniel RICCIARDO
Lap Time Seconds
Lap time

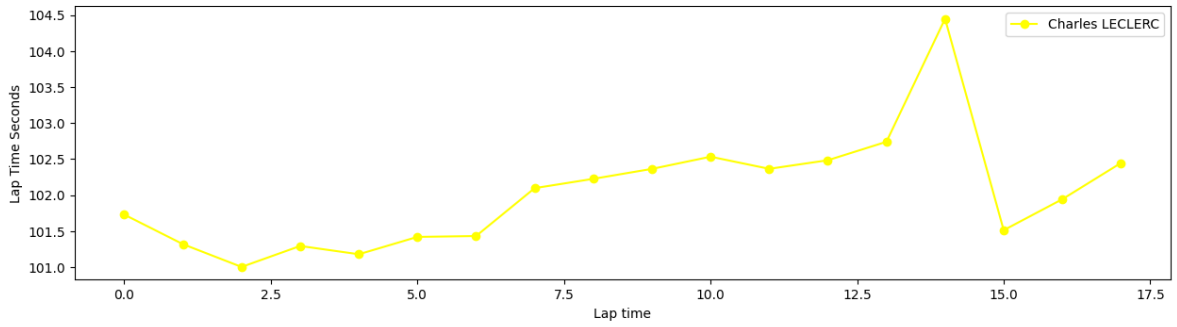

Lando NORRIS
Lap Time Seconds
Lap time

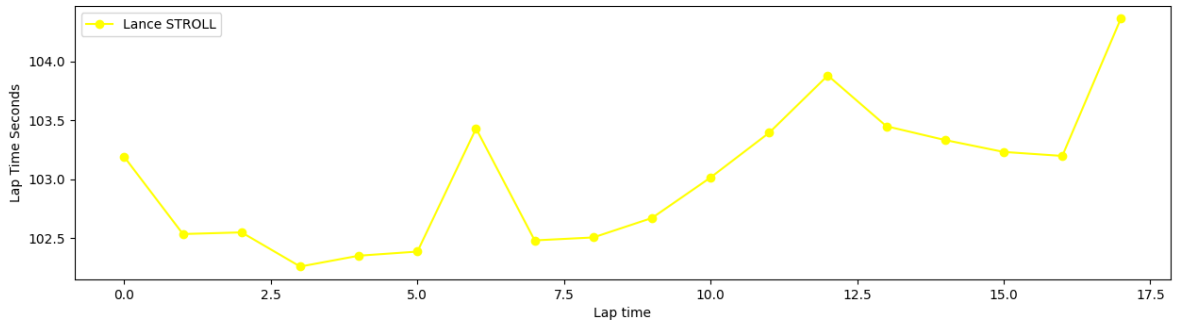

Pierre GASLY
Lap Time Seconds
Lap time

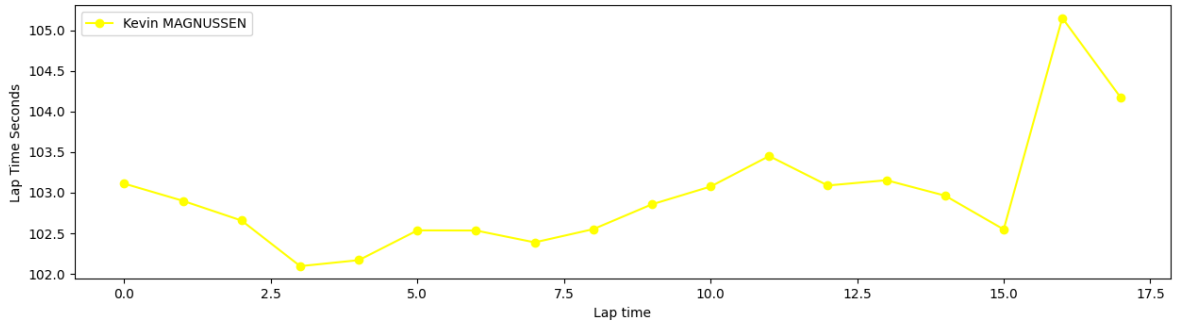

Sergio PEREZ
Lap Time Seconds
Lap time

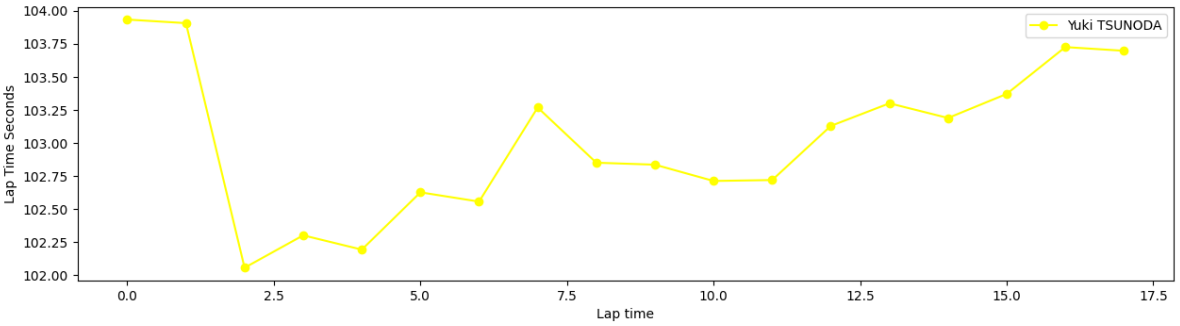

Fernando ALONSO

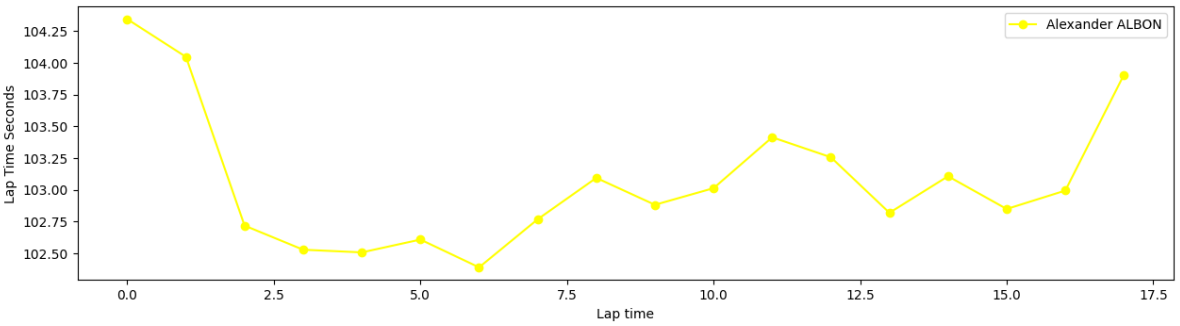

Lap Time Seconds
Lap time

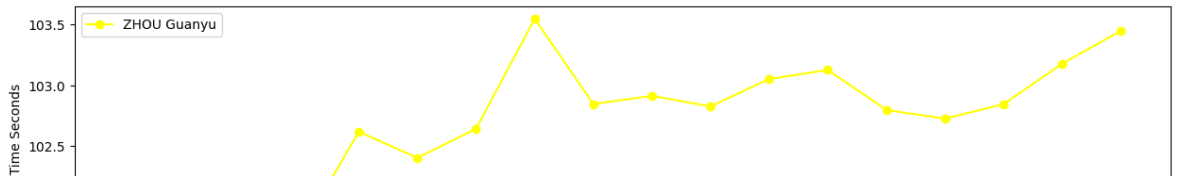

Charles LECLERC
Lap Time Seconds
Lap time

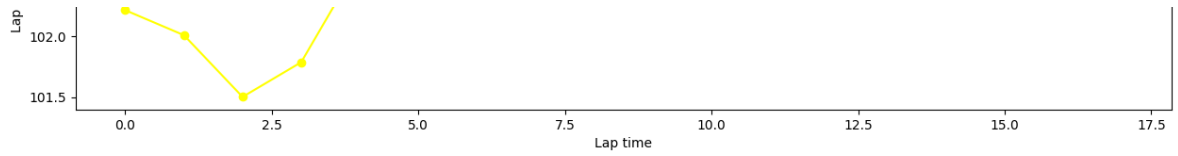

Lance STROLL
Lap Time Seconds
Lap time

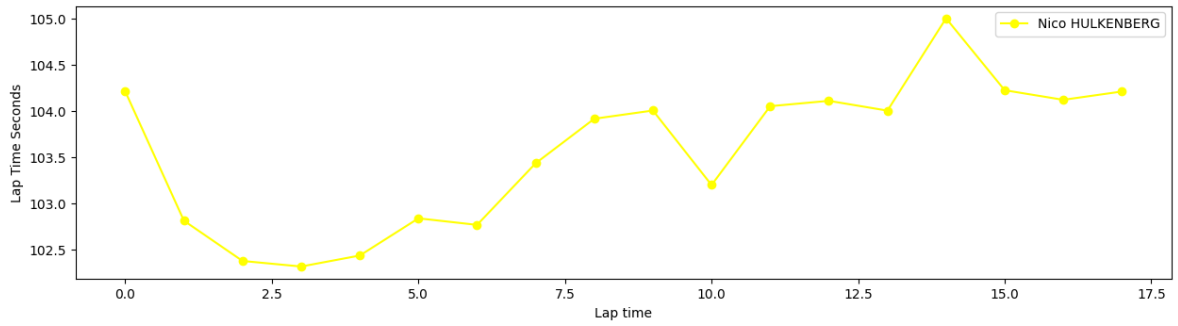

Kevin MAGNUSSEN
Lap Time Seconds
Lap time

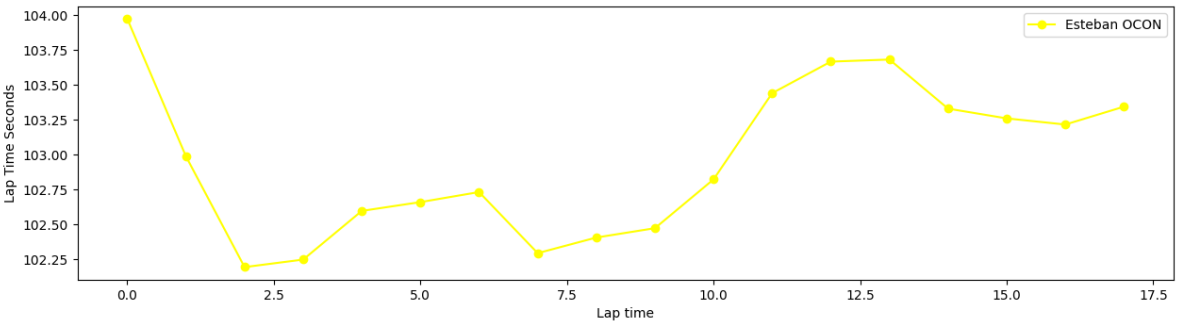

Yuki TSUNODA
Lap Time Seconds
Lap time

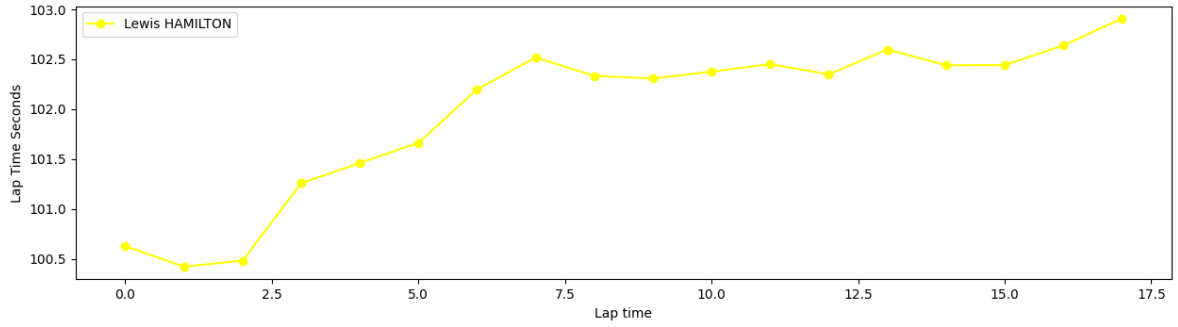

Alexander ALBON
Lap Time Seconds
Lap time

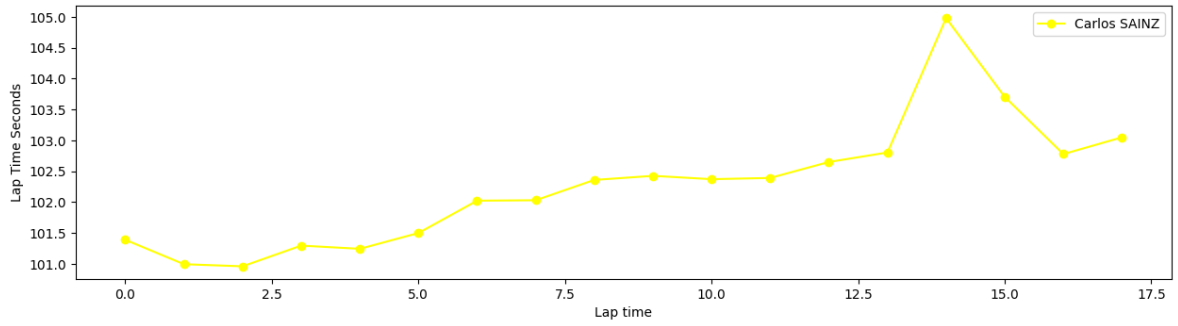

ZHOU Guanyu
Time Seconds

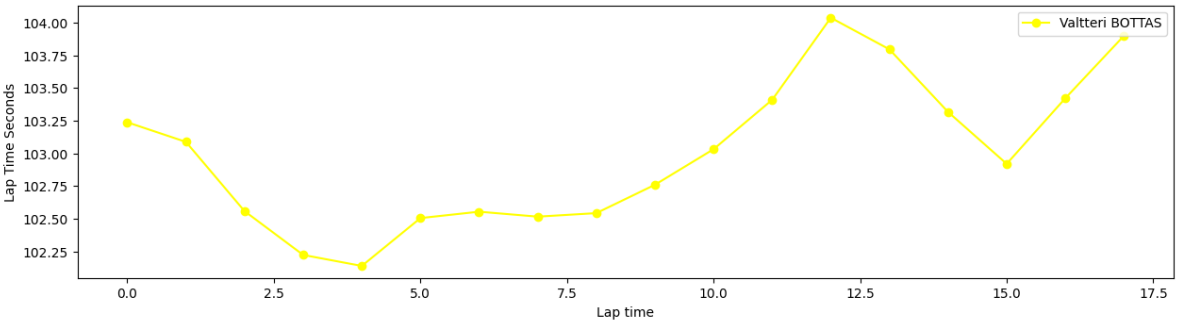

Lap
102.0
101.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time

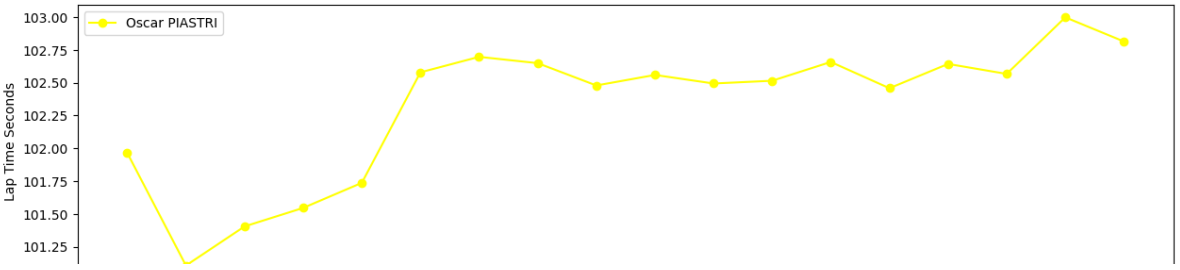

Nico HULKENBERG
Lap Time Seconds
105.0
104.5
104.0
103.5
103.0
102.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time

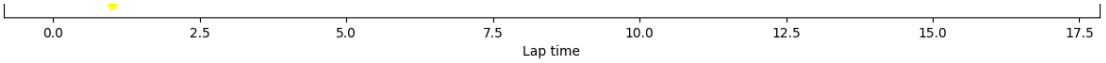

Esteban OCON
Lap Time Seconds
104.00
103.75
103.50
103.25
103.00
102.75
102.50
102.25
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time


Lewis HAMILTON
Lap Time Seconds
103.0
102.5
102.0
101.5
101.0
100.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time


Carlos SAINZ
Lap Time Seconds
105.0
104.5
104.0
103.5
103.0
102.5
102.0
101.5
101.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time


Valtteri BOTTAS
Lap Time Seconds
104.00
103.75
103.50
103.25
103.00
102.75
102.50
102.25
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Lap time

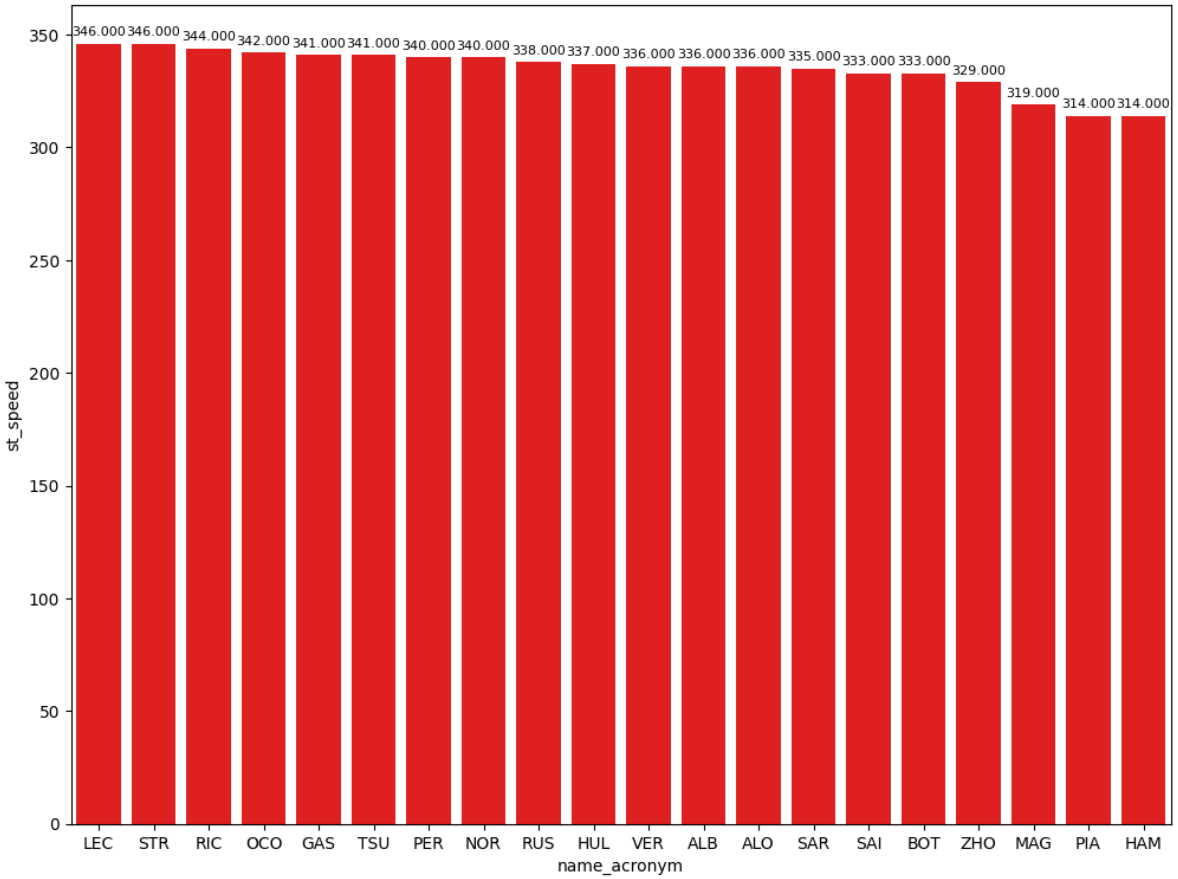

Oscar PIASTRI
Lap Time Seconds
103.00
102.75
102.50
102.25
102.00
101.75
101.50
101.25



Top speed captured in the speed trap

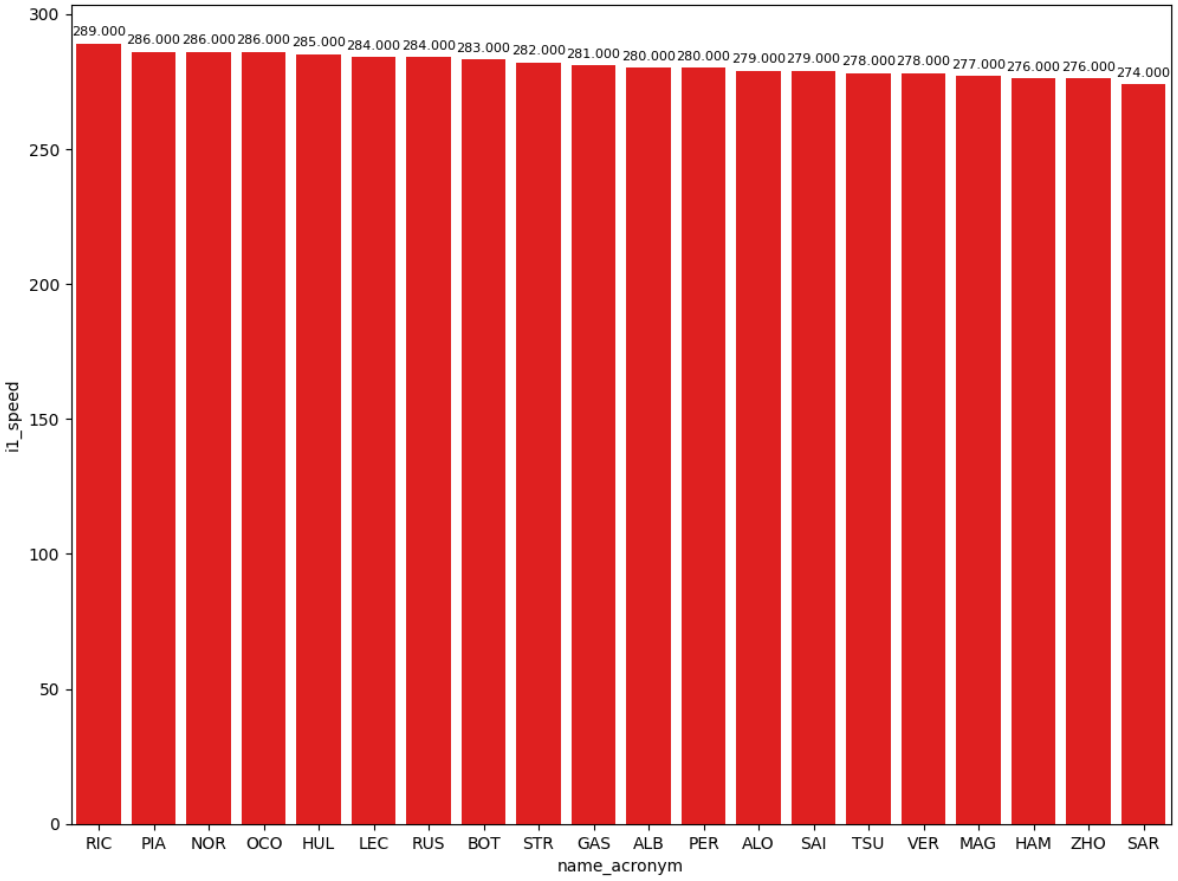
In [78]:

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

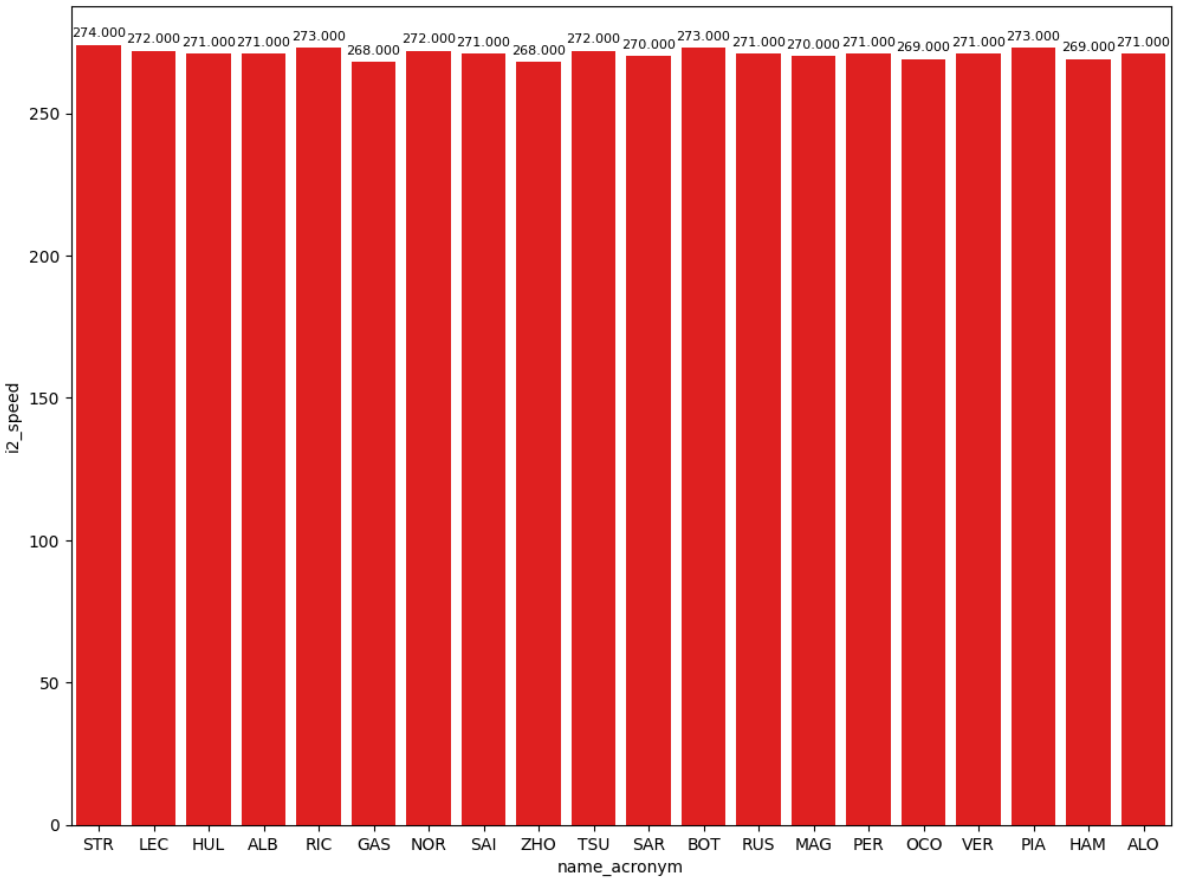


In [79]:

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



In [80]:
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['i2_speed'
libraryDataF1.obtainchart("name_acronym","i2_speed",top_speed)
```



In [81]:
```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False  and la
race_pace
```

Out[81]:

team_name	lap_duration
Red Bull Racing	101.560774
Mercedes	102.135727
Ferrari	102.185758
McLaren	102.312533
Aston Martin	102.564414
Kick Sauber	102.816903
RB	102.927100
Alpine	102.997441
Williams	103.168742
Haas F1 Team	103.170759

Race pace per teams

In [82]:
```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False  and la
race_pace
```

Out[82]:

team_name	duration_sector_1
Red Bull Racing	27.129323
McLaren	27.289700
Ferrari	27.306848
Mercedes	27.309515
Alpine	27.355000
Aston Martin	27.385034
RB	27.466633
Haas F1 Team	27.511759
Kick Sauber	27.527871
Williams	27.544677

In [83]:
```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False  and la
race_pace
```

Out[83]:

team_name	duration_sector_2
Red Bull Racing	30.967258
Mercedes	31.027333

team_name	duration_sector_2
Aston Martin	31.214448
McLaren	31.229000
Ferrari	31.250091
Kick Sauber	31.349032
RB	31.422133
Williams	31.487839

In [84]:
```
race_pace = pd.DataFrame(jointables.query("is_pit_out_lap == False  and la
race_pace
```

Out[84]:

team_name	duration_sector_3
Red Bull Racing	43.464194
Ferrari	43.628818
McLaren	43.793833
Mercedes	43.798879
Kick Sauber	43.940000
Aston Martin	43.964931
RB	44.038333
Haas F1 Team	44.084310
Williams	44.136226
Alpine	44.139294

Race pace

In [85]:
```
MINIMUN_SECONDS = 90
MAXIMUM_SECONDS = 110
```

Red Bull Racing

In [86]:
```
stintInformation.query('driver_number == 1 or driver_number == 11')
```

Out[86]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
1	1233	9672	1	1	1	20	MEDIUM	
6	1233	9672	1	11	1	20	MEDIUM	

In [87]:
```
libraryDataF1.getinfolongruns(jointables,1,'Red Bull Racing',MINIMUN_SECONI
```

Out[87]:

	full_name	compound	date_start	lap_number	duration_sector_1
20	Max VERSTAPPEN	MEDIUM	2024-04-20T03:05:46.920000+00:00	2	26.958

	full_name	compound	date_start	lap_number	duration_sector_1
40	Max VERSTAPPEN	MEDIUM	2024-04-20T03:07:28.376000+00:00	3	26.925
60	Max VERSTAPPEN	MEDIUM	2024-04-20T03:09:08.769000+00:00	4	26.874
80	Max VERSTAPPEN	MEDIUM	2024-04-20T03:10:49.454000+00:00	5	27.098
100	Max VERSTAPPEN	MEDIUM	2024-04-20T03:12:30.811000+00:00	6	27.169
120	Max VERSTAPPEN	MEDIUM	2024-04-20T03:14:11.722000+00:00	7	26.972
140	Max VERSTAPPEN	MEDIUM	2024-04-20T03:15:52.986000+00:00	8	27.064
160	Max VERSTAPPEN	MEDIUM	2024-04-20T03:17:34.127000+00:00	9	26.952
180	Max VERSTAPPEN	MEDIUM	2024-04-20T03:19:15.208000+00:00	10	27.079
200	Max VERSTAPPEN	MEDIUM	2024-04-20T03:20:56.108000+00:00	11	27.411
220	Max VERSTAPPEN	MEDIUM	2024-04-20T03:22:37.346000+00:00	12	27.243
240	Max VERSTAPPEN	MEDIUM	2024-04-20T03:24:18.488000+00:00	13	27.226
260	Max VERSTAPPEN	MEDIUM	2024-04-20T03:25:59.526000+00:00	14	27.394
280	Max VERSTAPPEN	MEDIUM	2024-04-20T03:27:40.707000+00:00	15	27.254
300	Max VERSTAPPEN	MEDIUM	2024-04-20T03:29:22.431000+00:00	16	27.273
320	Max VERSTAPPEN	MEDIUM	2024-04-20T03:31:03.410000+00:00	17	27.271
340	Max VERSTAPPEN	MEDIUM	2024-04-20T03:32:44.861000+00:00	18	27.383
359	Max [illegible]	MEDIUM	2024-04-20T03:34:26.246000+00:00	19	27.221

In [88]:
```
libraryDataF1.getinfolongruns(jointables,11,'Red Bull Racing',MINIMUN_SECOI
```

Out[88]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
25	Sergio PEREZ	MEDIUM	2024-04-20T03:05:48.111000+00:00	2	27.124	
45	Sergio PEREZ	MEDIUM	2024-04-20T03:07:29.486000+00:00	3	27.162	
65	Sergio PEREZ	MEDIUM	2024-04-20T03:09:10.846000+00:00	4	27.016	
85	Sergio PEREZ	MEDIUM	2024-04-20T03:10:51.852000+00:00	5	27.107	
105	Sergio PEREZ	MEDIUM	2024-04-20T03:12:32.950000+00:00	6	27.072	
125	Sergio PEREZ	MEDIUM	2024-04-20T03:14:14.236000+00:00	7	26.985	

	full_name	compound	date_start	lap_number	duration_sector_1	du
145	Sergio PEREZ	MEDIUM	2024-04-20T03:15:55.626000+00:00	8	26.891	
165	Sergio PEREZ	MEDIUM	2024-04-20T03:17:37.450000+00:00	9	26.973	
185	Sergio PEREZ	MEDIUM	2024-04-20T03:19:19.282000+00:00	10	27.043	
205	Sergio PEREZ	MEDIUM	2024-04-20T03:21:01.870000+00:00	11	27.121	
225	Sergio PEREZ	MEDIUM	2024-04-20T03:22:44.139000+00:00	12	27.052	
245	Sergio PEREZ	MEDIUM	2024-04-20T03:24:26.514000+00:00	13	27.282	
265	Sergio PEREZ	MEDIUM	2024-04-20T03:26:09.010000+00:00	14	27.183	
285	Sergio PEREZ	MEDIUM	2024-04-20T03:27:51.676000+00:00	15	27.080	
305	Sergio PEREZ	MEDIUM	2024-04-20T03:29:34.351000+00:00	16	27.158	
325	Sergio PEREZ	MEDIUM	2024-04-20T03:31:17.227000+00:00	17	27.316	
345	Sergio PEREZ	MEDIUM	2024-04-20T03:32:59.173000+00:00	18	27.428	
	Sergio					

Ferrari

In [89]:
```
stintInformation.query('driver_number == 16 or driver_number == 55')
```

Out[89]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
7	1233	9672	1	16	1	20	MEDIUM	
16	1233	9672	1	55	1	20	MEDIUM	

In [90]:
```
libraryDataF1.getinfolongruns(jointables,16,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[90]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
27	Charles LECLERC	MEDIUM	2024-04-20T03:05:48.650000+00:00	2	27.350	
47	Charles LECLERC	MEDIUM	2024-04-20T03:07:30.402000+00:00	3	27.157	
67	Charles LECLERC	MEDIUM	2024-04-20T03:09:11.690000+00:00	4	26.880	
87	Charles LECLERC	MEDIUM	2024-04-20T03:10:52.632000+00:00	5	26.964	
107	Charles LECLERC	MEDIUM	2024-04-20T03:12:33.938000+00:00	6	27.191	
127	Charles LECLERC	MEDIUM	2024-04-20T03:14:15.160000+00:00	7	27.096	

	full_name	compound	date_start	lap_number	duration_sector_1	du
147	Charles LECLERC	MEDIUM	2024-04-20T03:15:56.553000+00:00	8	27.353	
167	Charles LECLERC	MEDIUM	2024-04-20T03:17:37.994000+00:00	9	27.138	
187	Charles LECLERC	MEDIUM	2024-04-20T03:19:19.983000+00:00	10	27.255	
207	Charles LECLERC	MEDIUM	2024-04-20T03:21:02.264000+00:00	11	27.214	
227	Charles LECLERC	MEDIUM	2024-04-20T03:22:44.750000+00:00	12	27.260	
247	Charles LECLERC	MEDIUM	2024-04-20T03:24:27.213000+00:00	13	27.349	
267	Charles LECLERC	MEDIUM	2024-04-20T03:26:09.632000+00:00	14	27.318	
287	Charles LECLERC	MEDIUM	2024-04-20T03:27:52.080000+00:00	15	27.410	
307	Charles LECLERC	MEDIUM	2024-04-20T03:29:34.779000+00:00	16	27.143	
327	Charles LECLERC	MEDIUM	2024-04-20T03:31:19.167000+00:00	17	27.348	
346	Charles LECLERC	MEDIUM	2024-04-20T03:33:00.632000+00:00	18	27.454	

