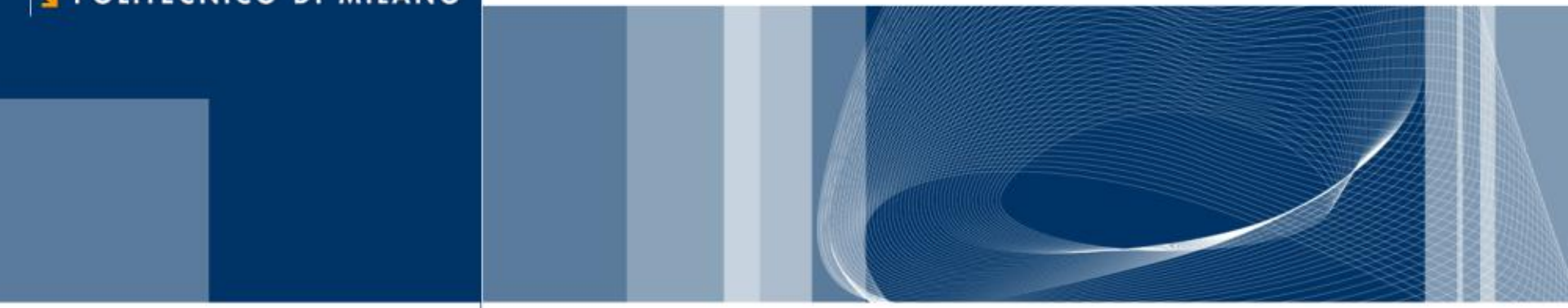
POLITECNICO DI MILANO



Non-Parametric methods application for Sleep Stages recognition.

