



Intro to **Formula 1 Data Analysis** with Python

September 27th, 2022
19:30 CEST (Amsterdam Time)

Hosted by **Jasper van Hattem**

Today

19:30 – 19:45

Welcome & Introduction

19:45 – 20:00

The concept of Formula 1 data Analysis with
Python

20:00 – 21:00

Set-up and live coding tutorial

21:00 – ?

Questions

Today

From my side

An interactive session: no
1.5h long lecture

Focus on beginners

Additional resources will be
shared afterwards

From your side

Ask questions in the chat if
you have any

You can code along with
me, or just listen and try it
out later

Be kind and positive 😊

Introduction



Introduction



Who are you?

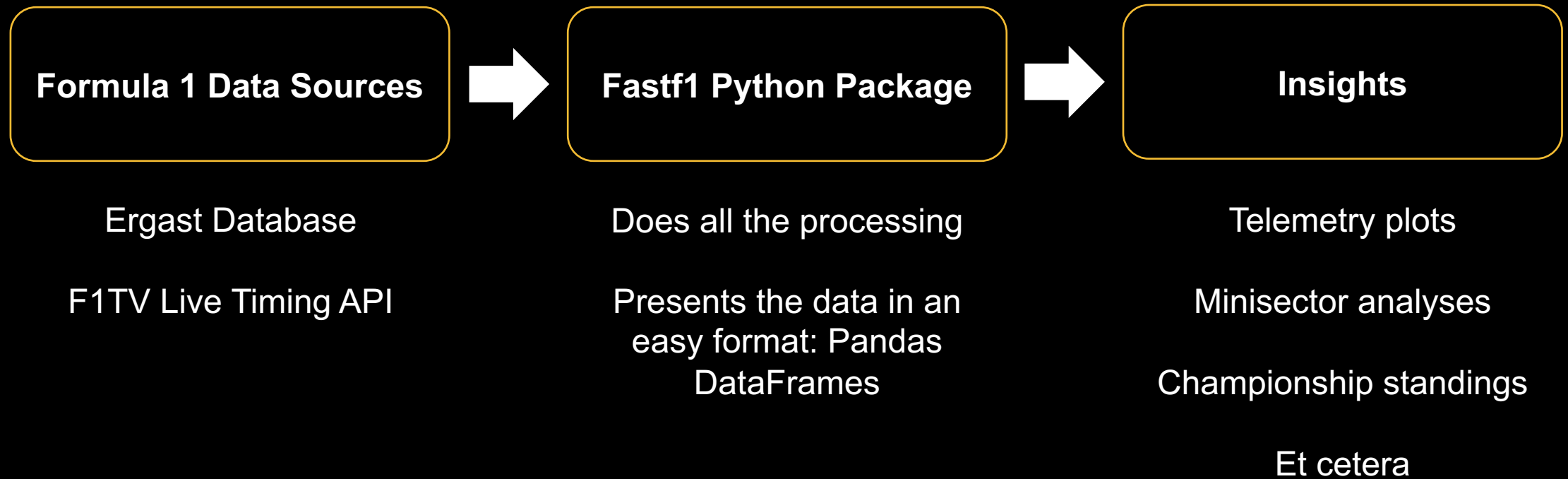
Write in the chat your **name**,
your **nationality**, and **the reason**
you signed up