In [91]:
```
libraryDataF1.getinfolongruns(jointables,55,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[91]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
36	Carlos SAINZ	MEDIUM	2024-04-20T03:05:47.217000+00:00	2	27.121	
56	Carlos SAINZ	MEDIUM	2024-04-20T03:07:28.783000+00:00	3	26.920	
76	Carlos SAINZ	MEDIUM	2024-04-20T03:09:09.829000+00:00	4	26.911	
96	Carlos SAINZ	MEDIUM	2024-04-20T03:10:50.653000+00:00	5	27.498	
116	Carlos SAINZ	MEDIUM	2024-04-20T03:12:32.127000+00:00	6	27.339	
136	Carlos SAINZ	MEDIUM	2024-04-20T03:14:13.302000+00:00	7	27.265	
156	Carlos SAINZ	MEDIUM	2024-04-20T03:15:54.698000+00:00	8	27.374	
176	Carlos SAINZ	MEDIUM	2024-04-20T03:17:36.851000+00:00	9	27.029	
196	Carlos SAINZ	MEDIUM	2024-04-20T03:19:18.857000+00:00	10	27.207	
216	Carlos SAINZ	MEDIUM	2024-04-20T03:21:01.236000+00:00	11	27.327	
236	Carlos SAINZ	MEDIUM	2024-04-20T03:22:43.658000+00:00	12	27.271	
256	Carlos SAINZ	MEDIUM	2024-04-20T03:24:26.047000+00:00	13	27.379	

	full_name	compound	date_start	lap_number	duration_sector_1	du
276	Carlos SAINZ	MEDIUM	2024-04-20T03:26:08.323000+00:00	14	27.353	
296	Carlos SAINZ	MEDIUM	2024-04-20T03:27:50.988000+00:00	15	27.272	
316	Carlos SAINZ	MEDIUM	2024-04-20T03:29:33.821000+00:00	16	27.242	
336	Carlos SAINZ	MEDIUM	2024-04-20T03:31:18.684000+00:00	17	28.182	
355	Carlos SAINZ	MEDIUM	2024-04-20T03:33:02.553000+00:00	18	27.753	
374	Carlos	MEDIUM	2024-04-20T03:34:45.337000+00:00	19	27.824	

McLaren

In [92]:
```
stintInformation.query('driver_number == 4 or driver_number == 81')
```

Out[92]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
4	1233	9672	1	4	1	20	MEDIUM	
19	1233	9672	1	81	1	20	MEDIUM	

In [93]:
```
libraryDataF1.getinfolongruns(jointables,4,'McLaren',MINIMUN_SECONDS,MAXIMU
```

Out[93]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
23	Lando NORRIS	MEDIUM	2024-04-20T03:05:49.676000+00:00	2	27.049	
43	Lando NORRIS	MEDIUM	2024-04-20T03:07:31.085000+00:00	3	26.617	
63	Lando NORRIS	MEDIUM	2024-04-20T03:09:12.247000+00:00	4	26.674	
83	Lando NORRIS	MEDIUM	2024-04-20T03:10:53.314000+00:00	5	26.945	
103	Lando NORRIS	MEDIUM	2024-04-20T03:12:34.889000+00:00	6	26.797	
123	Lando NORRIS	MEDIUM	2024-04-20T03:14:15.840000+00:00	7	27.104	
143	Lando NORRIS	MEDIUM	2024-04-20T03:15:57.326000+00:00	8	27.061	
163	Lando NORRIS	MEDIUM	2024-04-20T03:17:38.976000+00:00	9	26.810	
183	Lando NORRIS	MEDIUM	2024-04-20T03:19:21.148000+00:00	10	26.886	
203	Lando NORRIS	MEDIUM	2024-04-20T03:21:03.087000+00:00	11	27.070	
223	Lando NORRIS	MEDIUM	2024-04-20T03:22:45.768000+00:00	12	27.254	
243	Lando NORRIS	MEDIUM	2024-04-20T03:24:28.007000+00:00	13	27.210	

	full_name	compound	date_start	lap_number	duration_sector_1	du
263	Lando NORRIS	MEDIUM	2024-04-20T03:26:10.717000+00:00	14	27.433	
283	Lando NORRIS	MEDIUM	2024-04-20T03:27:53.053000+00:00	15	27.580	
303	Lando NORRIS	MEDIUM	2024-04-20T03:29:35.937000+00:00	16	27.431	
323	Lando NORRIS	MEDIUM	2024-04-20T03:31:19.962000+00:00	17	27.374	
343	Lando NORRIS	MEDIUM	2024-04-20T03:33:03.021000+00:00	18	27.642	

In [94]:
```
libraryDataF1.getinfolongruns(jointables,81,'McLaren',MINIMUN_SECONDS,MAXI
```

Out[94]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
39	Oscar PIASTRI	MEDIUM	2024-04-20T03:05:50.515000+00:00	2	27.227	
59	Oscar PIASTRI	MEDIUM	2024-04-20T03:07:32.476000+00:00	3	27.143	
79	Oscar PIASTRI	MEDIUM	2024-04-20T03:09:13.562000+00:00	4	27.204	
99	Oscar PIASTRI	MEDIUM	2024-04-20T03:10:54.929000+00:00	5	27.180	
119	Oscar PIASTRI	MEDIUM	2024-04-20T03:12:36.541000+00:00	6	27.237	
139	Oscar PIASTRI	MEDIUM	2024-04-20T03:14:18.222000+00:00	7	27.437	
159	Oscar PIASTRI	MEDIUM	2024-04-20T03:16:00.832000+00:00	8	27.501	
179	Oscar PIASTRI	MEDIUM	2024-04-20T03:17:43.501000+00:00	9	27.423	
199	Oscar PIASTRI	MEDIUM	2024-04-20T03:19:26.194000+00:00	10	27.488	
219	Oscar PIASTRI	MEDIUM	2024-04-20T03:21:08.637000+00:00	11	27.466	
239	Oscar PIASTRI	MEDIUM	2024-04-20T03:22:51.244000+00:00	12	27.494	
259	Oscar PIASTRI	MEDIUM	2024-04-20T03:24:33.760000+00:00	13	27.498	
279	Oscar PIASTRI	MEDIUM	2024-04-20T03:26:16.269000+00:00	14	27.667	
299	Oscar PIASTRI	MEDIUM	2024-04-20T03:27:58.944000+00:00	15	27.573	
319	Oscar PIASTRI	MEDIUM	2024-04-20T03:29:41.295000+00:00	16	27.495	
339	Oscar PIASTRI	MEDIUM	2024-04-20T03:31:23.818000+00:00	17	27.688	
358	Oscar PIASTRI	MEDIUM	2024-04-20T03:33:06.553000+00:00	18	27.827	
377	Oscar PIASTRI	MEDIUM	2024-04-20T03:34:49.526000+00:00	19	27.650	

Mercedes

In [95]:
```
stintInformation.query('driver_number == 44 or driver_number == 63')
```

Out[95]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
15	1233	9672	1	44	1	20	MEDIUM	
17	1233	9672	1	63	1	20	SOFT	

In [96]:
```
libraryDataF1.getinfolongruns(jointables,44,'Mercedes',MINIMUN_SECONDS,MAX
```

Out[96]:

	full_name	compound	date_start	lap_number	duration_sector_1	d
35	Lewis HAMILTON	MEDIUM	2024-04-20T03:05:45.238000+00:00	2	26.936	
55	Lewis HAMILTON	MEDIUM	2024-04-20T03:07:25.933000+00:00	3	26.967	
75	Lewis HAMILTON	MEDIUM	2024-04-20T03:09:06.338000+00:00	4	26.989	
95	Lewis HAMILTON	MEDIUM	2024-04-20T03:10:46.813000+00:00	5	27.207	
115	Lewis HAMILTON	MEDIUM	2024-04-20T03:12:28.033000+00:00	6	27.173	
135	Lewis HAMILTON	MEDIUM	2024-04-20T03:14:09.465000+00:00	7	27.375	
155	Lewis HAMILTON	MEDIUM	2024-04-20T03:15:51.198000+00:00	8	27.257	
175	Lewis HAMILTON	MEDIUM	2024-04-20T03:17:33.409000+00:00	9	27.361	
195	Lewis HAMILTON	MEDIUM	2024-04-20T03:19:15.833000+00:00	10	27.272	
215	Lewis HAMILTON	MEDIUM	2024-04-20T03:20:58.097000+00:00	11	27.512	
235	Lewis HAMILTON	MEDIUM	2024-04-20T03:22:40.470000+00:00	12	27.472	
255	Lewis HAMILTON	MEDIUM	2024-04-20T03:24:22.800000+00:00	13	27.473	
275	Lewis HAMILTON	MEDIUM	2024-04-20T03:26:05.246000+00:00	14	27.561	
295	Lewis HAMILTON	MEDIUM	2024-04-20T03:27:47.641000+00:00	15	27.493	
315	Lewis HAMILTON	MEDIUM	2024-04-20T03:29:30.288000+00:00	16	27.429	
335	Lewis HAMILTON	MEDIUM	2024-04-20T03:31:12.744000+00:00	17	27.425	
354	Lewis HAMILTON	MEDIUM	2024-04-20T03:32:55.223000+00:00	18	27.654	
373	Lewis HAMILTON	MEDIUM	2024-04-20T03:34:37.803000+00:00	19	27.696	

In [97]:
```
libraryDataF1.getinfolongruns(jointables,63,'Mercedes',MINIMUN_SECONDS,MAX
```

Out[97]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
37	George RUSSELL	SOFT	2024-04-20T03:05:52.404000+00:00	2	27.522	
57	George RUSSELL	SOFT	2024-04-20T03:07:35.706000+00:00	3	27.056	
77	George RUSSELL	SOFT	2024-04-20T03:09:17.259000+00:00	4	27.147	
97	George RUSSELL	SOFT	2024-04-20T03:10:59.033000+00:00	5	26.984	
117	George RUSSELL	SOFT	2024-04-20T03:12:40.576000+00:00	6	27.090	
137	George RUSSELL	SOFT	2024-04-20T03:14:22.403000+00:00	7	27.317	
157	George RUSSELL	SOFT	2024-04-20T03:16:04.819000+00:00	8	27.300	
177	George RUSSELL	SOFT	2024-04-20T03:17:46.816000+00:00	9	27.207	
197	George RUSSELL	SOFT	2024-04-20T03:19:28.867000+00:00	10	27.159	
217	George RUSSELL	SOFT	2024-04-20T03:21:11.244000+00:00	11	27.225	
237	George RUSSELL	SOFT	2024-04-20T03:22:53.269000+00:00	12	27.283	
257	George RUSSELL	SOFT	2024-04-20T03:24:35.910000+00:00	13	27.486	
277	George RUSSELL	SOFT	2024-04-20T03:26:18.347000+00:00	14	27.472	
297	George RUSSELL	SOFT	2024-04-20T03:28:00.588000+00:00	15	27.460	
317	George RUSSELL	SOFT	2024-04-20T03:29:43.100000+00:00	16	27.217	
337	George RUSSELL	SOFT	2024-04-20T03:31:25.929000+00:00	17	27.275	
356	George RUSSELL	SOFT	2024-04-20T03:33:08.063000+00:00	18	27.537	
375	George RUSSELL	SOFT	2024-04-20T03:34:50.553000+00:00	19	27.376	

Aston Martin

In [98]:
```
stintInformation.query('driver_number == 14 or driver_number == 18')
```

Out[98]:

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
0	1233	9672	1	14	1	16	MEDIUM	
8	1233	9672	1	18	1	20	MEDIUM	
20	1233	9672	2	14	17	18	MEDIUM	

In [99]:
```
libraryDataF1.getinfolongruns(jointables,14,'Aston Martin',MINIMUN_SECONDS
```

Out[99]:

	full_name	compound	date_start	lap_number	duration_sector_1	du
26	Fernando ALONSO	MEDIUM	2024-04-20T03:05:45.948000+00:00	2	26.935	
46	Fernando ALONSO	MEDIUM	2024-04-20T03:07:26.680000+00:00	3	26.810	
66	Fernando ALONSO	MEDIUM	2024-04-20T03:09:07.290000+00:00	4	26.808	
86	Fernando ALONSO	MEDIUM	2024-04-20T03:10:48.243000+00:00	5	27.193	
106	Fernando ALONSO	MEDIUM	2024-04-20T03:12:29.622000+00:00	6	27.024	
126	Fernando ALONSO	MEDIUM	2024-04-20T03:14:11.025000+00:00	7	27.233	
146	Fernando ALONSO	MEDIUM	2024-04-20T03:15:53.609000+00:00	8	27.325	
166	Fernando ALONSO	MEDIUM	2024-04-20T03:17:36.204000+00:00	9	27.216	
186	Fernando ALONSO	MEDIUM	2024-04-20T03:19:18.193000+00:00	10	27.479	
206	Fernando ALONSO	MEDIUM	2024-04-20T03:21:00.536000+00:00	11	27.342	
226	Fernando ALONSO	MEDIUM	2024-04-20T03:22:42.931000+00:00	12	27.390	
246	Fernando ALONSO	MEDIUM	2024-04-20T03:24:25.224000+00:00	13	27.684	
266	Fernando ALONSO	MEDIUM	2024-04-20T03:26:07.645000+00:00	14	27.666	
286	Fernando ALONSO	MEDIUM	2024-04-20T03:27:50.573000+00:00	15	27.461	

In [100…
```
libraryDataF1.getinfolongruns(jointables,18,'Aston Martin',MINIMUN_SECONDS
```

Out[100…

	full_name	compound	date_start	lap_number	duration_sector_1	du
28	Lance STROLL	MEDIUM	2024-04-20T03:05:53.728000+00:00	2	27.552	
48	Lance STROLL	MEDIUM	2024-04-20T03:07:36.751000+00:00	3	27.120	
68	Lance STROLL	MEDIUM	2024-04-20T03:09:19.477000+00:00	4	27.134	
88	Lance STROLL	MEDIUM	2024-04-20T03:11:02.031000+00:00	5	27.366	
108	Lance STROLL	MEDIUM	2024-04-20T03:12:44.344000+00:00	6	27.358	
128	Lance STROLL	MEDIUM	2024-04-20T03:14:26.654000+00:00	7	27.256	
148	Lance STROLL	MEDIUM	2024-04-20T03:16:09.065000+00:00	8	27.372	

	full_name	compound	date_start	lap_number	duration_sector_1	du
168	Lance STROLL	MEDIUM	2024-04-20T03:17:52.447000+00:00	9	27.320	
188	Lance STROLL	MEDIUM	2024-04-20T03:19:34.861000+00:00	10	27.320	
208	Lance STROLL	MEDIUM	2024-04-20T03:21:17.419000+00:00	11	27.399	
228	Lance STROLL	MEDIUM	2024-04-20T03:23:00.058000+00:00	12	27.508	
248	Lance STROLL	MEDIUM	2024-04-20T03:24:43.115000+00:00	13	27.644	
268	Lance STROLL	MEDIUM	2024-04-20T03:26:26.501000+00:00	14	27.658	
288	Lance STROLL	MEDIUM	2024-04-20T03:28:10.335000+00:00	15	27.736	
308	Lance STROLL	MEDIUM	2024-04-20T03:29:53.760000+00:00	16	27.680	
328	Lance STROLL	MEDIUM	2024-04-20T03:31:37.147000+00:00	17	27.711	
347	Lance STROLL	MEDIUM	2024-04-20T03:33:20.352000+00:00	18	27.737	
	Lance					

RB

In [101…

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

Out[101…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1233	9672	1	3	1	20	MEDIUM	
10	1233	9672	1	22	1	20	MEDIUM	

In [102…

```
libraryDataF1.getinfolongruns(jointables,3,'RB',MINIMUN_SECONDS,MAXIMUM_SE
```

Out[102…

	full_name	compound	date_start	lap_number	duration_sector_1
22	Daniel RICCIARDO	MEDIUM	2024-04-20T03:05:52.688000+00:00	2	27.851
42	Daniel RICCIARDO	MEDIUM	2024-04-20T03:07:36.027000+00:00	3	27.447
62	Daniel RICCIARDO	MEDIUM	2024-04-20T03:09:18.911000+00:00	4	27.242
82	Daniel RICCIARDO	MEDIUM	2024-04-20T03:11:01.316000+00:00	5	27.425
102	Daniel RICCIARDO	MEDIUM	2024-04-20T03:12:43.656000+00:00	6	27.312
122	Daniel RICCIARDO	MEDIUM	2024-04-20T03:14:25.882000+00:00	7	27.380
142	Daniel RICCIARDO	MEDIUM	2024-04-20T03:16:08.225000+00:00	8	27.516

	full_name	compound	date_start	lap_number	duration_sector_1
162	Daniel RICCIARDO	MEDIUM	2024-04-20T03:17:50.917000+00:00	9	27.521
182	Daniel RICCIARDO	MEDIUM	2024-04-20T03:19:33.541000+00:00	10	27.243
202	Daniel RICCIARDO	MEDIUM	2024-04-20T03:21:16.249000+00:00	11	27.289
222	Daniel RICCIARDO	MEDIUM	2024-04-20T03:22:58.904000+00:00	12	27.397
242	Daniel RICCIARDO	MEDIUM	2024-04-20T03:24:41.761000+00:00	13	27.594
262	Daniel RICCIARDO	MEDIUM	2024-04-20T03:26:25.147000+00:00	14	27.452
282	Daniel RICCIARDO	MEDIUM	2024-04-20T03:28:08.315000+00:00	15	27.361
302	Daniel RICCIARDO	MEDIUM	2024-04-20T03:29:51.909000+00:00	16	27.684
322	Daniel RICCIARDO	MEDIUM	2024-04-20T03:31:34.386000+00:00	17	27.578
342	Daniel RICCIARDO	MEDIUM	2024-04-20T03:33:16.680000+00:00	18	27.315

In [103…

```
libraryDataF1.getinfolongruns(jointables,22,'RB',MINIMUN_SECONDS,MAXIMUM_SI
```

Out[103…

	full_name	compound	date_start	lap_number	duration_sector_1	d
30	Yuki TSUNODA	MEDIUM	2024-04-20T03:05:55.123000+00:00	2	27.594	
50	Yuki TSUNODA	MEDIUM	2024-04-20T03:07:39.040000+00:00	3	27.284	
70	Yuki TSUNODA	MEDIUM	2024-04-20T03:09:22.938000+00:00	4	26.980	
90	Yuki TSUNODA	MEDIUM	2024-04-20T03:11:05.028000+00:00	5	27.340	
110	Yuki TSUNODA	MEDIUM	2024-04-20T03:12:47.297000+00:00	6	27.253	
130	Yuki TSUNODA	MEDIUM	2024-04-20T03:14:29.468000+00:00	7	27.297	
150	Yuki TSUNODA	MEDIUM	2024-04-20T03:16:12.114000+00:00	8	27.262	
170	Yuki TSUNODA	MEDIUM	2024-04-20T03:17:54.731000+00:00	9	27.500	
190	Yuki TSUNODA	MEDIUM	2024-04-20T03:19:37.947000+00:00	10	27.486	
210	Yuki TSUNODA	MEDIUM	2024-04-20T03:21:20.840000+00:00	11	27.315	
230	Yuki TSUNODA	MEDIUM	2024-04-20T03:23:03.560000+00:00	12	27.502	
250	Yuki TSUNODA	MEDIUM	2024-04-20T03:24:46.417000+00:00	13	27.629	
270	Yuki TSUNODA	MEDIUM	2024-04-20T03:26:29.189000+00:00	14	27.601	

	full_name	compound	date_start	lap_number	duration_sector_1	d
290	Yuki TSUNODA	MEDIUM	2024-04-20T03:28:12.290000+00:00	15	27.759	
310	Yuki TSUNODA	MEDIUM	2024-04-20T03:29:55.575000+00:00	16	27.490	
330	Yuki TSUNODA	MEDIUM	2024-04-20T03:31:38.763000+00:00	17	27.677	
349	Yuki TSUNODA	MEDIUM	2024-04-20T03:33:22.045000+00:00	18	27.943	
368	Yuki	MEDIUM	2024-04-20T03:35:05.886000+00:00	19	27.825	

Haas F1 Team

In [104…

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

Out[104…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
9	1233	9672	1	20	1	20	MEDIUM	
13	1233	9672	1	27	1	20	MEDIUM	

In [105…

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

Out[105…

	full_name	compound	date_start	lap_number	duration_sector_1
9	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:32:25.022000+00:00	2	26.246
43	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:36:28.014000+00:00	4	26.165
81	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:40:42.649000+00:00	6	26.080
141	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:53:51.061000+00:00	9	27.388
153	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:55:35.785000+00:00	10	27.529
170	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:57:20.562000+00:00	11	27.717
188	Kevin MAGNUSSEN	MEDIUM	2024-04-19T03:59:05.149000+00:00	12	27.850
206	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:00:50.542000+00:00	13	27.878
223	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:02:36.058000+00:00	14	28.056
241	Kevin MAGNUSSEN	MEDIUM	2024-04-19T04:04:23.442000+00:00	15	28.286
358	Kevin MAGNUSSEN	SOFT	2024-04-19T04:23:38.757000+00:00	18	25.383
412	Kevin MAGNUSSEN	SOFT	2024-04-19T04:29:50.735000+00:00	21	25.660

In [106…

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

Out[106…

	full_name	compound	date_start	lap_number	duration_sector_1
27	Nico HULKENBERG	MEDIUM	2024-04-19T03:34:25.959000+00:00	3	26.242
62	Nico HULKENBERG	MEDIUM	2024-04-19T03:38:24.512000+00:00	5	25.996
101	Nico HULKENBERG	MEDIUM	2024-04-19T03:42:34.841000+00:00	7	25.810
164	Nico HULKENBERG	MEDIUM	2024-04-19T03:56:33.671000+00:00	10	27.212
182	Nico HULKENBERG	MEDIUM	2024-04-19T03:58:17.757000+00:00	11	27.376
196	Nico HULKENBERG	MEDIUM	2024-04-19T04:00:01.368000+00:00	12	27.691
215	Nico HULKENBERG	MEDIUM	2024-04-19T04:01:45.633000+00:00	13	27.578
233	Nico HULKENBERG	MEDIUM	2024-04-19T04:03:30.220000+00:00	14	27.745
249	Nico HULKENBERG	MEDIUM	2024-04-19T04:05:15.430000+00:00	15	27.838
265	Nico HULKENBERG	MEDIUM	2024-04-19T04:07:00.558000+00:00	16	28.017
363	Nico HULKENBERG	SOFT	2024-04-19T04:24:39.314000+00:00	19	25.295
400	Nico HULKENBERG	SOFT	2024-04-19T04:28:42.573000+00:00	21	25.501

Alpine

In [107…

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

Out[107…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
5	1233	9672	1	10	1	20	MEDIUM	
14	1233	9672	1	31	1	20	MEDIUM	

In [108…

```
libraryDataF1.getinfolongruns(jointables,31,'Alpine',MINIMUN_SECONDS,MAXIMU
```

Out[108…

	full_name	compound	date_start	lap_number	duration_sector_1	du
34	Esteban OCON	MEDIUM	2024-04-20T03:05:54.104000+00:00	2	27.576	
54	Esteban OCON	MEDIUM	2024-04-20T03:07:38.197000+00:00	3	27.053	
74	Esteban OCON	MEDIUM	2024-04-20T03:09:21.168000+00:00	4	27.034	
94	Esteban OCON	MEDIUM	2024-04-20T03:11:03.380000+00:00	5	26.740	
114	Esteban OCON	MEDIUM	2024-04-20T03:12:45.610000+00:00	6	27.108	

	full_name	compound	date_start	lap_number	duration_sector_1	du
134	Esteban OCON	MEDIUM	2024-04-20T03:14:28.141000+00:00	7	26.980	
154	Esteban OCON	MEDIUM	2024-04-20T03:16:10.763000+00:00	8	27.026	
174	Esteban OCON	MEDIUM	2024-04-20T03:17:53.636000+00:00	9	26.949	
194	Esteban OCON	MEDIUM	2024-04-20T03:19:35.694000+00:00	10	27.016	
214	Esteban OCON	MEDIUM	2024-04-20T03:21:18.224000+00:00	11	27.010	
234	Esteban OCON	MEDIUM	2024-04-20T03:23:00.780000+00:00	12	27.137	
254	Esteban OCON	MEDIUM	2024-04-20T03:24:43.505000+00:00	13	27.313	
274	Esteban OCON	MEDIUM	2024-04-20T03:26:27.081000+00:00	14	27.481	
294	Esteban OCON	MEDIUM	2024-04-20T03:28:10.787000+00:00	15	27.879	
314	Esteban OCON	MEDIUM	2024-04-20T03:29:54.308000+00:00	16	27.521	
334	Esteban OCON	MEDIUM	2024-04-20T03:31:37.724000+00:00	17	27.579	
353	Esteban OCON	MEDIUM	2024-04-20T03:33:20.914000+00:00	18	27.599	

In [109…

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

Out[109…

	full_name	compound	date_start	lap_number	duration_sector_1	du
24	Pierre GASLY	MEDIUM	2024-04-20T03:05:54.739000+00:00	2	27.557	
44	Pierre GASLY	MEDIUM	2024-04-20T03:07:38.722000+00:00	3	27.115	
64	Pierre GASLY	MEDIUM	2024-04-20T03:09:21.839000+00:00	4	27.175	
84	Pierre GASLY	MEDIUM	2024-04-20T03:11:03.871000+00:00	5	27.112	
104	Pierre GASLY	MEDIUM	2024-04-20T03:12:46.073000+00:00	6	27.175	
124	Pierre GASLY	MEDIUM	2024-04-20T03:14:28.803000+00:00	7	27.302	
144	Pierre GASLY	MEDIUM	2024-04-20T03:16:11.347000+00:00	8	27.367	
164	Pierre GASLY	MEDIUM	2024-04-20T03:17:54.094000+00:00	9	27.325	
184	Pierre GASLY	MEDIUM	2024-04-20T03:19:36.973000+00:00	10	27.322	
204	Pierre GASLY	MEDIUM	2024-04-20T03:21:19.701000+00:00	11	27.393	
224	Pierre GASLY	MEDIUM	2024-04-20T03:23:02.217000+00:00	12	27.381	

	full_name	compound	date_start	lap_number	duration_sector_1	du
244	Pierre GASLY	MEDIUM	2024-04-20T03:24:44.721000+00:00	13	27.585	
264	Pierre GASLY	MEDIUM	2024-04-20T03:26:27.676000+00:00	14	27.610	
284	Pierre GASLY	MEDIUM	2024-04-20T03:28:11.137000+00:00	15	27.943	
304	Pierre GASLY	MEDIUM	2024-04-20T03:29:54.896000+00:00	16	27.602	
324	Pierre GASLY	MEDIUM	2024-04-20T03:31:38.191000+00:00	17	27.785	
344	Pierre GASLY	MEDIUM	2024-04-20T03:33:21.461000+00:00	18	27.375	
	Pierre					

Williams

In [110…

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

Out[110…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
2	1233	9672	1	2	1	20	MEDIUM	
11	1233	9672	1	23	1	20	MEDIUM	

In [111…

```
libraryDataF1.getinfolongruns(jointables,23,'Williams',MINIMUN_SECONDS,MAX
```

Out[111…

	full_name	compound	date_start	lap_number	duration_sector_1	du
31	Alexander ALBON	MEDIUM	2024-04-20T03:05:55.416000+00:00	2	27.883	
51	Alexander ALBON	MEDIUM	2024-04-20T03:07:39.712000+00:00	3	27.426	
71	Alexander ALBON	MEDIUM	2024-04-20T03:09:23.827000+00:00	4	27.146	
91	Alexander ALBON	MEDIUM	2024-04-20T03:11:06.583000+00:00	5	27.216	
111	Alexander ALBON	MEDIUM	2024-04-20T03:12:49.040000+00:00	6	27.226	
131	Alexander ALBON	MEDIUM	2024-04-20T03:14:31.597000+00:00	7	27.248	
151	Alexander ALBON	MEDIUM	2024-04-20T03:16:14.232000+00:00	8	27.337	
171	Alexander ALBON	MEDIUM	2024-04-20T03:17:56.612000+00:00	9	27.396	
191	Alexander ALBON	MEDIUM	2024-04-20T03:19:39.332000+00:00	10	27.531	
211	Alexander ALBON	MEDIUM	2024-04-20T03:21:22.460000+00:00	11	27.544	
231	Alexander ALBON	MEDIUM	2024-04-20T03:23:05.246000+00:00	12	27.473	

	full_name	compound	date_start	lap_number	duration_sector_1	du
251	Alexander ALBON	MEDIUM	2024-04-20T03:24:48.281000+00:00	13	27.587	
271	Alexander ALBON	MEDIUM	2024-04-20T03:26:31.695000+00:00	14	27.572	
291	Alexander ALBON	MEDIUM	2024-04-20T03:28:14.894000+00:00	15	27.523	
311	Alexander ALBON	MEDIUM	2024-04-20T03:29:57.724000+00:00	16	27.686	
331	Alexander ALBON	MEDIUM	2024-04-20T03:31:40.836000+00:00	17	27.779	
350	Alexander ALBON	MEDIUM	2024-04-20T03:33:23.702000+00:00	18	27.727	

In [112…

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

Out[112…

	full_name	compound	date_start	lap_number	duration_sector_1
21	Logan SARGEANT	MEDIUM	2024-04-20T03:05:56.105000+00:00	2	27.652
41	Logan SARGEANT	MEDIUM	2024-04-20T03:07:40.404000+00:00	3	27.332
61	Logan SARGEANT	MEDIUM	2024-04-20T03:09:24.257000+00:00	4	27.411
81	Logan SARGEANT	MEDIUM	2024-04-20T03:11:07.061000+00:00	5	27.574
101	Logan SARGEANT	MEDIUM	2024-04-20T03:12:49.727000+00:00	6	27.495
121	Logan SARGEANT	MEDIUM	2024-04-20T03:14:32.548000+00:00	7	27.335
141	Logan SARGEANT	MEDIUM	2024-04-20T03:16:14.976000+00:00	8	27.511
161	Logan SARGEANT	MEDIUM	2024-04-20T03:17:58.131000+00:00	9	27.587
181	Logan SARGEANT	MEDIUM	2024-04-20T03:19:41.219000+00:00	10	27.473
201	Logan SARGEANT	MEDIUM	2024-04-20T03:21:23.891000+00:00	11	27.609
221	Logan SARGEANT	MEDIUM	2024-04-20T03:23:06.824000+00:00	12	27.500
241	Logan SARGEANT	MEDIUM	2024-04-20T03:24:50.044000+00:00	13	27.620
261	Logan SARGEANT	MEDIUM	2024-04-20T03:26:33.203000+00:00	14	27.858
281	Logan SARGEANT	MEDIUM	2024-04-20T03:28:16.407000+00:00	15	27.759
301	Logan SARGEANT	MEDIUM	2024-04-20T03:29:59.984000+00:00	16	27.892
321	Logan SARGEANT	MEDIUM	2024-04-20T03:31:43.448000+00:00	17	27.870
341	Logan SARGEANT	MEDIUM	2024-04-20T03:33:27.331000+00:00	18	27.851

	full_name	compound	date_start	lap_number	duration_sector_1
360	Logan	MEDIUM	2024-04-20T03:35:10.878000+00:00	19	27.558

Kick Sauber

In [113…
```
stintInformation.query('driver_number == 24 or driver_number == 77')
```

Out[113…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
12	1233	9672	1	24	1	20	MEDIUM	
18	1233	9672	1	77	1	20	MEDIUM	

In [114…
```
libraryDataF1.getinfolongruns(jointables,24,'Kick Sauber',MINIMUN_SECONDS,
```

Out[114…

	full_name	compound	date_start	lap_number	duration_sector_1	du
32	ZHOU Guanyu	MEDIUM	2024-04-20T03:05:51.052000+00:00	2	27.421	
52	ZHOU Guanyu	MEDIUM	2024-04-20T03:07:33.344000+00:00	3	27.144	
72	ZHOU Guanyu	MEDIUM	2024-04-20T03:09:15.388000+00:00	4	27.239	
92	ZHOU Guanyu	MEDIUM	2024-04-20T03:10:56.864000+00:00	5	27.229	
112	ZHOU Guanyu	MEDIUM	2024-04-20T03:12:38.540000+00:00	6	27.414	
132	ZHOU Guanyu	MEDIUM	2024-04-20T03:14:21.268000+00:00	7	27.537	
152	ZHOU Guanyu	MEDIUM	2024-04-20T03:16:03.694000+00:00	8	27.695	
172	ZHOU Guanyu	MEDIUM	2024-04-20T03:17:46.363000+00:00	9	27.613	
192	ZHOU Guanyu	MEDIUM	2024-04-20T03:19:29.741000+00:00	10	27.471	
212	ZHOU Guanyu	MEDIUM	2024-04-20T03:21:12.621000+00:00	11	27.782	
232	ZHOU Guanyu	MEDIUM	2024-04-20T03:22:55.618000+00:00	12	27.621	
252	ZHOU Guanyu	MEDIUM	2024-04-20T03:24:38.376000+00:00	13	27.776	
272	ZHOU Guanyu	MEDIUM	2024-04-20T03:26:21.428000+00:00	14	27.798	
292	ZHOU Guanyu	MEDIUM	2024-04-20T03:28:04.626000+00:00	15	27.593	
312	ZHOU Guanyu	MEDIUM	2024-04-20T03:29:47.332000+00:00	16	27.618	
332	ZHOU Guanyu	MEDIUM	2024-04-20T03:31:30.190000+00:00	17	27.678	
351	ZHOU Guanyu	MEDIUM	2024-04-20T03:33:12.833000+00:00	18	27.756	

In [115…
```
libraryDataF1.getinfolongruns(jointables,77,'Kick Sauber',MINIMUN_SECONDS,
```

Out[115…

	full_name	compound	date_start	lap_number	duration_sector_1	du
38	Valtteri BOTTAS	MEDIUM	2024-04-20T03:05:51.975000+00:00	2	27.629	
58	Valtteri BOTTAS	MEDIUM	2024-04-20T03:07:35.174000+00:00	3	27.408	
78	Valtteri BOTTAS	MEDIUM	2024-04-20T03:09:18.234000+00:00	4	27.354	
98	Valtteri BOTTAS	MEDIUM	2024-04-20T03:11:00.851000+00:00	5	27.452	
118	Valtteri BOTTAS	MEDIUM	2024-04-20T03:12:43.134000+00:00	6	27.282	
138	Valtteri BOTTAS	MEDIUM	2024-04-20T03:14:25.170000+00:00	7	27.511	
158	Valtteri BOTTAS	MEDIUM	2024-04-20T03:16:07.721000+00:00	8	27.338	
178	Valtteri BOTTAS	MEDIUM	2024-04-20T03:17:50.292000+00:00	9	27.384	
198	Valtteri BOTTAS	MEDIUM	2024-04-20T03:19:32.777000+00:00	10	27.526	
218	Valtteri BOTTAS	MEDIUM	2024-04-20T03:21:15.390000+00:00	11	27.463	
238	Valtteri BOTTAS	MEDIUM	2024-04-20T03:22:58.106000+00:00	12	27.529	
258	Valtteri BOTTAS	MEDIUM	2024-04-20T03:24:41.094000+00:00	13	27.730	
278	Valtteri BOTTAS	MEDIUM	2024-04-20T03:26:24.493000+00:00	14	27.729	
298	Valtteri BOTTAS	MEDIUM	2024-04-20T03:28:08.535000+00:00	15	27.651	
318	Valtteri BOTTAS	MEDIUM	2024-04-20T03:29:52.433000+00:00	16	27.585	
338	Valtteri BOTTAS	MEDIUM	2024-04-20T03:31:35.717000+00:00	17	27.686	
357	Valtteri BOTTAS	MEDIUM	2024-04-20T03:33:18.565000+00:00	18	27.559	
376	Valtteri BOTTAS	MEDIUM	2024-04-20T03:35:02.043000+00:00	19	27.609	

Qualyfing

Set up

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

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 [116…

