

CBRU PLUGIN QUICK TUTORIAL

**Quick and practical data exploration for ERP signals
in .set and .mul data formats**

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DESCRIPTION

- CBRU plugin is a Matlab toolbox integrated with EEGlab
- It will offer great possibilities to explore your pre-processed ERP datasets (.set [EEGlab]/.mul [BESA]) in a graphical user interface
- Versatile visualization and quantification of EEG data have been optimized to CBRU's own needs to minimize the usage of Matlab scripts and thus to uniform the basic procedures in our unit



PREPARATION – GENERAL (IMPORTANT)

- Your preprocessed (filtered, cleaned and epoched) datasets will be loaded into computer's memory
- Each dataset file must include data of one subject (all channels) in one condition (stimulus type) (.set/.mul)
- As always with EEG analysis, use SIMILARLY preprocessed signals
- Equal amount of conditions (stimulus types) per group is highly recommended



PREPROCESSED IN EEGLAB OR IN BESA?

EEGlab



- Continue to next page

BESA



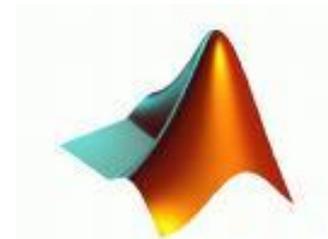
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- The preparation procedure is slightly different with .set and .mul file formats
- The next slides will show how to prepare and/or deal with the data preprocessed in these formats



STARTING THE TOOLBOX (.SET DATA)

- Programs needed: Matlab, EEGLab
 - 1) Run Matlab
 - 2) Set path to CBRU plugin with EEGLab –folders (File-Set path-Add with subfolders)
 - 3) Run EEGLab with command *'eeglab'*



PREPARATION – EEGLAB USERS

- Make sure that your .set files have been similarly preprocessed and that channel locations (and preferably labels) have been added to all datasets
- Naming of files
 - Data files can be named in various ways but this is the **best** choice when using CBRU plugin (recommended already in preprocessing): **group name**, **abbreviation for subject** (always the same, e.g. 'subj') + **subject number** and **condition name**
 - Good example for two groups:
 - Control_subj1_intDeviant.set, Patient_subj2_intDeviant.set
- First the STUDY structure is needed
 - Open StudyMaker ('Create Study') in CBRU tools
 - 1) Set the path which contains your .set and .fdt files (the folder must contain ALL files of all subjects to be analysed)
 - 2) Write the condition names, subject names and group names as they appear in the filenames (also empty names can be added if the filenames lack the identifier)
 - 3) Choose the correct order with the numbered buttons so that the sample name corresponds the real filename (you will see the example file structure at bottom)
 - 4) Add the listed subjects to the corresponding groups with 'Move to group' button
 - 5) Hit 'Load files' button (software loads the files into memory and fills in the study information in EEGlab)

HINT! See more detailed information in the end of this tutorial

HINT! With the lower double fields you can generate subject names and condition names by pressing the 'Express' button. Number vectors can be typed into the short field on the right (e.g. 1:10 will generate running number from 1 to 10)

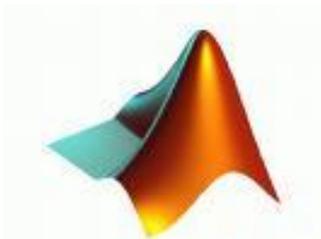
- Save the study for the next sessions (File – Save study as)
- Open CBRUplugin in CBRU menu

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STARTING THE TOOLBOX (.MUL DATA)

- Programs needed: Matlab, EEGLab
 - 1) Run Matlab
 - 2) Set path to CBRU plugin with EEGLab –folders (File-Set path-Add with subfolders)
 - 3) type *'mulplugin'* on the command line



PREPARATION – BESA USERS

Automatically

- **Renaming and listing can be done automatically with *Mul list creator*** (found in mulplugin's *Load* menu; See more instructions in the end of this tutorial)

Manually

Check/rename all of your .mul-files to have the following structure (remember to back up the originals): **G_####_S_####_C_####.mul**