Formula 1 Data Analysis with Python

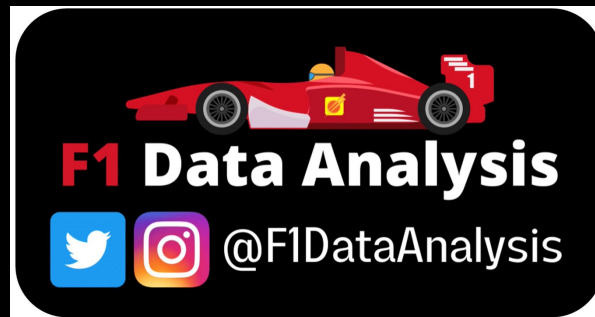
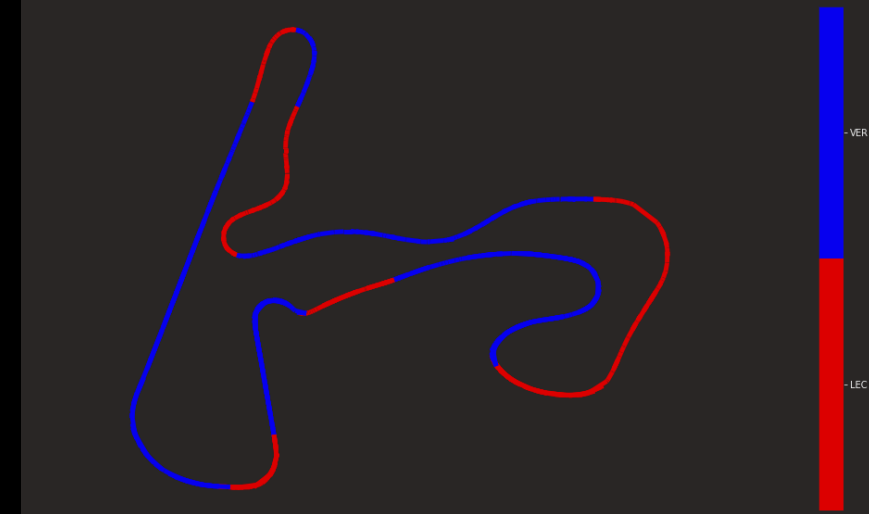
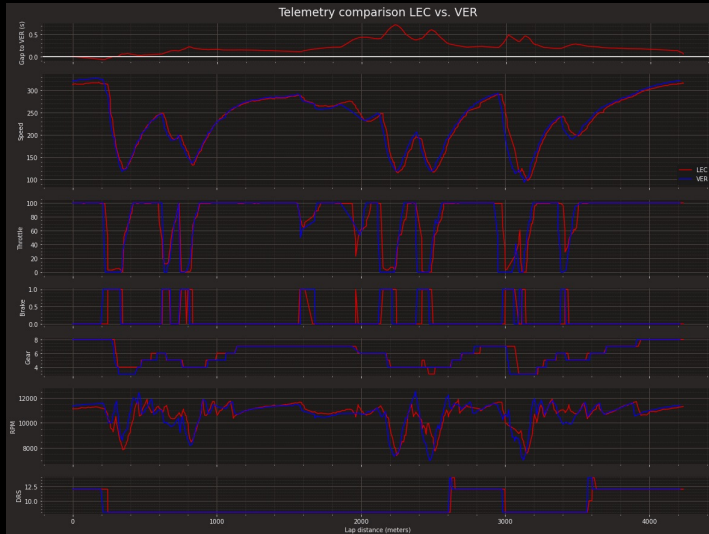
👍 if you have some experience

