STUDY Workshop Project Questions

Important Notes:

- Name your resulting PowerPoint slides with your presenter's name and question number, for example, '**Q9_Smith.ppt'**.
- Try to present your results in **1 slide** with 1-4 plot panels.

Questions:

1) STUDY scripting (based on basic scripting lecture)

a) Load stern.study in STUDY folder
b) Choose a cluster to investigate and plot ERP
c) Get command line call for plotting ERP (std_ploterp function)
d) Modify the script to plot spectrum instead of ERP (std_plotfreq function)
e) Export output to text file
f) Visualize output text file in another software

2) Advanced dataset and STUDY pipeline (based on advanced scripting lecture)

a) Load SimpleOddball.set dataset
b) Filter
c) Reject bad portion of data by hand
d) Re-reference to average ref. (optional)
e) Build your *datainfo.m* file using EEGLAB history (see scripting lecture)
f) Run ICA; select bad ICA components
g) Add to you *datainfo.m* file
h) Create a STUDY with this single file
i) Compare the ERP for Oddball (type 2) and Standard (type 1) and use single-trial statistics with cluster correction for multiple comparisons
j) Build a script that creates the STUDY and perform the same analysis
k) Save the figure at the end of the script in eps or jpg format ("print -deps file" command or "print –djpg file" command).
l) Run the full pipeline (dataset processing and STUDY processing)
m) Change the filtering in the pipeline and observe effects

1) ***Mu cluster dynamics***

a) Load the STUDY stern_cls15_clean.study

b) Identify a left and a right motor area cluster. Rename these two clusters with appropriate names.

c) Plot ERSP/ITC and ERP activity for each (plot both with and without statistical thresholds), compare activity between clusters.

d) Either take a single-subject example with ICs in both clusters, or use the clusters.

i) Plot cluster or individual cluster member ERP images of response-sorted activity and power at the relevant frequencies you found in c). Try different sorting variable and try sorting each cluster or IC activity by the sort order output of the other. Is there any interaction?

2) ***Frontal dynamics and attention***

a) Load the STUDY stern_cls15_clean.study

b) Identify one or more clusters of frontal ICs with a response in the theta band (recluster if desired). This should be cluster 6 (check scalp topography and spectrum). Remove outlier components if necessary.

c) Create a new design to include memorize letters and 2 conditions, memory load 1,2,3 versus 4,5,6

d) Plot any significant condition effects.

3) ***True ERPs or phase resetting?***

a) Load the STUDY stern_cls15_clean.study

b) Choose a subset of occipital/parietal clusters with a strong event-related potential following the target stimulus. Rename these clusters with appropriate names, remove outliers if necessary.

c) Examine the cluster ERP image (alternatively select single ICs from your clusters of interest) of each of these clusters in both the attend-left and attend-right conditions (all targets).

d) First sort trials by response time to detect clusters that are linked to stimulus onset or the button press or both.

e) Then sort trials by phase at their dominant alpha frequency around stimulus onset (latency 0 ms). Include the 'coher' options to observe concurrent power changes in your chosen frequency range.

f) Does the average ERP of each component represent a 'true ERP', or does its activity represent 'phase-resetting' -- or both? Try using various *erpimage()* views and options to explore this. For example, remove high alpha or low alpha trials, etc.

Dataset Workshop Project Questions

Important Notes:

- Name your resulting PowerPoint slides with your presenter's name and question number, for example, '**Q9_Smith.ppt'**.
- Try to present your results in **1 slide** with 1-4 plot panels.

1) ***Visual processing of faces versus objects***

a) Load continuous dataset **'faces_3.set'**.

b) Extract two sets of data epochs separately time-locked to events of type **'face'** and type **'object'**. *Remember to remove noisy epochs each time you epoch continuous data.*

c) Compare component ERPs using the functions available under menu item '**P*lot > Component ERPs*'**. Make a list of independent components (ICs) that appear to differentiate between face and object recognition.

d) Write a simple script to loop through these ICs and make an ERP-image plot for each. (Use *subplot()* to plot several panels in the same figure).

e) Write an analogous script to plot the component ERSP and ITC images in each condition. Which ICs show the most difference between 'face' versus 'object' processing?

f) Make another dataset containing response-locked epochs. Produce the same ERSP and ITC plots with these new datasets. With this additional information, can you guess whether the differences you observe reflect true visual processing differences?

g) Perform the same analysis on dataset **faces_4.set** from a second subject**.** Do you see any consistency between the event-related EEG dynamics of the two subjects? If so, plot the data from the matched components in one ERP-image (remember to consider IC polarity).

2) ***Channel ERSPs versus component ERSPs***

a) Load the dataset **'faces_3.set'** or **'faces_4.set'**

b) Find a subset of 19 evenly distributed channels (19 channels are selected to allow faster computation). Remove all other channels from dataset.

c) Write a script to collect event-related spectral perturbation (ERSP) images for this channel subset (*Use newtimef()*).

d) Find features of channel ERSPs that are common across several channels.

e) Use the *tftopo()* function to summarize these commonalities and plot time-frequency decomposition and scalp topographies.

f) Use the menu **'*Plot > Component spectra and maps*'** to find which components have most energy at each relevant channel.

g) Compute and plot mean ERSP images for these components. How do they account for the channel ERSP features?

3) ***Interaction between ERP amplitude and alpha activity***

a) Load **'faces_3.set'**

b) Using the ERP plotting parameters in the plot/edit gui, identify a channel with and consistent ERP and strong alpha activity

c) Using a single IC from the cluster or by scripting a cluster ERP image, sort the trials by activation amplitude in the max ERP amplitude window.

d) Plot the same ERP image, but turn on the 'plotamps' option to visualize power in a frequency range of your choice.

e) Is there any relationship between ERP amplitude and power? Try other frequency ranges to visualize.

4) ***Choose your own adventure!***

Load any of the datasets that we have provided (or your own if you desire). Ask your own question(s) of the data using any of the tools included in EEGLAB for computation and data visualization or using your own data. Use analysis scripts as necessary.