

Recognition of epileptic seizures from EEG data

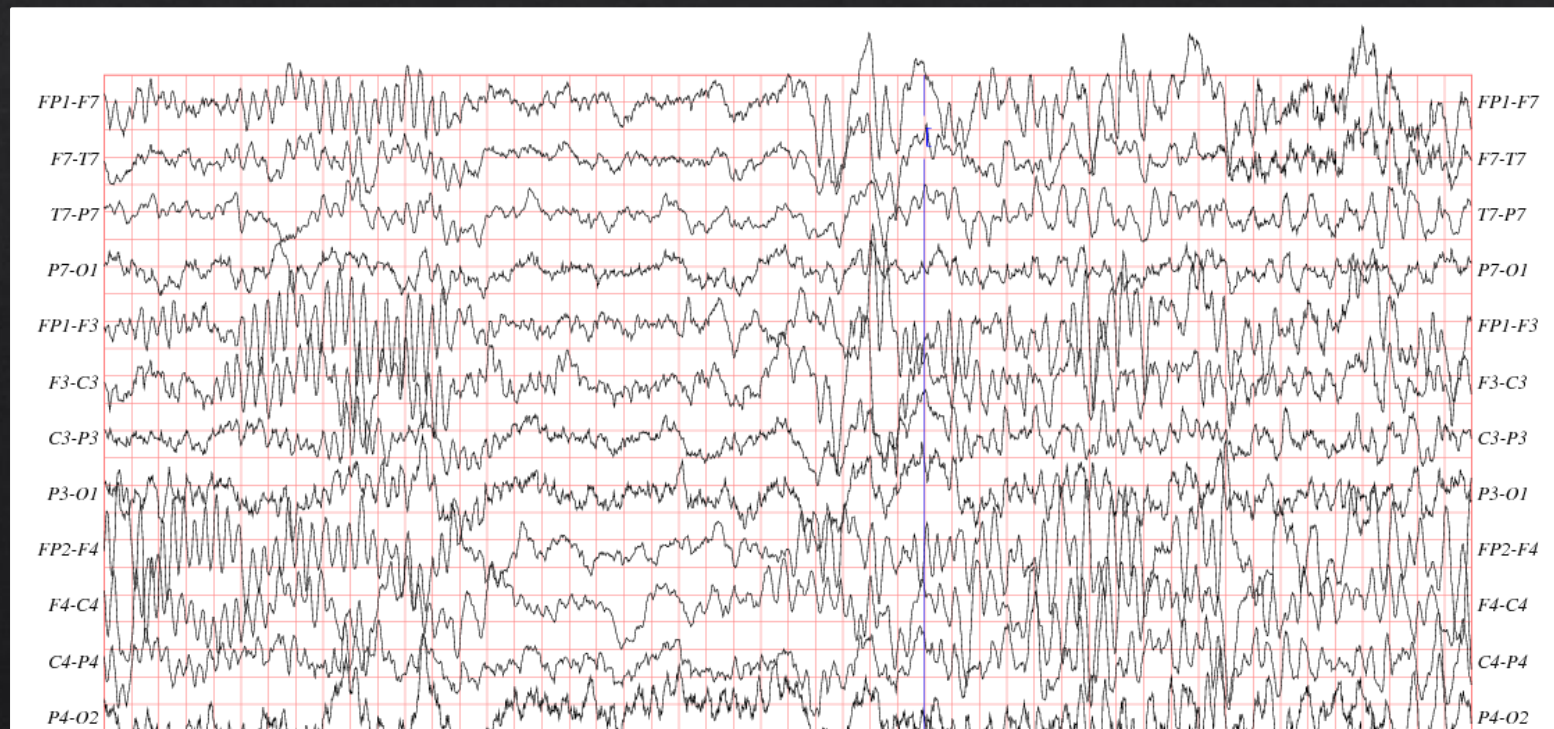
Christian Espinosa

Seizure Recognition
Motivation

Seizure Recognition

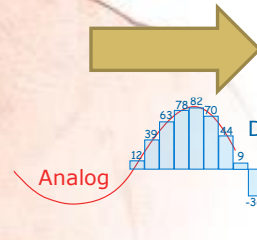
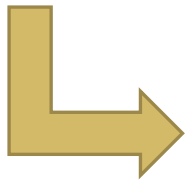
What is a EEG?