😱 if you're completely new to it

An overview



Let's talk **insights**

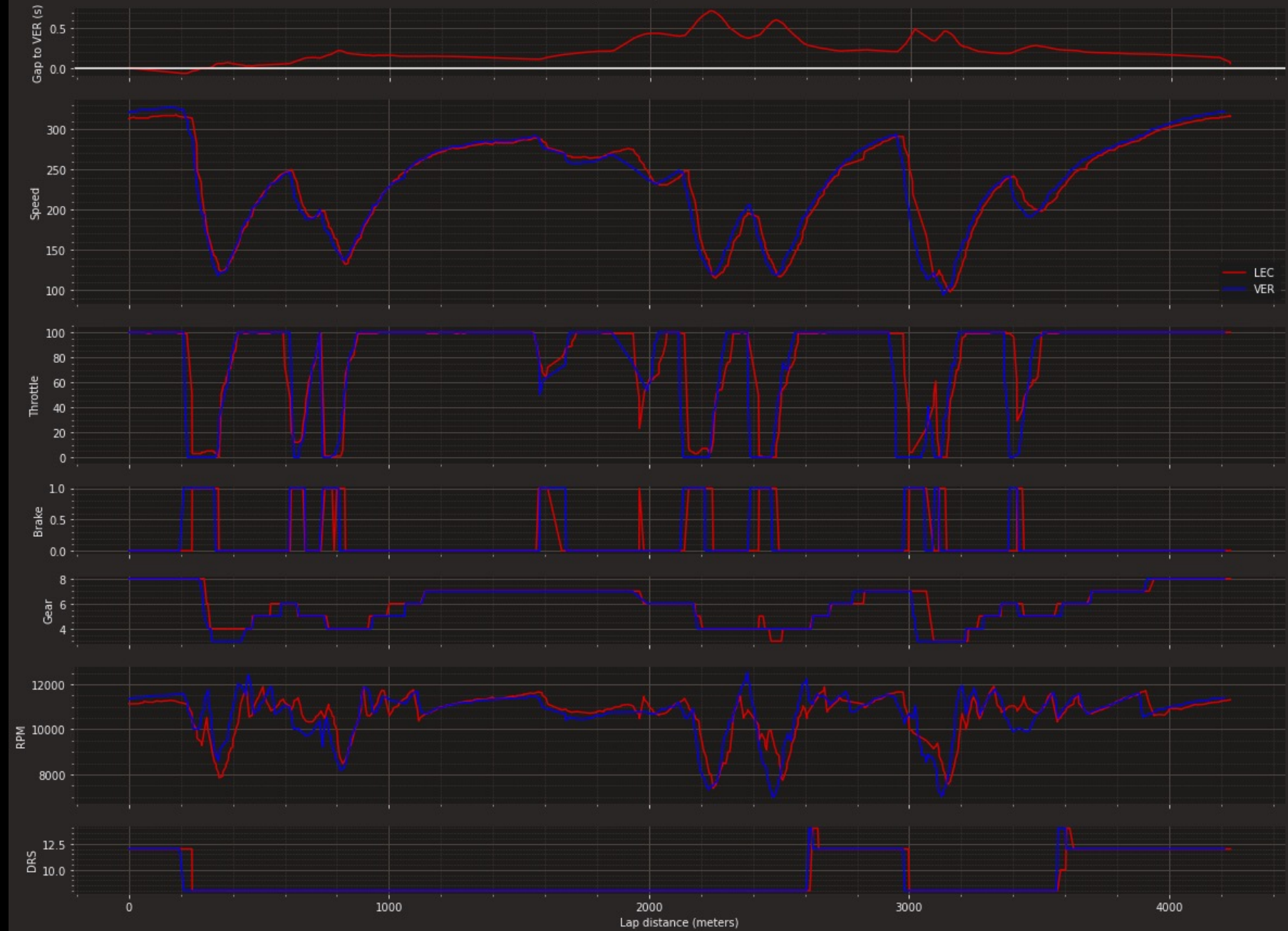