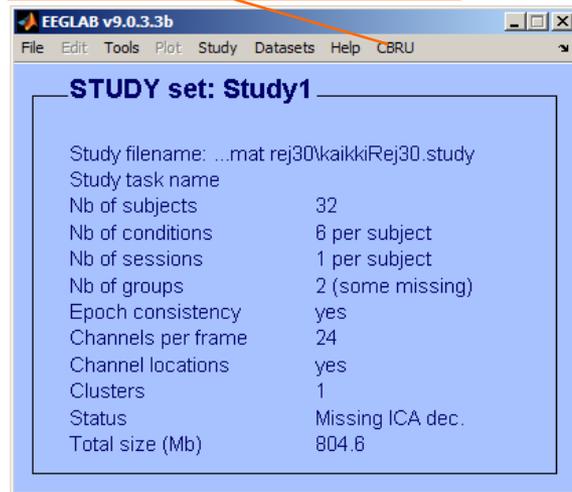
(G=group, S=subject, C=condition)

- Open e.g. Notepad and list your files
 - G_”groupname1”_S_”subjectname1”_C_”conditionname1”.mul
 - G_”groupname1”_S_”subjectname1”_C_”conditionname2”.mul
 - G_”groupname1”_S_”subjectname2”_C_”conditionname1”.mul
 - G_”groupname1”_S_”subjectname2”_C_”conditionname2”.mul
 - Etc.
 - Or alternatively you can use Windows CMD to print the folder contents into a text file: `dir /b > filelist.txt`
 - Save the text file into the folder with .mul files



MAIN MENU

Open up the window for grouping your subjects and conditions (for .set files only)

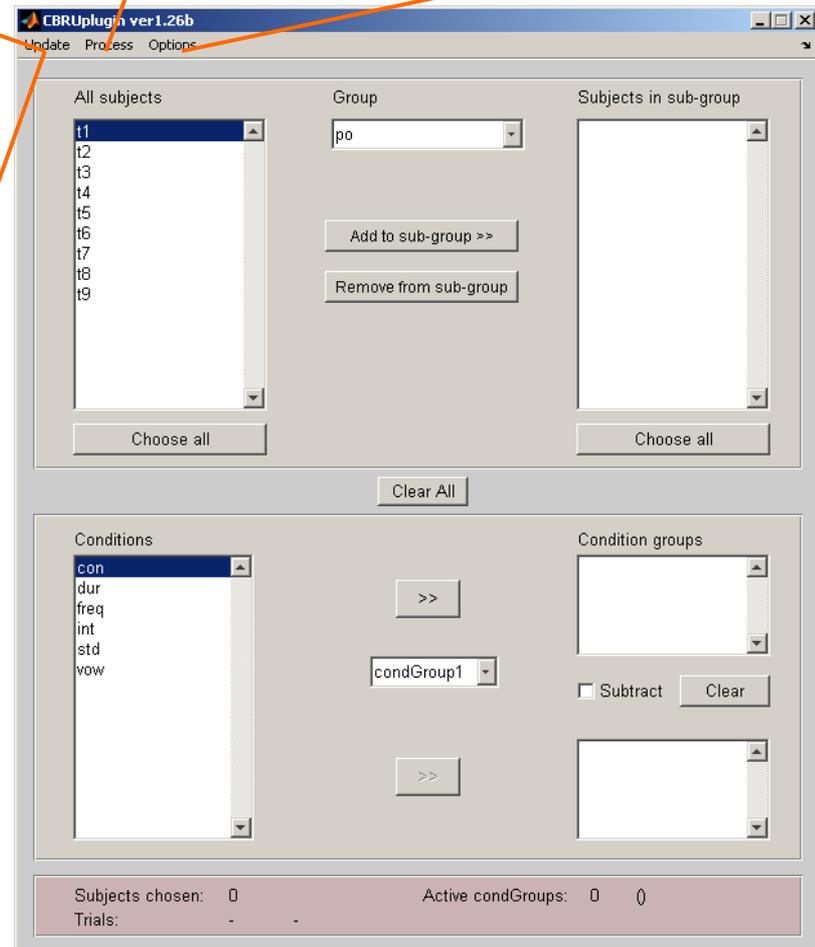


In mulplugin this menu is called *Load*. You can load the .mul files by pointing the text file (instructed on previous page). Filename regenerator is found in this menu too.