```
libraryDataF1.obtain_information('race_control',session_key=9664)
```

Out[116…

	session_key	meeting_key	date	category	flag	lap_number
0	9664	1233	2024-04-20T06:51:34+00:00	Other	None	None
1	9664	1233	2024-04-20T06:51:38+00:00	Other	None	None
2	9664	1233	2024-04-20T07:00:00+00:00	Flag	GREEN	None
3	9664	1233	2024-04-20T07:02:27+00:00	Other	None	None
4	9664	1233	2024-04-20T07:05:35+00:00	Other	None	None
5	9664	1233	2024-04-20T07:07:19+00:00	Other	None	None
6	9664	1233	2024-04-20T07:08:53+00:00	Other	None	None
7	9664	1233	2024-04-20T07:09:40+00:00	Other	None	None
8	9664	1233	2024-04-20T07:10:15+00:00	Other	None	None
9	9664	1233	2024-04-20T07:14:28+00:00	Other	None	None
10	9664	1233	2024-04-20T07:17:01+00:00	Flag	YELLOW	None
11	9664	1233	2024-04-20T07:17:08+00:00	Flag	CLEAR	None

	session_key	meeting_key	date	category	flag	lap_number
12	9664	1233	2024-04-20T07:17:35+00:00	CarEvent	None	None
13	9664	1233	2024-04-20T07:18:00+00:00	Flag	CHEQUERED	None
14	9664	1233	2024-04-20T07:18:17+00:00	Other	None	None
15	9664	1233	2024-04-20T07:21:46+00:00	Other	None	None
16	9664	1233	2024-04-20T07:22:15+00:00	Other	None	None
17	9664	1233	2024-04-20T07:25:00+00:00	Flag	GREEN	None
18	9664	1233	2024-04-20T07:32:59+00:00	Flag	DOUBLE YELLOW	None
19	9664	1233	2024-04-20T07:33:00+00:00	Other	None	None
20	9664	1233	2024-04-20T07:33:03+00:00	Flag	YELLOW	None
21	9664	1233	2024-04-20T07:33:10+00:00	Flag	YELLOW	None
22	9664	1233	2024-04-20T07:33:17+00:00	Flag	RED	None
23	9664	1233	2024-04-20T07:33:17+00:00	Flag	CLEAR	None
24	9664	1233	2024-04-20T07:33:17+00:00	Flag	CLEAR	None
25	9664	1233	2024-04-20T07:34:00+00:00	Other	None	None
26	9664	1233	2024-04-20T07:41:17+00:00	Flag	CLEAR	None
27	9664	1233	2024-04-20T07:41:18+00:00	Drs	None	None
28	9664	1233	2024-04-20T07:41:27+00:00	Other	None	None

	session_key	meeting_key	date	category	flag	lap_number
29	9664	1233	2024-04-20T07:45:00+00:00	Flag	GREEN	None
30	9664	1233	2024-04-20T07:51:44+00:00	Flag	CHEQUERED	None
31	9664	1233	2024-04-20T07:52:12+00:00	Other	None	None
32	9664	1233	2024-04-20T07:54:55+00:00	Other	None	None
33	9664	1233	2024-04-20T08:00:00+00:00	Flag	GREEN	None
34	9664	1233	2024-04-20T08:12:00+00:00	Flag	CHEQUERED	None
35	9664	1233	2024-04-20T08:12:07+00:00	Other	None	None

Obtain setup

In [117…

```
qualyfing = libraryDataF1.obtain_information('laps',session_key=9664)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9
drivers = libraryDataF1.obtain_information('drivers',session_key=9664)
```

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

In [118…

```
qualyfing = qualyfing.drop(40)
qualyfing = qualyfing.drop(49)
qualyfing = qualyfing.drop(50)
```

In [119…

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

Out[119…

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
267	1233	9664	1	279.0	272.0	333.0	2024-04-20T08:11:

In this case, the fastest lap is 93.66 seconds (1.33.66= so that to obtain the competitve laps the fastest lap will be multiplied by 1.07 (100.2162 seconds) due to, according to the rules all the drivers have to do unless one lap within this gap.

In [120…

```
competitiveLaps = qualyfing.query("is_pit_out_lap == False and lap_duratio
competitiveLaps
```

Out[120…

	meeting_key	session_key	driver_number	i1_speed	i2_speed	st_speed	
11	1233	9664	22	278.0	270.0	313.0	2024-04-20T07:02:
12	1233	9664	10	275.0	270.0	326.0	2024-04-20T07:02:
14	1233	9664	27	280.0	274.0	335.0	2024-04-20T07:02:
15	1233	9664	31	275.0	270.0	325.0	2024-04-20T07:02:
19	1233	9664	20	279.0	273.0	334.0	2024-04-20T07:02:
...	...	...	...	...	...	...	
265	1233	9664	77	277.0	273.0	329.0	2024-04-20T08:10:
266	1233	9664	4	279.0	273.0	329.0	2024-04-20T08:10:
267	1233	9664	1	279.0	272.0	333.0	2024-04-20T08:11:
268	1233	9664	14	277.0	273.0	333.0	2024-04-20T08:11:
269	1233	9664	11	279.0	272.0	334.0	2024-04-20T08:11:

88 rows × 16 columns

In [121…

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

Out[121…

	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
12	1	93.660	0.000	331.0	277.0	270.0	9664	1233
19	11	93.982	0.322	332.0	278.0	269.0	9664	1233
9	14	94.148	0.488	331.0	276.0	272.0	9664	1233
7	4	94.165	0.505	327.0	275.0	270.0	9664	1233
18	81	94.273	0.613	326.0	272.0	271.0	9664	1233
8	16	94.289	0.629	329.0	276.0	271.0	9664	1233

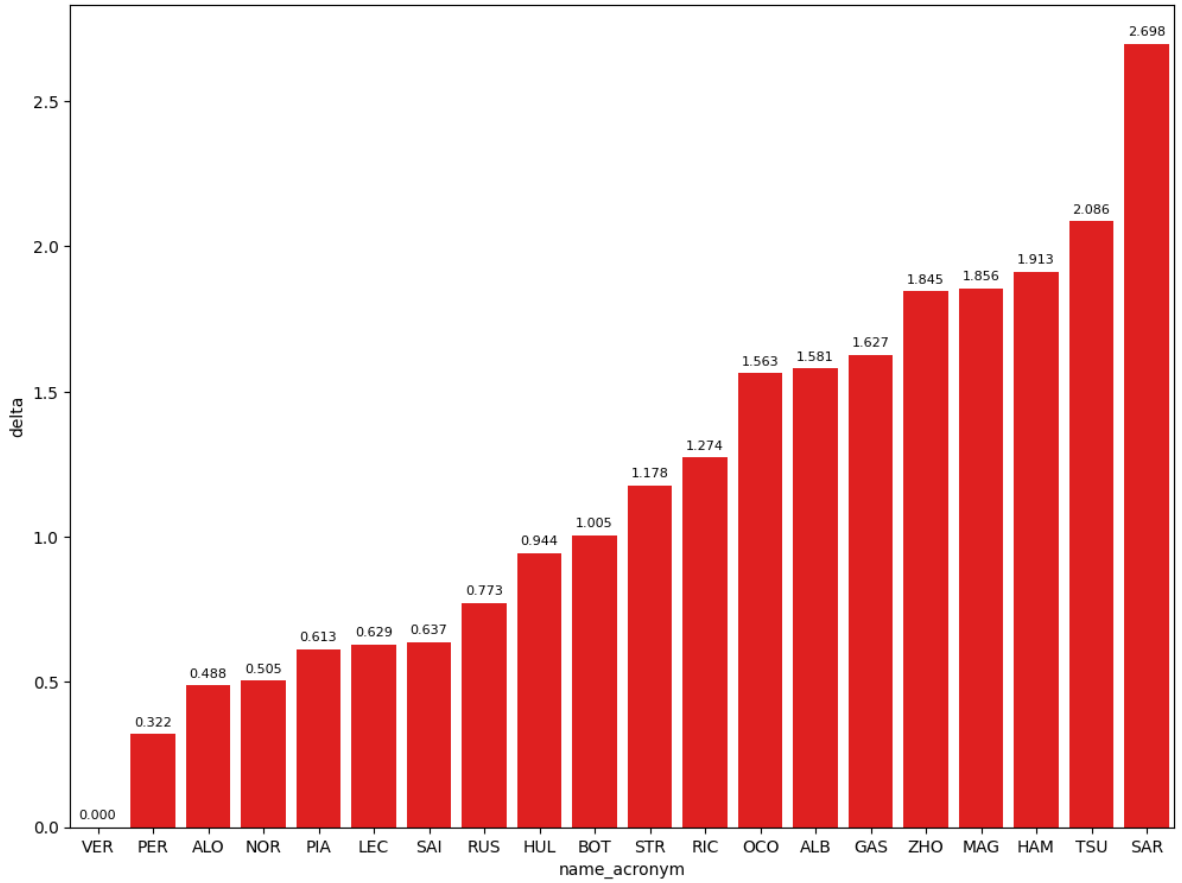
	driver_number	fastest_lap	delta	st_speed	i1_speed	i2_speed	session_key	meeting_key
5	55	94.297	0.637	329.0	277.0	272.0	9664	1233
6	63	94.433	0.773	328.0	276.0	272.0	9664	1233
2	27	94.604	0.944	333.0	279.0	272.0	9664	1233
11	77	94.665	1.005	329.0	277.0	271.0	9664	1233
10	18	94.838	1.178	333.0	278.0	272.0	9664	1233
14	3	94.934	1.274	332.0	277.0	270.0	9664	1233
3	31	95.223	1.563	325.0	275.0	270.0	9664	1233
17	23	95.241	1.581	332.0	278.0	272.0	9664	1233
1	10	95.287	1.627	326.0	275.0	268.0	9664	1233
16	24	95.505	1.845	330.0	277.0	272.0	9664	1233
4	20	95.516	1.856	334.0	279.0	273.0	9664	1233
13	44	95.573	1.913	330.0	276.0	271.0	9664	1233
0	22	95.746	2.086	313.0	277.0	270.0	9664	1233
15	2	96.358	2.698	330.0	276.0	271.0	9664	1233

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 [122…

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

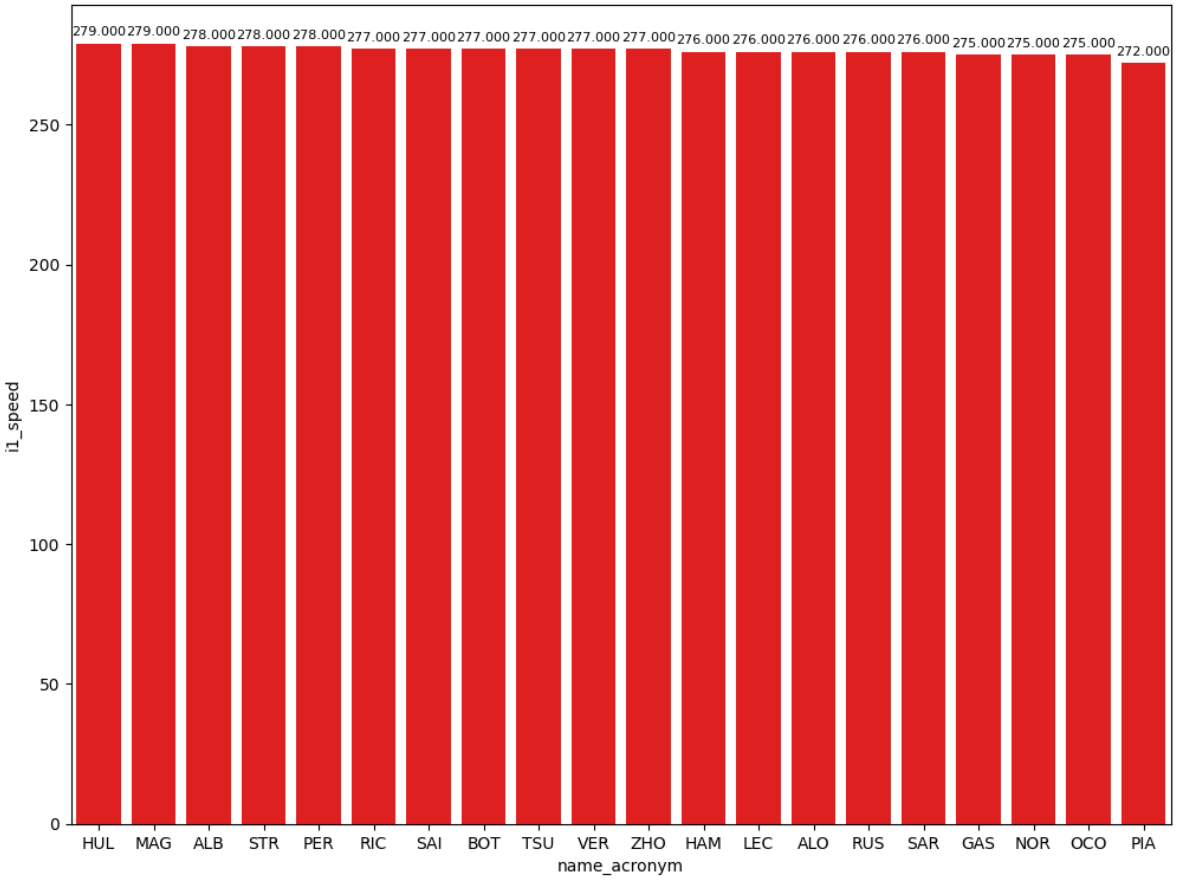


Speed trap

Maximum speed per drivers

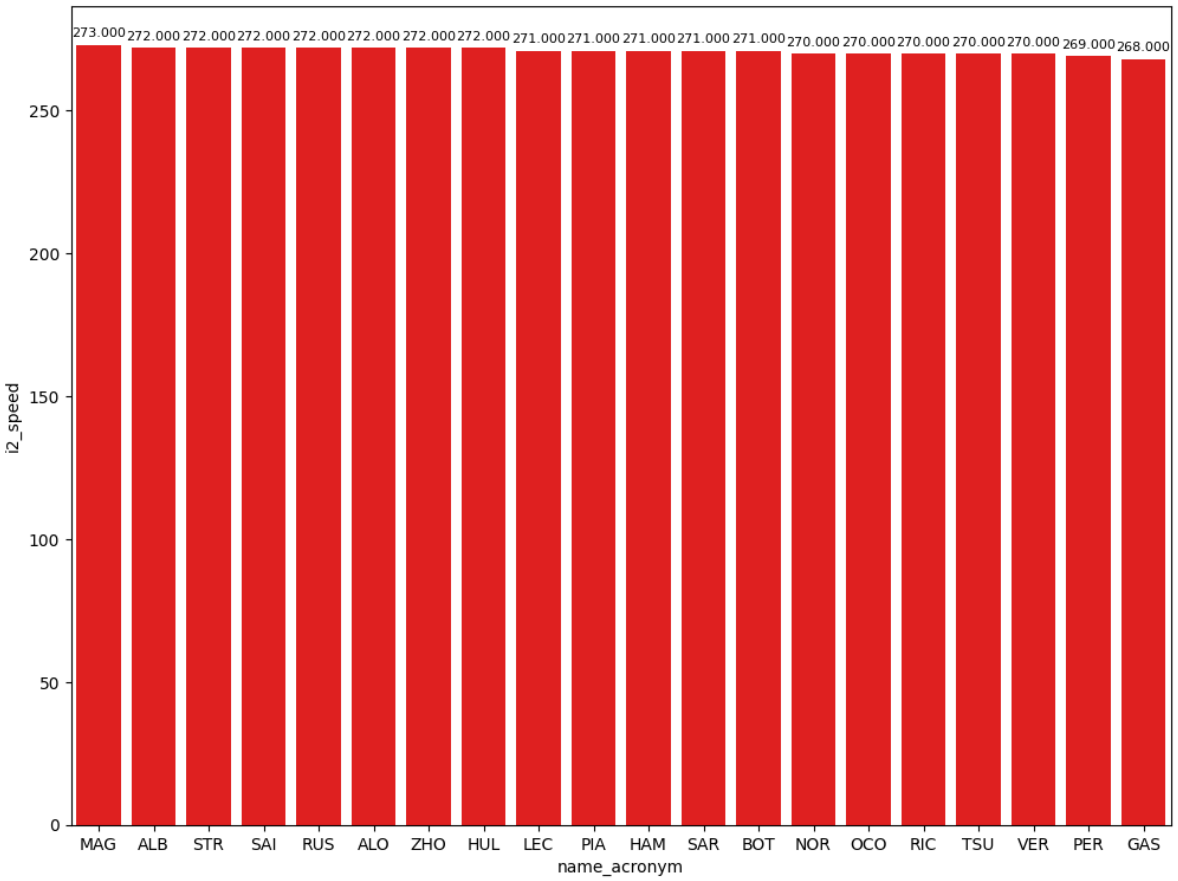
In [123…

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



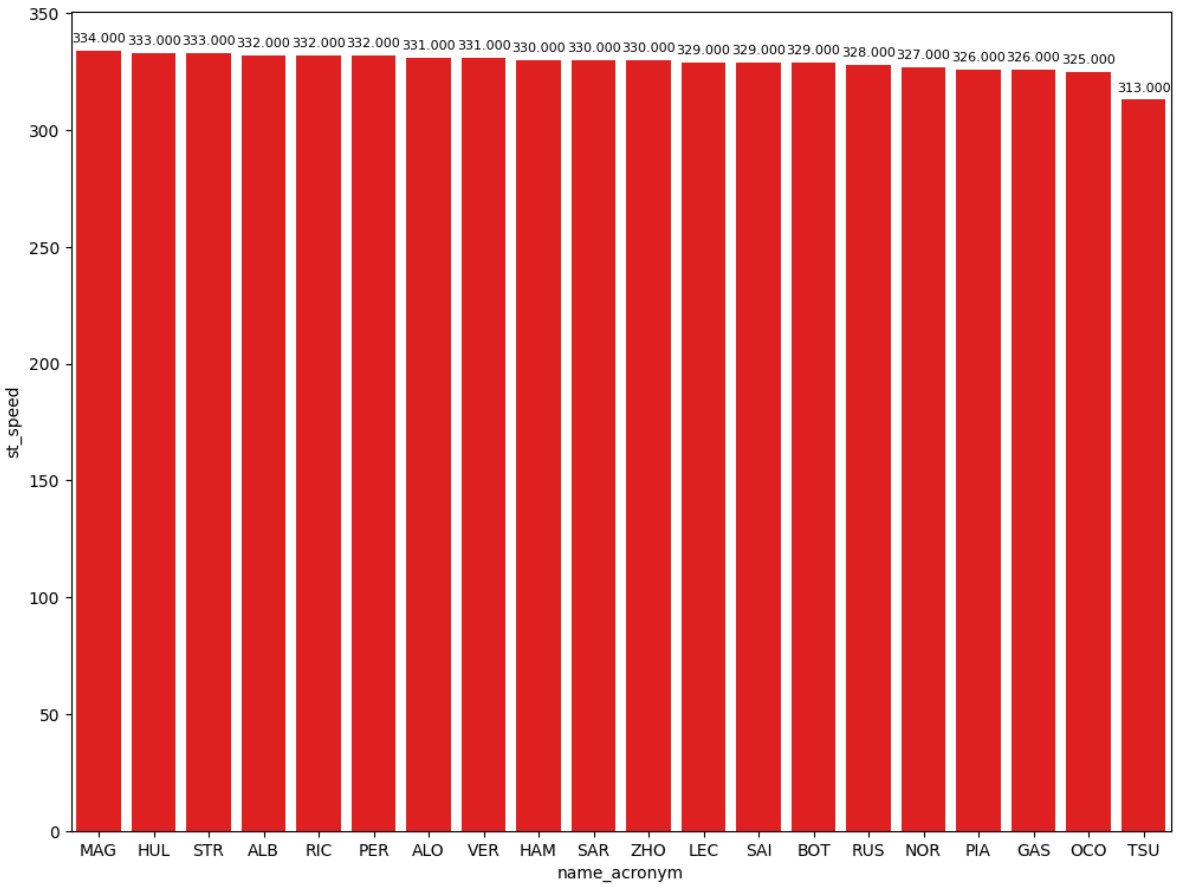
In [124…

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



In [125…

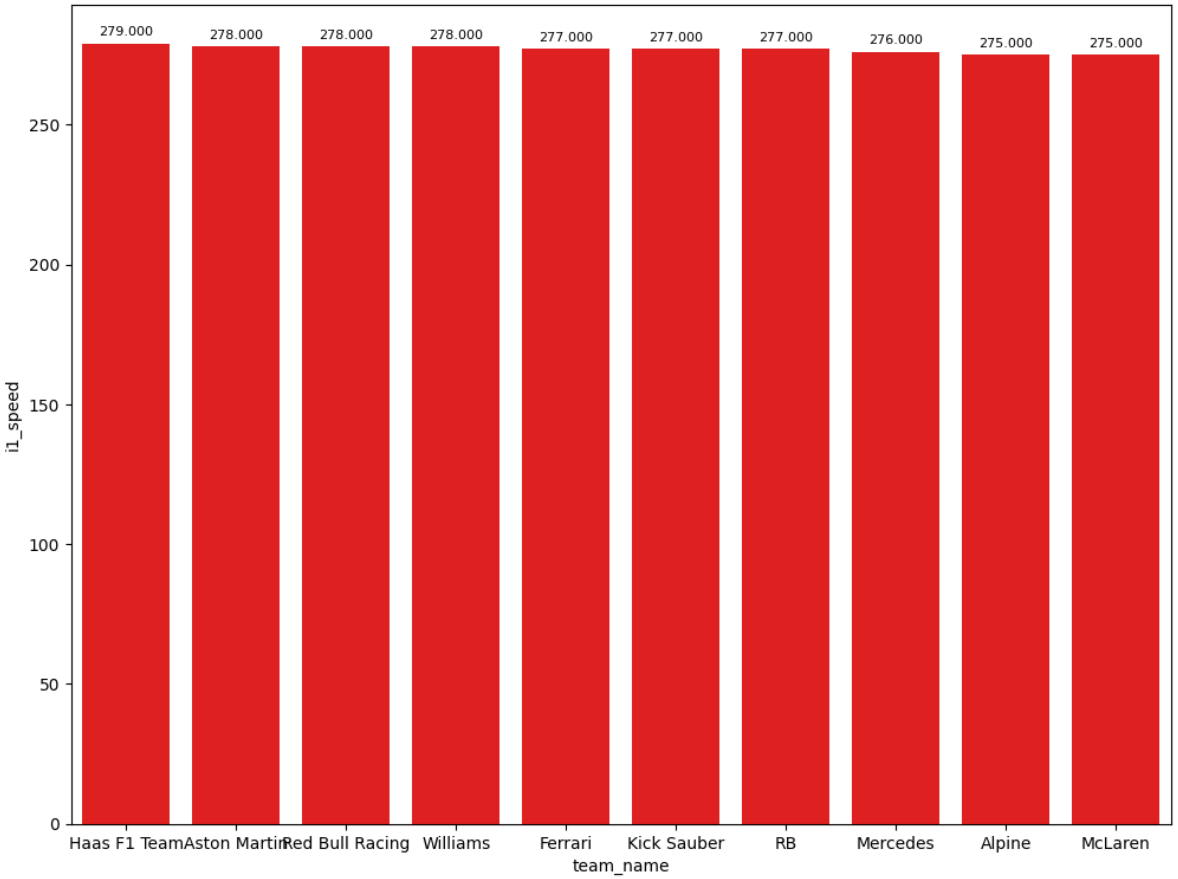
```
top_speed = jointables.loc[jointables.groupby(['name_acronym'])['st_speed'
libraryDataF1.obtainchart("name_acronym","st_speed",top_speed)
```



Maximum speed per teams

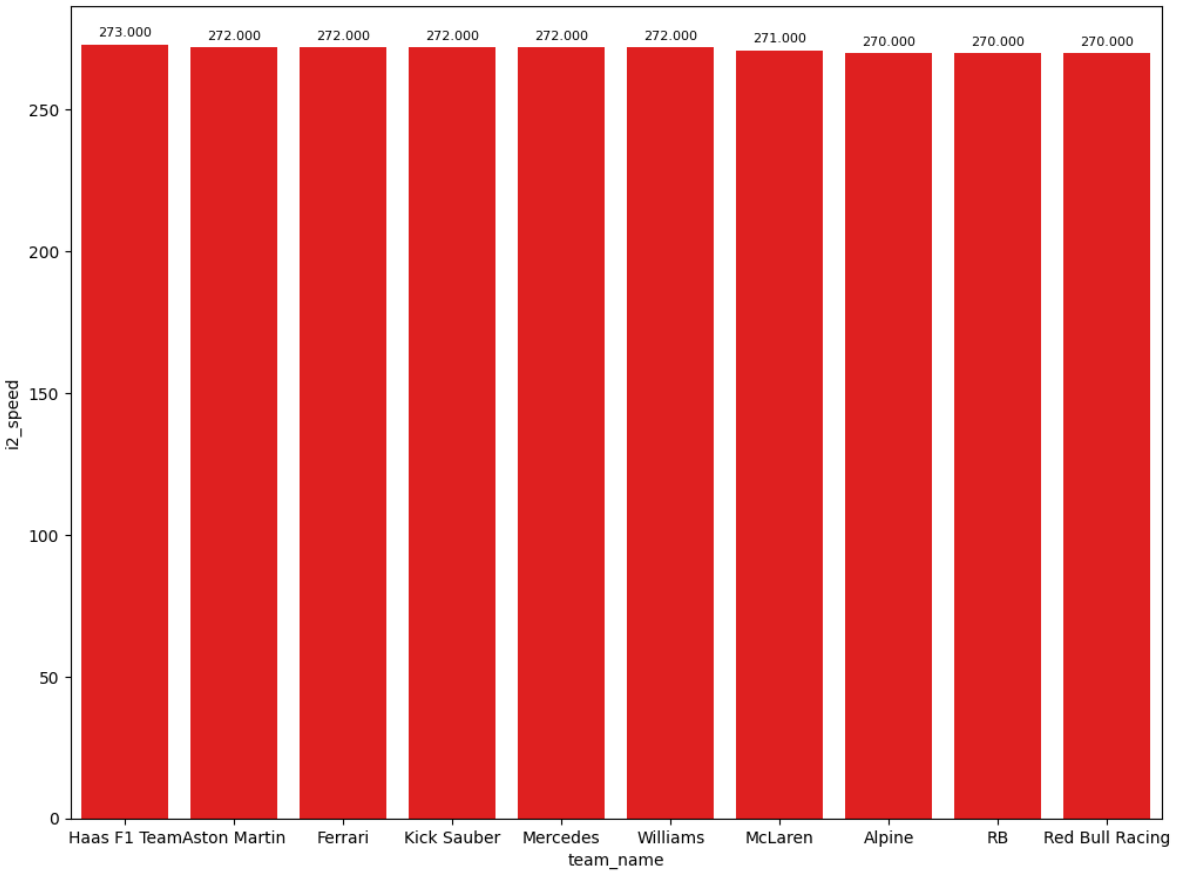
In [126…

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



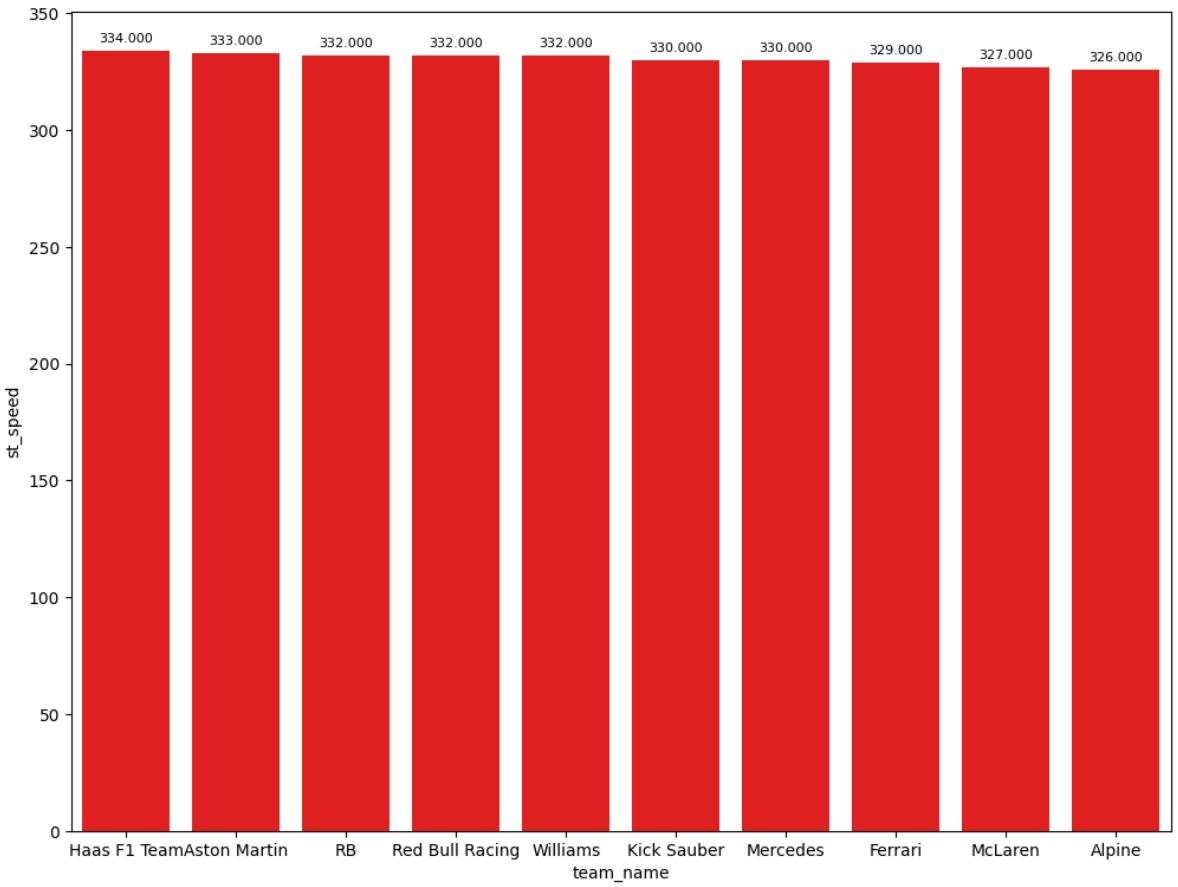
In [127…

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



In [128…

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



In [129…

```
mergequaly = pd.merge(competitiveLaps,drivers,on=['driver_number'])
mergequaly
```

Out[129…

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
0	1233	9664	22	278.0	270.0	313.0	2024-04-20T07
1	1233	9664	22	277.0	271.0	333.0	2024-04-20T07
2	1233	9664	22	277.0	271.0	333.0	2024-04-20T07
3	1233	9664	10	275.0	270.0	326.0	2024-04-20T07
4	1233	9664	10	275.0	270.0	327.0	2024-04-20T07
...	...	...	...	...	...	...	
83	1233	9664	11	280.0	271.0	334.0	2024-04-20T07
84	1233	9664	11	279.0	272.0	334.0	2024-04-20T07
85	1233	9664	11	278.0	272.0	333.0	2024-04-20T07
86	1233	9664	11	278.0	272.0	332.0	2024-04-20T08

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
87	1233	9664	11	279.0	272.0	334.0	2024-04-20T08

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

In [130…

```
maximumDateQ1 = "date_start <'2024-04-20T07:25:00'"
maximumDateQ2 = "date_start <'2024-04-20T08:00:00' and date_start >'2024-04
maximumDateQ3 = "date_start >'2024-04-20T08:00:00'"
```

Qualyfing 1

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

In [131…

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

Out[131…

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
60	1233	9664	1	279.0	271.0	334.0	2024-04-20T07
40	1233	9664	16	278.0	273.0	330.0	2024-04-20T07
34	1233	9664	4	277.0	270.0	327.0	2024-04-20T07
23	1233	9664	55	278.0	273.0	332.0	2024-04-20T07
78	1233	9664	81	272.0	271.0	328.0	2024-04-20T07
10	1233	9664	27	282.0	275.0	336.0	2024-04-20T07
29	1233	9664	63	278.0	274.0	333.0	2024-04-20T07
45	1233	9664	14	276.0	273.0	333.0	2024-04-20T07
55	1233	9664	77	278.0	273.0	330.0	2024-04-20T07
5	1233	9664	10	277.0	270.0	329.0	2024-04-20T07
51	1233	9664	18	280.0	274.0	336.0	2024-04-20T07
17	1233	9664	31	277.0	270.0	328.0	2024-04-20T07
75	1233	9664	23	280.0	273.0	334.0	2024-04-20T07
68	1233	9664	3	278.0	273.0	334.0	2024-04-20T07
82	1233	9664	11	279.0	269.0	333.0	2024-04-20T07

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
73	1233	9664	24	279.0	272.0	332.0	2024-04-20T07
21	1233	9664	20	282.0	273.0	334.0	2024-04-20T07
66	1233	9664	44	278.0	273.0	330.0	2024-04-20T07
2	1233	9664	22	277.0	271.0	333.0	2024-04-20T07
71	1233	9664	2	276.0	271.0	330.0	2024-04-20T07

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 [132…

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

Out[132…

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
82	1233	9664	11	279.0	269.0	333.0	2024-04-20T07

1 rows × 28 columns

In [133…

```
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: Sergio PEREZ Sector 1:  25.371 Sector 2:  28.791 Sector 3:  41.295
```

In [134…

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

Out[134…

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
73	1233	9664	24	279.0	272.0	332.0	2024-04-20T07
21	1233	9664	20	282.0	273.0	334.0	2024-04-20T07
66	1233	9664	44	278.0	273.0	330.0	2024-04-20T07
2	1233	9664	22	277.0	271.0	333.0	2024-04-20T07
71	1233	9664	2	276.0	271.0	330.0	2024-04-20T07

5 rows × 28 columns

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

In [135…

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

newdataset2
```

Out[135…

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	24	0.048	0.045	-0.025	0.028	
1	20	0.059	-0.167	0.102	0.124	
2	44	0.116	-0.125	-0.152	0.393	
3	22	0.289	-0.127	0.172	0.244	
4	2	0.901	0.211	0.275	0.415	

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

In [136…

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

newdataset2
```

Out[136…

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	n
0	1	-0.715	-0.129	-0.271	-0.315	
1	16	-0.660	-0.029	-0.351	-0.280	
2	4	-0.615	-0.148	-0.245	-0.222	
3	55	-0.487	-0.017	-0.280	-0.190	
4	81	-0.443	-0.195	-0.238	-0.010	
5	27	-0.389	-0.250	0.086	-0.225	
6	63	-0.373	-0.160	0.017	-0.230	
7	14	-0.341	-0.084	-0.135	-0.122	
8	77	-0.288	-0.107	-0.248	0.067	
9	10	-0.170	-0.204	-0.027	0.061	
10	18	-0.123	-0.312	-0.118	0.307	
11	31	-0.101	-0.271	-0.100	0.270	
12	23	-0.073	-0.254	0.012	0.169	
13	3	-0.014	-0.040	0.021	0.005	

Best sector per driver

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

In [137…

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

Out[137…

	duration_sector_1

name_acronym	
STR	25.059
OCO	25.100
ALB	25.117
HUL	25.121
GAS	25.167
PIA	25.176
MAG	25.204
RUS	25.211
NOR	25.223
VER	25.242
TSU	25.244
HAM	25.246
BOT	25.264
ALO	25.287
RIC	25.331
LEC	25.342
SAI	25.354
PER	25.371
ZHO	25.416
SAR	25.582

In [138…

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

Out[138…

name_acronym	duration_sector_2
LEC	28.440
SAI	28.511
VER	28.520
BOT	28.543
NOR	28.546
PIA	28.553
HAM	28.639
ALO	28.656
STR	28.673
OCO	28.691
GAS	28.764
ZHO	28.766
PER	28.791
ALB	28.803

name_acronym	duration_sector_2
RUS	28.808
RIC	28.812
HUL	28.877
MAG	28.893

In [139…
```
pd.DataFrame(q1Data.groupby("name_acronym")['duration_sector_3'].min().sor
```

Out[139…

name_acronym	duration_sector_3
VER	40.980
LEC	41.015
RUS	41.065
HUL	41.070
NOR	41.073
SAI	41.105
ALO	41.173
PIA	41.285
PER	41.295
RIC	41.300
ZHO	41.323
GAS	41.356
BOT	41.362
MAG	41.419
ALB	41.464
TSU	41.539
OCO	41.565
STR	41.602
HAM	41.688
SAR	41.710

Qualyfing 2

In this session, Bottas entered in Q3 knocking-out Stroll

In [140…
```
q2Data = libraryDataF1.obtainInfoAboutQualySession(mergequaly,maximumDateQ
q2Data
```

Out[140…

meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
62	1233	9664	1	277.0	273.0	331.0	2024-04-20T07
85	1233	9664	11	278.0	272.0	333.0	2024-04-20T07
24	1233	9664	55	278.0	273.0	331.0	2024-04-20T07
42	1233	9664	16	278.0	272.0	331.0	2024-04-20T07
35	1233	9664	4	277.0	274.0	330.0	2024-04-20T07
30	1233	9664	63	277.0	274.0	329.0	2024-04-20T07
47	1233	9664	14	277.0	272.0	333.0	2024-04-20T07
79	1233	9664	81	275.0	273.0	328.0	2024-04-20T07
12	1233	9664	27	280.0	274.0	333.0	2024-04-20T07
57	1233	9664	77	277.0	272.0	330.0	2024-04-20T07
53	1233	9664	18	279.0	273.0	333.0	2024-04-20T07
70	1233	9664	3	278.0	272.0	332.0	2024-04-20T07
19	1233	9664	31	276.0	271.0	327.0	2024-04-20T07
77	1233	9664	23	278.0	272.0	334.0	2024-04-20T07
7	1233	9664	10	275.0	268.0	327.0	2024-04-20T07

Comparaison with driver at risk

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

In [141…

```
#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: Valtteri BOTTAS Sector 1:  25.041 Sector 2:  28.705 Sector 3:  41.0
23
```

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

In [142…

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

newdataset2
```

Out[142…

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	18	0.069	0.039	-0.101	0.131	
1	3	0.165	0.073	0.050	0.042	
2	31	0.454	0.142	0.032	0.280	
3	23	0.472	0.210	0.169	0.093	
4	10	0.694	0.176	0.237	0.281	

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 qualyfing.