Electroencephalogram



ational 10-20 system

The diagram illustrates the international 10-20 EEG system. The top part shows a lateral view of a human brain with electrodes placed at specific locations, labeled with letters and numbers (e.g., F7, T7, P7, O7, F8, T8, P8, O8). The bottom part shows a corresponding EEG waveform, which is a line graph with multiple channels labeled on the right: F7-F8, T7-T8, P7-P8, and O7-O8. The waveform shows a series of peaks and troughs, representing electrical activity recorded from these electrodes.



```

E1P1F0del1data . . .
E1T1F0data2: .data . . .
E1P1F0data3: .data . . .
P1C1O1data4 .data . . .
E1P1F0del5data . . .

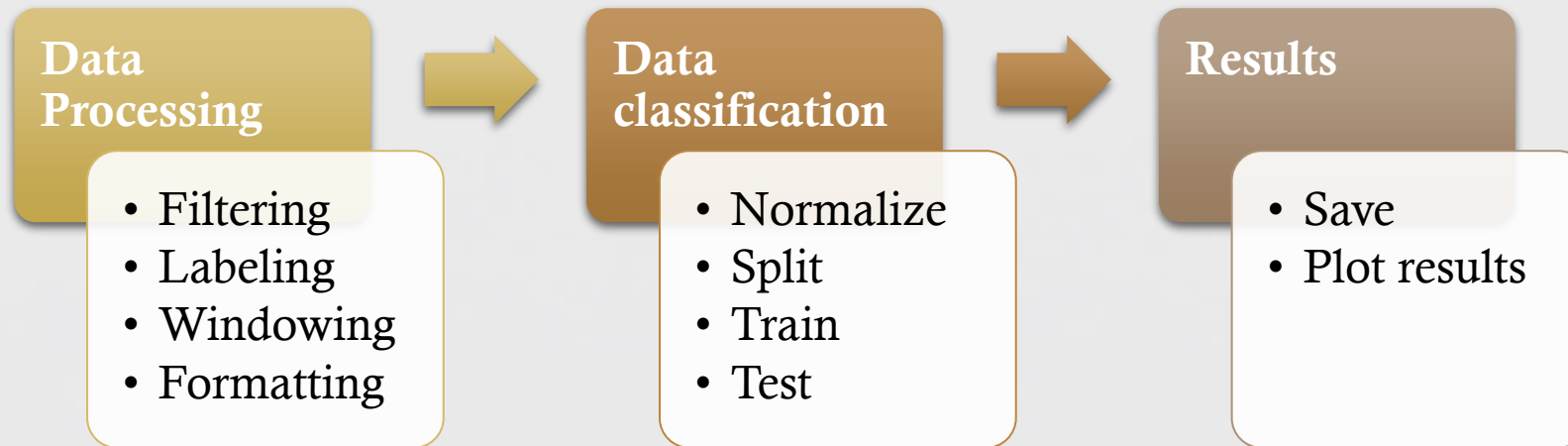
```