Gaia Vettori & Filippo Castellani

What is an Hypnogram

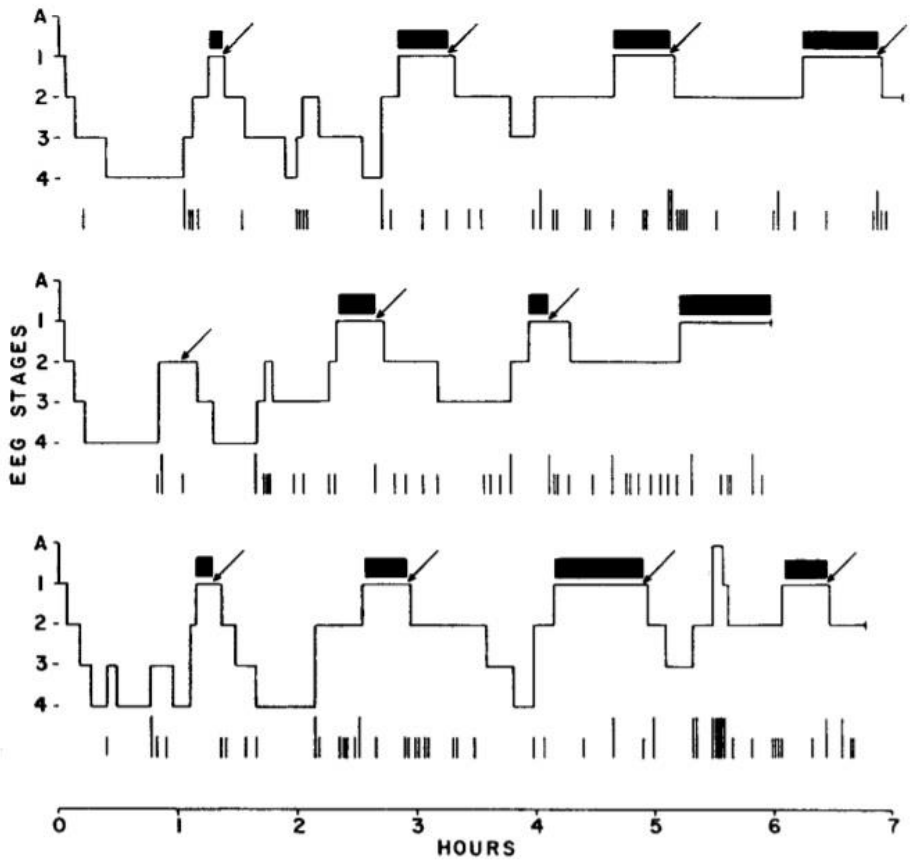


Fig. 3

Continuous plotting of the EEG patterns for three representative nights. The thick bars immediately above the EEG lines indicate periods during which rapid eye movements were seen. The vertical lines below stand for body movements. The longer vertical lines indicate major movements, changes in position of the whole body, and the shorter lines represent minor movements. The arrows indicate both the end of one EEG cycle and the beginning of the next.