In [143…

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

newdataset2
```

Out[143…

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	1	-0.975	-0.028	-0.478	-0.469	
1	11	-0.743	-0.131	-0.329	-0.283	
2	55	-0.401	0.003	-0.242	-0.162	
3	16	-0.370	0.106	-0.239	-0.237	
4	4	-0.309	-0.057	-0.360	0.108	
5	63	-0.160	0.130	-0.290	0.000	
6	14	-0.117	-0.103	-0.160	0.146	
7	81	-0.110	-0.045	-0.331	0.266	
8	27	-0.102	-0.017	-0.134	0.049	

Best sector per driver

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

In [144…

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

Out[144…

name_acronym	duration_sector_1
PER	24.910
ALO	24.938

name_acronym	duration_sector_1
NOR	24.984
PIA	24.996
VER	25.013
HUL	25.024
BOT	25.041
SAI	25.044
STR	25.080
RIC	25.114
LEC	25.147
RUS	25.171
OCO	25.183

In [145…
```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[145…

name_acronym	duration_sector_2
VER	28.227
NOR	28.345
PIA	28.374
PER	28.376
RUS	28.415
SAI	28.463
LEC	28.466
ALO	28.545
HUL	28.571
STR	28.604
BOT	28.705
OCO	28.737
RIC	28.755
ALB	28.874
GAS	28.942

In [146…
```
pd.DataFrame(q2Data.groupby("name_acronym")['duration_sector_3'].min().sor
```

Out[146…

name_acronym	duration_sector_3
VER	40.554
PER	40.740

name_acronym	duration_sector_3
LEC	40.786
SAI	40.861
BOT	41.023
RUS	41.023
RIC	41.065
HUL	41.072
ALB	41.116
NOR	41.131
STR	41.154
ALO	41.169
PIA	41.289

Qualyfing 3

In [147…

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

Out[147…

	meeting_key_x	session_key_x	driver_number	i1_speed	i2_speed	st_speed	
64	1233	9664	1	279.0	272.0	333.0	2024-04-20T08
87	1233	9664	11	279.0	272.0	334.0	2024-04-20T08
49	1233	9664	14	277.0	273.0	333.0	2024-04-20T08
37	1233	9664	4	279.0	273.0	329.0	2024-04-20T08
81	1233	9664	81	277.0	273.0	328.0	2024-04-20T08
44	1233	9664	16	278.0	274.0	330.0	2024-04-20T08
26	1233	9664	55	278.0	273.0	330.0	2024-04-20T08
32	1233	9664	63	278.0	274.0	331.0	2024-04-20T08
14	1233	9664	27	281.0	274.0	333.0	2024-04-20T08
58	1233	9664	77	277.0	273.0	329.0	2024-04-20T08

10 rows × 28 columns

Comparaison with poleman

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

In [148…

```
#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:  24.981 Sector 2:  28.168 Sector 3:  40.51
1
```

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

Red Bull was dominant in China as we can see in qualyfing.

In [149…

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

Out[149…

	driver_number	lap_duration	difference_sector_1	difference_sector_2	difference_sector_3	na
0	11	0.322	0.051	0.122	0.149	
1	14	0.488	0.076	0.140	0.272	
2	4	0.505	0.060	0.212	0.233	
3	81	0.613	0.103	0.095	0.415	
4	16	0.629	0.324	0.073	0.232	
5	55	0.637	0.215	0.193	0.229	
6	63	0.773	0.202	0.297	0.274	
7	27	0.944	-0.033	0.562	0.415	
8	77	1.005	0.247	0.290	0.468	

Best sector per driver

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

In [150…

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

Out[150…

name_acronym	duration_sector_1
HUL	24.948
VER	24.981
PER	25.032
NOR	25.041
ALO	25.057
PIA	25.084
RUS	25.183

	duration_sector_1
name_acronym	
SAI	25.196

In [151…
```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_2'].min().sor
```

Out[151…

	duration_sector_2
name_acronym	
VER	28.168
LEC	28.241
PIA	28.263
PER	28.290
ALO	28.308
SAI	28.361
NOR	28.380
BOT	28.458
RUS	28.465
HUL	28.730

In [152…
```
pd.DataFrame(q3Data.groupby("name_acronym")['duration_sector_1'].min().sor
```

Out[152…

	duration_sector_1
name_acronym	
HUL	24.948
VER	24.981
PER	25.032
NOR	25.041
ALO	25.057
PIA	25.084
RUS	25.183
SAI	25.196
BOT	25.228
LEC	25.305

Best sector per driver of the session (in general)

In [153…
```
pd.DataFrame(mergequaly.groupby("name_acronym")['duration_sector_1'].min()
```

Out[153…

	duration_sector_1
name_acronym	
PER	24.910

name_acronym	duration_sector_1
ALO	24.925
HUL	24.948
VER	24.965
NOR	24.984
PIA	24.996
BOT	25.041
SAI	25.044
STR	25.059
OCO	25.100
RIC	25.114
ALB	25.117
LEC	25.147
GAS	25.167
RUS	25.171
MAG	25.204
TSU	25.244
HAM	25.246

In [154…
```
pd.DataFrame(mergequaly.groupby("name_acronym")['duration_sector_2'].min()
```

Out[154…

name_acronym	duration_sector_2
VER	28.168
LEC	28.241
PIA	28.263
PER	28.290
ALO	28.308
NOR	28.345
SAI	28.361
RUS	28.415
BOT	28.458
HUL	28.571
STR	28.595
RIC	28.623
HAM	28.639
ALB	28.665
OCO	28.691
GAS	28.764

name_acronym	duration_sector_2
ZHO	28.766
TSU	28.864

In [155…
```
pd.DataFrame(mergequaly.groupby("name_acronym")['duration_sector_3'].min()
```

Out[155…

name_acronym	duration_sector_3
VER	40.511
PER	40.660
SAI	40.740
LEC	40.743
NOR	40.744
ALO	40.783
RUS	40.785
HUL	40.926
PIA	40.926
BOT	40.979
RIC	41.065
ALB	41.116
STR	41.154
OCO	41.303
GAS	41.304
ZHO	41.323
MAG	41.419
TSU	41.539
HAM	41.688
SAR	41.710

Race

Obtain setup

In [156…
```
race = libraryDataF1.obtain_information('laps',session_key=9673)
stintInformation = libraryDataF1.obtain_information('stints',session_key=9
drivers = libraryDataF1.obtain_information('drivers',session_key=9673)
```

In [157…
```
stintsDataFrame =libraryDataF1.stint_configuration(drivers,stintInformatio
```

In [158…

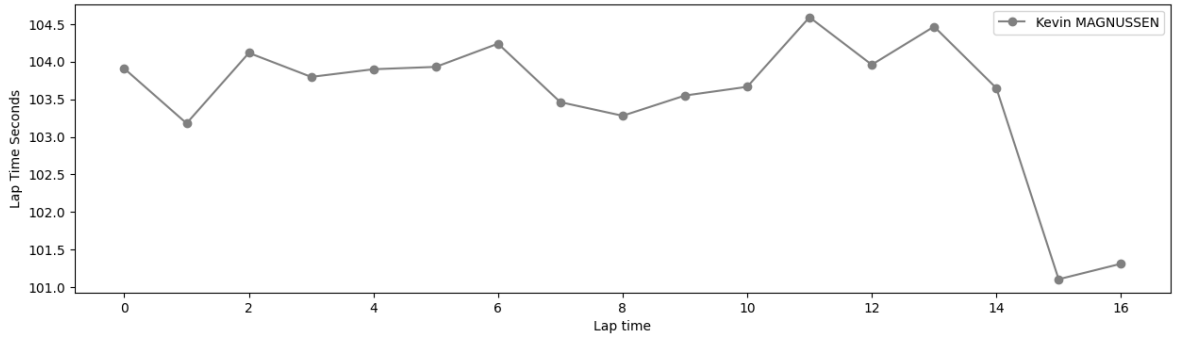
```
raceLaps = race.query("is_pit_out_lap == False")
jointables = pd.merge(raceLaps,stintsDataFrame,on=['lap_number','driver_nu
```

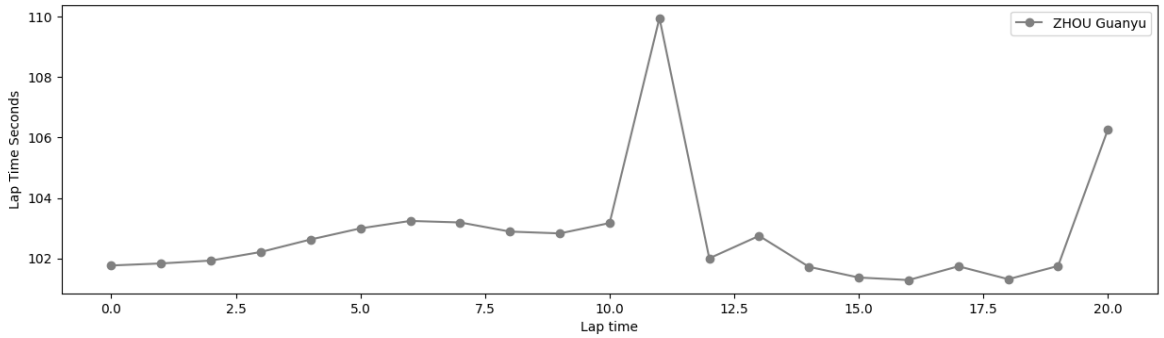
Obtain data tyres

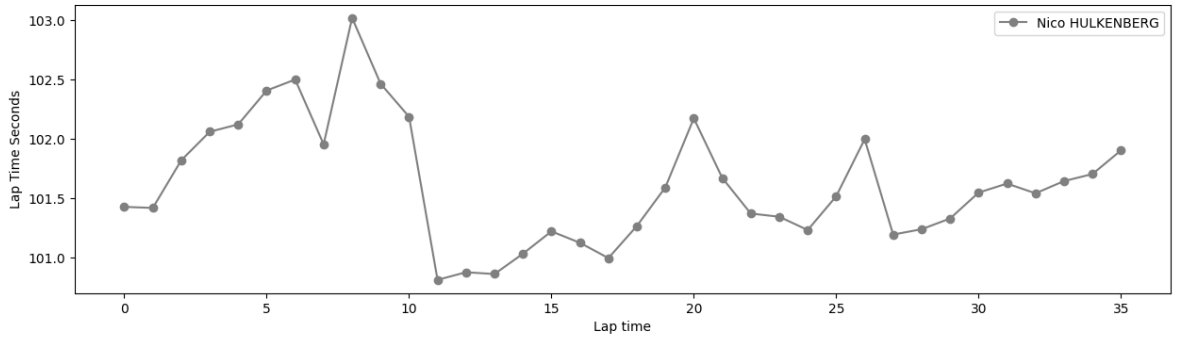
Hard tyres

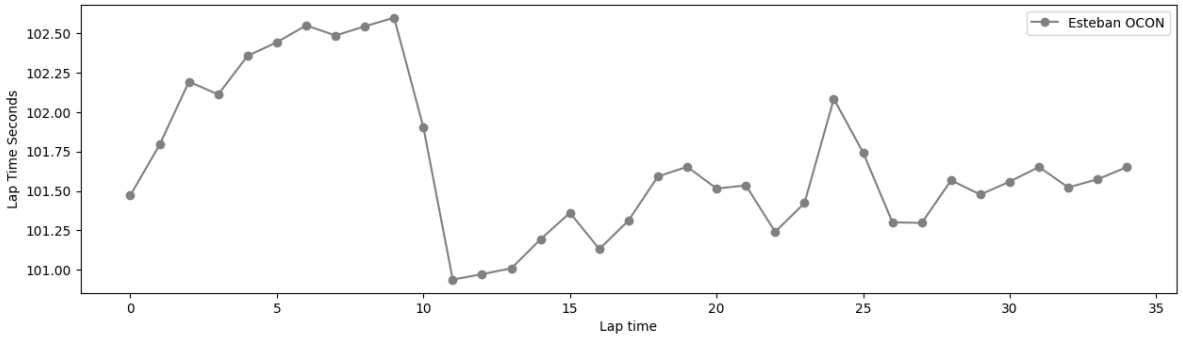
In [159…

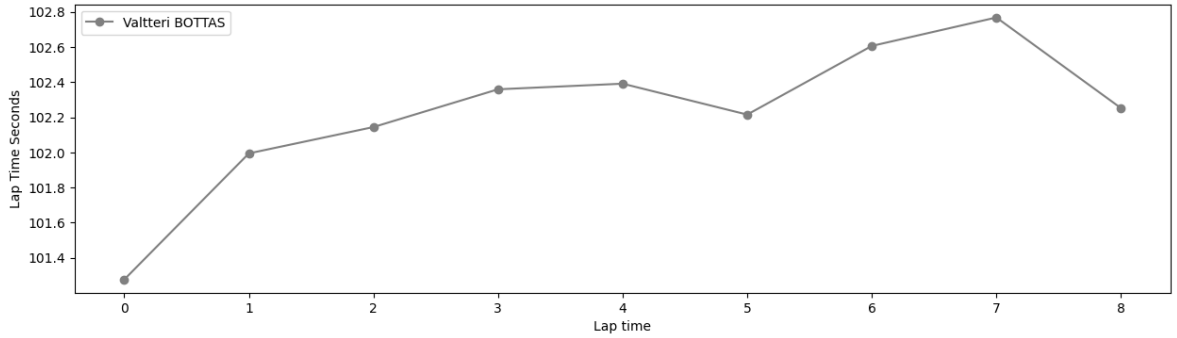
```
libraryDataF1.obtain_data_tyres(jointables,'HARD',110)
```

