Slow Wave detection algorithm in non-REM sleep

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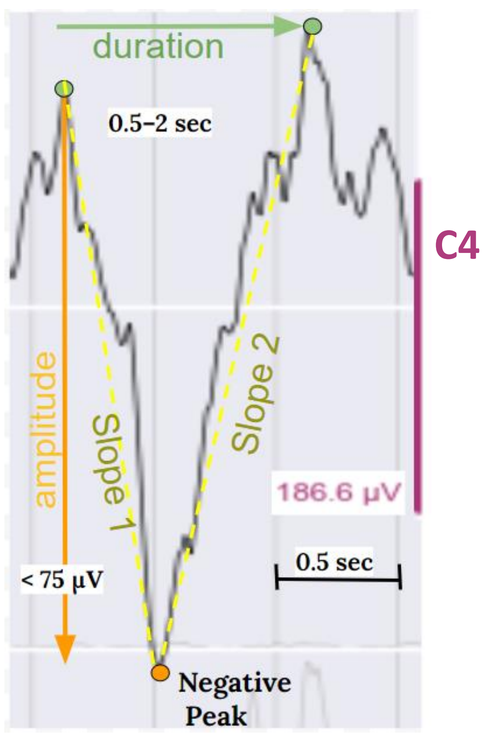
INTRODUCTION

- Slow oscillations (SO) are the most distinct type of the oscillations that hallmark the electroencephalogram (EEG) during slow-wave sleep (SWS) [1].SO alternate between "up" and "down" states with a periodicity of approximately one second [3].
- Due to the essential roles of SWS in cognition, sleep restoration and memory consolidation, multiple methods have been used to enhance SO [3][2].
- Auditory closed-loop stimulation is one of the least invasive methods and appears to be the most effective.

METHODS & RESULTS

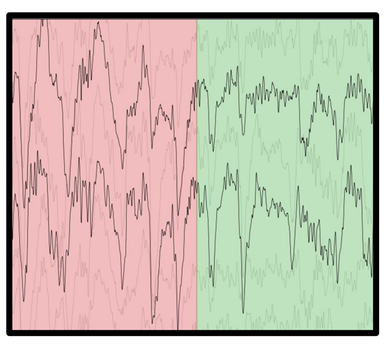
Main goal: Online detection of Slow Waves.

MIMIRs
***M**edia to **I**nvigorate **M**emory **I**n non-**R**EM **s**leep*

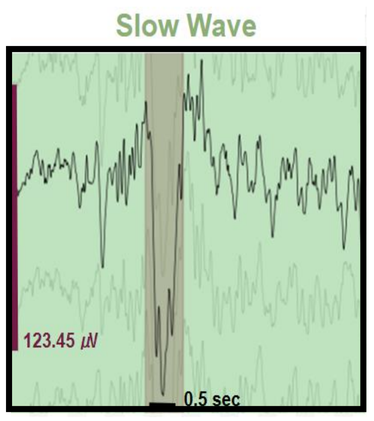


Load **Sleep Scoring**
According to
- **AASM** W, N1, N2, N3, REM
- **R & K** W, S1, S2, S3, S4, REM

Load event file
Manual labeling of events



Backwards compatible with **pre-made scoring**

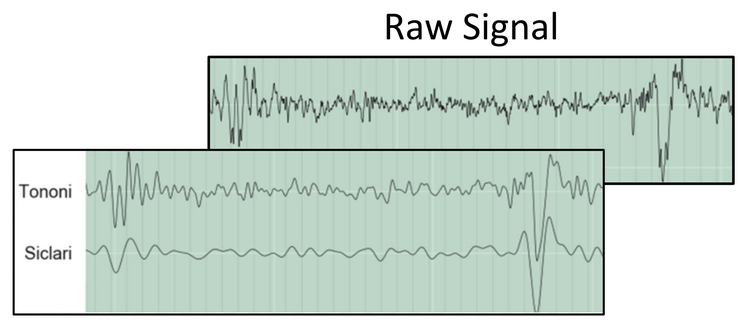


Allows **labeling specific events**

Pre-processing

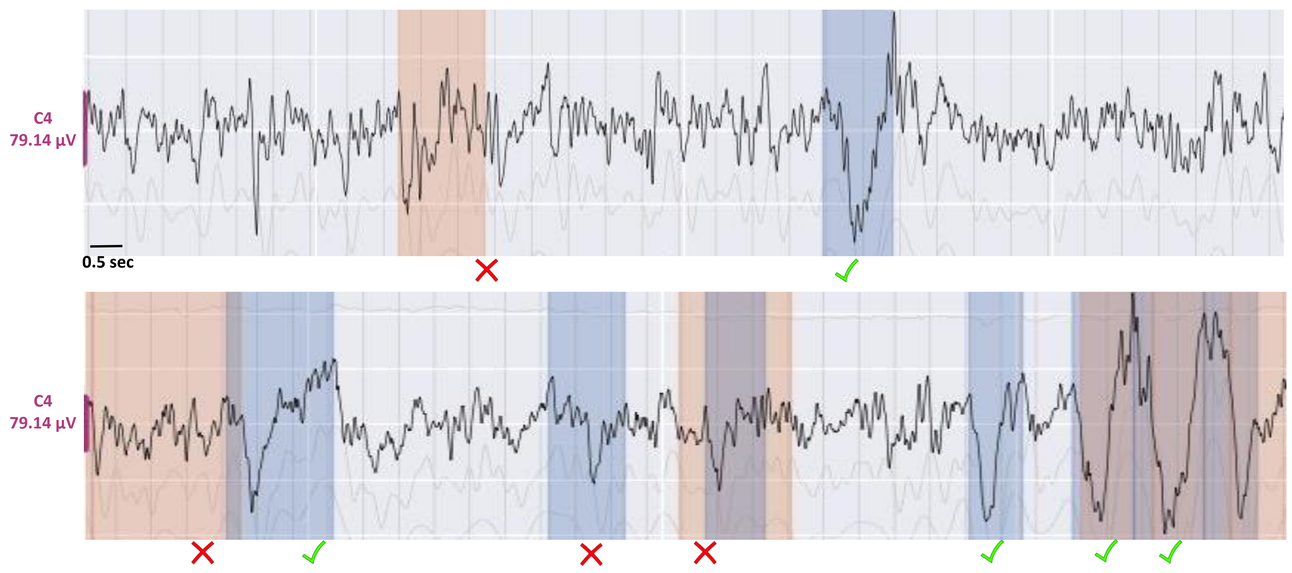
Riedner et al 2007
Mölle et al 2002
Massimini et al 2004
Carrier et al 2011
Siclari et al 2014

200 Hz → 100 Hz
Downsample
Low-pass
30 Hz
Band-pass
0,5 – 4Hz
Upsample
100 Hz → 200 Hz



This tool performs **semi-automatic labeling** to **assist** a visual expert in the **identification of signal components**. In particular, we detect **Slow Oscillations (SO)** due to their role in **memory** function.

YASA Detection **MIMIRs Detection**



Programming language:
Python 3.7.6 –MNE Python Library[6], YASA v0.3.0[5]

FUTURE DIRECTIONS

Working towards improving the MIMIRs detection algorithm. Subsequently, adding online detection and coupling it, it with auditory stimulation. In order to apply it as a treatment in patients who show a decrease in SO.

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