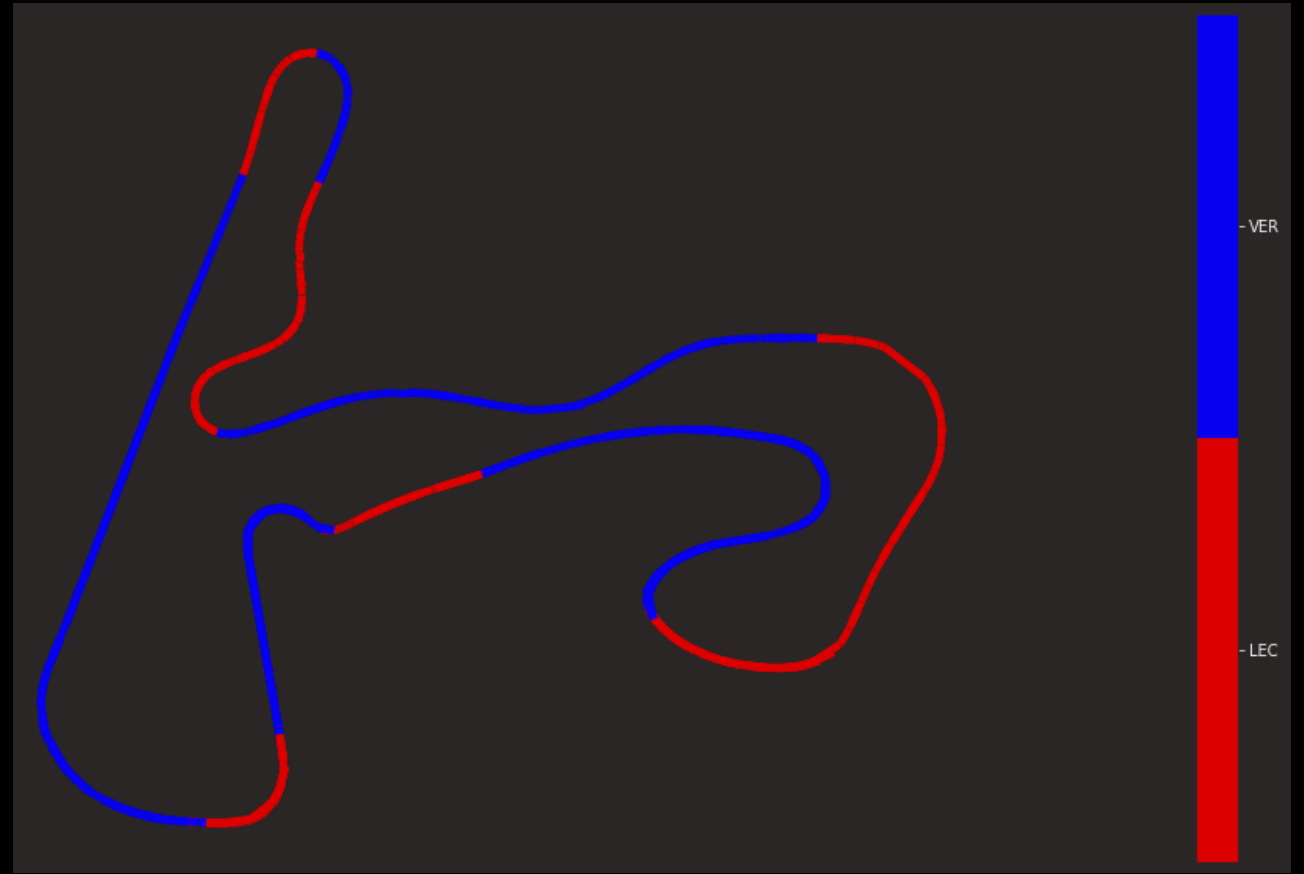
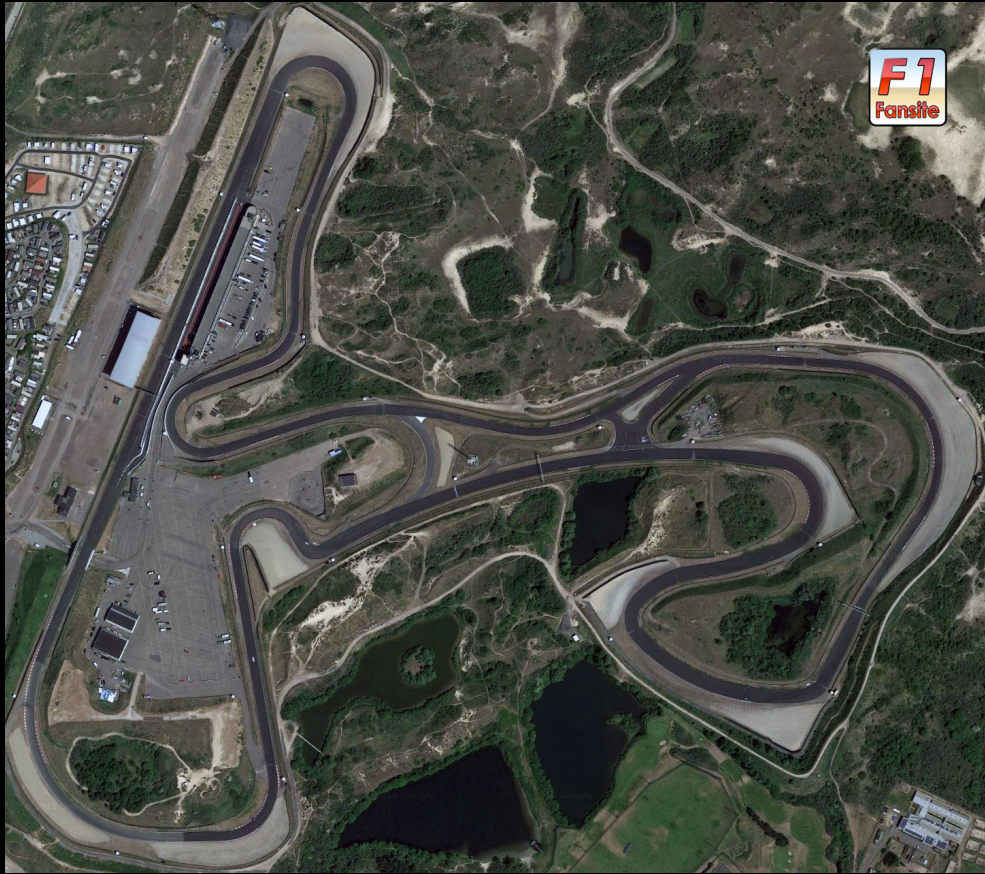
Mirco Bartolozzi