Descriptions

Hypnograms are **Stages of Sleep vs Time plots.**

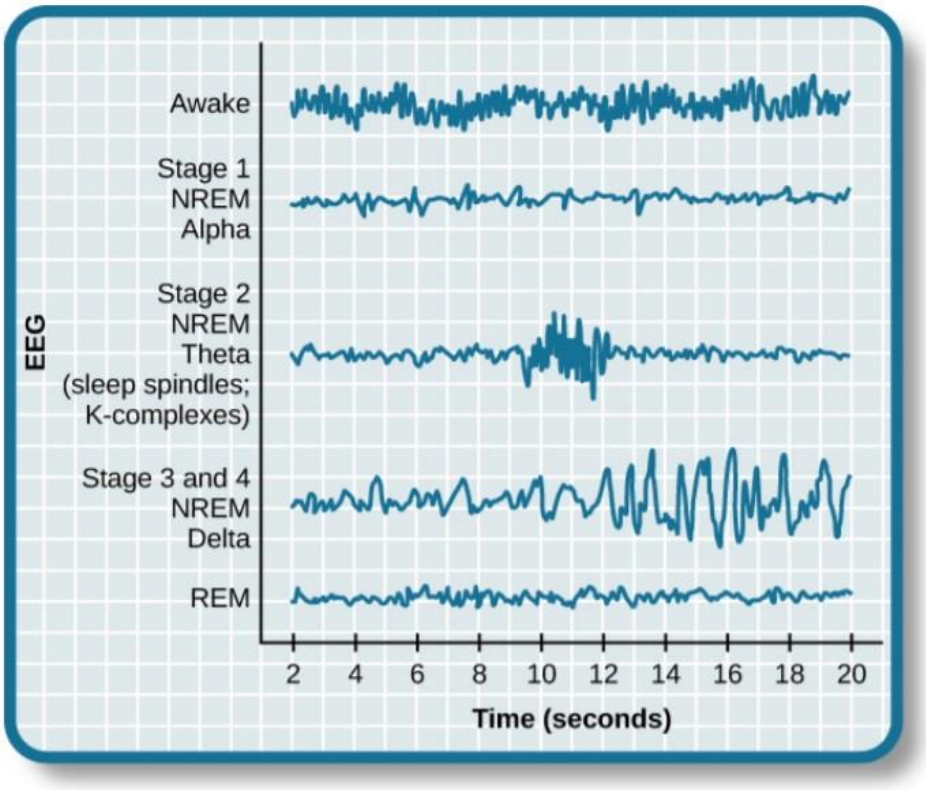
Hypnograms are **usually obtained by visually scoring the recordings** from polysomnography recordings.

Stages of Sleep

SoS characteristics

Sleep is composed of **several different stages.**

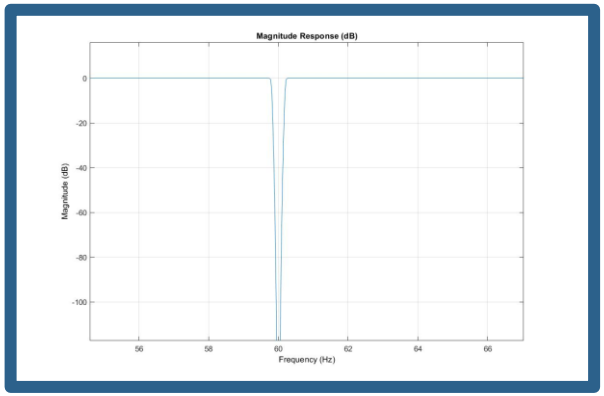
Stages are **differentiated by the patterns of brain wave activity** that occur during each stage.