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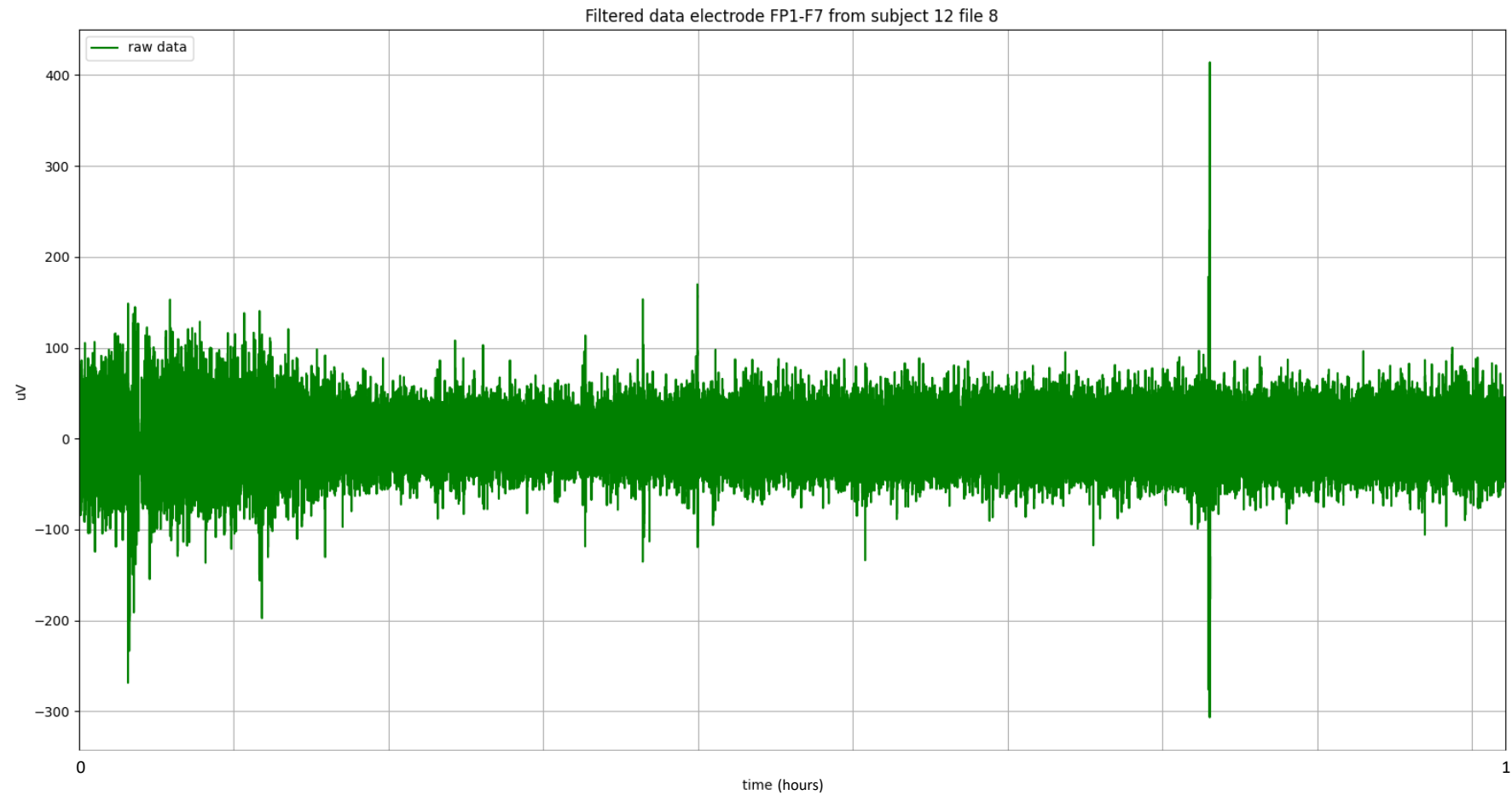
CHB-MIT Scalp EEG Database

- ◆ 23 cases
 - ◆ 9 to 42 .edf files
- ◆ 256Hz, 16bit resolution
- ◆ 22 electrodes
- ◆ 1 to 4 hours long
- ◆ Interruptions

