

# Sleep EEG Data Project

## Data from the laboratory of Dr. Mary Carskadon

This project will allow you to compare sleep data from four subjects. For each of these 4 subjects, we have a baseline night (BSL) of rested sleep and a recovery night following sleep deprivation (REC). There is a separate .npz file for each subject under each of the two conditions.

For each data set, there are 3 keys: DATA, srates, and stages. (To load each .npz file, look at the loading code provided in Problem Set 4. Notice that srates needs to be converted to an integer.)

There are 9 channels in DATA:

### EEG Channels:

Channel 1: C3/A2

Channel 2: O2/A1

Channel 8: C4/A1

Channel 9: O1/A2

(See [http://en.wikipedia.org/wiki/10-20\\_system\\_\(EEG\)](http://en.wikipedia.org/wiki/10-20_system_(EEG)) for more information on the electrode naming conventions and for information about electrode locations. The channels are named “recording electrode location”/ “reference electrode location”. The reference electrodes help remove noise from the recordings.)

### EOG Channels:

Channel 3: ROC/A2

Channel 4: LOC/A1

ROC and LOC are the right and left outer canthi electrodes. The canthus is the corner of the eye.

### EMG Channels:

Channel 5: Chin EMG 1

Channel 6: Chin EMG 2

Channel 7: Chin EMG 3

With these 9 channels you can use EOG and EMG to identify REM sleep and periods of wakefulness.

DATA is a channel x samples 2-dimensional array. (So 9 x the number of samples).

srates is the sampling rate.

stages are the researcher classified stages for each 30s epoch in the data set. The classification scheme is as follows:

- 7 - Unscored (typically before lights out or after lights on, not analyzed)
- 0 - Awake
- 1 - NREM Stage 1
- 2 - NREM Stage 2
- 3 - NREM Stage 3
- 4 - NREM Stage 4
- 5 - REM Sleep
- 6 - Movement Time

(Notice the researchers separate NREM stage 3 and 4. You may find it easier to lump them together, or you may keep them separate.)

For more information about the experiment, you can re-watch the interview with Dr. Carskadon.

### **Choosing A Question**

There are many possible questions you could consider with this data set.

- How does the amount of time spent in each sleep stage change between the well-rested night and the sleep-deprived night?
- How does the amount of time spent in each sleep stage change throughout the night?
- How much variability is there between time spent in each sleep stage between different subjects?

Or, choose your own question!

You could explore these questions by using the classified states provided by the researchers, or by expanding your classification scheme to make use of all the channels of provided data and to account for all sleep stages. (We recommend you use your own classifier!)

### **Exploring This Data**

There are many possible avenues to explore with this data set. Feel free to incorporate any or all of these into your project:

- Use PANDAS to organize your data into a more useable format
- Update your automatic classifier from Problem Set 4 to make use of the additional channels in the data set. You can add in the ability to detect REM sleep and wakefulness. You can use some data to setup your classifier and leave the rest as test data.
  - What differences do you notice between EEG channels?
  - Does your classifier work well on different subjects?
  - Does it work well before and after sleep deprivation?

- Using either the data you classified automatically or the classifications provided by the researcher, what differences can you find between subjects? Between well rested sleep and recovery sleep after deprivation?
- How can this sleep data be visualized? How can you best show the differences between conditions or between subjects?