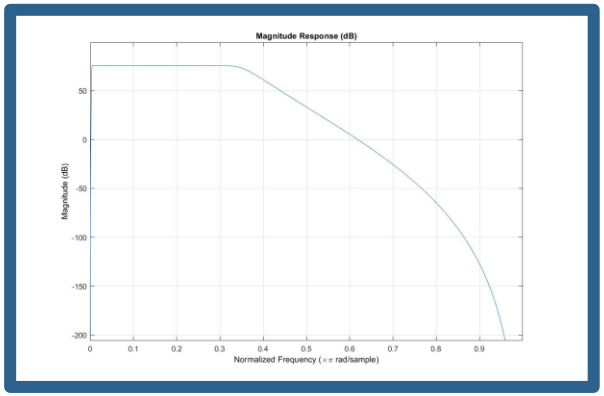
Signal Pre-Processing

original signal

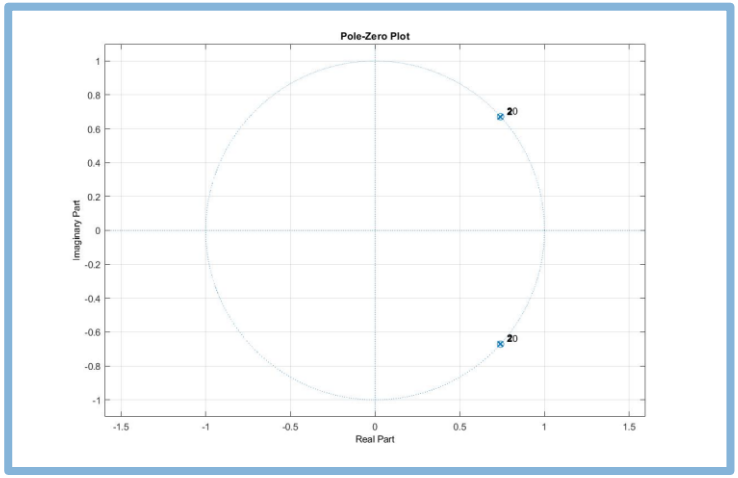
De-Noising

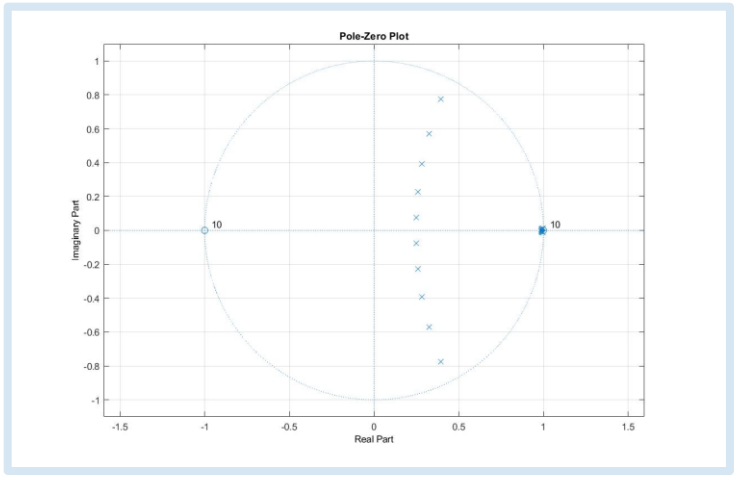


Removing high and low frequencies

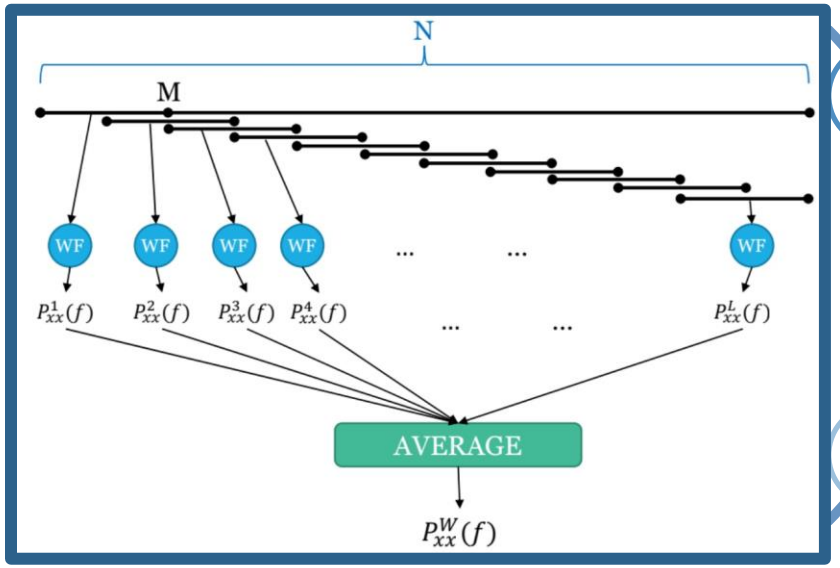


filtered signal





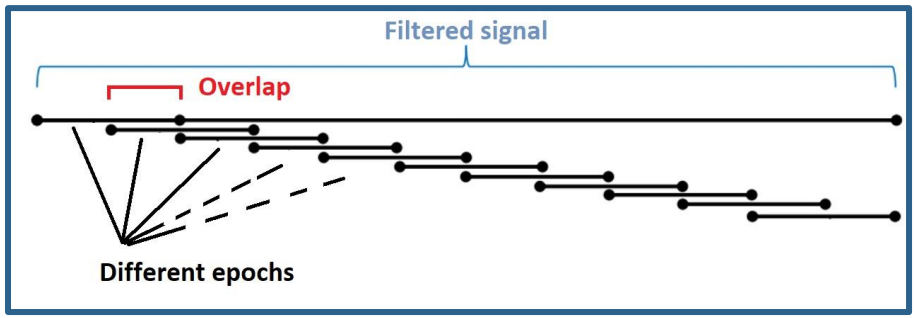
Welch's modified periodogram (non-parametric frequency analysis)