Pipeline

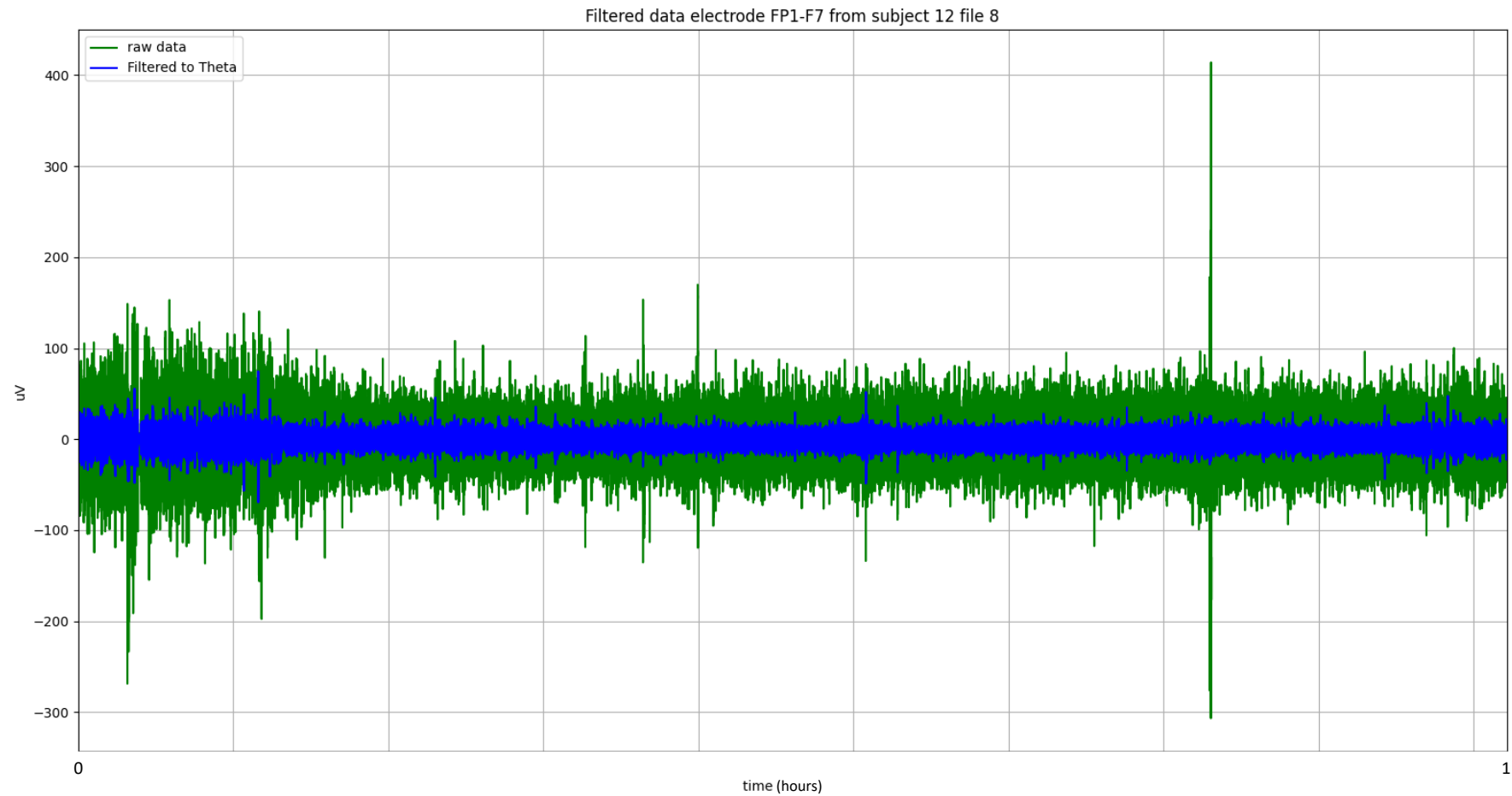


Data processing

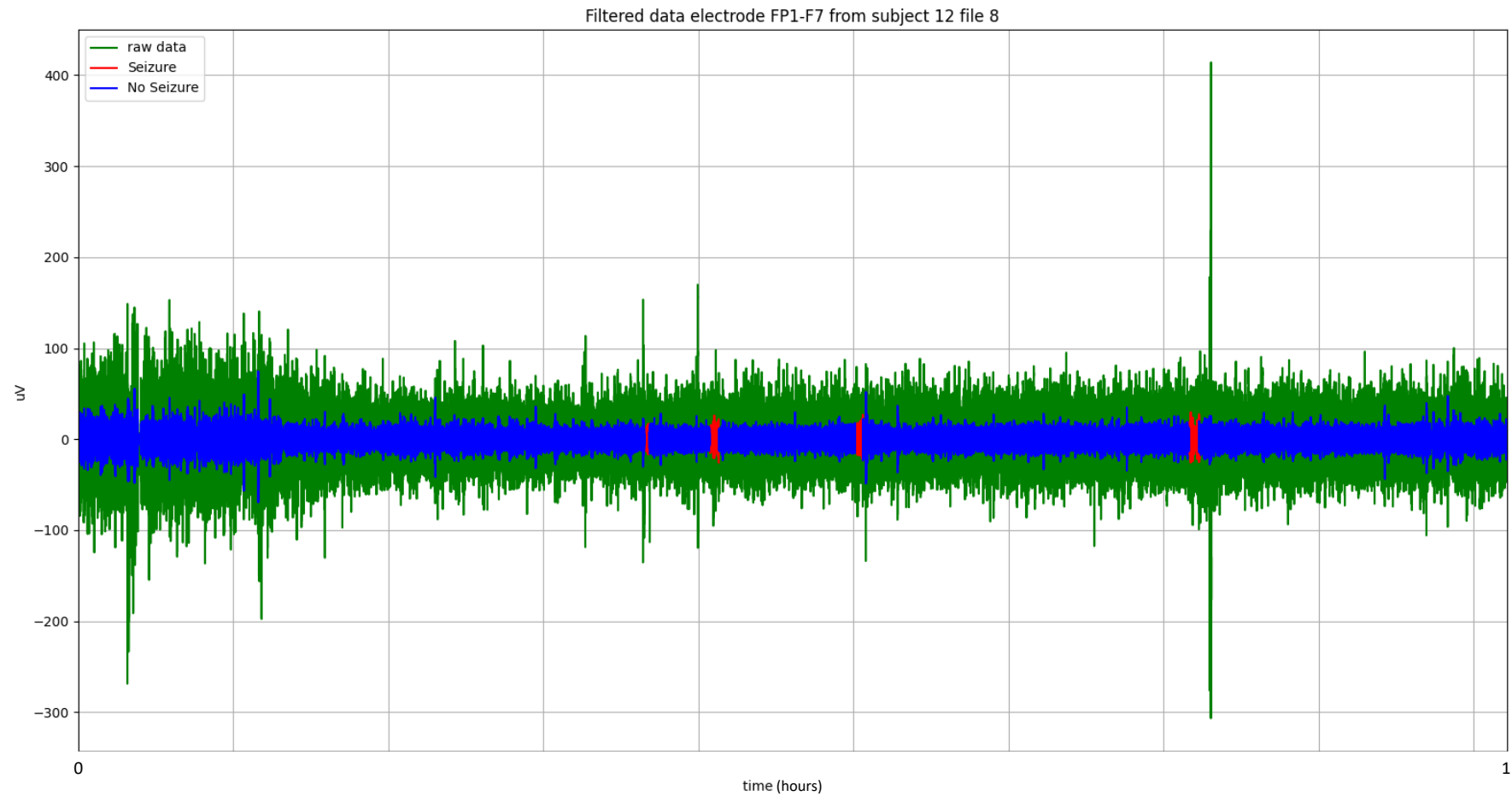


Data processing

Butter band pass filter: Theta 4Hz – 8Hz