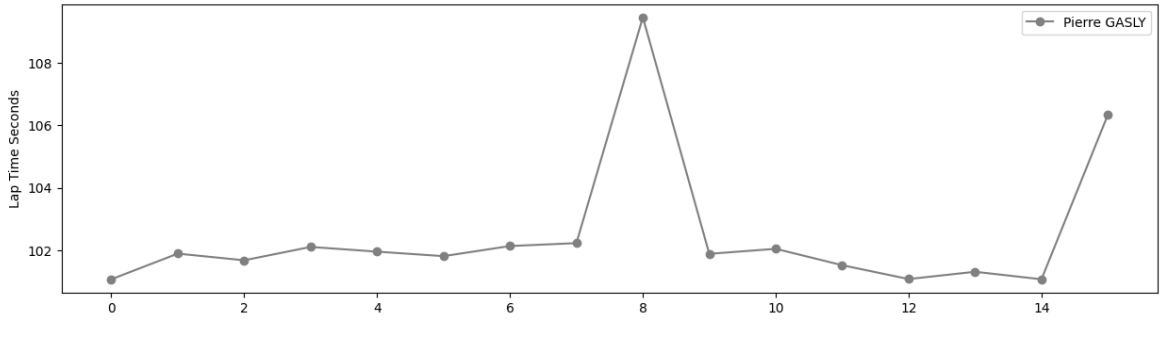

Kevin MAGNUSSEN
Lap Time Seconds
Lap time

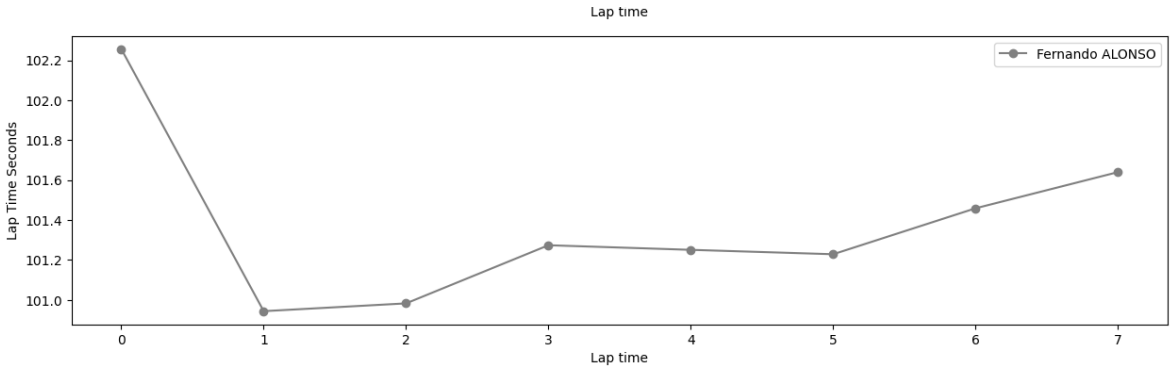

ZHOU Guanyu
Lap Time Seconds
Lap time

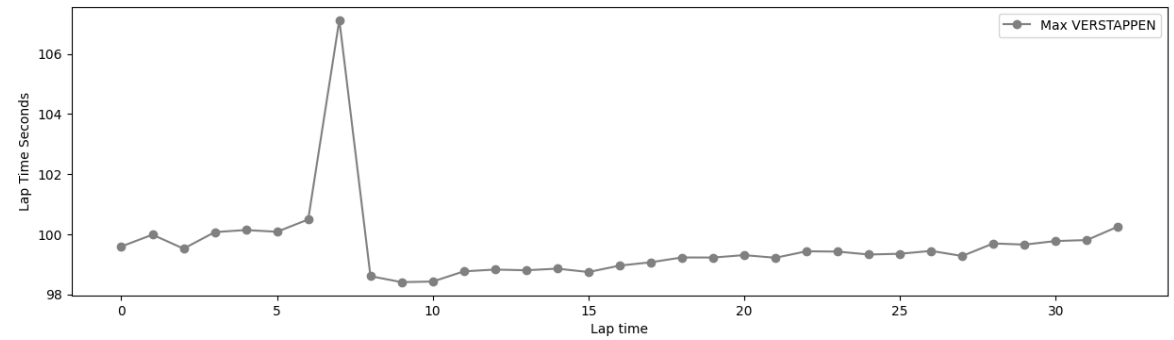

Nico HULKENBERG
Lap Time Seconds
Lap time

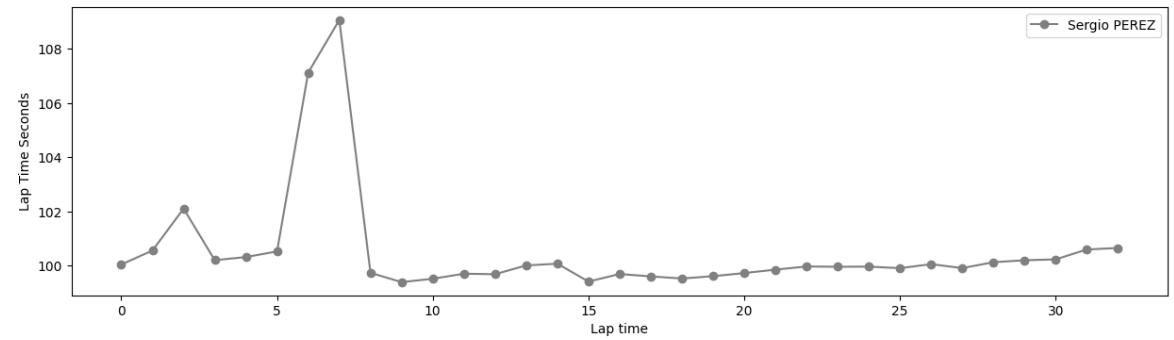

Esteban OCON
Lap Time Seconds
Lap time

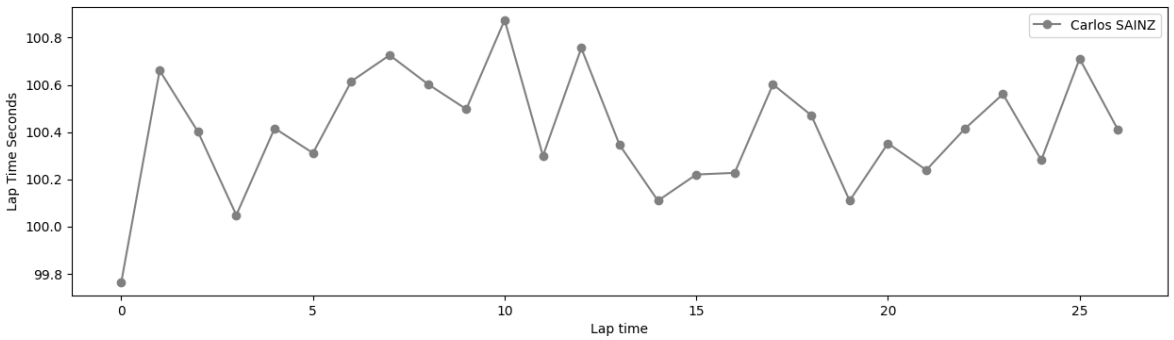

Valtteri BOTTAS
Lap Time Seconds
Lap time

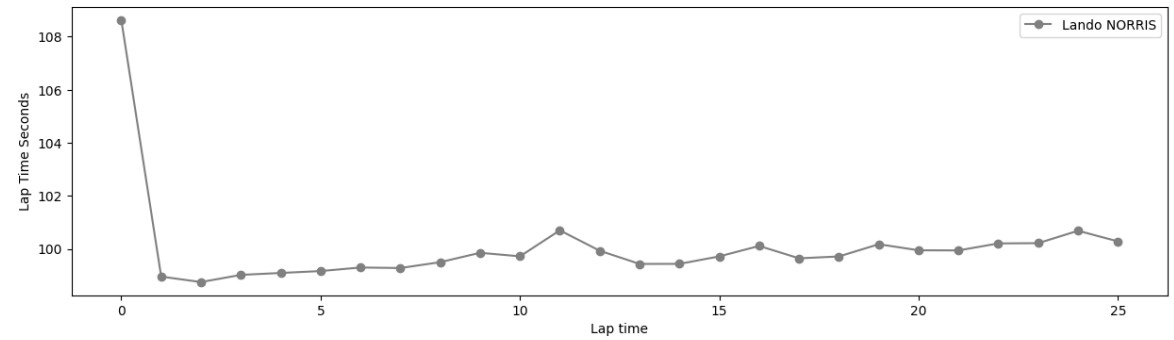

Pierre GASLY
Lap Time Seconds

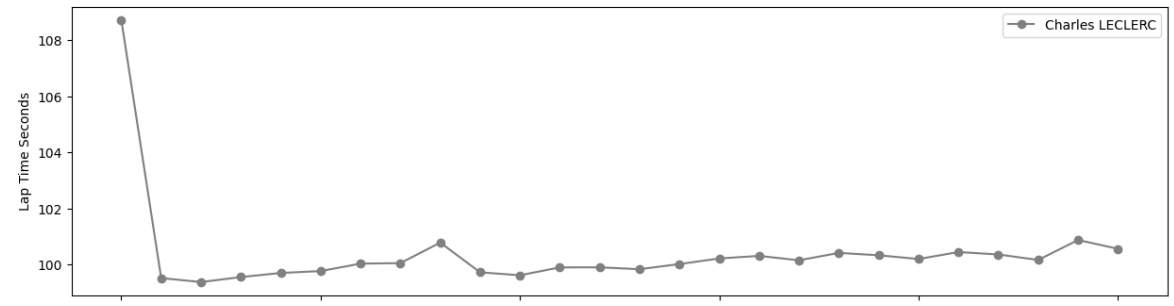

Lap time
Fernando ALONSO
Lap Time Seconds
Lap time

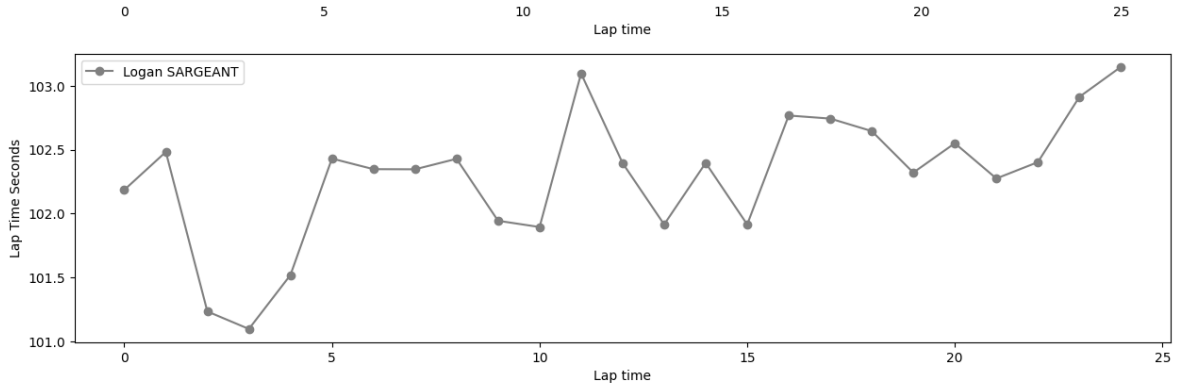

Max VERSTAPPEN
Lap Time Seconds
Lap time

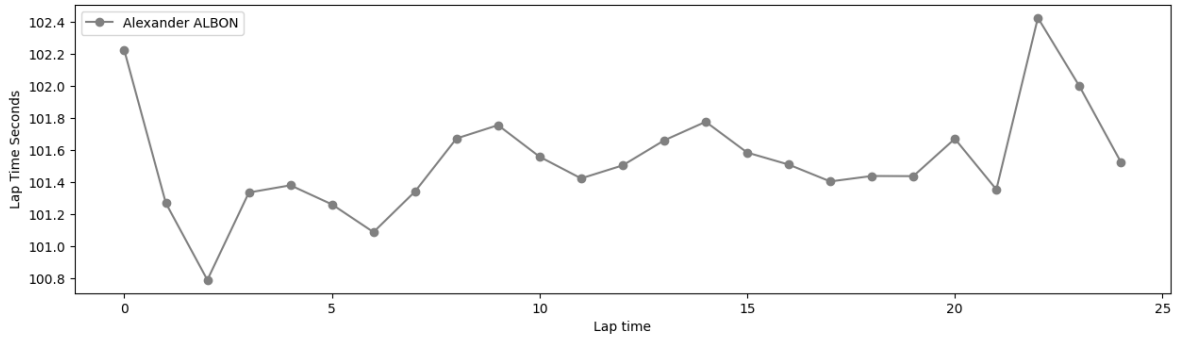

Sergio PEREZ
Lap Time Seconds
Lap time

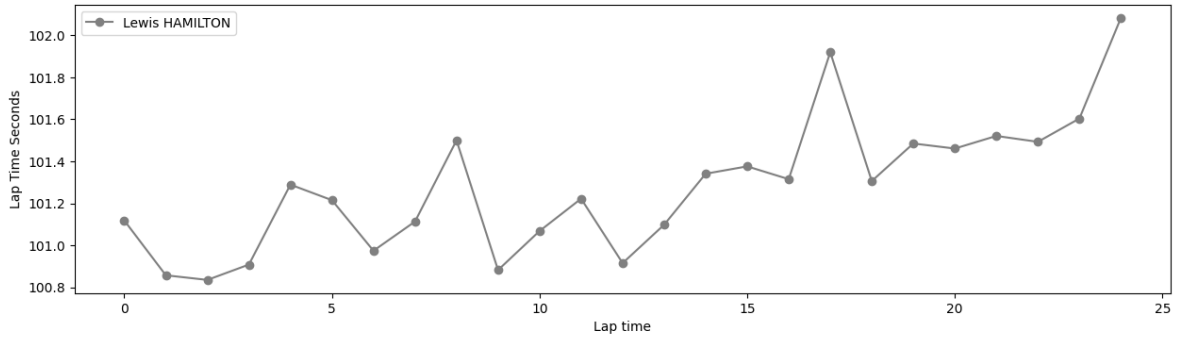

Carlos SAINZ
Lap Time Seconds
Lap time

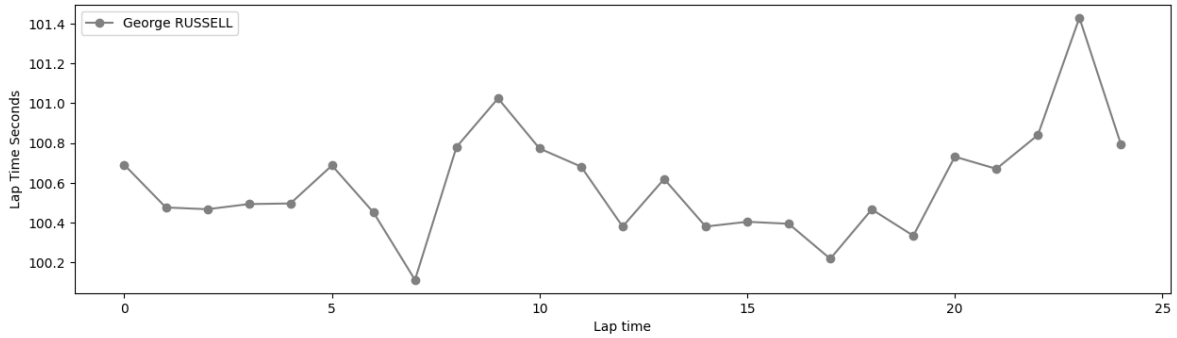

Lando NORRIS
Lap Time Seconds
Lap time

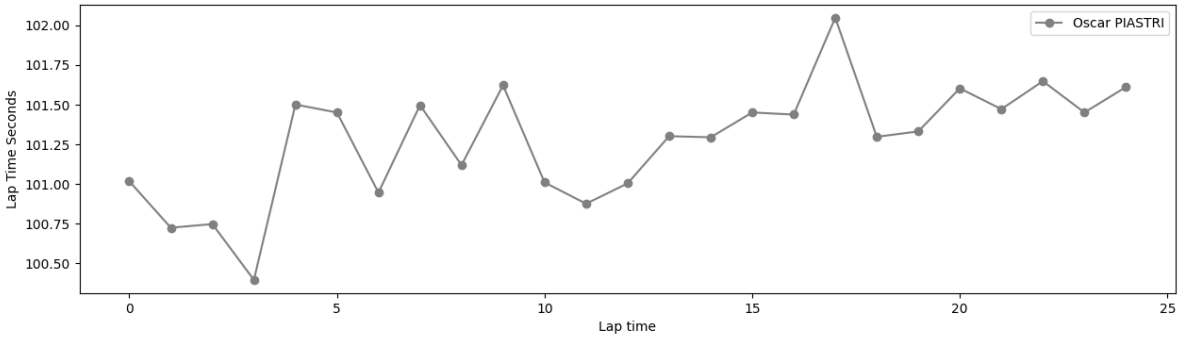

Charles LECLERC
Lap Time Seconds

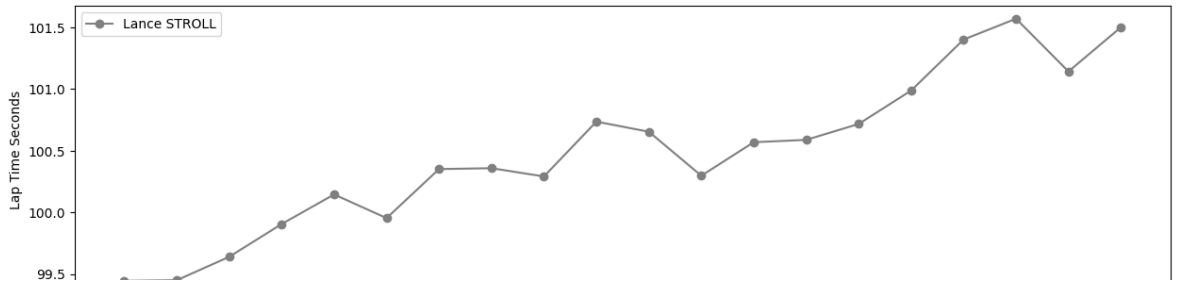

Logan SARGEANT
Lap Time Seconds
Lap time

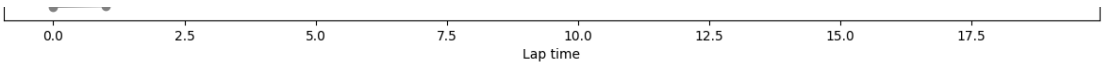

Alexander ALBON
Lap Time Seconds
Lap time


Lewis HAMILTON
Lap Time Seconds
Lap time


George RUSSELL
Lap Time Seconds
Lap time


Oscar PIASTRI
Lap Time Seconds
Lap time

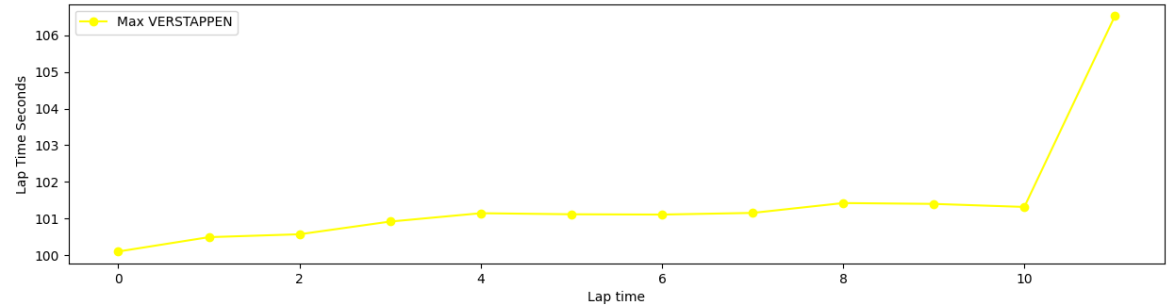

Lance STROLL
Lap Time Seconds

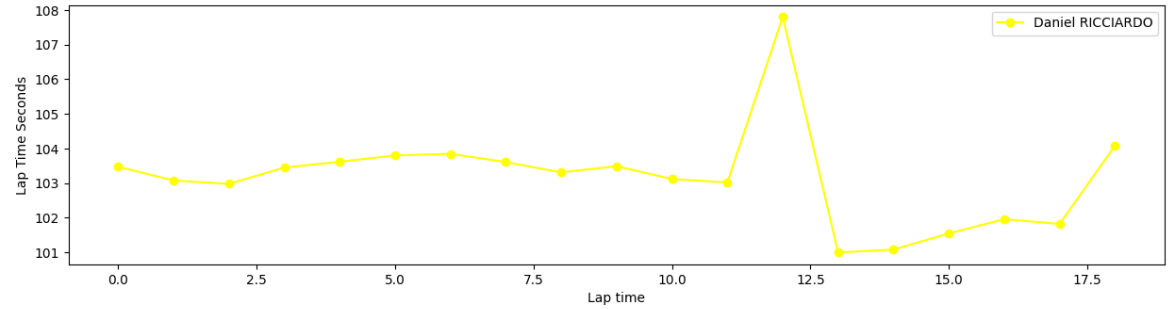


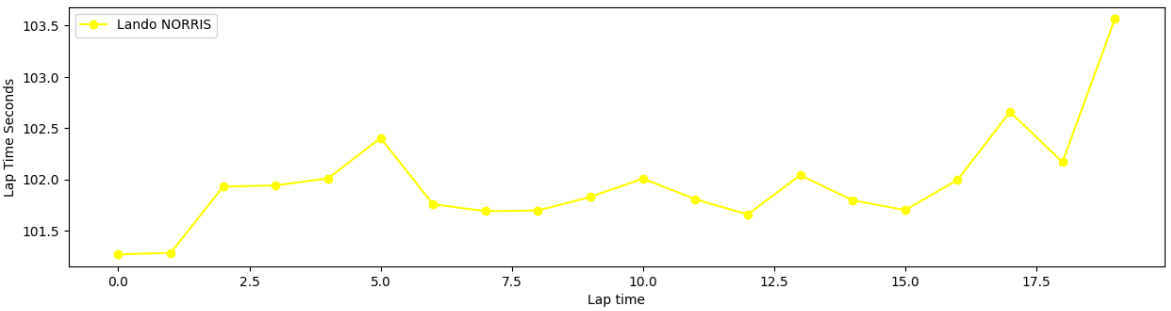
Medium tyres

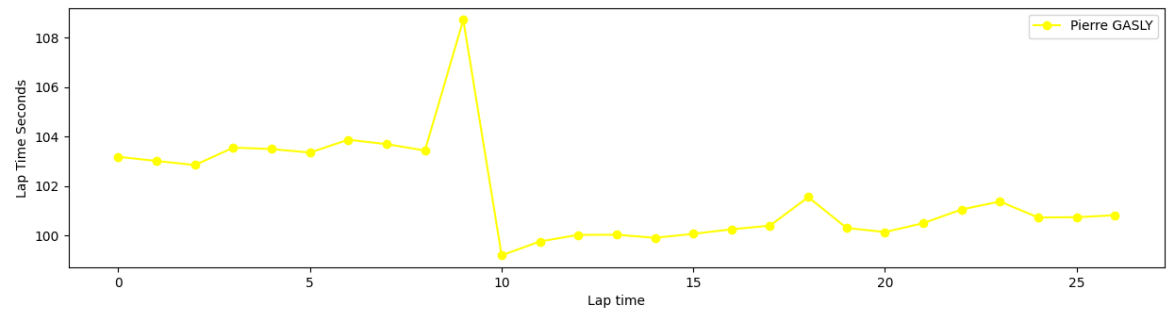
In [160…

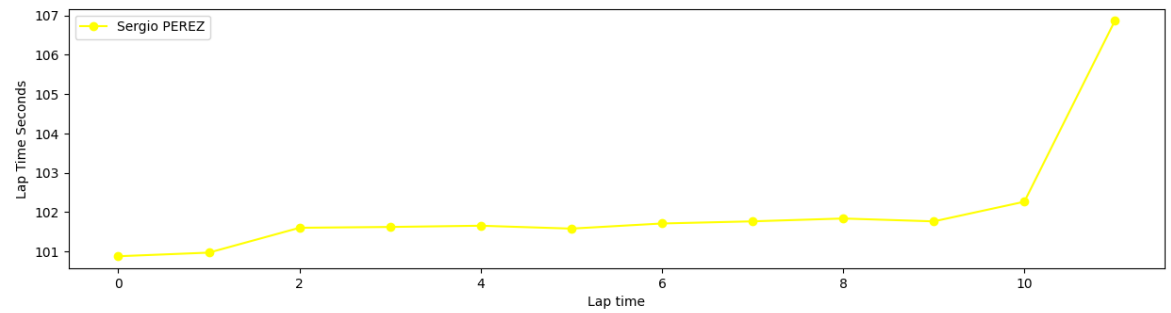
```
libraryDataF1.obtain_data_tyres(jointables,'MEDIUM',110)
```