- Epoch: 30 sec (N)
- Window: 10 sec (M)
- Window type: Hann
- OL: 0.5

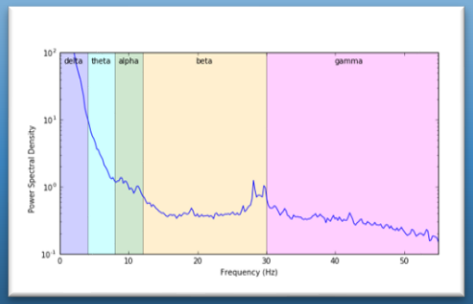
+ ***Zero padding***

This procedure has been applied **overlapping the epochs** as well

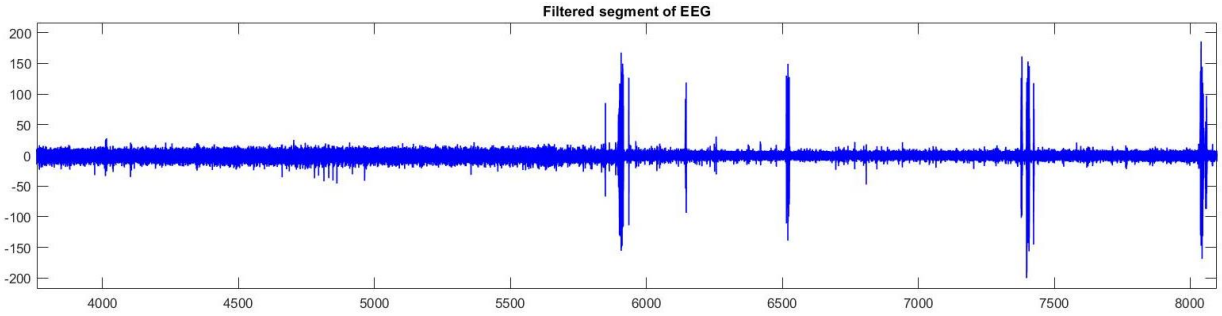


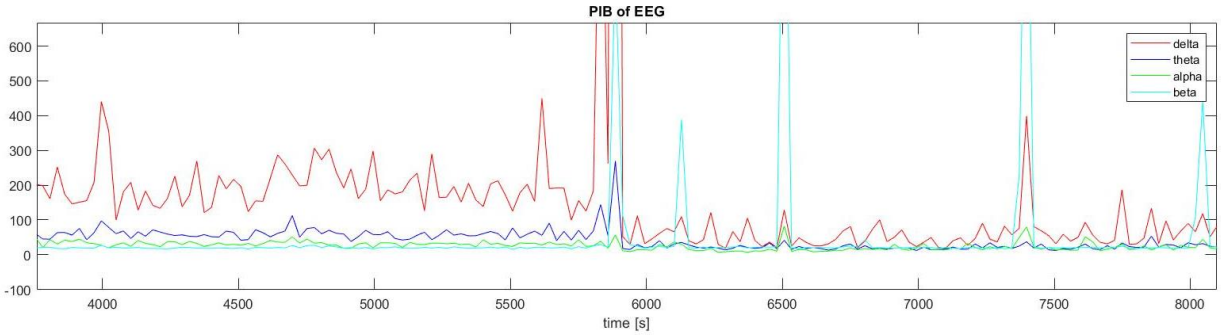
Variable Jump = 0.9
*(overlapping samples number is = M*0.9)*