Data processing



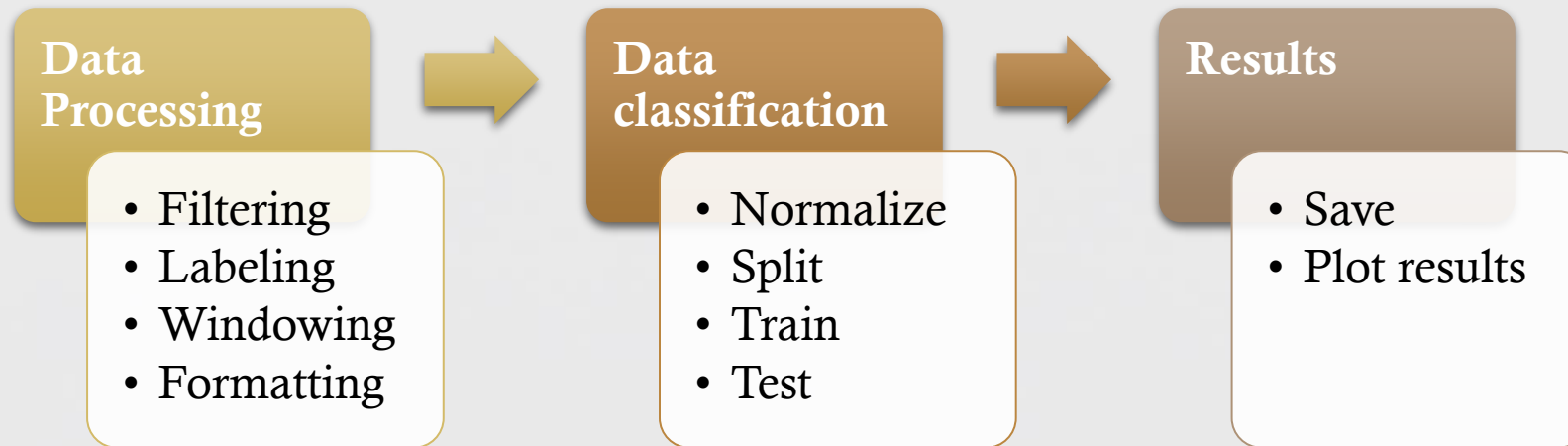
Data processing

- ◆ Filtering
- ◆ Labeled data in parquet
- ◆ Windowed data in numpy