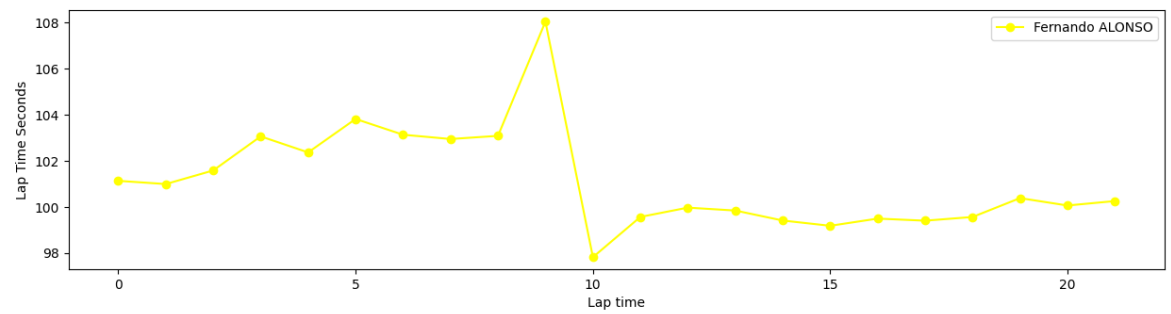

Max VERSTAPPEN
Lap Time Seconds
Lap time


Daniel RICCIARDO
Lap Time Seconds
Lap time

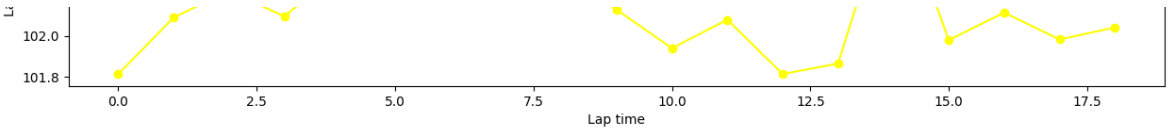

Lando NORRIS
Lap Time Seconds
Lap time

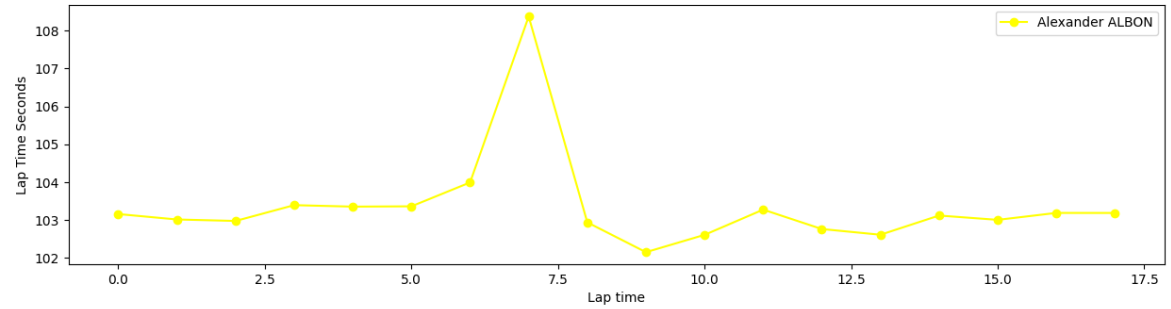

Pierre GASLY
Lap Time Seconds
Lap time

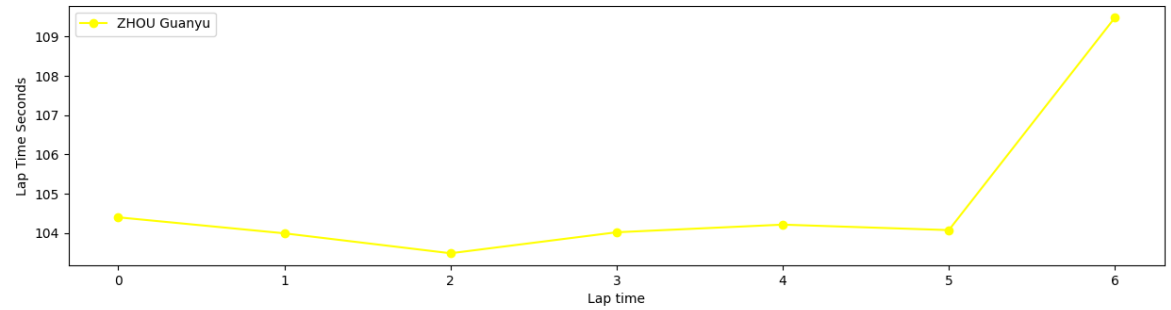

Sergio PEREZ
Lap Time Seconds
Lap time

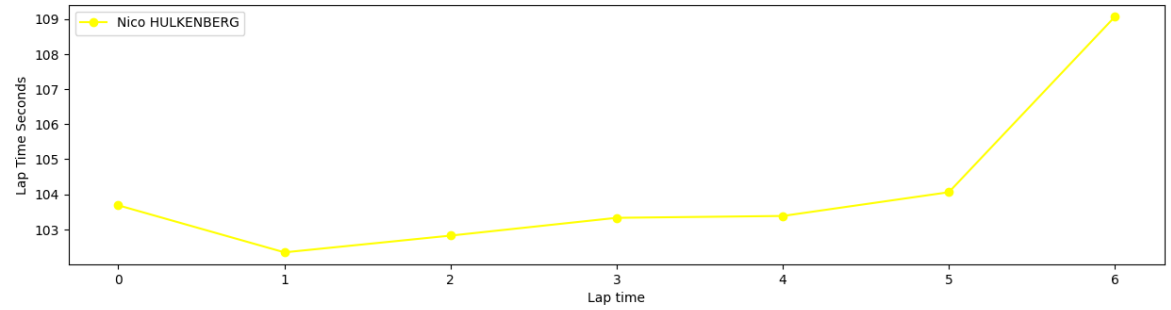

Fernando ALONSO
Lap Time Seconds
Lap time

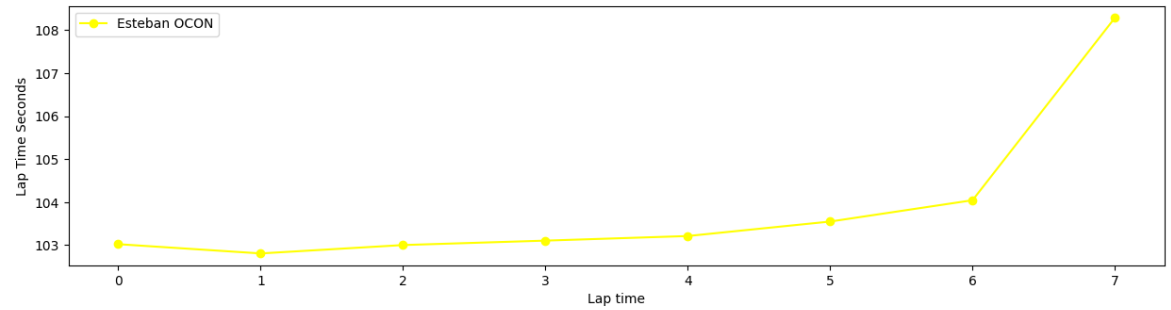

Charles LECLERC
Lap Time Seconds

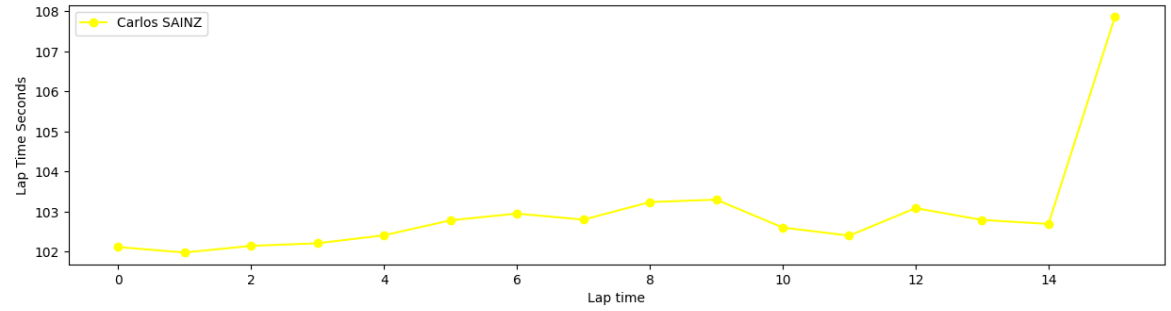

Lap time

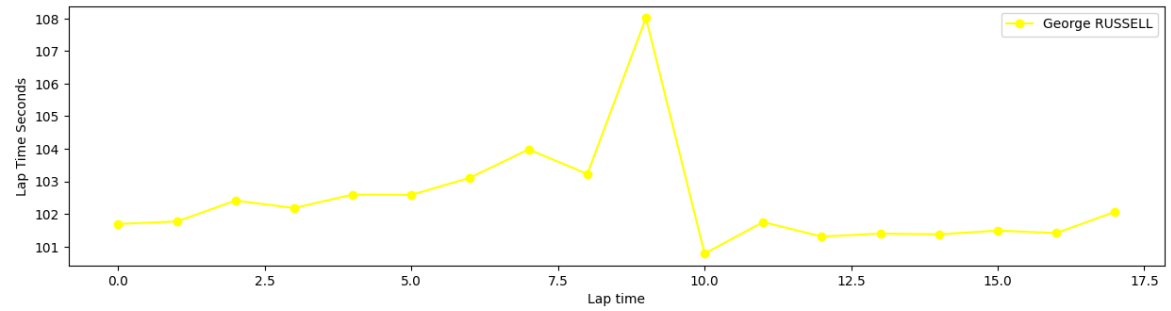

Alexander ALBON
Lap Time Seconds
Lap time


ZHOU Guanyu
Lap Time Seconds
Lap time

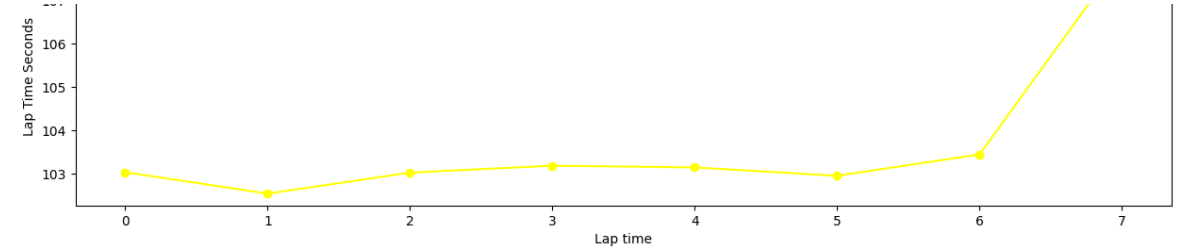

Nico HULKENBERG
Lap Time Seconds
Lap time

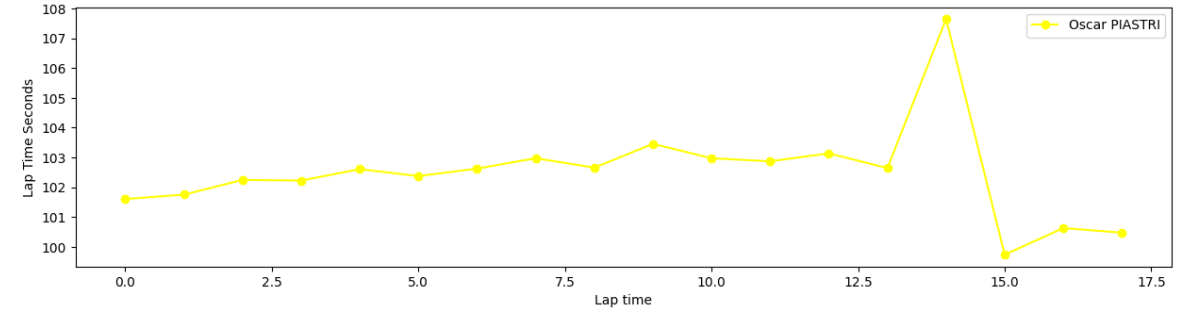

Esteban OCON
Lap Time Seconds
Lap time

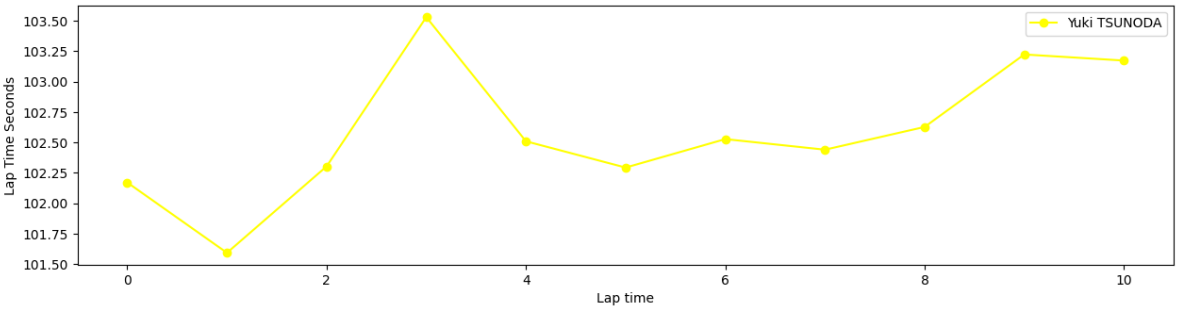

Carlos SAINZ
Lap Time Seconds
Lap time

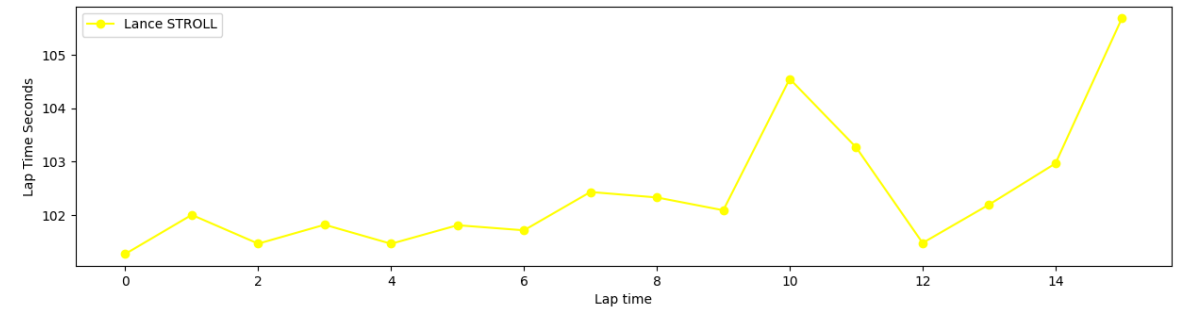

George RUSSELL
Lap Time Seconds
Lap time

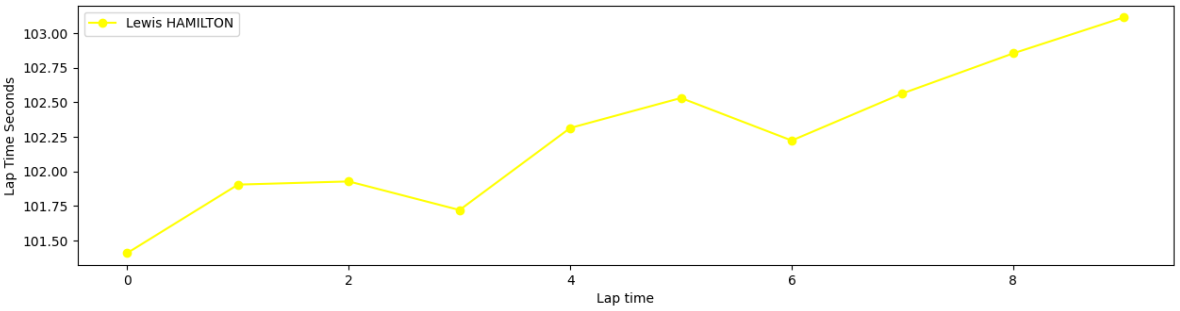

Valtteri BOTTAS

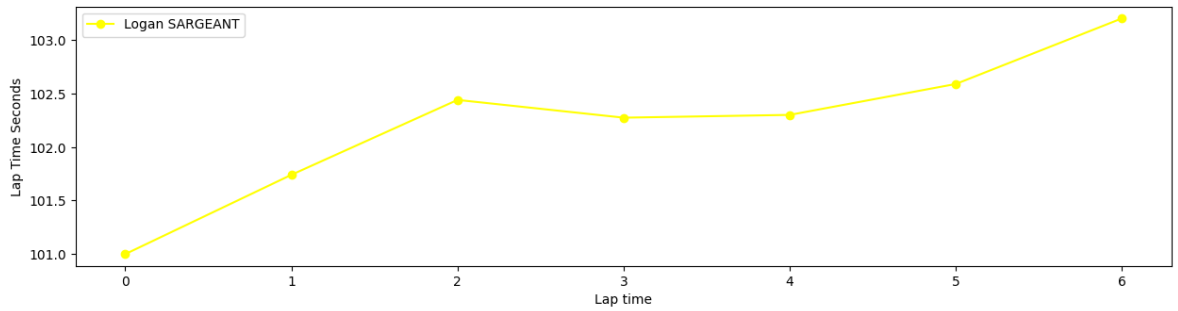

Lap Time Seconds
Lap time

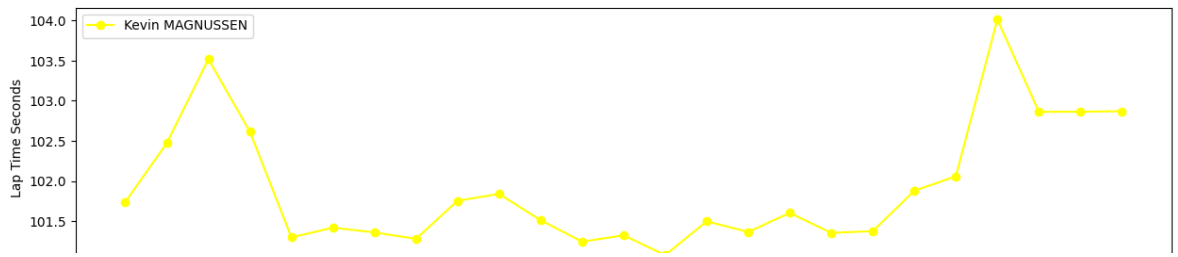

Oscar PIASTRI
Lap Time Seconds
Lap time

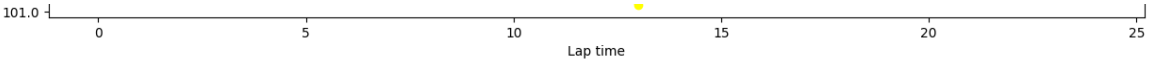

Yuki TSUNODA
Lap Time Seconds
Lap time


Lance STROLL
Lap Time Seconds
Lap time


Lewis HAMILTON
Lap Time Seconds
Lap time


Logan SARGEANT
Lap Time Seconds
Lap time

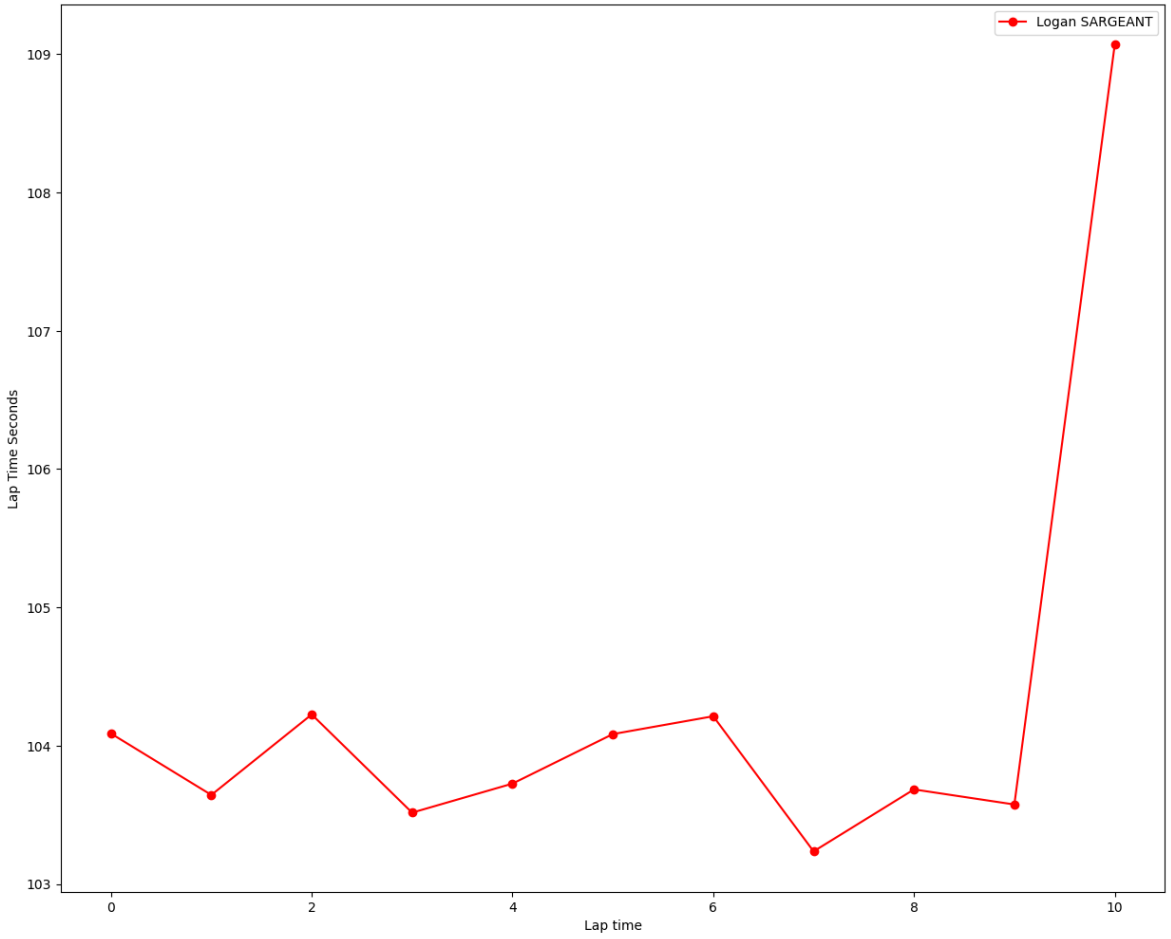

Kevin MAGNUSSEN
Lap Time Seconds

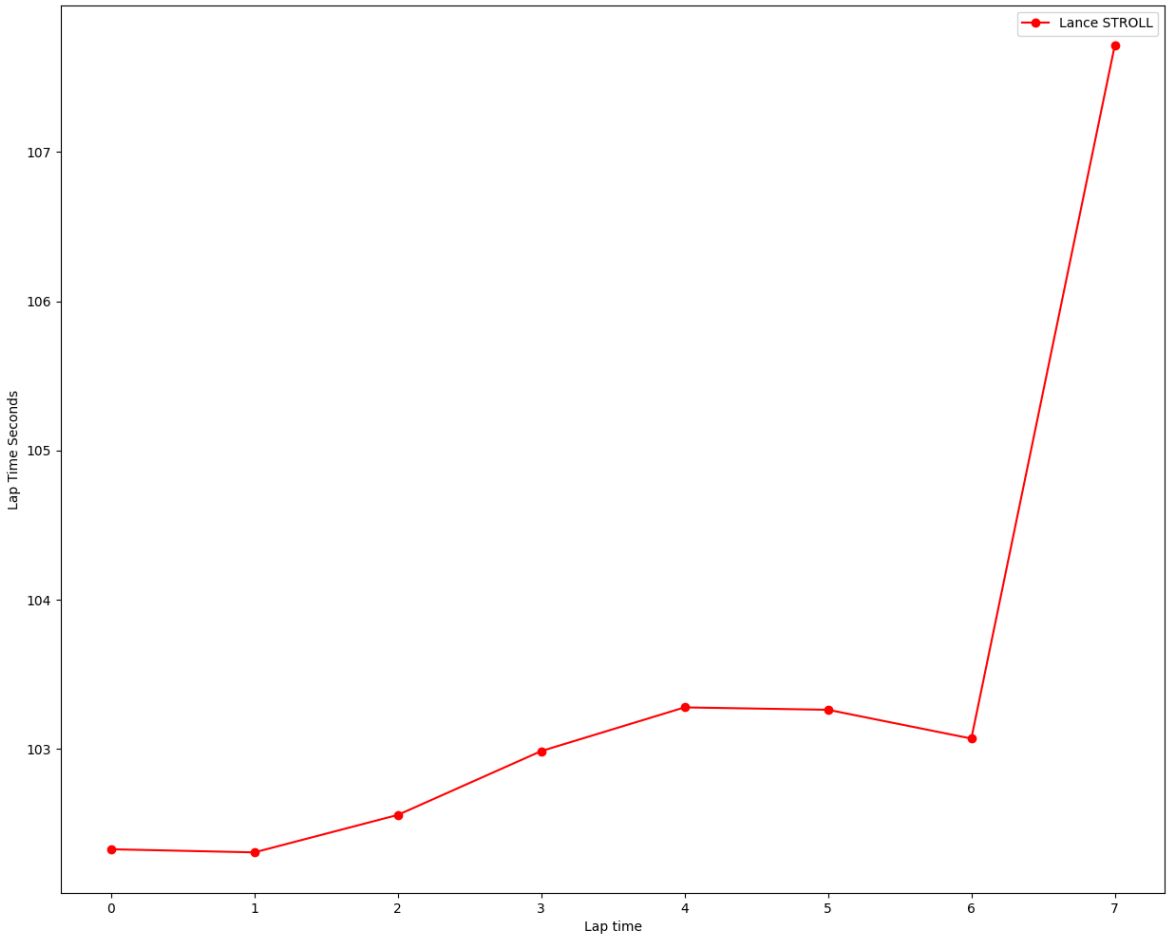


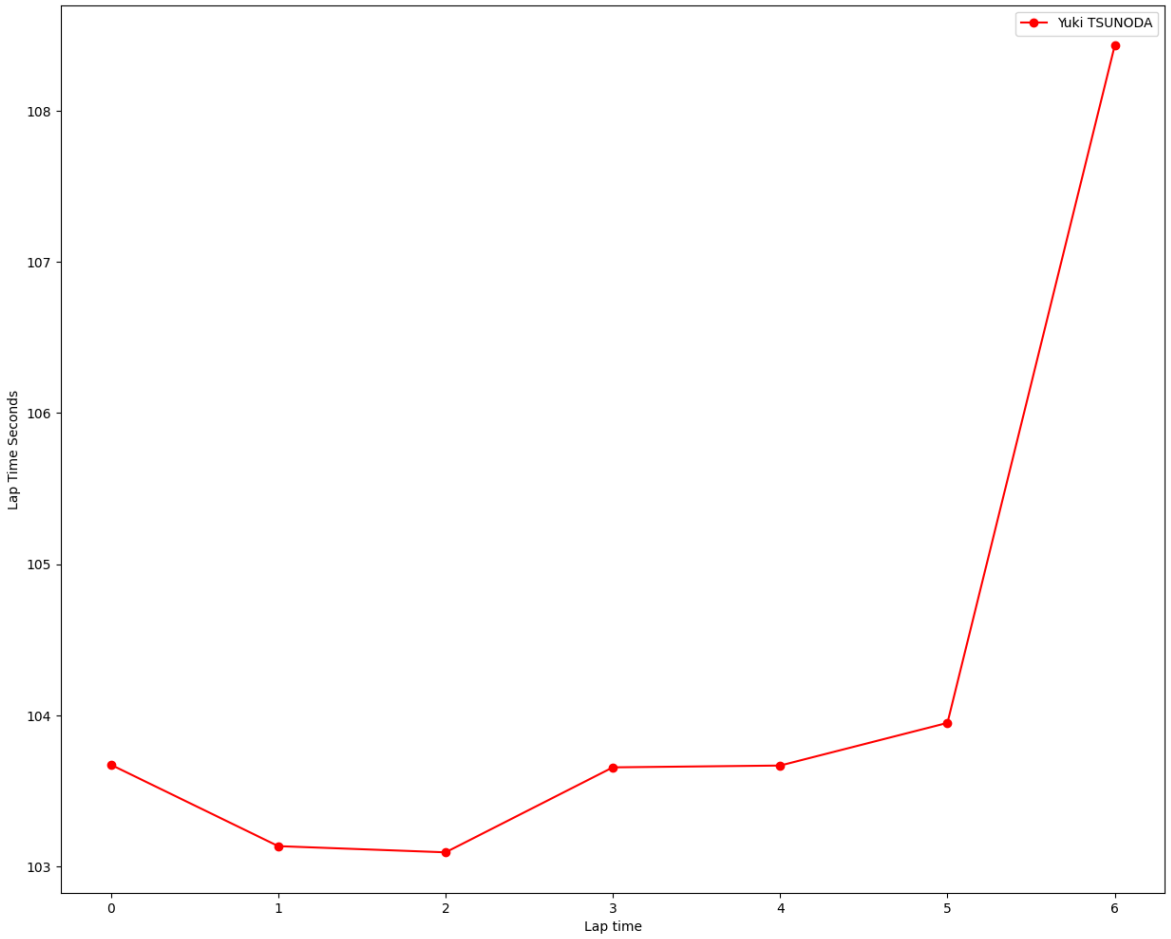
Soft tyres

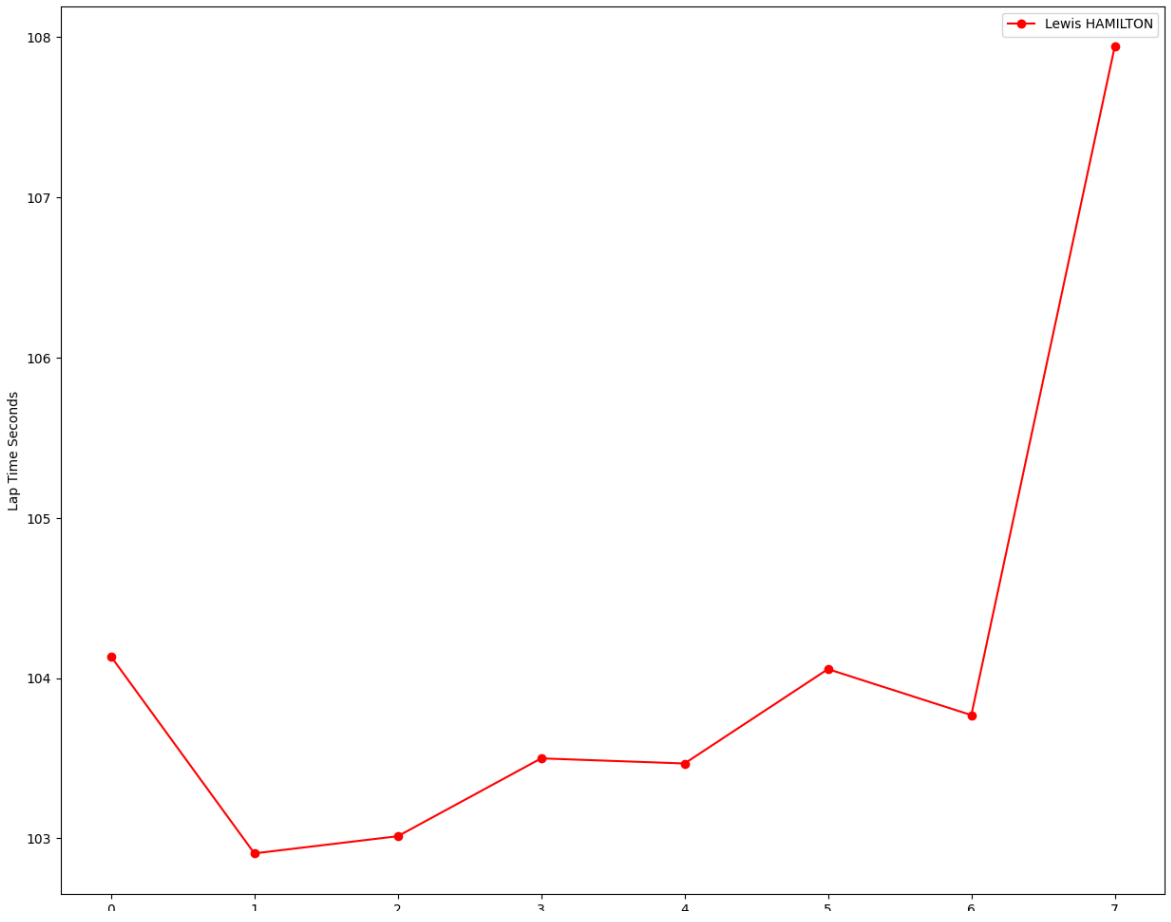
In [161…

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

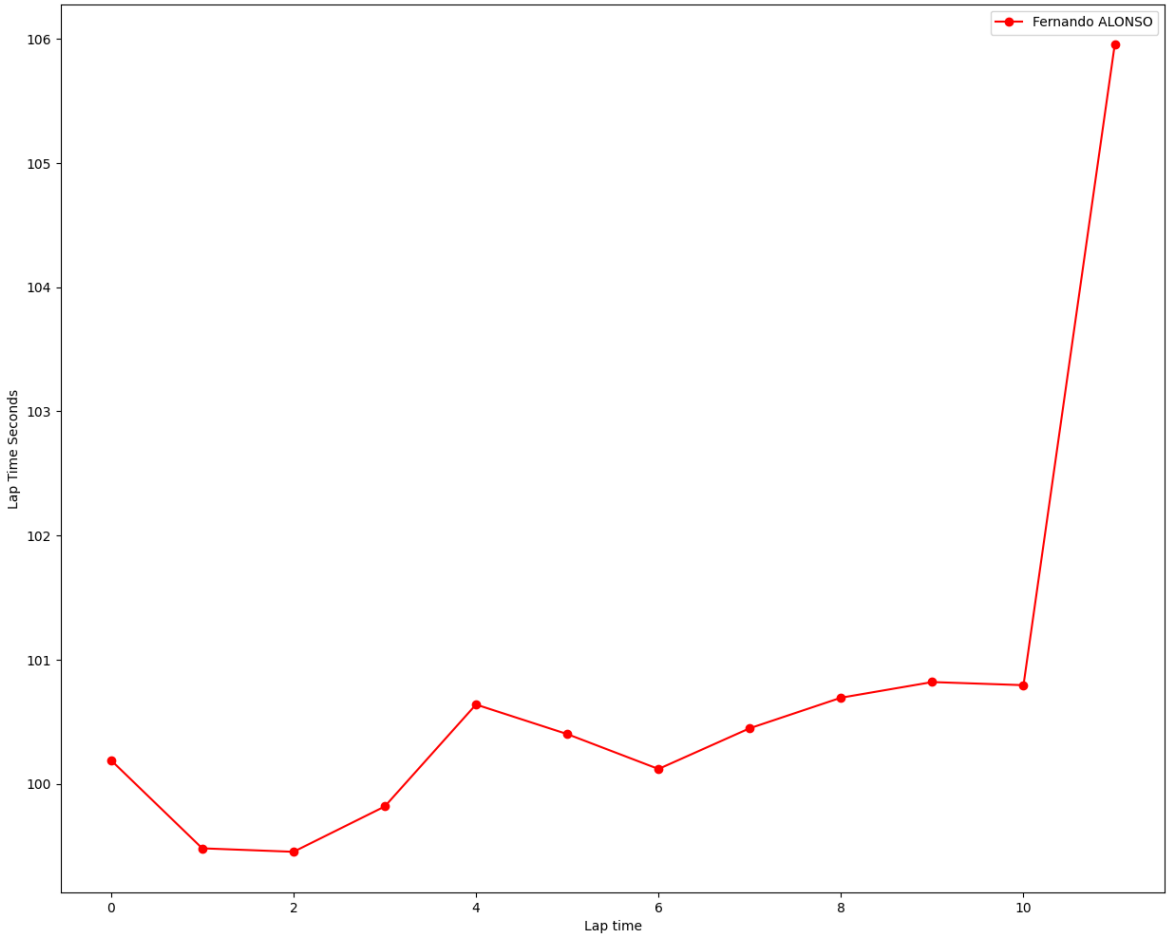

Logan SARGEANT
Lap Time Seconds
Lap time
109
108
107
106
105
104
103
0
2
4
6
8
10

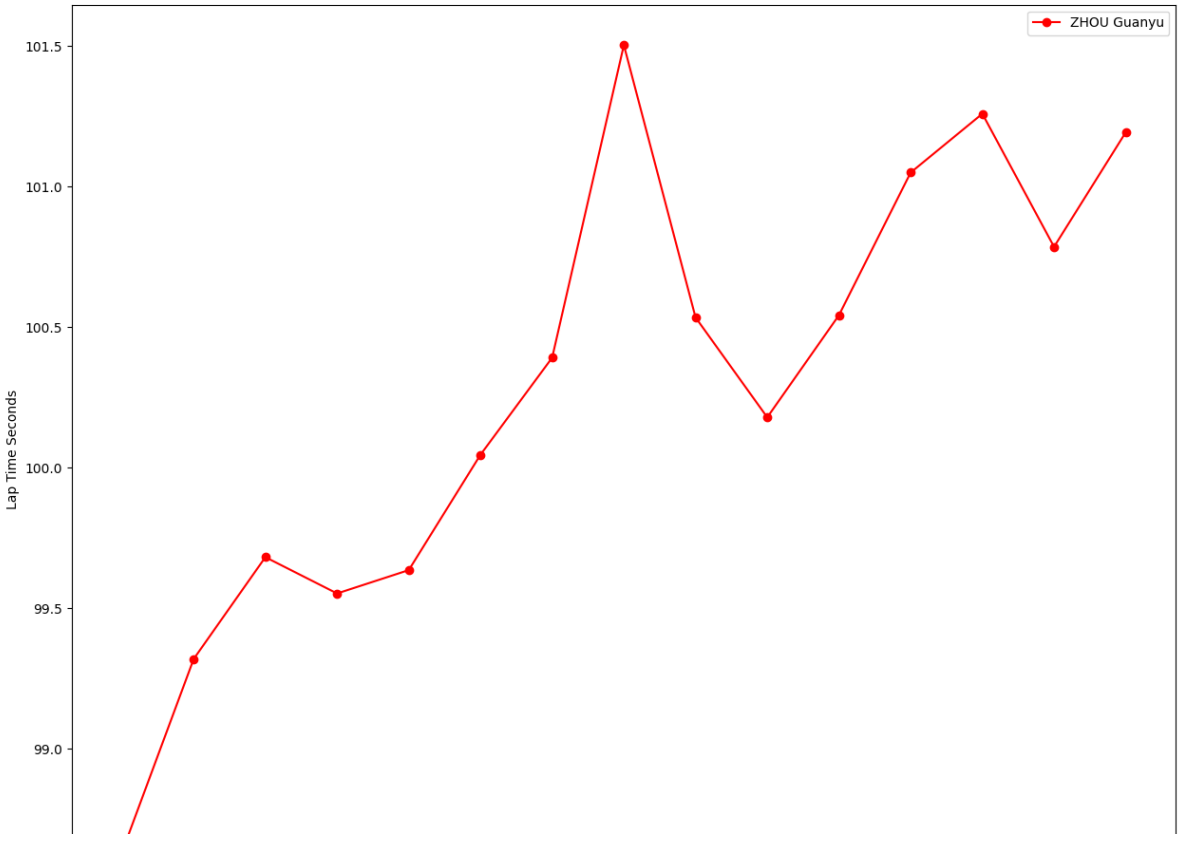

Lance STROLL
Lap Time Seconds
Lap time
107
106
105
104
103
0
1
2
3
4
5
6
7

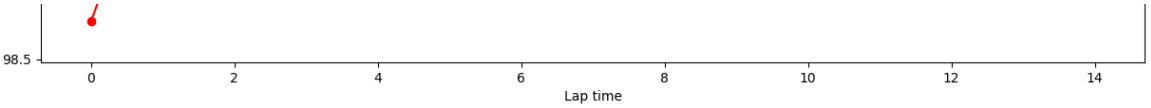

Yuki TSUNODA
Lap Time Seconds
Lap time
108
107
106
105
104
103
0
1
2
3
4
5
6


Lewis HAMILTON
Lap Time Seconds
108
107
106
105
104
103
0
1
2
3
4
5
6
7

Lap time


Fernando ALONSO
Lap Time Seconds
106
105
104
103
102
101
100
0
2
4
6
8
10
Lap time


ZHOU Guanyu
Lap Time Seconds
101.5
101.0
100.5
100.0
99.5
99.0



Mean pace with the different compound used on the session

In [162…

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

Out[162…

compound	lap_duration
HARD	101.051504
SOFT	101.981196
MEDIUM	102.148626

Race pace

General explanation Explanation per teams

In [163…

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

Out[163…

team_name	lap_duration
Red Bull Racing	100.172463
Ferrari	101.168538
Aston Martin	101.171164
McLaren	101.250771
Mercedes	101.614343
Alpine	101.821800
Kick Sauber	102.173622
Haas F1 Team	102.298968
Williams	102.470897
RB	102.947080

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 [164…

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

Out[164…

team_name	duration_sector_1
Red Bull Racing	26.710090
Aston Martin	26.891279
Ferrari	26.988000
McLaren	27.028286
Alpine	27.065418
Mercedes	27.066786
Haas F1 Team	27.144698
Williams	27.265485
Kick Sauber	27.275889
RB	27.388000

Sector 2

General explanation

In [165…

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

Out[165…

team_name	duration_sector_2
Red Bull Racing	30.147403
Aston Martin	30.469869
McLaren	30.509900
Ferrari	30.544831
Mercedes	30.652271
Alpine	30.687036
Kick Sauber	30.814644
Williams	30.974059
Haas F1 Team	30.994476
RB	31.196000

Sector 3

General explanation

In [166…

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

Out[166…

team_name	duration_sector_3
Red Bull Racing	43.314970

team_name	duration_sector_3
Ferrari	43.635708
McLaren	43.712586
Aston Martin	43.810016
Mercedes	43.895286
Alpine	44.069345
Kick Sauber	44.083089
Haas F1 Team	44.159794

Comparaison beetween drivers

Red Bull Racing

In [167…
```
race.query("driver_number== 1 and lap_duration <=105 and lap_duration >94"
```

Out[167…
```
99.77874418604651
```

In [168…
```
race.query("driver_number== 11 and lap_duration <=105 and lap_duration >94
```

Out[168…
```
100.43847619047617
```

Ferrari

In [169…
```
race.query("driver_number== 16 and lap_duration <=105 and lap_duration >94
```

Out[169…
```
100.9791590909091
```

In [170…
```
race.query("driver_number== 55 and lap_duration <=105 and lap_duration >94
```

Out[170…
```
101.203
```

McLaren

In [171…
```
race.query("driver_number== 4 and lap_duration <=105 and lap_duration >94"
```

Out[171…
```
100.71097777777776
```

In [172…
```
race.query("driver_number== 81 and lap_duration <=105 and lap_duration >94
```

Out[172…
```
101.63952380952381
```

Mercedes

In [173…
```
race.query("driver_number== 44 and lap_duration <=105 and lap_duration >94
```

Out[173…
```
101.88823809523811
```

In [174…
```
race.query("driver_number== 63 and lap_duration <=105 and lap_duration >94
```
Out[174…
```
101.1895476190476
```

Aston Martin

In [175…
```
race.query("driver_number== 14 and lap_duration <=105 and lap_duration >94
```
Out[175…
```
100.77122499999999
```

In [176…
```
race.query("driver_number== 18 and lap_duration <=105 and lap_duration >94
```
Out[176…
```
101.48590476190478
```

Haas F1 Team

In [177…
```
race.query("driver_number== 20 and lap_duration <=105 and lap_duration >94
```
Out[177…
```
102.57873809523807
```

In [178…
```
race.query("driver_number== 27 and lap_duration <=105 and lap_duration >94
```
Out[178…
```
101.85426190476188
```

RB

In [179…
```
race.query("driver_number== 3 and lap_duration <=105 and lap_duration >94"
```
Out[179…
```
102.90077777777778
```

In [180…
```
race.query("driver_number== 22 and lap_duration <=105 and lap_duration >94
```
Out[180…
```
102.91647058823528
```

Williams

In [181…
```
race.query("driver_number== 2 and lap_duration <=105 and lap_duration >94"
```
Out[181…
```
102.64097619047618
```

In [182…
```
race.query("driver_number== 23 and lap_duration <=105 and lap_duration >94
```
Out[182…
```
102.15371428571429
```

Alpine

In [183…
```
race.query("driver_number== 10 and lap_duration <=105 and lap_duration >94
```
Out[183…
```
101.526425
```

In [184…
```
race.query("driver_number== 31 and lap_duration <=105 and lap_duration >94
```

Out[184…
```
101.94035714285712
```

Kick Sauber

In [185…
```
race.query("driver_number== 24 and lap_duration <=105 and lap_duration >94
```

Out[185…
```
101.7766
```

In [186…
```
race.query("driver_number== 77 and lap_duration <=105 and lap_duration >94
```

Out[186…
```
102.586125
```

Race pace

In [187…
```
MINIMUN_SECONDS = 94
MAXIMUM_SECONDS = 105
```

Red Bull Racing

In [188…
```
stintInformation.query('driver_number == 1 or driver_number == 11')
```

Out[188…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
12	1233	9673	1	1	1	13	MEDIUM	
13	1233	9673	1	11	1	13	MEDIUM	
32	1233	9673	2	1	14	23	HARD	
33	1233	9673	2	11	14	23	HARD	
46	1233	9673	3	1	24	57	HARD	
47	1233	9673	3	11	24	57	HARD	

In [189…
```
libraryDataF1.getinfolongruns(jointables,1,'Red Bull Racing',MINIMUN_SECONI
```

Out[189…

	full_name	compound	date_start	lap_number	duration_sector_1
20	Max VERSTAPPEN	MEDIUM	2024-04-21T07:05:18.750000+00:00	2	26.651
40	Max VERSTAPPEN	MEDIUM	2024-04-21T07:06:58.955000+00:00	3	27.011
60	Max VERSTAPPEN	MEDIUM	2024-04-21T07:08:39.501000+00:00	4	26.923
80	Max VERSTAPPEN	MEDIUM	2024-04-21T07:10:20.023000+00:00	5	27.106
100	Max VERSTAPPEN	MEDIUM	2024-04-21T07:12:00.855000+00:00	6	27.114
120	Max VERSTAPPEN	MEDIUM	2024-04-21T07:13:42.050000+00:00	7	27.164

	full_name	compound	date_start	lap_number	duration_sector_1
140	Max VERSTAPPEN	MEDIUM	2024-04-21T07:15:23.205000+00:00	8	27.129
160	Max VERSTAPPEN	MEDIUM	2024-04-21T07:17:04.233000+00:00	9	27.111
177	Max VERSTAPPEN	MEDIUM	2024-04-21T07:18:45.489000+00:00	10	27.172
192	Max VERSTAPPEN	MEDIUM	2024-04-21T07:20:26.821000+00:00	11	27.170
212	Max VERSTAPPEN	MEDIUM	2024-04-21T07:22:08.344000+00:00	12	27.121
266	Max VERSTAPPEN	HARD	2024-04-21T07:27:35.186000+00:00	15	26.640
285	Max VERSTAPPEN	HARD	2024-04-21T07:29:14.755000+00:00	16	26.616
305	Max VERSTAPPEN	HARD	2024-04-21T07:30:54.674000+00:00	17	26.503
324	Max VERSTAPPEN	HARD	2024-04-21T07:32:34.316000+00:00	18	26.781
342	Max VERSTAPPEN	HARD	2024-04-21T07:34:14.355000+00:00	19	26.720
362	Max VERSTAPPEN	HARD	2024-04-21T07:35:54.472000+00:00	20	26.759
382	Max VERSTAPPEN	HARD	2024-04-21T07:37:34.630000+00:00	21	26.737
569	Max VERSTAPPEN	HARD	2024-04-21T08:03:10.032000+00:00	32	26.060
587	Max VERSTAPPEN	HARD	2024-04-21T08:04:48.701000+00:00	33	26.220
605	Max VERSTAPPEN	HARD	2024-04-21T08:06:27.077000+00:00	34	26.212
622	Max VERSTAPPEN	HARD	2024-04-21T08:08:05.460000+00:00	35	26.531
639	Max VERSTAPPEN	HARD	2024-04-21T08:09:44.170000+00:00	36	26.274
655	Max VERSTAPPEN	HARD	2024-04-21T08:11:23.067000+00:00	37	26.374
672	Max VERSTAPPEN	HARD	2024-04-21T08:13:01.817000+00:00	38	26.332
689	Max VERSTAPPEN	HARD	2024-04-21T08:14:40.593000+00:00	39	26.312
705	Max VERSTAPPEN	HARD	2024-04-21T08:16:19.539000+00:00	40	26.475
722	Max VERSTAPPEN	HARD	2024-04-21T08:17:58.459000+00:00	41	26.480
738	Max VERSTAPPEN	HARD	2024-04-21T08:19:37.515000+00:00	42	26.533
755	Max VERSTAPPEN	HARD	2024-04-21T08:21:16.636000+00:00	43	26.429
772	Max VERSTAPPEN	HARD	2024-04-21T08:22:55.955000+00:00	44	26.502

	full_name	compound	date_start	lap_number	duration_sector_1
788	Max VERSTAPPEN	HARD	2024-04-21T08:24:35.239000+00:00	45	26.507
805	Max VERSTAPPEN	HARD	2024-04-21T08:26:14.429000+00:00	46	26.517
822	Max VERSTAPPEN	HARD	2024-04-21T08:27:53.821000+00:00	47	26.620
839	Max VERSTAPPEN	HARD	2024-04-21T08:29:33.349000+00:00	48	26.496
856	Max VERSTAPPEN	HARD	2024-04-21T08:31:12.527000+00:00	49	26.492
873	Max VERSTAPPEN	HARD	2024-04-21T08:32:51.906000+00:00	50	26.510
890	Max VERSTAPPEN	HARD	2024-04-21T08:34:31.364000+00:00	51	26.484
907	Max VERSTAPPEN	HARD	2024-04-21T08:36:10.685000+00:00	52	26.581
924	Max VERSTAPPEN	HARD	2024-04-21T08:37:50.309000+00:00	53	26.533
941	Max VERSTAPPEN	HARD	2024-04-21T08:39:30.048000+00:00	54	26.599
958	Max VERSTAPPEN	HARD	2024-04-21T08:41:09.746000+00:00	55	26.714

In [190…

```
libraryDataF1.getinfolongruns(jointables,11,'Red Bull Racing',MINIMUN_SECOI
```

Out[190…

	full_name	compound	date_start	lap_number	duration_sector_1	du
25	Sergio PEREZ	MEDIUM	2024-04-21T07:05:21.249000+00:00	2	26.856	
45	Sergio PEREZ	MEDIUM	2024-04-21T07:07:02.142000+00:00	3	27.004	
65	Sergio PEREZ	MEDIUM	2024-04-21T07:08:43.054000+00:00	4	27.000	
85	Sergio PEREZ	MEDIUM	2024-04-21T07:10:24.651000+00:00	5	26.937	
105	Sergio PEREZ	MEDIUM	2024-04-21T07:12:06.224000+00:00	6	27.190	
125	Sergio PEREZ	MEDIUM	2024-04-21T07:13:48.126000+00:00	7	27.096	
145	Sergio PEREZ	MEDIUM	2024-04-21T07:15:29.517000+00:00	8	27.121	
165	Sergio PEREZ	MEDIUM	2024-04-21T07:17:11.330000+00:00	9	27.242	
182	Sergio PEREZ	MEDIUM	2024-04-21T07:18:53.083000+00:00	10	27.198	
197	Sergio PEREZ	MEDIUM	2024-04-21T07:20:34.959000+00:00	11	27.220	
216	Sergio PEREZ	MEDIUM	2024-04-21T07:22:16.700000+00:00	12	27.442	
270	Sergio PEREZ	HARD	2024-04-21T07:27:44.165000+00:00	15	26.702	

	full_name	compound	date_start	lap_number	duration_sector_1	du
290	Sergio PEREZ	HARD	2024-04-21T07:29:24.131000+00:00	16	26.763	
310	Sergio PEREZ	HARD	2024-04-21T07:31:04.703000+00:00	17	26.834	
329	Sergio PEREZ	HARD	2024-04-21T07:32:46.644000+00:00	18	26.920	
347	Sergio PEREZ	HARD	2024-04-21T07:34:27.005000+00:00	19	26.929	
367	Sergio PEREZ	HARD	2024-04-21T07:36:07.224000+00:00	20	26.801	
574	Sergio PEREZ	HARD	2024-04-21T08:03:12.027000+00:00	32	26.494	
592	Sergio PEREZ	HARD	2024-04-21T08:04:51.757000+00:00	33	26.362	
609	Sergio PEREZ	HARD	2024-04-21T08:06:31.105000+00:00	34	26.285	
626	Sergio PEREZ	HARD	2024-04-21T08:08:10.671000+00:00	35	26.499	
643	Sergio PEREZ	HARD	2024-04-21T08:09:50.342000+00:00	36	26.338	
659	Sergio PEREZ	HARD	2024-04-21T08:11:30.090000+00:00	37	26.445	
676	Sergio PEREZ	HARD	2024-04-21T08:13:09.987000+00:00	38	26.507	
692	Sergio PEREZ	HARD	2024-04-21T08:14:50.019000+00:00	39	26.318	
709	Sergio PEREZ	HARD	2024-04-21T08:16:29.508000+00:00	40	26.606	
726	Sergio PEREZ	HARD	2024-04-21T08:18:09.151000+00:00	41	26.600	
742	Sergio PEREZ	HARD	2024-04-21T08:19:48.716000+00:00	42	26.403	
759	Sergio PEREZ	HARD	2024-04-21T08:21:28.360000+00:00	43	26.529	
776	Sergio PEREZ	HARD	2024-04-21T08:23:07.918000+00:00	44	26.487	
792	Sergio PEREZ	HARD	2024-04-21T08:24:47.605000+00:00	45	26.591	
809	Sergio PEREZ	HARD	2024-04-21T08:26:27.433000+00:00	46	26.686	
826	Sergio PEREZ	HARD	2024-04-21T08:28:07.364000+00:00	47	26.660	
843	Sergio PEREZ	HARD	2024-04-21T08:29:47.325000+00:00	48	26.647	
860	Sergio PEREZ	HARD	2024-04-21T08:31:27.350000+00:00	49	26.588	
877	Sergio PEREZ	HARD	2024-04-21T08:33:07.256000+00:00	50	26.645	
894	Sergio PEREZ	HARD	2024-04-21T08:34:47.405000+00:00	51	26.570	

	full_name	compound	date_start	lap_number	duration_sector_1	du
911	Sergio PEREZ	HARD	2024-04-21T08:36:27.289000+00:00	52	26.576	
928	Sergio PEREZ	HARD	2024-04-21T08:38:07.374000+00:00	53	26.729	
945	Sergio PEREZ	HARD	2024-04-21T08:39:47.592000+00:00	54	26.692	
962	Sergio PEREZ	HARD	2024-04-21T08:41:27.712000+00:00	55	26.768	

Ferrari

In [191…
```
stintInformation.query('driver_number == 16 or driver_number == 55')
```

Out[191…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
17	1233	9673	1	55	1	17	MEDIUM	
18	1233	9673	1	16	1	21	MEDIUM	
37	1233	9673	2	55	18	57	HARD	
39	1233	9673	2	16	22	57	HARD	

In [192…
```
libraryDataF1.getinfolongruns(jointables,16,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[192…

	full_name	compound	date_start	lap_number	duration_sector_1	du
27	Charles LECLERC	MEDIUM	2024-04-21T07:05:23.764000+00:00	2	27.305	
47	Charles LECLERC	MEDIUM	2024-04-21T07:07:05.524000+00:00	3	27.068	
67	Charles LECLERC	MEDIUM	2024-04-21T07:08:47.624000+00:00	4	27.289	
87	Charles LECLERC	MEDIUM	2024-04-21T07:10:29.936000+00:00	5	27.308	
107	Charles LECLERC	MEDIUM	2024-04-21T07:12:11.912000+00:00	6	27.267	
127	Charles LECLERC	MEDIUM	2024-04-21T07:13:54.314000+00:00	7	27.201	
147	Charles LECLERC	MEDIUM	2024-04-21T07:15:36.768000+00:00	8	27.283	
167	Charles LECLERC	MEDIUM	2024-04-21T07:17:19.725000+00:00	9	27.245	
184	Charles LECLERC	MEDIUM	2024-04-21T07:19:01.847000+00:00	10	27.238	
199	Charles LECLERC	MEDIUM	2024-04-21T07:20:44.255000+00:00	11	27.066	
217	Charles LECLERC	MEDIUM	2024-04-21T07:22:26.342000+00:00	12	27.165	
235	Charles LECLERC	MEDIUM	2024-04-21T07:24:08.290000+00:00	13	27.348	
253	Charles LECLERC	MEDIUM	2024-04-21T07:25:50.306000+00:00	14	27.246	

	full_name	compound	date_start	lap_number	duration_sector_1	du
272	Charles LECLERC	MEDIUM	2024-04-21T07:27:32.093000+00:00	15	27.212	
292	Charles LECLERC	MEDIUM	2024-04-21T07:29:14.095000+00:00	16	27.237	
312	Charles LECLERC	MEDIUM	2024-04-21T07:30:56.711000+00:00	17	27.306	
331	Charles LECLERC	MEDIUM	2024-04-21T07:32:38.809000+00:00	18	27.442	
349	Charles LECLERC	MEDIUM	2024-04-21T07:34:20.791000+00:00	19	27.275	
369	Charles LECLERC	MEDIUM	2024-04-21T07:36:02.808000+00:00	20	27.337	
576	Charles LECLERC	HARD	2024-04-21T08:03:11.545000+00:00	32	26.515	
594	Charles LECLERC	HARD	2024-04-21T08:04:51.035000+00:00	33	26.529	
611	Charles LECLERC	HARD	2024-04-21T08:06:30.390000+00:00	34	26.526	
628	Charles LECLERC	HARD	2024-04-21T08:08:09.983000+00:00	35	26.680	
645	Charles LECLERC	HARD	2024-04-21T08:09:49.678000+00:00	36	26.525	
661	Charles LECLERC	HARD	2024-04-21T08:11:29.399000+00:00	37	26.585	
678	Charles LECLERC	HARD	2024-04-21T08:13:09.519000+00:00	38	26.762	
694	Charles LECLERC	HARD	2024-04-21T08:14:49.527000+00:00	39	26.666	
711	Charles LECLERC	HARD	2024-04-21T08:16:30.252000+00:00	40	26.506	
728	Charles LECLERC	HARD	2024-04-21T08:18:10.077000+00:00	41	26.415	
744	Charles LECLERC	HARD	2024-04-21T08:19:49.702000+00:00	42	26.532	
761	Charles LECLERC	HARD	2024-04-21T08:21:29.633000+00:00	43	26.691	
777	Charles LECLERC	HARD	2024-04-21T08:23:09.528000+00:00	44	26.662	
794	Charles LECLERC	HARD	2024-04-21T08:24:49.349000+00:00	45	26.729	
811	Charles LECLERC	HARD	2024-04-21T08:26:29.429000+00:00	46	26.857	
828	Charles LECLERC	HARD	2024-04-21T08:28:09.575000+00:00	47	26.713	
845	Charles LECLERC	HARD	2024-04-21T08:29:49.940000+00:00	48	26.759	
862	Charles LECLERC	HARD	2024-04-21T08:31:30.129000+00:00	49	26.786	
879	Charles LECLERC	HARD	2024-04-21T08:33:10.469000+00:00	50	26.803	

	full_name	compound	date_start	lap_number	duration_sector_1	du
896	Charles LECLERC	HARD	2024-04-21T08:34:50.844000+00:00	51	26.813	
913	Charles LECLERC	HARD	2024-04-21T08:36:31.092000+00:00	52	26.834	
930	Charles LECLERC	HARD	2024-04-21T08:38:11.440000+00:00	53	26.810	
947	Charles LECLERC	HARD	2024-04-21T08:39:51.843000+00:00	54	26.820	
964	Charles LECLERC	HARD	2024-04-21T08:41:32.004000+00:00	55	27.018	

In [193…