Sleep Stages Classification

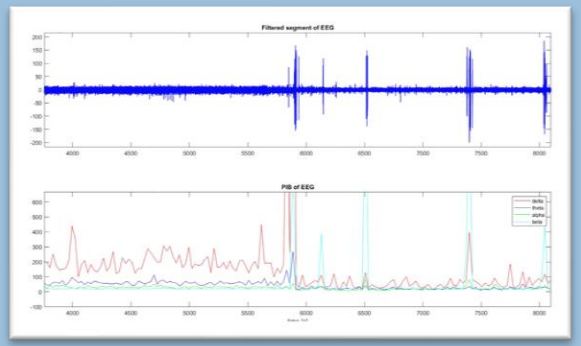


Partitioning power in four classes

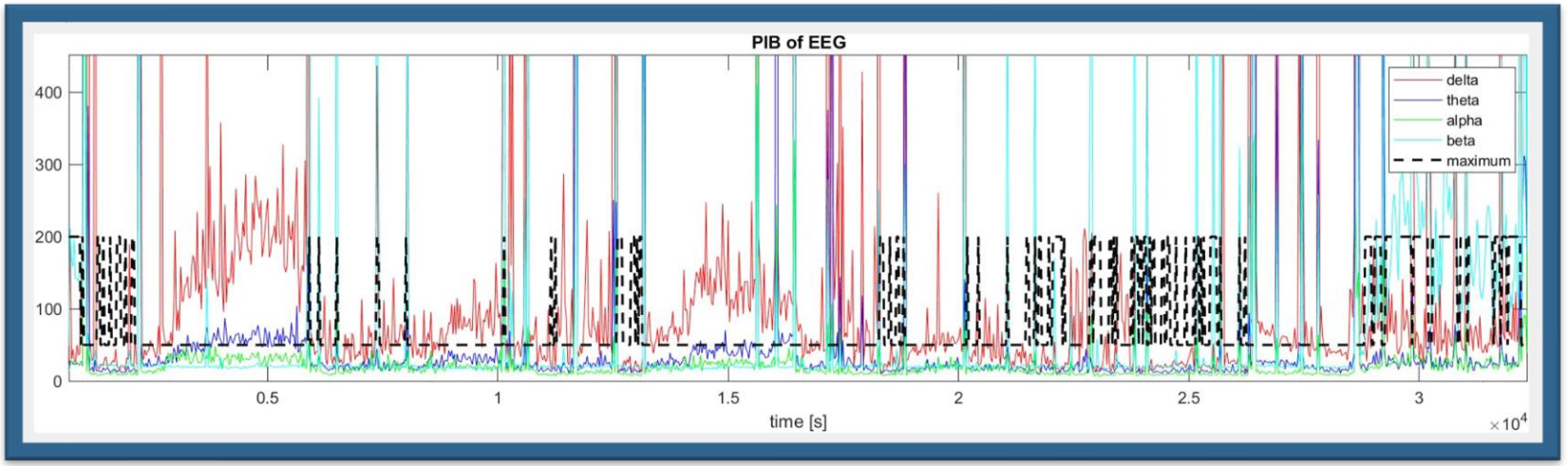




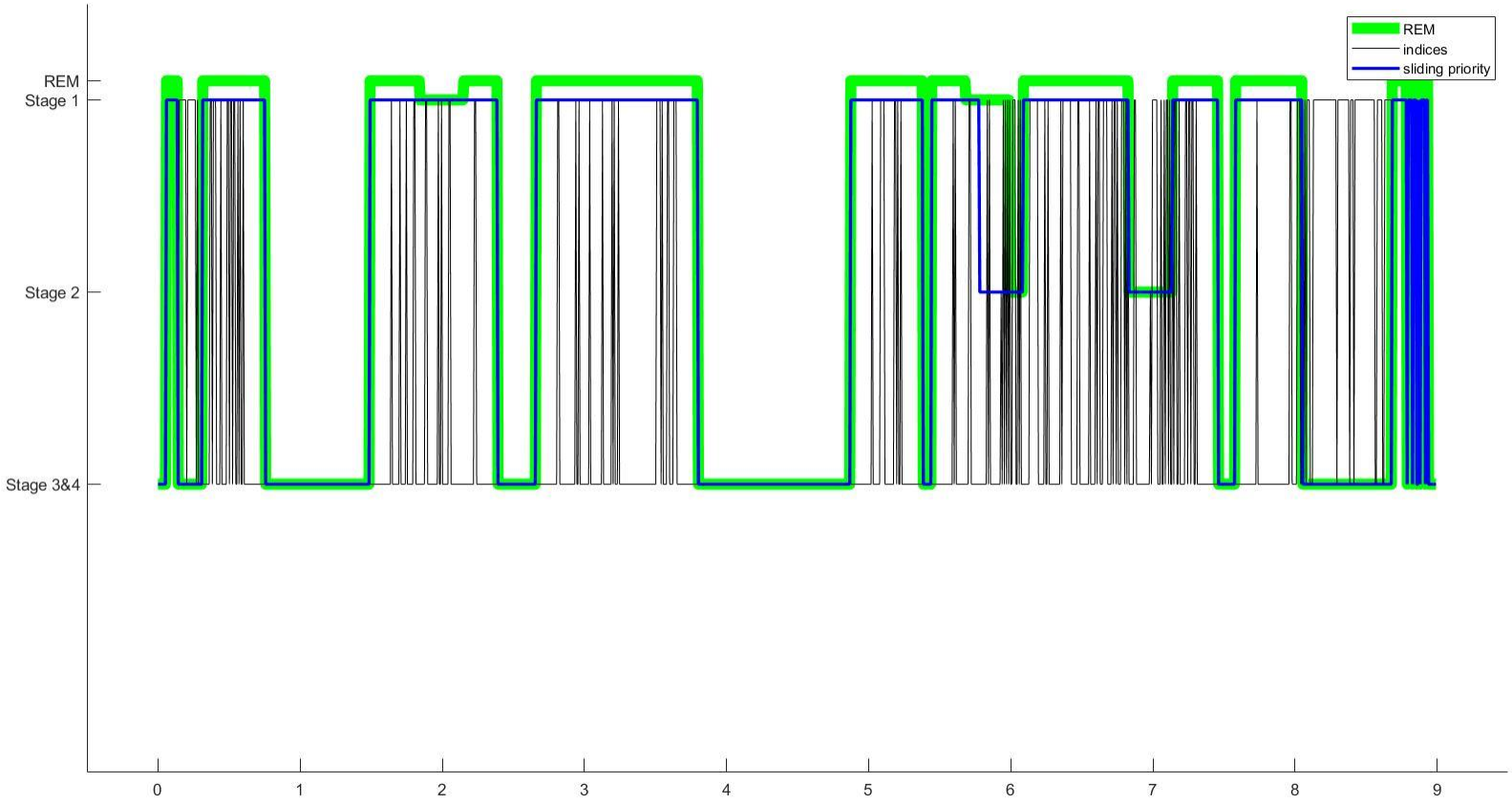
Sleep Stages Classification



*Which **band** has the **highest power ?***
$\boldsymbol{\delta}$ *vs* $\boldsymbol{\vartheta}$ *vs* $\boldsymbol{\alpha}$ *vs* $\boldsymbol{\beta}$



Results & Conclusions



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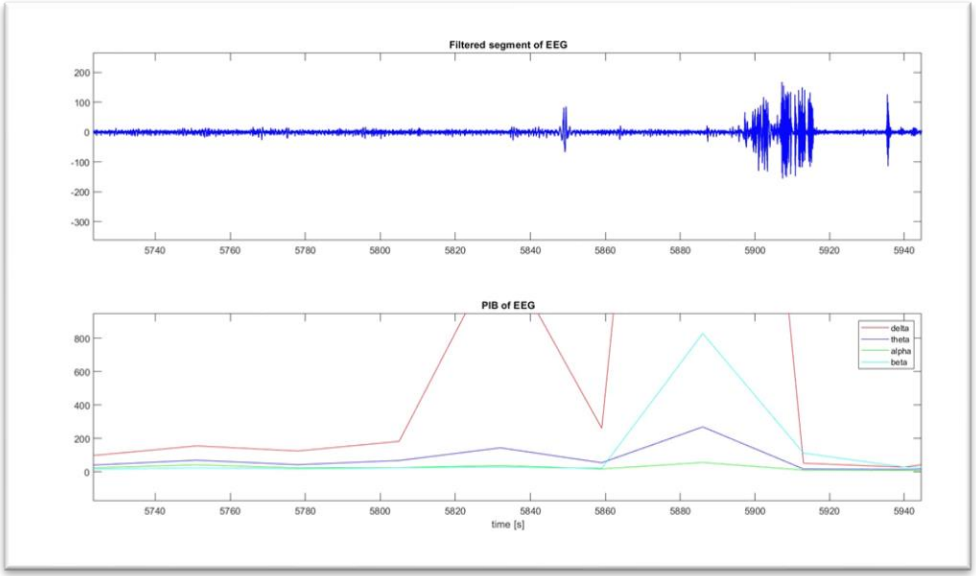
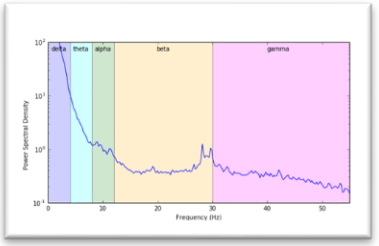
Thank you for your attention

Gaia Vettori & Filippo Castellani

Sleep Stages Classification (Priority Assignment)



$$\delta \; vs \; \vartheta \; vs \; \alpha \; vs \; \beta$$



Priority Assignment **stabilizes the winning indices plot**.
The function gives **priority to weak but crucial events** which **appear enough** times **to overcome an "occurrency threshold"**.