- ◆ Modular code



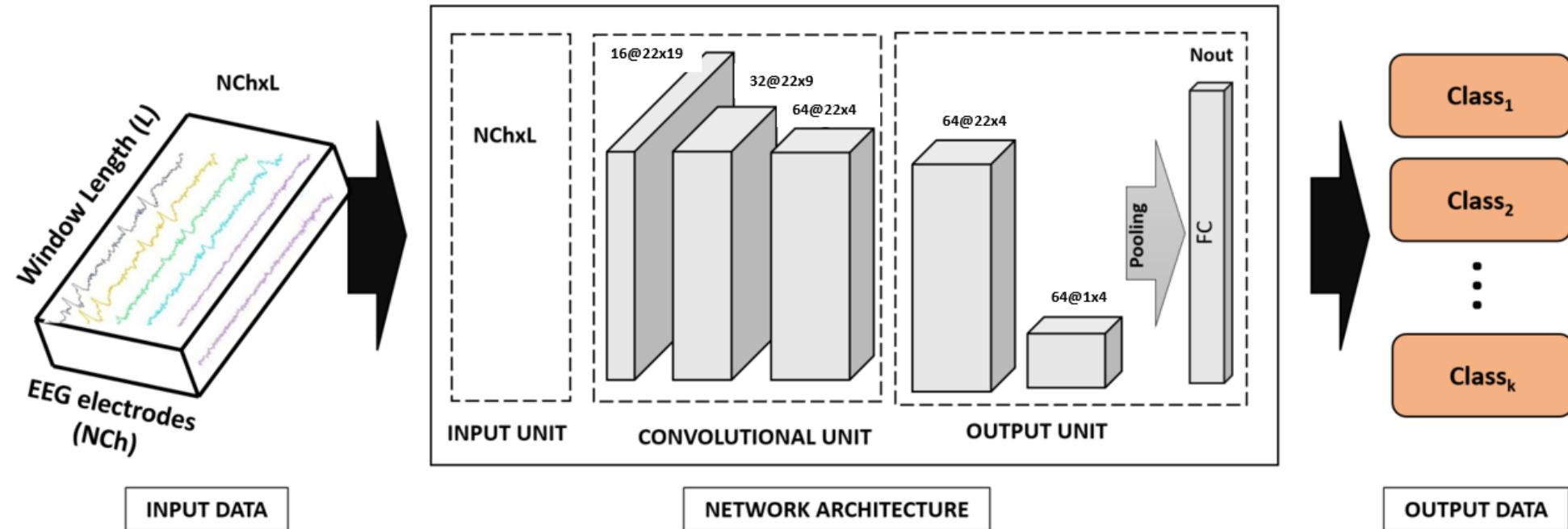
- ◆ data_x
 - ◆ n_windows
 - ◆ electrodes
 - ◆ values
- ◆ data_y
 - ◆ num_seizure_window
 - ◆ window_seizure