Open up the window for visualization and quantification

Evaluate the datasets added in the STUDY (needed if the study is being updated during the session)

View and modify options related to processing



GROUPING

All subjects found in the chosen group

Change the group; subjects will be updated on the left

Add subjects to create a new sub-group of subjects

All conditions found in the chosen group

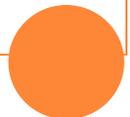
Add conditions to create a new sub-group of them; multiple selections in the boxes will be averaged (before grand average)

Create more condition groups

To make subtraction curves add conditions to the lower box

The screenshot shows the CBRUpugin ver1.26b interface with the following components:

- Top Panel:** Contains a menu bar (Update, Process, Options), a "Group" dropdown menu set to "po", and two list boxes: "All subjects" (containing t1-t9) and "Subjects in sub-group". Between these boxes are "Add to sub-group >>" and "Remove from sub-group" buttons. "Choose all" buttons are at the bottom of each list box, and a "Clear All" button is centered below them.
- Bottom Panel:** Contains a "Conditions" list box (containing con, dur, freq, int, std, vow), a "Condition groups" list box, and a "condGroup1" dropdown menu. Between the list boxes are ">>" buttons. A "Subtract" checkbox and a "Clear" button are located below the "Condition groups" list box.
- Status Bar:** At the bottom, it displays "Subjects chosen: 0", "Trials: -", "Active condGroups: 0", and "0".



PROCESSING: WINDOW 1 – PLOTTING CURVES

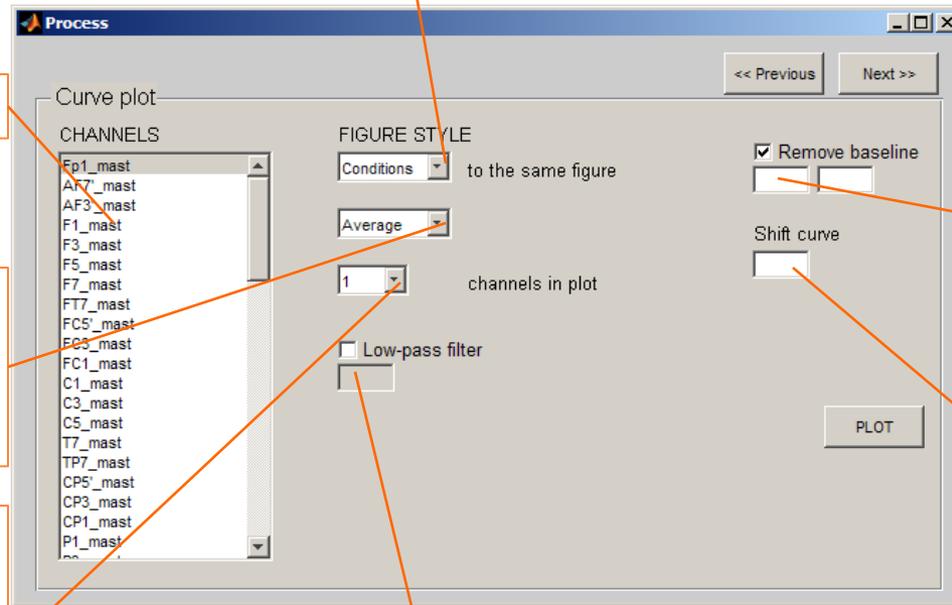
Choose to plot conditions/groups in the same figure

Choose channels to plot

Choose to plot average of subjects or individual curves or single trials (with .set)

Plot one or more channels in the same figure. If *all* is chosen, channel location information will be used.

