K-Complex detection algorithm in non-REM sleep

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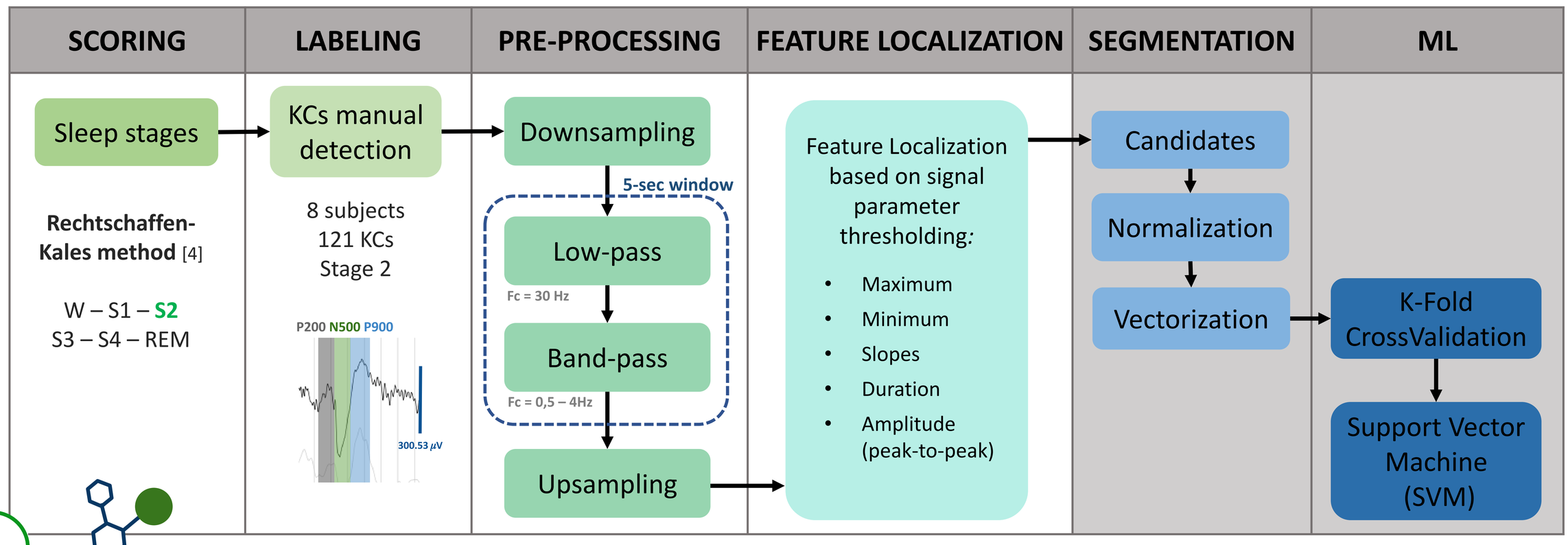
INTRODUCTION

- Slow waves orchestrate the hippocampal-cortical communication favoring the transfer of information from the hippocampus to the cortex and its long-term consolidation. [1]
- K- complex (KC) are a type of slow wave that can be evoked by different stimuli or occur spontaneously during sleep.[2]
- It is possible to induce the reactivation of specific memories through the presentation of cues linked to the learned task resulting in induced KCs and memory enhancement.[3]
  - **Main goal:** In order to evaluate the relation between KC and memory processes our main goal was to create a method with Machine Learning techniques to characterize and identify KCs.

METHODS



Programming language: Python 3.7.6 - MNE Python Library[5]

RESULTS

$$\text{SNR}_{[\text{dB}]} = 10 \times log\left(\frac{signal}{noise}\right)$$

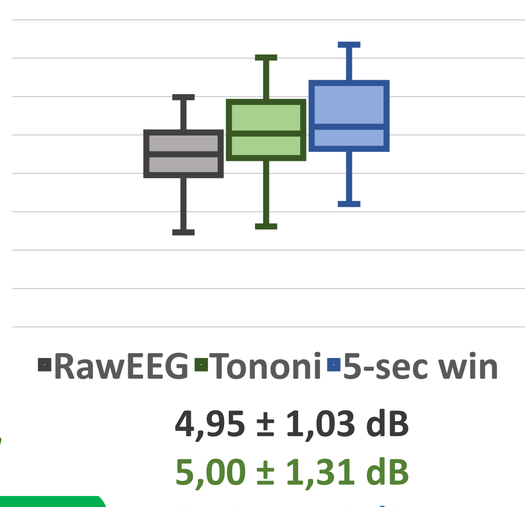
A_{pp}: Peak-to-peak amplitude

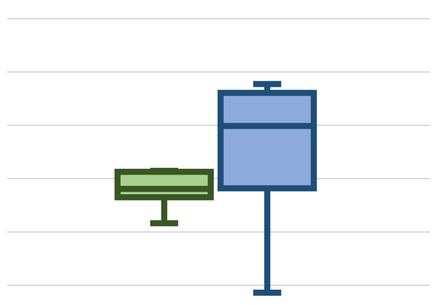
σ^2: Variance

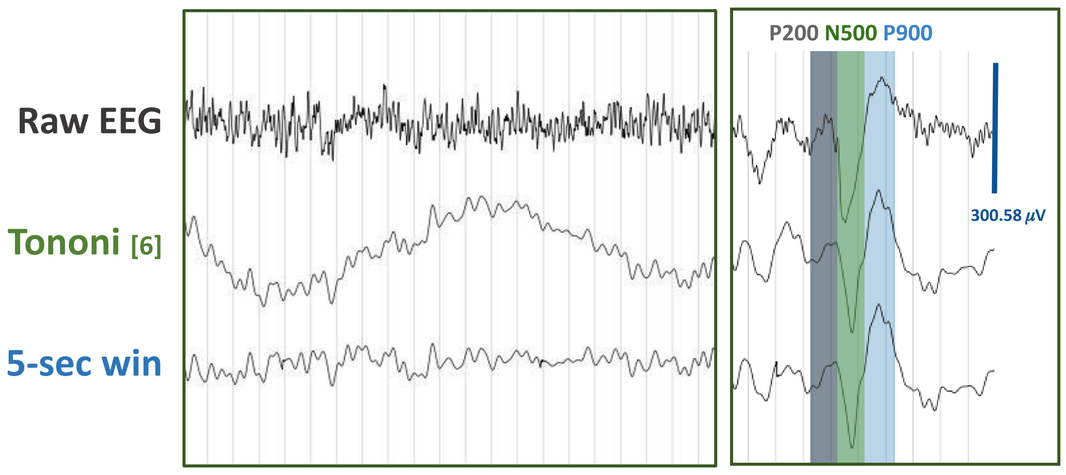
Raw: KC with no-filtering

$Filt$: KC with filtering

$$\widehat{SNR}_1 = \frac{A_{pp}}{\sigma^2}\ [\text{dB}] \qquad \widehat{SNR}_2 = \frac{Filt}{Raw - Filt}\ [\text{dB}]$$







CONCLUSIONS

- Filter improved (visual & analytical).
- Higher number of hits.

Future directions: Optimize the algorithm with SVM.

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