Pipeline



Data classification

- Model CNN ProjOut Conv



Data classification

- ◆ Execution modes
 - ◆ Check model
 - ◆ Train
 - ◆ Test

Data classification

- ◆ Execution modes → cuda
 - ◆ Check model
 - ◆ Train
 - ◆ Test



Data classification

- ◆ Execution modes

- ◆ Check model → torch.rand

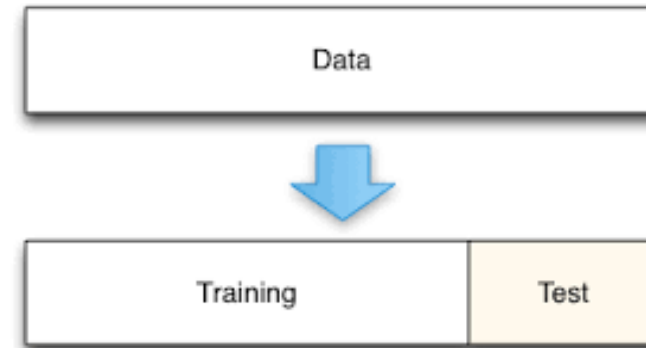
- ◆ Train

- ◆ Test



Data classification

- ◆ Execution modes
 - ◆ Check model
 - ◆ Train → {
 - ◆ From 1 to 10 case
 - ◆ 0% to split
 - ◆ Test



Data classification

- ◇ Execution modes
 - ◇ Check model
 - ◇ Train
 - ◇ Test →
 - ◇ From 11 to 16 case
 - ◇ 100% to split