Low-pass filter signals for plotting (values in Hz)



Remove baseline (values in ms); default is the pre-stimulus interval

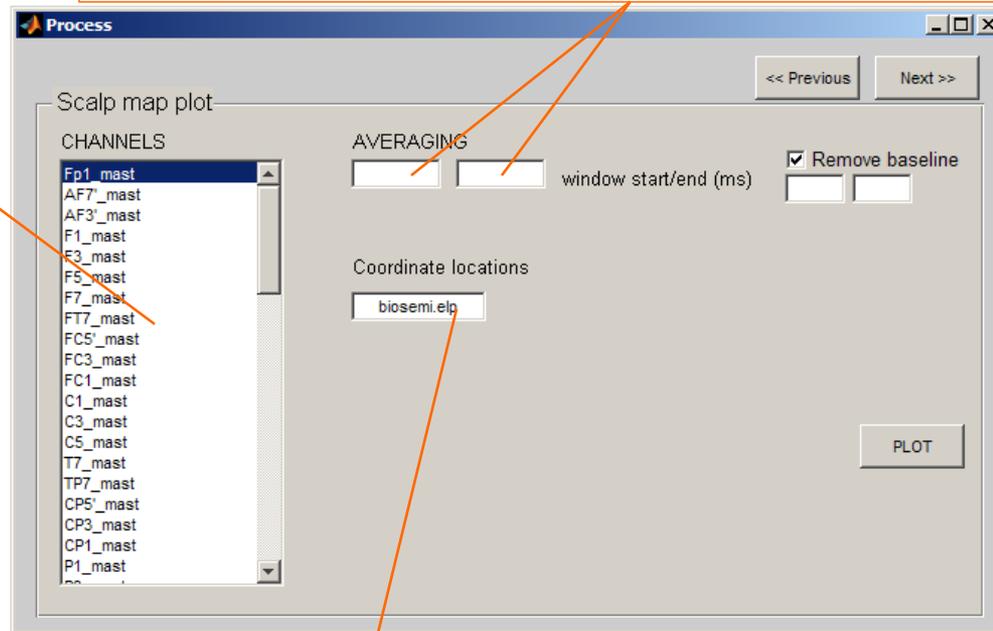
Shift curve in time; default is stimulus onset at 0



PROCESSING: WINDOW 2 – PLOTTING SCALP MAPS

Define the window in which the map will be plotted; multiple selection can be done by e.g. [100;150] [140;190]. (Will result plots within 100-140 ms and 150-190 ms in the same figure)

Choose channels to include in the calculation. The more, the better (only EEG, though). Chosen channels must be listed in location data.



Mulplugin users ONLY: Path and filename of location file (.elp) should be pointed here