@F1DataAnalysis (50k followers on Twitter)

Mechanical Engineer
PhD in Vehicle Testing

Telemetry comparison LEC vs. VER





Let's talk **coding**



```
import fastf1 as ff1
```

Let's talk **coding**



```
import fastf1 as ff1
```

```
# Enable the cache
```

```
ff1.Cache.enable_cache('cache')
```

Let's talk coding



```
import fastf1 as ff1

# Enable the cache
ff1.Cache.enable_cache('cache')

# Specify the session (no data downloaded yet)
session = ff1.get_session(2022, 'Zandvoort', 'Q')
```

Let's talk coding



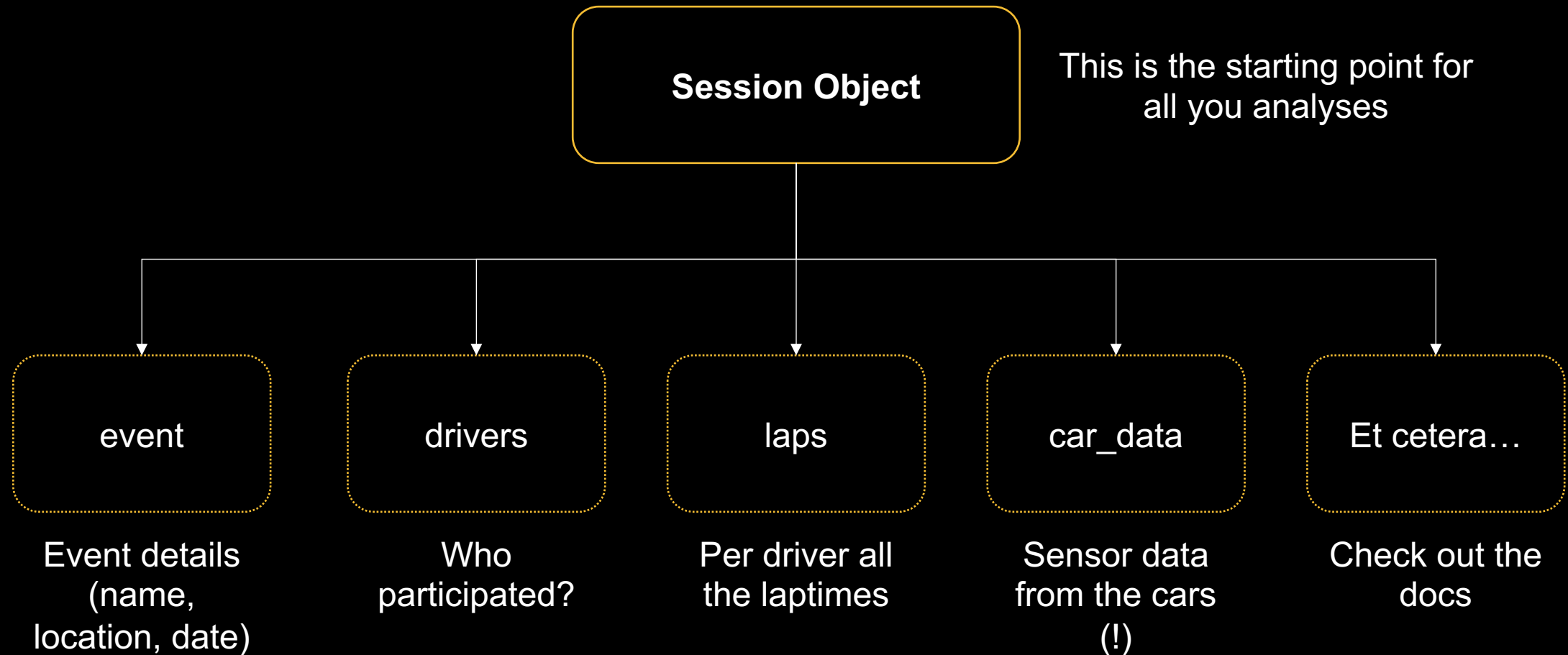
```
import fastf1 as ff1

# Enable the cache
ff1.Cache.enable_cache('cache')

# Specify the session (no data downloaded yet)
session = ff1.get_session(2022, 'Zandvoort', 'Q')

# Download the data
session.load()
```

