



Brain-Computer Interaction

Step 1 – EEG Data

- Load *EEG*
- Dimension of variables
 - Signal
 - Trigger
- What do these dimensions mean?

Step 2 - Triggers

- Triggers are markers of the signal. They can refer to:
 - Starting point of the trials
 - Cues
 - ...
- Triggers can be stored as:
 - Additional (analog/digital) channel (same length of the signal)
 - Timepoints
- How it is in our case?
- Can we deduce the number of trials? How?

Step 3 – Raw signals

- Plot the raw signal
- On top, plot when the triggers appear

Step 4 - Filtering

- Function *filter* in Matlab
 - `>> help filter`
- `f_a = [9 11]; % alpha band`
- `f_b = [18 22]; % beta band`
- `N = 5; % filter order`
- `[B, A] = butter(N, [f_a(1) f_b(2)]*2 / fs);`
- `s_a = filter(B, A, signal);`
- Filter signal in alpha & beta bands
([9 11] Hz & [18 22] Hz, respectively)
- Plot the two filtered signals on top of the raw signal

Step 5 – Power

- Compute the power of the signal
- Plot the s^2 of the signal

Step 6 – Single trial plots

- Plot some trials of raw signal
- Plot same trials filtered in alpha and beta bands
 - `trial_id = [55 56 74 77];`
 - `trial_timing = [-2 6];`
- What can you infer from the different plots?
 - There are (dis)similarities between different bands?
 - There are (dis)similarities between trials?

Step 7 – Grand average

- What are the differences between single trial and grand average signals?
- What is more useful for online real time BCI?
- What are the main difficulties dealing with single trial analysis?