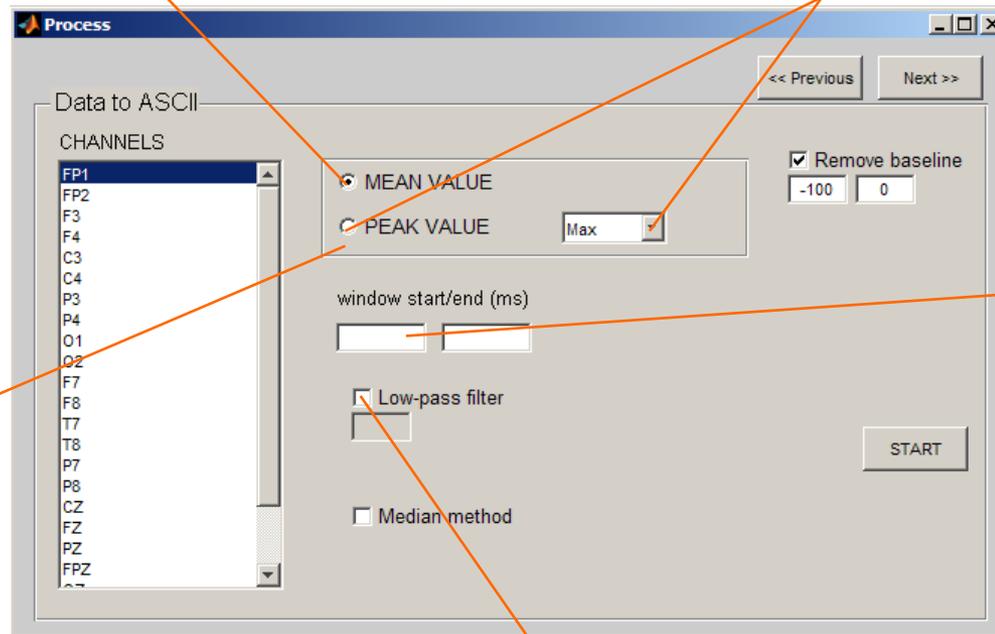


PROCESSING: WINDOW 3 – QUANTIFICATION TO ASCII

Calculate mean values within a time window for each subject and save in text file

Find local maximum and minimum within a time window. Both amplitude and latency will be saved in text file. If extreme value is not found, values will be NaN.

With .set files you can select *Event info* here. It will print a list of amount of trials in each condition for each subject.



Specify the time window here (from...to)

Low-pass filter signals before quantification (values in Hz)



RESULTING EXAMPLES

testi.txt - Notepad

File Edit Format View Help

Peak amplitudes and latencies

Condition group 1

Interval 109.38-148.44 ms
Local maximum

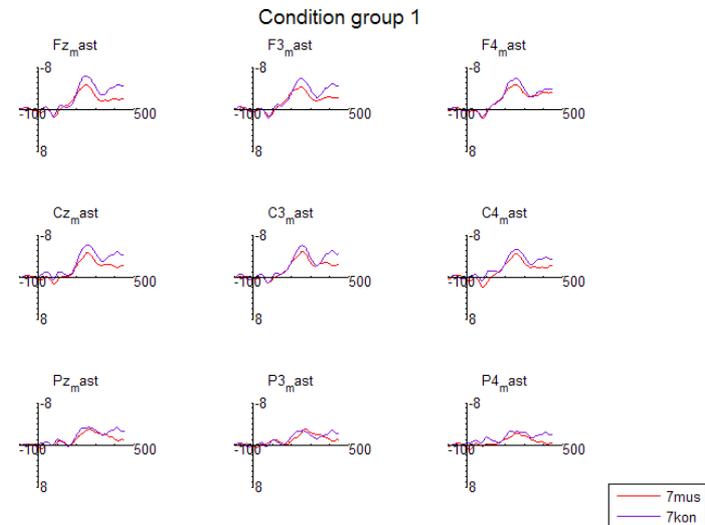
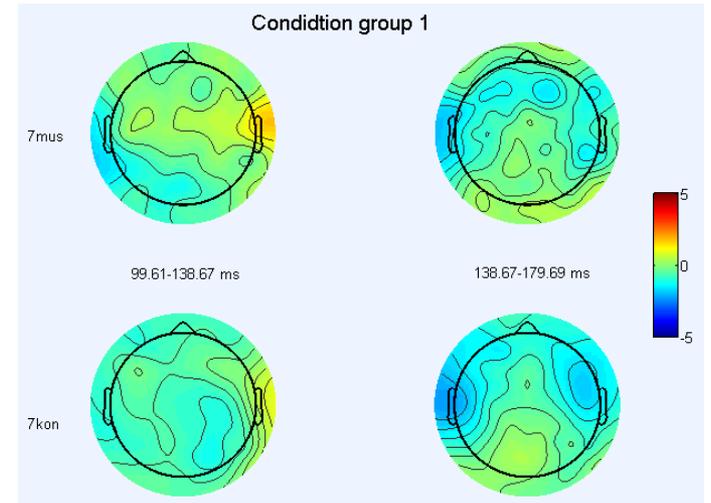
group_7mus