What is a **session** object?



How to analyze laps?

Remember our **session** variable?



```
session.laps
```


How to analyze laps?

Remember our **session** variable?

	Time	DriverNumber	LapTime	LapNumber	Stint	PitOutTime	PitInTime	Sector1Time	Sector2Time	Sector3Time	...	Is
0	0 days 00:21:09.642000	1	NaT	1	1	0 days 00:19:46.866000	NaT	NaT	0 days 00:00:30.588000	0 days 00:00:22.747000	...	
1	0 days 00:22:20.959000	1	0 days 00:01:11.317000	2	1	NaT	NaT	0 days 00:00:24.455000	0 days 00:00:24.776000	0 days 00:00:22.086000	...	
2	0 days 00:24:07.220000	1	0 days 00:01:46.261000	3	2	NaT	0 days 00:24:03.490000	0 days 00:00:34.813000	0 days 00:00:37.411000	0 days 00:00:34.037000	...	
3	0 days 00:48:49.924000	1	NaT	4	2	0 days 00:47:27.401000	NaT	NaT	0 days 00:00:29.760000	0 days 00:00:22.891000	...	
4	0 days 00:50:00.851000	1	0 days 00:01:10.927000	5	2	NaT	NaT	0 days 00:00:24.529000	0 days 00:00:24.644000	0 days 00:00:21.754000	...	
...	
274	0 days 00:17:38.487000	6	NaT	1	1	0 days 00:16:03.595000	NaT	NaT	0 days 00:00:31.119000	0 days 00:00:25.250000	...	
275	0 days 00:18:51.840000	6	0 days 00:01:13.353000	2	1	NaT	NaT	0 days 00:00:25.080000	0 days 00:00:25.871000	0 days 00:00:22.402000	...	
276	0 days 00:20:32.590000	6	0 days 00:01:40.750000	3	2	NaT	0 days 00:20:31.017000	0 days 00:00:32.807000	0 days 00:00:33.179000	0 days 00:00:34.764000	...	
277	0 days 00:31:32.716000	6	NaT	4	2	0 days 00:29:56.836000	NaT	NaT	0 days 00:00:30.243000	0 days 00:00:26.444000	...	
278	0 days 00:33:27.814000	6	0 days 00:01:55.098000	5	2	NaT	0 days 00:33:23.464000	0 days 00:00:24.653000	0 days 00:00:46.173000	0 days 00:00:44.272000	...	

How to analyze laps?

What if we want to find laps of **one driver**?



```
# Get all laps from Latifi  
session.laps.pick_driver('LAT')
```

How to analyze laps?

What if we want to find laps of **one driver**?

