A Specialized Interactive Data Application for EEG-Based Sleep Studies

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Outline

- Problem
- Proposed Solution
- Case Study
- Demo
- Future Directions
Problem

Researchers experience problems managing sensor data (EEG)

- Insert the data to the software
  - Too many data types (.dat, .edf, .csv, .txt, .eeg, .NsN etc..)
  - Stimuli files are separate
- Subset the data to regions of interest and synchronize
- Fusing data from several sensors is hard and that limits experiments
A sensor specific software is too limited on the above.

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<th>Sensors with their own Software</th>
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Proposed Solution

- Close collaboration between a data scientist and a domain expert
- Share knowledge from both sides
- Instead of creating a static report, create a data app
- Intersection between general software tools and hypothesis driven reports
Demo
Experiment

- Clinically anxious vs Healthy children
- Completed one night of at-home polysomnography monitoring through an American Academy of Sleep Medicine (AASM)-accredited sleep center.
- NicoletOne Ambulatory electroencephalogram (EEG) equipment\(^1\). 6 channels
- PSG technologists performed sleep scoring in 30 second epochs on the criteria of the AASM
- 1 minute before sleep and 5 minutes after
- Spectral power differences that can not be detected with sleep scoring software

Data App

- Used R Shiny
- Processing
  - Filtering (Delta, Theta, Alpha, Sigma, Beta, Gamma)
  - Spectral Density Estimation (in filtered frequency)
  - Independent Component Analysis
- Visualization
  - Filtered Signal by Epoch.
  - Channel Boxplots.
  - Mean Spectral Density by Epoch and Channel.
  - 3D depiction of channel spectrum
Benefits

- Reproducibility
- Transparency
- Interactivity
- Flexibility & Modularity
- Not a complete “black box”
Future Work

- Create a new data app or enhance the current one to perform group comparisons
- Evaluate the same methodology to similar experiments

- Code and exemplary Data can be found in: https://github.com/GiorgosPanagopoulos/Data-app-for-sleep-EEG-analysis
Thank you

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