Data classification

- ◆ Execution modes

- ◆ Check model

- ◆ Train

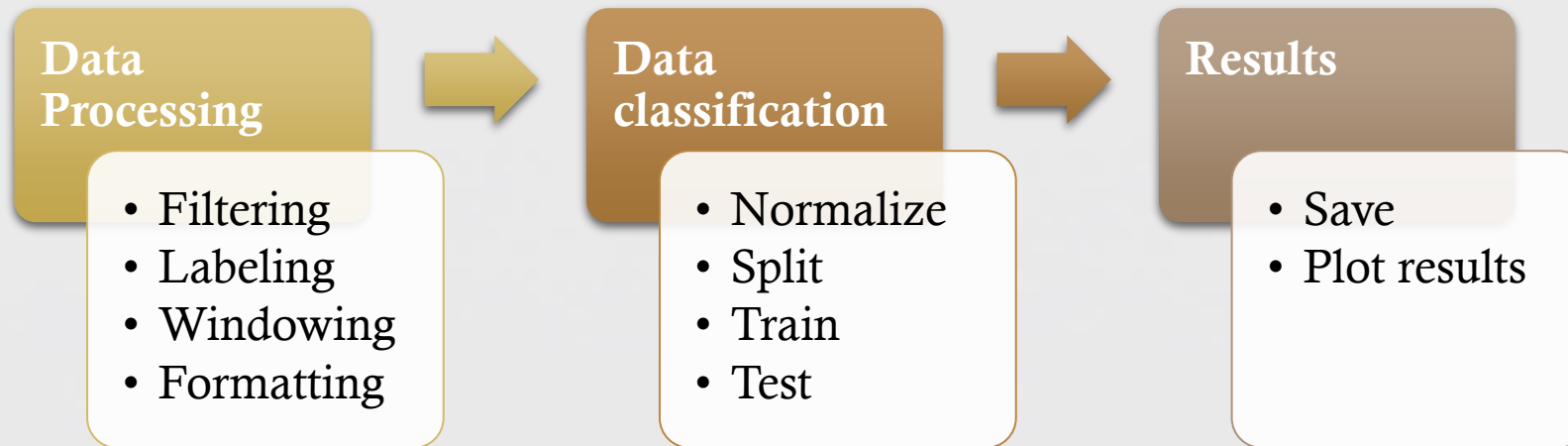
- ◆ Test



- ◆ Normalization

- ◆ Get Scalers

Pipeline



Results

	0	Accuracy
Precision	1,0	1,0
Recall	1,0	1,0
support	360.0	1,0

Results From Subject Chb14 File 11

Results



	0	1	Accuracy
Precision	0,983	0,0	0,983
Recall	1,000	0,0	0,994
F1-score	0,997	0,0	0,994
Support	358.00	2,0	0,994

Results From Subject Chb14 File 6

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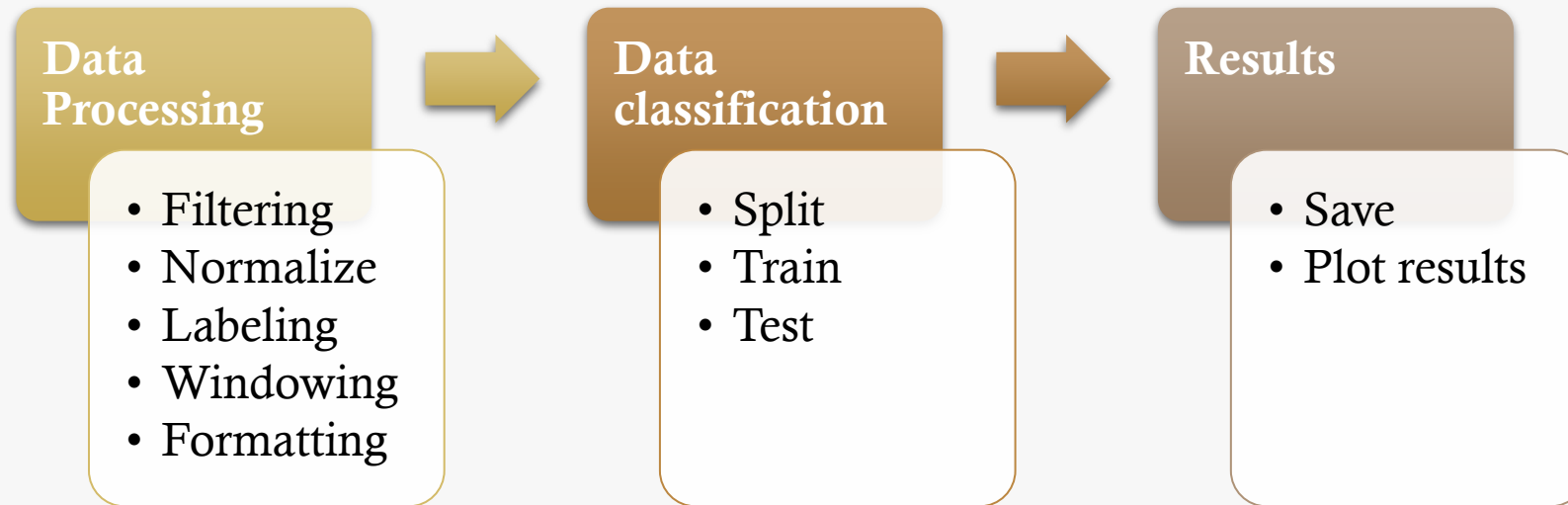
Results From Subject Chb14 File 11

	No Seizure ↓ 0	Seizure ↓ 1	Accuracy
Precision	0,983	0,0	0,983
Recall	1,000	0,0	0,994
F1-score	0,997	0,0	0,994
Support	358.00	2,0	0,994

Results From Subject Chb14 File 6

Conclusions

- ◆ Results
 - ◆ Inconsistent data processing
- ◆ Add normalization to data processing
- ◆ Different strategies



Thank you for your attention

Any Questions?