	Time	DriverNumber	LapTime	LapNumber	Stint	PitOutTime	PitInTime	Sector1Time	Sector2Time	Sector3Time	...	Is
274	0 days 00:17:38.487000	6	NaT	1	1	0 days 00:16:03.595000	NaT	NaT	0 days 00:00:31.119000	0 days 00:00:25.250000	...	
275	0 days 00:18:51.840000	6	0 days 00:01:13.353000	2	1	NaT	NaT	0 days 00:00:25.080000	0 days 00:00:25.871000	0 days 00:00:22.402000	...	
276	0 days 00:20:32.590000	6	0 days 00:01:40.750000	3	2	NaT	0 days 00:20:31.017000	0 days 00:00:32.807000	0 days 00:00:33.179000	0 days 00:00:34.764000	...	
277	0 days 00:31:32.716000	6	NaT	4	2	0 days 00:29:56.836000	NaT	NaT	0 days 00:00:30.243000	0 days 00:00:26.444000	...	
278	0 days 00:33:27.814000	6	0 days 00:01:55.098000	5	2	NaT	0 days 00:33:23.464000	0 days 00:00:24.653000	0 days 00:00:46.173000	0 days 00:00:44.272000	...	

How to analyze laps?

How do we find the **fastest**?



```
session.laps.pick_driver('LAT').pick_fastest()
```

How to analyze laps?

How do we find the **fastest**?

```
Time                0 days 00:18:51.840000
DriverNumber        6
LapTime             0 days 00:01:13.353000
LapNumber           2
Stint               1
PitOutTime          NaT
PitInTime           NaT
Sector1Time         0 days 00:00:25.080000
Sector2Time         0 days 00:00:25.871000
Sector3Time         0 days 00:00:22.402000
Sector1SessionTime  0 days 00:18:03.567000
Sector2SessionTime  0 days 00:18:29.438000
Sector3SessionTime  0 days 00:18:51.840000
SpeedI1             279.0
SpeedI2             283.0
SpeedFL             311.0
SpeedST             251.0
IsPersonalBest      True
Compound            SOFT
TyreLife            2.0
FreshTyre           True
LapStartTime        0 days 00:17:38.487000
Team                Williams
Driver              LAT
TrackStatus         1
IsAccurate          True
LapStartDate        2022-09-03 13:02:38.497000
Name: 275, dtype: object
```

How to analyze laps?

And finally... how do we get **telemetry**?



```
# Get telemetry of the fastest lap from Latifi  
session.laps.pick_driver('LAT').pick_fastest().get_telemetry()
```

How to analyze laps?

And finally... how do we get **telemetry**?

Ahead	DistanceToDriverAhead	Time	RPM	Speed	nGear	Throttle	Brake	DRS	Source	Distance	RelativeDistance	Status	X	Y	Z
	407.412500	0 days 00:00:00	11536	313	8	100	False	12	interpolation	0.107189	0.000025	OnTrack	493	3744	535
	407.412500	0 days 00:00:00.017000	11550	314	8	100	False	12	car	1.589167	0.000375	OnTrack	499	3758	536
	407.412500	0 days 00:00:00.070000	11552	314	8	100	False	12	pos	6.209185	0.001465	OnTrack	518	3804	537
23	407.412500	0 days 00:00:00.177000	11554	314	8	100	False	12	car	15.544722	0.003667	OnTrack	560	3908	537
23	401.145833	0 days 00:00:00.430000	11596	315	8	100	False	12	pos	37.741692	0.008902	OnTrack	665	4161	537
...
23	400.437500	0 days 00:01:13.070000	11462	310	8	100	False	12	pos	4202.384375	0.991227	OnTrack	405	3520	537
23	391.127500	0 days 00:01:13.138000	11490	311	8	100	False	12	car	4208.267500	0.992615	OnTrack	426	3576	537
23	386.038611	0 days 00:01:13.230000	11504	311	8	100	False	12	pos	4216.233690	0.994494	OnTrack	456	3650	537
23	380.949722	0 days 00:01:13.298000	11519	312	8	100	False	12	car	4222.134167	0.995885	OnTrack	477	3704	536
23	380.949722	0 days 00:01:13.353000	11536	313	8	100	False	12	interpolation	4226.917779	0.997014	OnTrack	494	3748	535

Questions so far?

Let's bring this into practice

If you have **Python** and
Jupyter installed, start it up
now



```
Jaspers-MacBook-Pro % jupyter-notebook
```

If not, no worries.

I will share resources afterwards

Notebook

Links to tutorials

Slide deck

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