```
libraryDataF1.getinfolongruns(jointables,55,'Ferrari',MINIMUN_SECONDS,MAXI
```

Out[193…

	full_name	compound	date_start	lap_number	duration_sector_1	du
36	Carlos SAINZ	MEDIUM	2024-04-21T07:05:24.478000+00:00	2	27.246	
56	Carlos SAINZ	MEDIUM	2024-04-21T07:07:06.474000+00:00	3	27.267	
76	Carlos SAINZ	MEDIUM	2024-04-21T07:08:48.526000+00:00	4	27.400	
96	Carlos SAINZ	MEDIUM	2024-04-21T07:10:30.648000+00:00	5	27.279	
116	Carlos SAINZ	MEDIUM	2024-04-21T07:12:12.848000+00:00	6	27.317	
136	Carlos SAINZ	MEDIUM	2024-04-21T07:13:55.327000+00:00	7	27.351	
156	Carlos SAINZ	MEDIUM	2024-04-21T07:15:38.082000+00:00	8	27.480	
173	Carlos SAINZ	MEDIUM	2024-04-21T07:17:21.028000+00:00	9	27.441	
189	Carlos SAINZ	MEDIUM	2024-04-21T07:19:03.808000+00:00	10	27.371	
208	Carlos SAINZ	MEDIUM	2024-04-21T07:20:47.065000+00:00	11	27.380	
226	Carlos SAINZ	MEDIUM	2024-04-21T07:22:30.237000+00:00	12	27.289	
244	Carlos SAINZ	MEDIUM	2024-04-21T07:24:13.025000+00:00	13	27.455	
262	Carlos SAINZ	MEDIUM	2024-04-21T07:25:55.414000+00:00	14	27.657	
281	Carlos SAINZ	MEDIUM	2024-04-21T07:27:38.344000+00:00	15	27.496	
301	Carlos SAINZ	MEDIUM	2024-04-21T07:29:21.293000+00:00	16	27.384	
358	Carlos SAINZ	HARD	2024-04-21T07:34:50.760000+00:00	19	26.609	
378	Carlos SAINZ	HARD	2024-04-21T07:36:30.501000+00:00	20	26.873	

	full_name	compound	date_start	lap_number	duration_sector_1	du
584	Carlos SAINZ	HARD	2024-04-21T08:03:13.303000+00:00	32	26.813	
602	Carlos SAINZ	HARD	2024-04-21T08:04:53.646000+00:00	33	26.579	
619	Carlos SAINZ	HARD	2024-04-21T08:06:33.716000+00:00	34	26.856	
636	Carlos SAINZ	HARD	2024-04-21T08:08:14.156000+00:00	35	26.839	
652	Carlos SAINZ	HARD	2024-04-21T08:09:54.464000+00:00	36	26.863	
669	Carlos SAINZ	HARD	2024-04-21T08:11:35.053000+00:00	37	26.883	
686	Carlos SAINZ	HARD	2024-04-21T08:13:15.767000+00:00	38	26.920	
702	Carlos SAINZ	HARD	2024-04-21T08:14:56.276000+00:00	39	26.878	
719	Carlos SAINZ	HARD	2024-04-21T08:16:36.871000+00:00	40	26.942	
735	Carlos SAINZ	HARD	2024-04-21T08:18:17.742000+00:00	41	26.722	
752	Carlos SAINZ	HARD	2024-04-21T08:19:58.098000+00:00	42	26.846	
769	Carlos SAINZ	HARD	2024-04-21T08:21:38.833000+00:00	43	26.766	
785	Carlos SAINZ	HARD	2024-04-21T08:23:19.118000+00:00	44	26.644	
802	Carlos SAINZ	HARD	2024-04-21T08:24:59.273000+00:00	45	26.740	
819	Carlos SAINZ	HARD	2024-04-21T08:26:39.493000+00:00	46	26.838	
836	Carlos SAINZ	HARD	2024-04-21T08:28:19.600000+00:00	47	26.859	
853	Carlos SAINZ	HARD	2024-04-21T08:30:00.341000+00:00	48	26.880	
870	Carlos SAINZ	HARD	2024-04-21T08:31:40.716000+00:00	49	26.705	
887	Carlos SAINZ	HARD	2024-04-21T08:33:20.897000+00:00	50	26.727	
904	Carlos SAINZ	HARD	2024-04-21T08:35:01.215000+00:00	51	26.745	
921	Carlos SAINZ	HARD	2024-04-21T08:36:41.448000+00:00	52	26.766	
938	Carlos SAINZ	HARD	2024-04-21T08:38:21.844000+00:00	53	26.819	
955	Carlos SAINZ	HARD	2024-04-21T08:40:02.444000+00:00	54	26.594	
972	Carlos SAINZ	HARD	2024-04-21T08:41:42.745000+00:00	55	26.895	

Mercedes

In [194…
```
stintInformation.query('driver_number == 44 or driver_number == 63')
```

Out[194…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
6	1233	9673	1	44	1	9	SOFT	
10	1233	9673	1	63	1	11	MEDIUM	
25	1233	9673	2	44	10	21	MEDIUM	
30	1233	9673	2	63	12	23	MEDIUM	
40	1233	9673	3	44	22	57	HARD	
51	1233	9673	3	63	24	57	HARD	

In [195…
```
libraryDataF1.getinfolongruns(jointables,44,'Mercedes',MINIMUN_SECONDS,MAX
```

Out[195…

	full_name	compound	date_start	lap_number	duration_sector_1	d
35	Lewis HAMILTON	SOFT	2024-04-21T07:05:28.693000+00:00	2	27.777	
55	Lewis HAMILTON	SOFT	2024-04-21T07:07:12.888000+00:00	3	27.516	
75	Lewis HAMILTON	SOFT	2024-04-21T07:08:55.858000+00:00	4	27.290	
95	Lewis HAMILTON	SOFT	2024-04-21T07:10:38.821000+00:00	5	27.586	
115	Lewis HAMILTON	SOFT	2024-04-21T07:12:22.396000+00:00	6	27.510	
135	Lewis HAMILTON	SOFT	2024-04-21T07:14:05.844000+00:00	7	27.593	
155	Lewis HAMILTON	SOFT	2024-04-21T07:15:49.922000+00:00	8	27.507	
207	Lewis HAMILTON	MEDIUM	2024-04-21T07:21:20.546000+00:00	11	26.848	
225	Lewis HAMILTON	MEDIUM	2024-04-21T07:23:01.741000+00:00	12	26.938	
243	Lewis HAMILTON	MEDIUM	2024-04-21T07:24:43.764000+00:00	13	27.321	
261	Lewis HAMILTON	MEDIUM	2024-04-21T07:26:25.605000+00:00	14	27.232	
280	Lewis HAMILTON	MEDIUM	2024-04-21T07:28:07.393000+00:00	15	27.361	
300	Lewis HAMILTON	MEDIUM	2024-04-21T07:29:49.681000+00:00	16	27.293	
320	Lewis HAMILTON	MEDIUM	2024-04-21T07:31:32.299000+00:00	17	27.338	
338	Lewis HAMILTON	MEDIUM	2024-04-21T07:33:14.518000+00:00	18	27.397	
357	Lewis HAMILTON	MEDIUM	2024-04-21T07:34:57.075000+00:00	19	27.385	
377	Lewis HAMILTON	MEDIUM	2024-04-21T07:36:39.962000+00:00	20	27.444	

	full_name	compound	date_start	lap_number	duration_sector_1	d
583	Lewis HAMILTON	HARD	2024-04-21T08:03:15.916000+00:00	32	27.031	
601	Lewis HAMILTON	HARD	2024-04-21T08:04:56.898000+00:00	33	26.758	
618	Lewis HAMILTON	HARD	2024-04-21T08:06:37.958000+00:00	34	26.615	
635	Lewis HAMILTON	HARD	2024-04-21T08:08:18.777000+00:00	35	26.707	
651	Lewis HAMILTON	HARD	2024-04-21T08:09:59.608000+00:00	36	26.845	
668	Lewis HAMILTON	HARD	2024-04-21T08:11:40.898000+00:00	37	26.794	
685	Lewis HAMILTON	HARD	2024-04-21T08:13:22.182000+00:00	38	26.745	
701	Lewis HAMILTON	HARD	2024-04-21T08:15:03.089000+00:00	39	26.948	
718	Lewis HAMILTON	HARD	2024-04-21T08:16:44.343000+00:00	40	26.915	
734	Lewis HAMILTON	HARD	2024-04-21T08:18:25.804000+00:00	41	26.958	
751	Lewis HAMILTON	HARD	2024-04-21T08:20:06.620000+00:00	42	27.094	
768	Lewis HAMILTON	HARD	2024-04-21T08:21:47.717000+00:00	43	27.038	
784	Lewis HAMILTON	HARD	2024-04-21T08:23:28.962000+00:00	44	26.942	
801	Lewis HAMILTON	HARD	2024-04-21T08:25:09.747000+00:00	45	26.985	
818	Lewis HAMILTON	HARD	2024-04-21T08:26:51.017000+00:00	46	27.014	
835	Lewis HAMILTON	HARD	2024-04-21T08:28:32.321000+00:00	47	27.082	
852	Lewis HAMILTON	HARD	2024-04-21T08:30:13.717000+00:00	48	26.972	
869	Lewis HAMILTON	HARD	2024-04-21T08:31:54.932000+00:00	49	27.010	
886	Lewis HAMILTON	HARD	2024-04-21T08:33:36.911000+00:00	50	27.041	
903	Lewis HAMILTON	HARD	2024-04-21T08:35:18.167000+00:00	51	27.133	
920	Lewis HAMILTON	HARD	2024-04-21T08:36:59.680000+00:00	52	27.058	
937	Lewis HAMILTON	HARD	2024-04-21T08:38:41.086000+00:00	53	27.013	
954	Lewis HAMILTON	HARD	2024-04-21T08:40:22.600000+00:00	54	27.053	
971	Lewis HAMILTON	HARD	2024-04-21T08:42:04.062000+00:00	55	27.124	
	Lewis					

In [196…

```
libraryDataF1.getinfolongruns(jointables,63,'Mercedes',MINIMUN_SECONDS,MAX
```

Out[196…

	full_name	compound	date_start	lap_number	duration_sector_1	du
37	George RUSSELL	MEDIUM	2024-04-21T07:05:23.024000+00:00	2	26.985	
57	George RUSSELL	MEDIUM	2024-04-21T07:07:04.710000+00:00	3	26.895	
77	George RUSSELL	MEDIUM	2024-04-21T07:08:46.530000+00:00	4	27.441	
97	George RUSSELL	MEDIUM	2024-04-21T07:10:28.903000+00:00	5	27.178	
117	George RUSSELL	MEDIUM	2024-04-21T07:12:11.078000+00:00	6	27.312	
137	George RUSSELL	MEDIUM	2024-04-21T07:13:53.644000+00:00	7	27.340	
157	George RUSSELL	MEDIUM	2024-04-21T07:15:36.205000+00:00	8	27.416	
174	George RUSSELL	MEDIUM	2024-04-21T07:17:19.369000+00:00	9	27.976	
190	George RUSSELL	MEDIUM	2024-04-21T07:19:03.362000+00:00	10	27.548	
245	George RUSSELL	MEDIUM	2024-04-21T07:24:32.617000+00:00	13	26.911	
263	George RUSSELL	MEDIUM	2024-04-21T07:26:13.265000+00:00	14	27.036	
282	George RUSSELL	MEDIUM	2024-04-21T07:27:55.059000+00:00	15	27.202	
302	George RUSSELL	MEDIUM	2024-04-21T07:29:36.478000+00:00	16	27.034	
322	George RUSSELL	MEDIUM	2024-04-21T07:31:17.937000+00:00	17	27.016	
339	George RUSSELL	MEDIUM	2024-04-21T07:32:59.233000+00:00	18	27.005	
359	George RUSSELL	MEDIUM	2024-04-21T07:34:40.638000+00:00	19	26.995	
379	George RUSSELL	MEDIUM	2024-04-21T07:36:22.199000+00:00	20	27.247	
585	George RUSSELL	HARD	2024-04-21T08:03:13.829000+00:00	32	26.911	
603	George RUSSELL	HARD	2024-04-21T08:04:54.449000+00:00	33	26.712	
620	George RUSSELL	HARD	2024-04-21T08:06:34.986000+00:00	34	26.774	
637	George RUSSELL	HARD	2024-04-21T08:08:15.405000+00:00	35	26.993	
653	George RUSSELL	HARD	2024-04-21T08:09:55.958000+00:00	36	26.798	
670	George RUSSELL	HARD	2024-04-21T08:11:36.346000+00:00	37	26.898	

	full_name	compound	date_start	lap_number	duration_sector_1	du
687	George RUSSELL	HARD	2024-04-21T08:13:17.031000+00:00	38	26.874	
703	George RUSSELL	HARD	2024-04-21T08:14:57.546000+00:00	39	26.699	
720	George RUSSELL	HARD	2024-04-21T08:16:37.655000+00:00	40	26.764	
736	George RUSSELL	HARD	2024-04-21T08:18:18.474000+00:00	41	26.851	
753	George RUSSELL	HARD	2024-04-21T08:19:59.374000+00:00	42	26.790	
770	George RUSSELL	HARD	2024-04-21T08:21:40.180000+00:00	43	26.757	
786	George RUSSELL	HARD	2024-04-21T08:23:20.760000+00:00	44	26.791	
803	George RUSSELL	HARD	2024-04-21T08:25:01.268000+00:00	45	26.971	
820	George RUSSELL	HARD	2024-04-21T08:26:41.896000+00:00	46	26.794	
837	George RUSSELL	HARD	2024-04-21T08:28:22.292000+00:00	47	26.775	
854	George RUSSELL	HARD	2024-04-21T08:30:02.733000+00:00	48	26.879	
871	George RUSSELL	HARD	2024-04-21T08:31:43.088000+00:00	49	26.711	
888	George RUSSELL	HARD	2024-04-21T08:33:23.252000+00:00	50	26.714	
905	George RUSSELL	HARD	2024-04-21T08:35:03.822000+00:00	51	26.764	
922	George RUSSELL	HARD	2024-04-21T08:36:44.204000+00:00	52	26.750	
939	George RUSSELL	HARD	2024-04-21T08:38:24.836000+00:00	53	26.934	
956	George RUSSELL	HARD	2024-04-21T08:40:05.573000+00:00	54	26.899	
973	George RUSSELL	HARD	2024-04-21T08:41:46.339000+00:00	55	26.942	

Aston Martin

In [197…

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

Out[197…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
3	1233	9673	1	18	1	9	SOFT	
9	1233	9673	1	14	1	11	MEDIUM	
24	1233	9673	2	18	10	21	MEDIUM	
29	1233	9673	2	14	12	23	HARD	
38	1233	9673	3	18	22	26	HARD	
45	1233	9673	3	14	24	43	SOFT	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
54	1233	9673	4	18	27	35	MEDIUM	
56	1233	9673	5	18	36	57	HARD	

In [198…

```
libraryDataF1.getinfolongruns(jointables,14,'Aston Martin',MINIMUN_SECONDS
```

Out[198…

	full_name	compound	date_start	lap_number	duration_sector_1	du
26	Fernando ALONSO	MEDIUM	2024-04-21T07:05:20.479000+00:00	2	26.834	
46	Fernando ALONSO	MEDIUM	2024-04-21T07:07:01.530000+00:00	3	26.859	
66	Fernando ALONSO	MEDIUM	2024-04-21T07:08:42.571000+00:00	4	27.063	
86	Fernando ALONSO	MEDIUM	2024-04-21T07:10:24.173000+00:00	5	27.323	
106	Fernando ALONSO	MEDIUM	2024-04-21T07:12:07.207000+00:00	6	27.069	
126	Fernando ALONSO	MEDIUM	2024-04-21T07:13:49.664000+00:00	7	27.371	
146	Fernando ALONSO	MEDIUM	2024-04-21T07:15:33.383000+00:00	8	27.391	
166	Fernando ALONSO	MEDIUM	2024-04-21T07:17:16.554000+00:00	9	27.552	
183	Fernando ALONSO	MEDIUM	2024-04-21T07:18:59.481000+00:00	10	27.571	
234	Fernando ALONSO	HARD	2024-04-21T07:24:30.602000+00:00	13	26.720	
252	Fernando ALONSO	HARD	2024-04-21T07:26:12.900000+00:00	14	26.921	
271	Fernando ALONSO	HARD	2024-04-21T07:27:53.828000+00:00	15	26.810	
291	Fernando ALONSO	HARD	2024-04-21T07:29:34.810000+00:00	16	26.819	
311	Fernando ALONSO	HARD	2024-04-21T07:31:16.166000+00:00	17	26.859	
330	Fernando ALONSO	HARD	2024-04-21T07:32:57.272000+00:00	18	26.948	
348	Fernando ALONSO	HARD	2024-04-21T07:34:38.506000+00:00	19	26.930	
368	Fernando ALONSO	HARD	2024-04-21T07:36:20.006000+00:00	20	26.937	
575	Fernando ALONSO	SOFT	2024-04-21T08:03:12.383000+00:00	32	26.552	
593	Fernando ALONSO	SOFT	2024-04-21T08:04:52.498000+00:00	33	26.546	
610	Fernando ALONSO	SOFT	2024-04-21T08:06:31.956000+00:00	34	26.422	
627	Fernando ALONSO	SOFT	2024-04-21T08:08:11.462000+00:00	35	26.507	

	full_name	compound	date_start	lap_number	duration_sector_1	du
644	Fernando ALONSO	SOFT	2024-04-21T08:09:51.207000+00:00	36	26.637	
660	Fernando ALONSO	SOFT	2024-04-21T08:11:31.857000+00:00	37	26.770	
677	Fernando ALONSO	SOFT	2024-04-21T08:13:12.225000+00:00	38	26.763	
693	Fernando ALONSO	SOFT	2024-04-21T08:14:52.407000+00:00	39	26.810	
710	Fernando ALONSO	SOFT	2024-04-21T08:16:32.844000+00:00	40	26.836	
727	Fernando ALONSO	SOFT	2024-04-21T08:18:13.501000+00:00	41	26.929	
743	Fernando ALONSO	SOFT	2024-04-21T08:19:54.287000+00:00	42	26.912	
793	Fernando ALONSO	MEDIUM	2024-04-21T08:25:18.384000+00:00	45	26.106	
810	Fernando ALONSO	MEDIUM	2024-04-21T08:26:56.282000+00:00	46	26.370	
827	Fernando ALONSO	MEDIUM	2024-04-21T08:28:35.748000+00:00	47	26.627	
844	Fernando ALONSO	MEDIUM	2024-04-21T08:30:15.645000+00:00	48	26.620	
861	Fernando ALONSO	MEDIUM	2024-04-21T08:31:55.501000+00:00	49	26.485	
878	Fernando ALONSO	MEDIUM	2024-04-21T08:33:34.837000+00:00	50	26.460	
895	Fernando ALONSO	MEDIUM	2024-04-21T08:35:14.197000+00:00	51	26.457	
912	Fernando ALONSO	MEDIUM	2024-04-21T08:36:53.600000+00:00	52	26.333	
929	Fernando ALONSO	MEDIUM	2024-04-21T08:38:32.986000+00:00	53	26.571	
946	Fernando ALONSO	MEDIUM	2024-04-21T08:40:12.629000+00:00	54	26.704	
963	Fernando ALONSO	MEDIUM	2024-04-21T08:41:52.913000+00:00	55	26.627	

In [199…

```
libraryDataF1.getinfolongruns(jointables,18,'Aston Martin',MINIMUN_SECONDS
```

Out[199…

	full_name	compound	date_start	lap_number	duration_sector_1	du
28	Lance STROLL	SOFT	2024-04-21T07:05:24.975000+00:00	2	27.410	
48	Lance STROLL	SOFT	2024-04-21T07:07:07.331000+00:00	3	27.167	
68	Lance STROLL	SOFT	2024-04-21T07:08:49.725000+00:00	4	27.311	
88	Lance STROLL	SOFT	2024-04-21T07:10:32.152000+00:00	5	27.387	

	full_name	compound	date_start	lap_number	duration_sector_1	du
108	Lance STROLL	SOFT	2024-04-21T07:12:15.185000+00:00	6	27.427	
128	Lance STROLL	SOFT	2024-04-21T07:13:58.448000+00:00	7	27.390	
148	Lance STROLL	SOFT	2024-04-21T07:15:41.774000+00:00	8	27.530	
200	Lance STROLL	MEDIUM	2024-04-21T07:21:12.208000+00:00	11	26.844	
218	Lance STROLL	MEDIUM	2024-04-21T07:22:53.591000+00:00	12	27.174	
236	Lance STROLL	MEDIUM	2024-04-21T07:24:35.483000+00:00	13	27.017	
254	Lance STROLL	MEDIUM	2024-04-21T07:26:17.068000+00:00	14	27.231	
273	Lance STROLL	MEDIUM	2024-04-21T07:27:58.876000+00:00	15	26.966	
293	Lance STROLL	MEDIUM	2024-04-21T07:29:40.222000+00:00	16	27.068	
313	Lance STROLL	MEDIUM	2024-04-21T07:31:22.178000+00:00	17	27.139	
332	Lance STROLL	MEDIUM	2024-04-21T07:33:03.752000+00:00	18	27.200	
350	Lance STROLL	MEDIUM	2024-04-21T07:34:46.262000+00:00	19	27.278	
370	Lance STROLL	MEDIUM	2024-04-21T07:36:28.570000+00:00	20	27.339	
523	Lance STROLL	MEDIUM	2024-04-21T07:57:47.886000+00:00	29	26.825	
541	Lance STROLL	MEDIUM	2024-04-21T07:59:32.463000+00:00	30	27.180	
577	Lance STROLL	MEDIUM	2024-04-21T08:03:19.992000+00:00	32	26.753	
595	Lance STROLL	MEDIUM	2024-04-21T08:05:01.566000+00:00	33	27.202	
612	Lance STROLL	MEDIUM	2024-04-21T08:06:43.549000+00:00	34	26.884	
662	Lance STROLL	HARD	2024-04-21T08:12:22.935000+00:00	37	26.455	
679	Lance STROLL	HARD	2024-04-21T08:14:02.396000+00:00	38	26.429	
695	Lance STROLL	HARD	2024-04-21T08:15:41.837000+00:00	39	26.526	
712	Lance STROLL	HARD	2024-04-21T08:17:21.450000+00:00	40	26.628	
729	Lance STROLL	HARD	2024-04-21T08:19:01.418000+00:00	41	26.689	
745	Lance STROLL	HARD	2024-04-21T08:20:41.526000+00:00	42	26.730	
762	Lance STROLL	HARD	2024-04-21T08:22:21.426000+00:00	43	26.860	

	full_name	compound	date_start	lap_number	duration_sector_1	du
778	Lance STROLL	HARD	2024-04-21T08:24:01.870000+00:00	44	26.680	
795	Lance STROLL	HARD	2024-04-21T08:25:42.206000+00:00	45	26.755	
812	Lance STROLL	HARD	2024-04-21T08:27:22.481000+00:00	46	26.878	
829	Lance STROLL	HARD	2024-04-21T08:29:03.131000+00:00	47	26.949	
846	Lance STROLL	HARD	2024-04-21T08:30:43.816000+00:00	48	26.820	
863	Lance STROLL	HARD	2024-04-21T08:32:24.225000+00:00	49	26.939	
880	Lance STROLL	HARD	2024-04-21T08:34:04.716000+00:00	50	26.844	
897	Lance STROLL	HARD	2024-04-21T08:35:45.390000+00:00	51	26.863	
914	Lance STROLL	HARD	2024-04-21T08:37:26.013000+00:00	52	26.919	
931	Lance STROLL	HARD	2024-04-21T08:39:07.032000+00:00	53	26.979	
948	Lance STROLL	HARD	2024-04-21T08:40:48.419000+00:00	54	27.031	

McLaren

In [200…

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

Out[200…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
15	1233	9673	1	81	1	16	MEDIUM	
19	1233	9673	1	4	1	22	MEDIUM	
35	1233	9673	2	81	17	24	MEDIUM	
41	1233	9673	2	4	23	57	HARD	
53	1233	9673	3	81	25	57	HARD	

In [201…

```
libraryDataF1.getinfolongruns(jointables,4,'McLaren',MINIMUN_SECONDS,MAXIMU
```

Out[201…

	full_name	compound	date_start	lap_number	duration_sector_1	du
23	Lando NORRIS	MEDIUM	2024-04-21T07:05:21.826000+00:00	2	26.911	
43	Lando NORRIS	MEDIUM	2024-04-21T07:07:03.041000+00:00	3	26.859	
63	Lando NORRIS	MEDIUM	2024-04-21T07:08:44.345000+00:00	4	27.067	
83	Lando NORRIS	MEDIUM	2024-04-21T07:10:26.305000+00:00	5	27.170	
103	Lando NORRIS	MEDIUM	2024-04-21T07:12:08.271000+00:00	6	27.086	

	full_name	compound	date_start	lap_number	duration_sector_1	du
123	Lando NORRIS	MEDIUM	2024-04-21T07:13:50.252000+00:00	7	27.022	
143	Lando NORRIS	MEDIUM	2024-04-21T07:15:32.529000+00:00	8	27.141	
163	Lando NORRIS	MEDIUM	2024-04-21T07:17:14.397000+00:00	9	27.142	
180	Lando NORRIS	MEDIUM	2024-04-21T07:18:56.093000+00:00	10	27.120	
195	Lando NORRIS	MEDIUM	2024-04-21T07:20:37.818000+00:00	11	27.163	
215	Lando NORRIS	MEDIUM	2024-04-21T07:22:19.589000+00:00	12	27.266	
231	Lando NORRIS	MEDIUM	2024-04-21T07:24:01.688000+00:00	13	27.251	
250	Lando NORRIS	MEDIUM	2024-04-21T07:25:43.336000+00:00	14	27.225	
268	Lando NORRIS	MEDIUM	2024-04-21T07:27:25.037000+00:00	15	27.341	
288	Lando NORRIS	MEDIUM	2024-04-21T07:29:07.084000+00:00	16	27.205	
308	Lando NORRIS	MEDIUM	2024-04-21T07:30:48.934000+00:00	17	27.132	
327	Lando NORRIS	MEDIUM	2024-04-21T07:32:30.678000+00:00	18	27.352	
345	Lando NORRIS	MEDIUM	2024-04-21T07:34:12.594000+00:00	19	27.345	
365	Lando NORRIS	MEDIUM	2024-04-21T07:35:55.305000+00:00	20	27.181	
385	Lando NORRIS	MEDIUM	2024-04-21T07:37:37.414000+00:00	21	27.457	
572	Lando NORRIS	HARD	2024-04-21T08:03:10.836000+00:00	32	26.404	
590	Lando NORRIS	HARD	2024-04-21T08:04:49.775000+00:00	33	26.281	
607	Lando NORRIS	HARD	2024-04-21T08:06:28.427000+00:00	34	26.441	
624	Lando NORRIS	HARD	2024-04-21T08:08:07.550000+00:00	35	26.534	
641	Lando NORRIS	HARD	2024-04-21T08:09:46.587000+00:00	36	26.484	
657	Lando NORRIS	HARD	2024-04-21T08:11:25.746000+00:00	37	26.467	
674	Lando NORRIS	HARD	2024-04-21T08:13:05.096000+00:00	38	26.523	
691	Lando NORRIS	HARD	2024-04-21T08:14:44.348000+00:00	39	26.579	
707	Lando NORRIS	HARD	2024-04-21T08:16:23.855000+00:00	40	26.660	
724	Lando NORRIS	HARD	2024-04-21T08:18:03.780000+00:00	41	26.620	

	full_name	compound	date_start	lap_number	duration_sector_1	du
740	Lando NORRIS	HARD	2024-04-21T08:19:43.429000+00:00	42	26.593	
757	Lando NORRIS	HARD	2024-04-21T08:21:24.302000+00:00	43	26.832	
774	Lando NORRIS	HARD	2024-04-21T08:23:04.133000+00:00	44	26.601	
790	Lando NORRIS	HARD	2024-04-21T08:24:43.489000+00:00	45	26.598	
807	Lando NORRIS	HARD	2024-04-21T08:26:22.960000+00:00	46	26.651	
824	Lando NORRIS	HARD	2024-04-21T08:28:02.701000+00:00	47	26.743	
841	Lando NORRIS	HARD	2024-04-21T08:29:42.818000+00:00	48	26.612	
858	Lando NORRIS	HARD	2024-04-21T08:31:22.412000+00:00	49	26.684	
875	Lando NORRIS	HARD	2024-04-21T08:33:02.192000+00:00	50	26.911	
892	Lando NORRIS	HARD	2024-04-21T08:34:42.283000+00:00	51	26.621	
909	Lando NORRIS	HARD	2024-04-21T08:36:22.358000+00:00	52	26.698	
926	Lando NORRIS	HARD	2024-04-21T08:38:02.228000+00:00	53	26.643	
943	Lando NORRIS	HARD	2024-04-21T08:39:42.401000+00:00	54	26.716	
960	Lando NORRIS	HARD	2024-04-21T08:41:22.610000+00:00	55	26.901	

In [202…

```
libraryDataF1.getinfolongruns(jointables,81,'McLaren',MINIMUN_SECONDS,MAXI
```

Out[202…

	full_name	compound	date_start	lap_number	duration_sector_1	du
39	Oscar PIASTRI	MEDIUM	2024-04-21T07:05:22.353000+00:00	2	27.303	
59	Oscar PIASTRI	MEDIUM	2024-04-21T07:07:03.985000+00:00	3	27.073	
79	Oscar PIASTRI	MEDIUM	2024-04-21T07:08:45.782000+00:00	4	27.517	
99	Oscar PIASTRI	MEDIUM	2024-04-21T07:10:28.127000+00:00	5	27.488	
119	Oscar PIASTRI	MEDIUM	2024-04-21T07:12:10.292000+00:00	6	27.420	
139	Oscar PIASTRI	MEDIUM	2024-04-21T07:13:52.823000+00:00	7	27.431	
159	Oscar PIASTRI	MEDIUM	2024-04-21T07:15:35.247000+00:00	8	27.427	
176	Oscar PIASTRI	MEDIUM	2024-04-21T07:17:17.845000+00:00	9	27.543	

	full_name	compound	date_start	lap_number	duration_sector_1	du
191	Oscar PIASTRI	MEDIUM	2024-04-21T07:19:00.796000+00:00	10	27.411	
211	Oscar PIASTRI	MEDIUM	2024-04-21T07:20:43.556000+00:00	11	27.320	
228	Oscar PIASTRI	MEDIUM	2024-04-21T07:22:26.795000+00:00	12	27.564	
247	Oscar PIASTRI	MEDIUM	2024-04-21T07:24:09.935000+00:00	13	27.614	
265	Oscar PIASTRI	MEDIUM	2024-04-21T07:25:52.730000+00:00	14	27.647	
284	Oscar PIASTRI	MEDIUM	2024-04-21T07:27:35.847000+00:00	15	27.433	
341	Oscar PIASTRI	MEDIUM	2024-04-21T07:33:05.562000+00:00	18	26.748	
361	Oscar PIASTRI	MEDIUM	2024-04-21T07:34:45.122000+00:00	19	26.874	
381	Oscar PIASTRI	MEDIUM	2024-04-21T07:36:25.907000+00:00	20	26.907	
586	Oscar PIASTRI	HARD	2024-04-21T08:03:14.163000+00:00	32	26.910	
604	Oscar PIASTRI	HARD	2024-04-21T08:04:55.256000+00:00	33	26.960	
621	Oscar PIASTRI	HARD	2024-04-21T08:06:35.987000+00:00	34	26.939	
638	Oscar PIASTRI	HARD	2024-04-21T08:08:16.723000+00:00	35	26.844	
654	Oscar PIASTRI	HARD	2024-04-21T08:09:57.012000+00:00	36	27.069	
671	Oscar PIASTRI	HARD	2024-04-21T08:11:38.514000+00:00	37	27.084	
688	Oscar PIASTRI	HARD	2024-04-21T08:13:20.133000+00:00	38	26.850	
704	Oscar PIASTRI	HARD	2024-04-21T08:15:00.952000+00:00	39	27.005	
721	Oscar PIASTRI	HARD	2024-04-21T08:16:42.486000+00:00	40	27.102	
737	Oscar PIASTRI	HARD	2024-04-21T08:18:23.628000+00:00	41	27.078	
754	Oscar PIASTRI	HARD	2024-04-21T08:20:05.164000+00:00	42	26.998	
771	Oscar PIASTRI	HARD	2024-04-21T08:21:46.248000+00:00	43	26.880	
787	Oscar PIASTRI	HARD	2024-04-21T08:23:27.164000+00:00	44	26.999	
804	Oscar PIASTRI	HARD	2024-04-21T08:25:08.074000+00:00	45	27.105	
821	Oscar PIASTRI	HARD	2024-04-21T08:26:49.489000+00:00	46	26.957	
838	Oscar PIASTRI	HARD	2024-04-21T08:28:30.733000+00:00	47	26.982	

	full_name	compound	date_start	lap_number	duration_sector_1	du
855	Oscar PIASTRI	HARD	2024-04-21T08:30:12.144000+00:00	48	26.986	
872	Oscar PIASTRI	HARD	2024-04-21T08:31:53.660000+00:00	49	27.078	
889	Oscar PIASTRI	HARD	2024-04-21T08:33:35.602000+00:00	50	26.913	
906	Oscar PIASTRI	HARD	2024-04-21T08:35:16.977000+00:00	51	26.947	
923	Oscar PIASTRI	HARD	2024-04-21T08:36:58.251000+00:00	52	27.234	
940	Oscar PIASTRI	HARD	2024-04-21T08:38:39.876000+00:00	53	27.208	
957	Oscar PIASTRI	HARD	2024-04-21T08:40:21.255000+00:00	54	27.195	

RB

In [203…

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

Out[203…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
0	1233	9673	1	22	1	8	SOFT	
14	1233	9673	1	3	1	14	MEDIUM	
20	1233	9673	2	22	9	23	MEDIUM	
34	1233	9673	2	3	15	34	MEDIUM	
42	1233	9673	3	22	24	27	HARD	

In [204…

```
libraryDataF1.getinfolongruns(jointables,3,'RB',MINIMUN_SECONDS,MAXIMUM_SE
```

Out[204…

	full_name	compound	date_start	lap_number	duration_sector_1
22	Daniel RICCIARDO	MEDIUM	2024-04-21T07:05:27.604000+00:00	2	27.587
42	Daniel RICCIARDO	MEDIUM	2024-04-21T07:07:10.947000+00:00	3	27.047
62	Daniel RICCIARDO	MEDIUM	2024-04-21T07:08:54.100000+00:00	4	27.253
82	Daniel RICCIARDO	MEDIUM	2024-04-21T07:10:37.132000+00:00	5	27.483
102	Daniel RICCIARDO	MEDIUM	2024-04-21T07:12:20.495000+00:00	6	27.519
122	Daniel RICCIARDO	MEDIUM	2024-04-21T07:14:04.167000+00:00	7	27.670
142	Daniel RICCIARDO	MEDIUM	2024-04-21T07:15:47.912000+00:00	8	27.696
162	Daniel RICCIARDO	MEDIUM	2024-04-21T07:17:31.732000+00:00	9	27.551
179	Daniel RICCIARDO	MEDIUM	2024-04-21T07:19:15.448000+00:00	10	27.532

	full_name	compound	date_start	lap_number	duration_sector_1
194	Daniel RICCIARDO	MEDIUM	2024-04-21T07:20:58.707000+00:00	11	27.366
214	Daniel RICCIARDO	MEDIUM	2024-04-21T07:22:42.138000+00:00	12	27.577
230	Daniel RICCIARDO	MEDIUM	2024-04-21T07:24:25.237000+00:00	13	27.628
287	Daniel RICCIARDO	MEDIUM	2024-04-21T07:29:56.320000+00:00	16	26.682
307	Daniel RICCIARDO	MEDIUM	2024-04-21T07:31:37.329000+00:00	17	26.947
326	Daniel RICCIARDO	MEDIUM	2024-04-21T07:33:18.418000+00:00	18	27.188
344	Daniel RICCIARDO	MEDIUM	2024-04-21T07:34:59.942000+00:00	19	27.157
364	Daniel RICCIARDO	MEDIUM	2024-04-21T07:36:41.856000+00:00	20	27.248

In [205…

