



COMPUTATIONAL PHYSIOLOGY LAB

# A Specialized Interactive Data Application for EEG-Based Sleep Studies

*George Panagopoulos*

*Cara Palmer*

*Rhodes, Greece 23-June-2017*

University of Houston



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

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.

## Sensors with their own Software

Emotiv

OpenBCI

BrainVision

## Tools for Data management and Visualization

Acqknowledge

Empirisoft

EEGLAB

BCI 2000

Subjectbook

# 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

- 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<sup>1</sup>. 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

<sup>1</sup>[http://www.biolinkarg.com/nicoletone\\_amb\\_eeg/folleto/folleto-nicoletone-ambulatoria-eeg.pdf](http://www.biolinkarg.com/nicoletone_amb_eeg/folleto/folleto-nicoletone-ambulatoria-eeg.pdf)

- 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



- 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*

[gpanagopoulos@uh.edu](mailto:gpanagopoulos@uh.edu)

[http://cpl.uh.edu/people/george\\_panagopoulos/](http://cpl.uh.edu/people/george_panagopoulos/)