```
libraryDataF1.getinfolongruns(jointables,22,'RB',MINIMUN_SECONDS,MAXIMUM_SI
```

Out[205…

	full_name	compound	date_start	lap_number	duration_sector_1	d
30	Yuki TSUNODA	SOFT	2024-04-21T07:05:27.751000+00:00	2	27.489	
50	Yuki TSUNODA	SOFT	2024-04-21T07:07:11.558000+00:00	3	27.279	
70	Yuki TSUNODA	SOFT	2024-04-21T07:08:54.772000+00:00	4	27.329	
90	Yuki TSUNODA	SOFT	2024-04-21T07:10:37.826000+00:00	5	27.539	
110	Yuki TSUNODA	SOFT	2024-04-21T07:12:21.525000+00:00	6	27.431	
130	Yuki TSUNODA	SOFT	2024-04-21T07:14:05.098000+00:00	7	27.667	
186	Yuki TSUNODA	MEDIUM	2024-04-21T07:19:37.360000+00:00	10	27.086	
202	Yuki TSUNODA	MEDIUM	2024-04-21T07:21:19.452000+00:00	11	27.019	
220	Yuki TSUNODA	MEDIUM	2024-04-21T07:23:01.164000+00:00	12	27.316	
238	Yuki TSUNODA	MEDIUM	2024-04-21T07:24:43.320000+00:00	13	27.814	
256	Yuki TSUNODA	MEDIUM	2024-04-21T07:26:26.987000+00:00	14	27.415	
275	Yuki TSUNODA	MEDIUM	2024-04-21T07:28:09.448000+00:00	15	27.269	
295	Yuki TSUNODA	MEDIUM	2024-04-21T07:29:51.783000+00:00	16	27.228	
315	Yuki TSUNODA	MEDIUM	2024-04-21T07:31:34.339000+00:00	17	27.284	

	full_name	compound	date_start	lap_number	duration_sector_1	d
333	Yuki TSUNODA	MEDIUM	2024-04-21T07:33:16.690000+00:00	18	27.376	
352	Yuki TSUNODA	MEDIUM	2024-04-21T07:34:59.305000+00:00	19	27.279	

Haas F1 Team

In [206…

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

Out[206…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
2	1233	9673	1	27	1	8	MEDIUM	
16	1233	9673	1	20	1	17	HARD	
22	1233	9673	2	27	9	23	HARD	
36	1233	9673	2	20	18	27	HARD	
49	1233	9673	3	27	24	57	HARD	
55	1233	9673	3	20	28	57	MEDIUM	

In [207…

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

Out[207…

	full_name	compound	date_start	lap_number	duration_sector_1
29	Kevin MAGNUSSEN	HARD	2024-04-21T07:05:28.312000+00:00	2	27.241
49	Kevin MAGNUSSEN	HARD	2024-04-21T07:07:12.279000+00:00	3	27.319
69	Kevin MAGNUSSEN	HARD	2024-04-21T07:08:55.408000+00:00	4	27.237
89	Kevin MAGNUSSEN	HARD	2024-04-21T07:10:39.538000+00:00	5	27.387
109	Kevin MAGNUSSEN	HARD	2024-04-21T07:12:23.347000+00:00	6	27.510
129	Kevin MAGNUSSEN	HARD	2024-04-21T07:14:07.287000+00:00	7	27.684
149	Kevin MAGNUSSEN	HARD	2024-04-21T07:15:51.229000+00:00	8	27.632
169	Kevin MAGNUSSEN	HARD	2024-04-21T07:17:35.367000+00:00	9	27.564
185	Kevin MAGNUSSEN	HARD	2024-04-21T07:19:18.866000+00:00	10	27.469
201	Kevin MAGNUSSEN	HARD	2024-04-21T07:21:02.056000+00:00	11	27.633
219	Kevin MAGNUSSEN	HARD	2024-04-21T07:22:45.728000+00:00	12	27.690
237	Kevin MAGNUSSEN	HARD	2024-04-21T07:24:29.322000+00:00	13	27.710
255	Kevin MAGNUSSEN	HARD	2024-04-21T07:26:13.915000+00:00	14	27.722

	full_name	compound	date_start	lap_number	duration_sector_1
274	Kevin MAGNUSSEN	HARD	2024-04-21T07:27:57.982000+00:00	15	27.668
294	Kevin MAGNUSSEN	HARD	2024-04-21T07:29:42.281000+00:00	16	27.578
351	Kevin MAGNUSSEN	HARD	2024-04-21T07:35:17.270000+00:00	19	26.677
371	Kevin MAGNUSSEN	HARD	2024-04-21T07:36:58.370000+00:00	20	26.807
578	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:03:19.284000+00:00	32	26.956
596	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:05:00.937000+00:00	33	26.986
613	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:06:43.342000+00:00	34	27.045
630	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:08:26.865000+00:00	35	27.264
646	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:10:09.456000+00:00	36	27.032
663	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:11:50.792000+00:00	37	26.956
680	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:13:32.260000+00:00	38	26.932
696	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:15:13.642000+00:00	39	27.030
713	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:16:54.863000+00:00	40	27.248
730	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:18:36.517000+00:00	41	26.974
746	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:20:18.480000+00:00	42	26.817
763	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:21:59.918000+00:00	43	26.925
779	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:23:41.239000+00:00	44	27.049
796	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:25:22.522000+00:00	45	27.024
813	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:27:03.582000+00:00	46	27.187
830	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:28:45.152000+00:00	47	27.055
847	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:30:26.583000+00:00	48	27.113
864	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:32:08.172000+00:00	49	27.034
881	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:33:49.431000+00:00	50	27.023
898	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:35:30.816000+00:00	51	27.093
915	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:37:12.672000+00:00	52	27.171

	full_name	compound	date_start	lap_number	duration_sector_1
932	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:38:54.794000+00:00	53	27.502
949	Kevin MAGNUSSEN	MEDIUM	2024-04-21T08:40:38.823000+00:00	54	27.279

In [208…

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

Out[208…

	full_name	compound	date_start	lap_number	duration_sector_1
33	Nico HULKENBERG	MEDIUM	2024-04-21T07:05:24.148000+00:00	2	27.83(
53	Nico HULKENBERG	MEDIUM	2024-04-21T07:07:07.980000+00:00	3	26.95(
73	Nico HULKENBERG	MEDIUM	2024-04-21T07:08:50.403000+00:00	4	27.14
93	Nico HULKENBERG	MEDIUM	2024-04-21T07:10:33.168000+00:00	5	27.24
113	Nico HULKENBERG	MEDIUM	2024-04-21T07:12:16.576000+00:00	6	27.46
133	Nico HULKENBERG	MEDIUM	2024-04-21T07:13:59.866000+00:00	7	27.55
188	Nico HULKENBERG	HARD	2024-04-21T07:19:32.918000+00:00	10	26.85
205	Nico HULKENBERG	HARD	2024-04-21T07:21:14.291000+00:00	11	26.86
223	Nico HULKENBERG	HARD	2024-04-21T07:22:55.870000+00:00	12	26.98
241	Nico HULKENBERG	HARD	2024-04-21T07:24:37.640000+00:00	13	27.10
259	Nico HULKENBERG	HARD	2024-04-21T07:26:19.590000+00:00	14	27.01
278	Nico HULKENBERG	HARD	2024-04-21T07:28:01.935000+00:00	15	27.13
298	Nico HULKENBERG	HARD	2024-04-21T07:29:44.085000+00:00	16	27.22
318	Nico HULKENBERG	HARD	2024-04-21T07:31:26.763000+00:00	17	26.98
336	Nico HULKENBERG	HARD	2024-04-21T07:33:08.666000+00:00	18	27.15
355	Nico HULKENBERG	HARD	2024-04-21T07:34:51.745000+00:00	19	27.06
375	Nico HULKENBERG	HARD	2024-04-21T07:36:34.175000+00:00	20	27.23(
581	Nico HULKENBERG	HARD	2024-04-21T08:03:15.468000+00:00	32	26.76
599	Nico HULKENBERG	HARD	2024-04-21T08:04:56.257000+00:00	33	26.71
616	Nico HULKENBERG	HARD	2024-04-21T08:06:37.181000+00:00	34	26.75(

	full_name	compound	date_start	lap_number	duration_sector_1
633	Nico HULKENBERG	HARD	2024-04-21T08:08:18.023000+00:00	35	26.861
649	Nico HULKENBERG	HARD	2024-04-21T08:09:59.017000+00:00	36	26.823
666	Nico HULKENBERG	HARD	2024-04-21T08:11:40.266000+00:00	37	26.802
683	Nico HULKENBERG	HARD	2024-04-21T08:13:21.398000+00:00	38	26.742
699	Nico HULKENBERG	HARD	2024-04-21T08:15:02.407000+00:00	39	26.909
716	Nico HULKENBERG	HARD	2024-04-21T08:16:43.689000+00:00	40	26.960
732	Nico HULKENBERG	HARD	2024-04-21T08:18:25.203000+00:00	41	26.931
749	Nico HULKENBERG	HARD	2024-04-21T08:20:07.398000+00:00	42	27.018
766	Nico HULKENBERG	HARD	2024-04-21T08:21:49.161000+00:00	43	26.997
782	Nico HULKENBERG	HARD	2024-04-21T08:23:30.479000+00:00	44	26.967
799	Nico HULKENBERG	HARD	2024-04-21T08:25:11.772000+00:00	45	26.897
816	Nico HULKENBERG	HARD	2024-04-21T08:26:53.086000+00:00	46	27.055
833	Nico HULKENBERG	HARD	2024-04-21T08:28:34.572000+00:00	47	27.031
850	Nico HULKENBERG	HARD	2024-04-21T08:30:16.595000+00:00	48	26.807
867	Nico HULKENBERG	HARD	2024-04-21T08:31:57.808000+00:00	49	27.042
884	Nico HULKENBERG	HARD	2024-04-21T08:33:39.065000+00:00	50	27.022
901	Nico HULKENBERG	HARD	2024-04-21T08:35:20.414000+00:00	51	27.039
918	Nico HULKENBERG	HARD	2024-04-21T08:37:01.960000+00:00	52	27.015
935	Nico HULKENBERG	HARD	2024-04-21T08:38:43.502000+00:00	53	27.085
952	Nico HULKENBERG	HARD	2024-04-21T08:40:25.043000+00:00	54	27.140
969	Nico HULKENBERG	HARD	2024-04-21T08:42:06.642000+00:00	55	27.092

Kick Sauber

In [209…

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

Out[209…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
1	1233	9673	1	24	1	8	MEDIUM	

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
7	1233	9673	1	77	1	9	MEDIUM	
21	1233	9673	2	24	9	23	HARD	
23	1233	9673	2	77	10	20	HARD	
44	1233	9673	3	24	24	40	HARD	

In [210…

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

Out[210…

	full_name	compound	date_start	lap_number	duration_sector_1	du
32	ZHOU Guanyu	MEDIUM	2024-04-21T07:05:27.983000+00:00	2	28.069	
52	ZHOU Guanyu	MEDIUM	2024-04-21T07:07:12.349000+00:00	3	27.896	
72	ZHOU Guanyu	MEDIUM	2024-04-21T07:08:56.410000+00:00	4	27.403	
92	ZHOU Guanyu	MEDIUM	2024-04-21T07:10:39.802000+00:00	5	27.700	
112	ZHOU Guanyu	MEDIUM	2024-04-21T07:12:23.829000+00:00	6	27.719	
132	ZHOU Guanyu	MEDIUM	2024-04-21T07:14:07.997000+00:00	7	27.488	
187	ZHOU Guanyu	HARD	2024-04-21T07:19:42.765000+00:00	10	27.052	
204	ZHOU Guanyu	HARD	2024-04-21T07:21:24.610000+00:00	11	27.344	
222	ZHOU Guanyu	HARD	2024-04-21T07:23:06.442000+00:00	12	27.403	
240	ZHOU Guanyu	HARD	2024-04-21T07:24:48.252000+00:00	13	27.372	
258	ZHOU Guanyu	HARD	2024-04-21T07:26:30.459000+00:00	14	27.602	
277	ZHOU Guanyu	HARD	2024-04-21T07:28:13.199000+00:00	15	27.530	
297	ZHOU Guanyu	HARD	2024-04-21T07:29:56.092000+00:00	16	27.931	
317	ZHOU Guanyu	HARD	2024-04-21T07:31:39.392000+00:00	17	27.646	
335	ZHOU Guanyu	HARD	2024-04-21T07:33:22.674000+00:00	18	27.540	
354	ZHOU Guanyu	HARD	2024-04-21T07:35:05.521000+00:00	19	27.525	
374	ZHOU Guanyu	HARD	2024-04-21T07:36:48.309000+00:00	20	27.588	
580	ZHOU Guanyu	HARD	2024-04-21T08:03:18.267000+00:00	32	27.006	
598	ZHOU Guanyu	HARD	2024-04-21T08:05:00.237000+00:00	33	27.367	
615	ZHOU Guanyu	HARD	2024-04-21T08:06:42.905000+00:00	34	27.131	

	full_name	compound	date_start	lap_number	duration_sector_1	du
632	ZHOU Guanyu	HARD	2024-04-21T08:08:24.737000+00:00	35	27.059	
648	ZHOU Guanyu	HARD	2024-04-21T08:10:06.134000+00:00	36	26.713	
665	ZHOU Guanyu	HARD	2024-04-21T08:11:47.306000+00:00	37	26.919	
682	ZHOU Guanyu	HARD	2024-04-21T08:13:29.106000+00:00	38	26.890	
698	ZHOU Guanyu	HARD	2024-04-21T08:15:10.386000+00:00	39	27.327	
748	ZHOU Guanyu	SOFT	2024-04-21T08:20:37.203000+00:00	42	26.215	
765	ZHOU Guanyu	SOFT	2024-04-21T08:22:15.865000+00:00	43	26.501	
781	ZHOU Guanyu	SOFT	2024-04-21T08:23:55.223000+00:00	44	26.646	
798	ZHOU Guanyu	SOFT	2024-04-21T08:25:34.915000+00:00	45	26.604	
815	ZHOU Guanyu	SOFT	2024-04-21T08:27:14.485000+00:00	46	26.686	
832	ZHOU Guanyu	SOFT	2024-04-21T08:28:54.003000+00:00	47	26.838	
849	ZHOU Guanyu	SOFT	2024-04-21T08:30:34.112000+00:00	48	26.801	
866	ZHOU Guanyu	SOFT	2024-04-21T08:32:14.548000+00:00	49	27.223	
883	ZHOU Guanyu	SOFT	2024-04-21T08:33:55.888000+00:00	50	26.795	
900	ZHOU Guanyu	SOFT	2024-04-21T08:35:36.581000+00:00	51	26.761	
917	ZHOU Guanyu	SOFT	2024-04-21T08:37:16.694000+00:00	52	26.876	
934	ZHOU Guanyu	SOFT	2024-04-21T08:38:57.221000+00:00	53	27.047	
951	ZHOU Guanyu	SOFT	2024-04-21T08:40:38.201000+00:00	54	27.125	
968	ZHOU Guanyu	SOFT	2024-04-21T08:42:19.561000+00:00	55	26.951	
	ZHOU					

In [211…

```
libraryDataF1.getinfolongruns(jointables,77,'Kick Sauber',MINIMUN_SECONDS,
```

Out[211…

	full_name	compound	date_start	lap_number	duration_sector_1	du
38	Valtteri BOTTAS	MEDIUM	2024-04-21T07:05:25.487000+00:00	2	27.648	
58	Valtteri BOTTAS	MEDIUM	2024-04-21T07:07:08.558000+00:00	3	27.242	
78	Valtteri BOTTAS	MEDIUM	2024-04-21T07:08:50.950000+00:00	4	27.247	

	full_name	compound	date_start	lap_number	duration_sector_1	du
98	Valtteri BOTTAS	MEDIUM	2024-04-21T07:10:34.101000+00:00	5	27.299	
118	Valtteri BOTTAS	MEDIUM	2024-04-21T07:12:17.213000+00:00	6	27.357	
138	Valtteri BOTTAS	MEDIUM	2024-04-21T07:14:00.603000+00:00	7	27.557	
158	Valtteri BOTTAS	MEDIUM	2024-04-21T07:15:43.319000+00:00	8	27.595	
210	Valtteri BOTTAS	HARD	2024-04-21T07:21:15.715000+00:00	11	27.030	
227	Valtteri BOTTAS	HARD	2024-04-21T07:22:57.148000+00:00	12	27.306	
246	Valtteri BOTTAS	HARD	2024-04-21T07:24:38.950000+00:00	13	27.393	
264	Valtteri BOTTAS	HARD	2024-04-21T07:26:21.141000+00:00	14	27.546	
283	Valtteri BOTTAS	HARD	2024-04-21T07:28:03.570000+00:00	15	27.389	
303	Valtteri BOTTAS	HARD	2024-04-21T07:29:45.889000+00:00	16	27.116	
323	Valtteri BOTTAS	HARD	2024-04-21T07:31:28.196000+00:00	17	27.347	
340	Valtteri BOTTAS	HARD	2024-04-21T07:33:10.746000+00:00	18	27.472	

Williams

In [212…

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

Out[212…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyr
4	1233	9673	1	23	1	9	MEDIUM	
11	1233	9673	1	2	1	12	SOFT	
26	1233	9673	2	23	10	23	MEDIUM	
31	1233	9673	2	2	13	24	MEDIUM	
48	1233	9673	3	23	24	57	HARD	
52	1233	9673	3	2	25	57	HARD	

In [213…

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

Out[213…

	full_name	compound	date_start	lap_number	duration_sector_1	du
31	Alexander ALBON	MEDIUM	2024-04-21T07:05:26.666000+00:00	2	27.453	
51	Alexander ALBON	MEDIUM	2024-04-21T07:07:09.834000+00:00	3	27.257	
71	Alexander ALBON	MEDIUM	2024-04-21T07:08:52.773000+00:00	4	27.274	

	full_name	compound	date_start	lap_number	duration_sector_1	du
91	Alexander ALBON	MEDIUM	2024-04-21T07:10:35.759000+00:00	5	27.334	
111	Alexander ALBON	MEDIUM	2024-04-21T07:12:19.164000+00:00	6	27.518	
131	Alexander ALBON	MEDIUM	2024-04-21T07:14:02.556000+00:00	7	27.681	
151	Alexander ALBON	MEDIUM	2024-04-21T07:15:45.821000+00:00	8	27.722	
203	Alexander ALBON	MEDIUM	2024-04-21T07:21:19.774000+00:00	11	27.044	
221	Alexander ALBON	MEDIUM	2024-04-21T07:23:02.709000+00:00	12	27.062	
239	Alexander ALBON	MEDIUM	2024-04-21T07:24:44.690000+00:00	13	27.474	
257	Alexander ALBON	MEDIUM	2024-04-21T07:26:27.340000+00:00	14	27.494	
276	Alexander ALBON	MEDIUM	2024-04-21T07:28:10.794000+00:00	15	27.388	
296	Alexander ALBON	MEDIUM	2024-04-21T07:29:53.491000+00:00	16	27.301	
316	Alexander ALBON	MEDIUM	2024-04-21T07:31:36.139000+00:00	17	27.312	
334	Alexander ALBON	MEDIUM	2024-04-21T07:33:19.257000+00:00	18	27.376	
353	Alexander ALBON	MEDIUM	2024-04-21T07:35:02.271000+00:00	19	27.446	
373	Alexander ALBON	MEDIUM	2024-04-21T07:36:45.475000+00:00	20	27.408	
579	Alexander ALBON	HARD	2024-04-21T08:03:16.983000+00:00	32	27.078	
597	Alexander ALBON	HARD	2024-04-21T08:04:59.154000+00:00	33	27.015	
614	Alexander ALBON	HARD	2024-04-21T08:06:40.349000+00:00	34	26.852	
631	Alexander ALBON	HARD	2024-04-21T08:08:21.271000+00:00	35	26.914	
647	Alexander ALBON	HARD	2024-04-21T08:10:02.715000+00:00	36	26.941	
664	Alexander ALBON	HARD	2024-04-21T08:11:44.028000+00:00	37	26.977	
681	Alexander ALBON	HARD	2024-04-21T08:13:25.210000+00:00	38	26.938	
697	Alexander ALBON	HARD	2024-04-21T08:15:06.283000+00:00	39	27.081	
714	Alexander ALBON	HARD	2024-04-21T08:16:47.651000+00:00	40	27.103	
731	Alexander ALBON	HARD	2024-04-21T08:18:29.301000+00:00	41	27.126	
747	Alexander ALBON	HARD	2024-04-21T08:20:11.042000+00:00	42	27.029	

	full_name	compound	date_start	lap_number	duration_sector_1	du
764	Alexander ALBON	HARD	2024-04-21T08:21:52.657000+00:00	43	27.087	
780	Alexander ALBON	HARD	2024-04-21T08:23:34.130000+00:00	44	27.135	
797	Alexander ALBON	HARD	2024-04-21T08:25:15.498000+00:00	45	27.005	
814	Alexander ALBON	HARD	2024-04-21T08:26:57.233000+00:00	46	27.014	
831	Alexander ALBON	HARD	2024-04-21T08:28:38.944000+00:00	47	27.136	
848	Alexander ALBON	HARD	2024-04-21T08:30:20.556000+00:00	48	27.065	
865	Alexander ALBON	HARD	2024-04-21T08:32:02.066000+00:00	49	27.098	
882	Alexander ALBON	HARD	2024-04-21T08:33:43.473000+00:00	50	27.096	
899	Alexander ALBON	HARD	2024-04-21T08:35:25.006000+00:00	51	26.910	
916	Alexander ALBON	HARD	2024-04-21T08:37:06.344000+00:00	52	27.085	
933	Alexander ALBON	HARD	2024-04-21T08:38:48.023000+00:00	53	26.995	
950	Alexander ALBON	HARD	2024-04-21T08:40:29.463000+00:00	54	27.029	
	Alexander					

In [214…

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

Out[214…

	full_name	compound	date_start	lap_number	duration_sector_1
21	Logan SARGEANT	SOFT	2024-04-21T07:05:29.399000+00:00	2	27.800
41	Logan SARGEANT	SOFT	2024-04-21T07:07:13.550000+00:00	3	27.390
61	Logan SARGEANT	SOFT	2024-04-21T07:08:57.081000+00:00	4	27.493
81	Logan SARGEANT	SOFT	2024-04-21T07:10:41.509000+00:00	5	27.567
101	Logan SARGEANT	SOFT	2024-04-21T07:12:24.919000+00:00	6	27.432
121	Logan SARGEANT	SOFT	2024-04-21T07:14:08.661000+00:00	7	27.722
141	Logan SARGEANT	SOFT	2024-04-21T07:15:52.661000+00:00	8	27.352
161	Logan SARGEANT	SOFT	2024-04-21T07:17:36.823000+00:00	9	27.431
178	Logan SARGEANT	SOFT	2024-04-21T07:19:20.088000+00:00	10	27.691
193	Logan SARGEANT	SOFT	2024-04-21T07:21:03.723000+00:00	11	27.649

	full_name	compound	date_start	lap_number	duration_sector_1
248	Logan SARGEANT	MEDIUM	2024-04-21T07:26:36.693000+00:00	14	26.901
267	Logan SARGEANT	MEDIUM	2024-04-21T07:28:17.760000+00:00	15	27.173
286	Logan SARGEANT	MEDIUM	2024-04-21T07:29:59.436000+00:00	16	27.198
306	Logan SARGEANT	MEDIUM	2024-04-21T07:31:41.894000+00:00	17	27.182
325	Logan SARGEANT	MEDIUM	2024-04-21T07:33:24.166000+00:00	18	27.271
343	Logan SARGEANT	MEDIUM	2024-04-21T07:35:06.483000+00:00	19	27.320
363	Logan SARGEANT	MEDIUM	2024-04-21T07:36:49.072000+00:00	20	27.348
570	Logan SARGEANT	HARD	2024-04-21T08:03:17.599000+00:00	32	27.148
588	Logan SARGEANT	HARD	2024-04-21T08:04:59.847000+00:00	33	27.223
606	Logan SARGEANT	HARD	2024-04-21T08:06:42.204000+00:00	34	26.959
623	Logan SARGEANT	HARD	2024-04-21T08:08:23.476000+00:00	35	26.992
640	Logan SARGEANT	HARD	2024-04-21T08:10:04.586000+00:00	36	27.089
656	Logan SARGEANT	HARD	2024-04-21T08:11:46.116000+00:00	37	27.063
673	Logan SARGEANT	HARD	2024-04-21T08:13:28.571000+00:00	38	26.947
690	Logan SARGEANT	HARD	2024-04-21T08:15:10.773000+00:00	39	27.547
706	Logan SARGEANT	HARD	2024-04-21T08:16:53.205000+00:00	40	27.325
723	Logan SARGEANT	HARD	2024-04-21T08:18:35.478000+00:00	41	27.158
739	Logan SARGEANT	HARD	2024-04-21T08:20:17.579000+00:00	42	27.105
756	Logan SARGEANT	HARD	2024-04-21T08:21:59.491000+00:00	43	27.347
773	Logan SARGEANT	HARD	2024-04-21T08:23:42.597000+00:00	44	27.409
789	Logan SARGEANT	HARD	2024-04-21T08:25:24.988000+00:00	45	27.239
806	Logan SARGEANT	HARD	2024-04-21T08:27:06.831000+00:00	46	27.451
823	Logan SARGEANT	HARD	2024-04-21T08:28:49.209000+00:00	47	27.210
840	Logan SARGEANT	HARD	2024-04-21T08:30:31.138000+00:00	48	27.150
857	Logan SARGEANT	HARD	2024-04-21T08:32:13.974000+00:00	49	27.378

	full_name	compound	date_start	lap_number	duration_sector_1
874	Logan SARGEANT	HARD	2024-04-21T08:33:56.661000+00:00	50	27.397
891	Logan SARGEANT	HARD	2024-04-21T08:35:39.411000+00:00	51	27.225
908	Logan SARGEANT	HARD	2024-04-21T08:37:21.739000+00:00	52	27.375
925	Logan SARGEANT	HARD	2024-04-21T08:39:04.269000+00:00	53	27.195
942	Logan SARGEANT	HARD	2024-04-21T08:40:46.493000+00:00	54	27.381
959	Logan	HARD	2024-04-21T08:42:28.883000+00:00	55	27.293

Alpine

In [215…
```
stintInformation.query('driver_number == 10 or driver_number == 31')
```

Out[215…

	meeting_key	session_key	stint_number	driver_number	lap_start	lap_end	compound	tyre
5	1233	9673	1	31	1	9	MEDIUM	
8	1233	9673	1	10	1	11	MEDIUM	
27	1233	9673	2	31	10	23	HARD	
28	1233	9673	2	10	12	23	HARD	
43	1233	9673	3	10	24	38	HARD	
50	1233	9673	3	31	24	57	HARD	
57	1233	9673	4	10	39	57	MEDIUM	

In [216…
```
libraryDataF1.getinfolongruns(jointables,31,'Alpine',MINIMUN_SECONDS,MAXIMU
```

Out[216…

	full_name	compound	date_start	lap_number	duration_sector_1	du
34	Esteban OCON	MEDIUM	2024-04-21T07:05:26.116000+00:00	2	27.727	
54	Esteban OCON	MEDIUM	2024-04-21T07:07:09.249000+00:00	3	27.250	
74	Esteban OCON	MEDIUM	2024-04-21T07:08:51.936000+00:00	4	27.228	
94	Esteban OCON	MEDIUM	2024-04-21T07:10:35.085000+00:00	5	27.270	
114	Esteban OCON	MEDIUM	2024-04-21T07:12:18.126000+00:00	6	27.330	
134	Esteban OCON	MEDIUM	2024-04-21T07:14:01.349000+00:00	7	27.503	
154	Esteban OCON	MEDIUM	2024-04-21T07:15:44.843000+00:00	8	27.521	
206	Esteban OCON	HARD	2024-04-21T07:21:17.819000+00:00	11	26.867	
224	Esteban OCON	HARD	2024-04-21T07:22:59.395000+00:00	12	27.224	

	full_name	compound	date_start	lap_number	duration_sector_1	du
242	Esteban OCON	HARD	2024-04-21T07:24:41.101000+00:00	13	27.207	
260	Esteban OCON	HARD	2024-04-21T07:26:23.283000+00:00	14	27.255	
279	Esteban OCON	HARD	2024-04-21T07:28:05.496000+00:00	15	27.368	
299	Esteban OCON	HARD	2024-04-21T07:29:47.751000+00:00	16	27.243	
319	Esteban OCON	HARD	2024-04-21T07:31:30.292000+00:00	17	27.267	
337	Esteban OCON	HARD	2024-04-21T07:33:12.677000+00:00	18	27.338	
356	Esteban OCON	HARD	2024-04-21T07:34:55.283000+00:00	19	27.397	
376	Esteban OCON	HARD	2024-04-21T07:36:37.849000+00:00	20	27.330	
582	Esteban OCON	HARD	2024-04-21T08:03:16.503000+00:00	32	26.904	
600	Esteban OCON	HARD	2024-04-21T08:04:58.332000+00:00	33	26.841	
617	Esteban OCON	HARD	2024-04-21T08:06:39.247000+00:00	34	26.909	
634	Esteban OCON	HARD	2024-04-21T08:08:20.205000+00:00	35	26.806	
650	Esteban OCON	HARD	2024-04-21T08:10:01.272000+00:00	36	27.012	
667	Esteban OCON	HARD	2024-04-21T08:11:42.425000+00:00	37	27.147	
684	Esteban OCON	HARD	2024-04-21T08:13:23.860000+00:00	38	27.017	
700	Esteban OCON	HARD	2024-04-21T08:15:04.912000+00:00	39	27.103	
717	Esteban OCON	HARD	2024-04-21T08:16:46.303000+00:00	40	27.062	
733	Esteban OCON	HARD	2024-04-21T08:18:27.879000+00:00	41	27.133	
750	Esteban OCON	HARD	2024-04-21T08:20:09.555000+00:00	42	26.965	
767	Esteban OCON	HARD	2024-04-21T08:21:51.048000+00:00	43	27.081	
783	Esteban OCON	HARD	2024-04-21T08:23:32.566000+00:00	44	27.029	
800	Esteban OCON	HARD	2024-04-21T08:25:13.780000+00:00	45	27.049	
817	Esteban OCON	HARD	2024-04-21T08:26:55.154000+00:00	46	27.082	
834	Esteban OCON	HARD	2024-04-21T08:28:37.269000+00:00	47	27.150	
851	Esteban OCON	HARD	2024-04-21T08:30:19.065000+00:00	48	26.945	

	full_name	compound	date_start	lap_number	duration_sector_1	du
868	Esteban OCON	HARD	2024-04-21T08:32:00.305000+00:00	49	26.952	
885	Esteban OCON	HARD	2024-04-21T08:33:41.641000+00:00	50	26.962	
902	Esteban OCON	HARD	2024-04-21T08:35:23.255000+00:00	51	26.927	
919	Esteban OCON	HARD	2024-04-21T08:37:04.697000+00:00	52	26.953	
936	Esteban OCON	HARD	2024-04-21T08:38:46.223000+00:00	53	27.039	
953	Esteban OCON	HARD	2024-04-21T08:40:27.889000+00:00	54	26.963	
	Esteban					

In [217…

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

Out[217…

	full_name	compound	date_start	lap_number	duration_sector_1	du
24	Pierre GASLY	MEDIUM	2024-04-21T07:05:27.032000+00:00	2	27.391	
44	Pierre GASLY	MEDIUM	2024-04-21T07:07:10.301000+00:00	3	27.238	
64	Pierre GASLY	MEDIUM	2024-04-21T07:08:53.393000+00:00	4	27.150	
84	Pierre GASLY	MEDIUM	2024-04-21T07:10:36.251000+00:00	5	27.593	
104	Pierre GASLY	MEDIUM	2024-04-21T07:12:19.797000+00:00	6	27.579	
124	Pierre GASLY	MEDIUM	2024-04-21T07:14:03.269000+00:00	7	27.528	
144	Pierre GASLY	MEDIUM	2024-04-21T07:15:46.629000+00:00	8	27.673	
164	Pierre GASLY	MEDIUM	2024-04-21T07:17:30.454000+00:00	9	27.522	
181	Pierre GASLY	MEDIUM	2024-04-21T07:19:14.184000+00:00	10	27.311	
232	Pierre GASLY	HARD	2024-04-21T07:25:03.985000+00:00	13	27.043	
251	Pierre GASLY	HARD	2024-04-21T07:26:45.131000+00:00	14	27.333	
269	Pierre GASLY	HARD	2024-04-21T07:28:26.919000+00:00	15	27.204	
289	Pierre GASLY	HARD	2024-04-21T07:30:08.695000+00:00	16	27.248	
309	Pierre GASLY	HARD	2024-04-21T07:31:50.719000+00:00	17	27.303	
328	Pierre GASLY	HARD	2024-04-21T07:33:32.673000+00:00	18	27.118	
346	Pierre GASLY	HARD	2024-04-21T07:35:14.444000+00:00	19	27.302	

	full_name	compound	date_start	lap_number	duration_sector_1	du
366	Pierre GASLY	HARD	2024-04-21T07:36:56.599000+00:00	20	27.252	
573	Pierre GASLY	HARD	2024-04-21T08:03:18.788000+00:00	32	26.989	
591	Pierre GASLY	HARD	2024-04-21T08:05:00.710000+00:00	33	27.021	
608	Pierre GASLY	HARD	2024-04-21T08:06:42.658000+00:00	34	26.869	
625	Pierre GASLY	HARD	2024-04-21T08:08:24.385000+00:00	35	26.903	
642	Pierre GASLY	HARD	2024-04-21T08:10:05.224000+00:00	36	26.719	
658	Pierre GASLY	HARD	2024-04-21T08:11:46.634000+00:00	37	26.683	
708	Pierre GASLY	MEDIUM	2024-04-21T08:17:12.267000+00:00	40	26.381	
725	Pierre GASLY	MEDIUM	2024-04-21T08:18:51.479000+00:00	41	26.464	
741	Pierre GASLY	MEDIUM	2024-04-21T08:20:31.153000+00:00	42	26.735	
758	Pierre GASLY	MEDIUM	2024-04-21T08:22:11.267000+00:00	43	26.675	
775	Pierre GASLY	MEDIUM	2024-04-21T08:23:51.260000+00:00	44	26.647	
791	Pierre GASLY	MEDIUM	2024-04-21T08:25:31.211000+00:00	45	26.604	
808	Pierre GASLY	MEDIUM	2024-04-21T08:27:11.172000+00:00	46	26.703	
825	Pierre GASLY	MEDIUM	2024-04-21T08:28:51.426000+00:00	47	26.674	
842	Pierre GASLY	MEDIUM	2024-04-21T08:30:31.908000+00:00	48	26.507	
859	Pierre GASLY	MEDIUM	2024-04-21T08:32:13.464000+00:00	49	26.766	
876	Pierre GASLY	MEDIUM	2024-04-21T08:33:53.718000+00:00	50	26.558	
893	Pierre GASLY	MEDIUM	2024-04-21T08:35:33.913000+00:00	51	26.744	
910	Pierre GASLY	MEDIUM	2024-04-21T08:37:14.307000+00:00	52	26.827	
927	Pierre GASLY	MEDIUM	2024-04-21T08:38:55.486000+00:00	53	26.980	
944	Pierre GASLY	MEDIUM	2024-04-21T08:40:36.662000+00:00	54	26.831	
961	Pierre GASLY	MEDIUM	2024-04-21T08:42:17.533000+00:00	55	26.799	

Pits

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

In [218…

```
pit = libraryDataF1.obtain_information('pit',session_key=9673)
```

In [219…

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

Out[219…

team_name	pit_duration
Red Bull Racing	22.225000
McLaren	22.300000
Ferrari	22.450000
Mercedes	22.550000
RB	22.633333
Williams	23.150000
Haas F1 Team	23.725000
Kick Sauber	23.750000
Alpine	26.540000
Aston Martin	34.757143