Subj	Fp1_mast	Lat (ms)	value (uv)	AF7'_mast	AF3'_mast
14	144.53	0.09	121.09	1.29	0.00
13	119.14	0.68	132.81	0.38	0.00
11	0.00	0.00	134.77	0.66	0.00
10	140.63	0.91	134.77	1.27	0.00
9	132.81	-0.24	138.67	0.78	132.81
8	119.14	2.03	121.09	0.72	117.19
7	0.00	0.00	0.00	0.00	0.33
6	0.00	0.00	0.00	0.00	146.48
5	0.00	0.00	126.95	2.41	115.23
2	144.53	-2.62	144.53	-1.49	0.00
1	0.00	0.00	111.33	-2.33	138.67

group_7kon

Subj	Fp1_mast	Lat (ms)	value (uv)	AF7'_mast	AF3'_mast
22	144.53	1.25	144.53	0.37	146.48
21	146.48	-0.82	144.53	-0.91	0.00
18	136.72	1.04	144.53	-1.34	119.14
17	0.00	0.00	0.00	0.00	0.00
16	121.09	-1.89	119.14	-2.13	0.00
15	136.72	0.29	136.72	0.69	136.72
13	144.53	-0.22	132.81	-0.26	142.58
12	142.58	0.72	0.00	0.00	0.00
11	128.91	-1.41	0.00	0.00	123.05
10	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00
7	136.72	-2.57	121.09	-0.79	132.81
6	144.53	-1.52	128.91	-0.67	0.00
5	119.14	0.16	117.19	0.40	111.33
3	126.95	1.61	123.05	-0.90	128.91
2	121.09	1.57	128.91	0.51	0.00
1	136.72	0.15	138.67	-0.38	138.67

Ln 1, Col 1

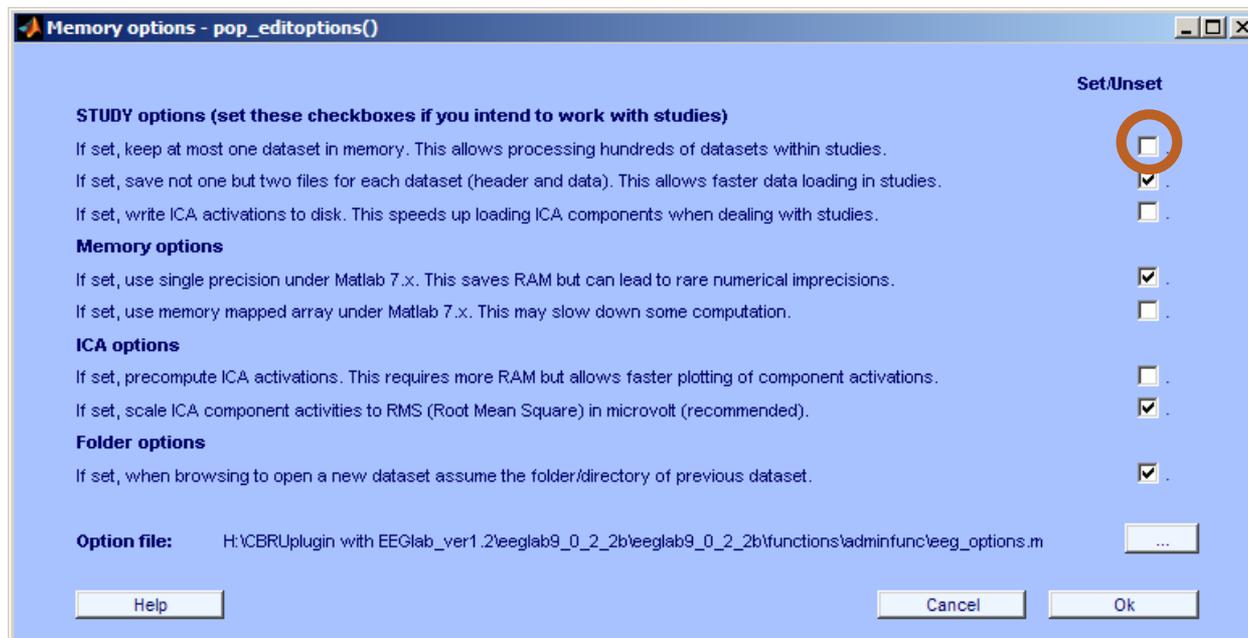


TROUBLESHOOTING (MORE DETAILED INSTRUCTIONS)

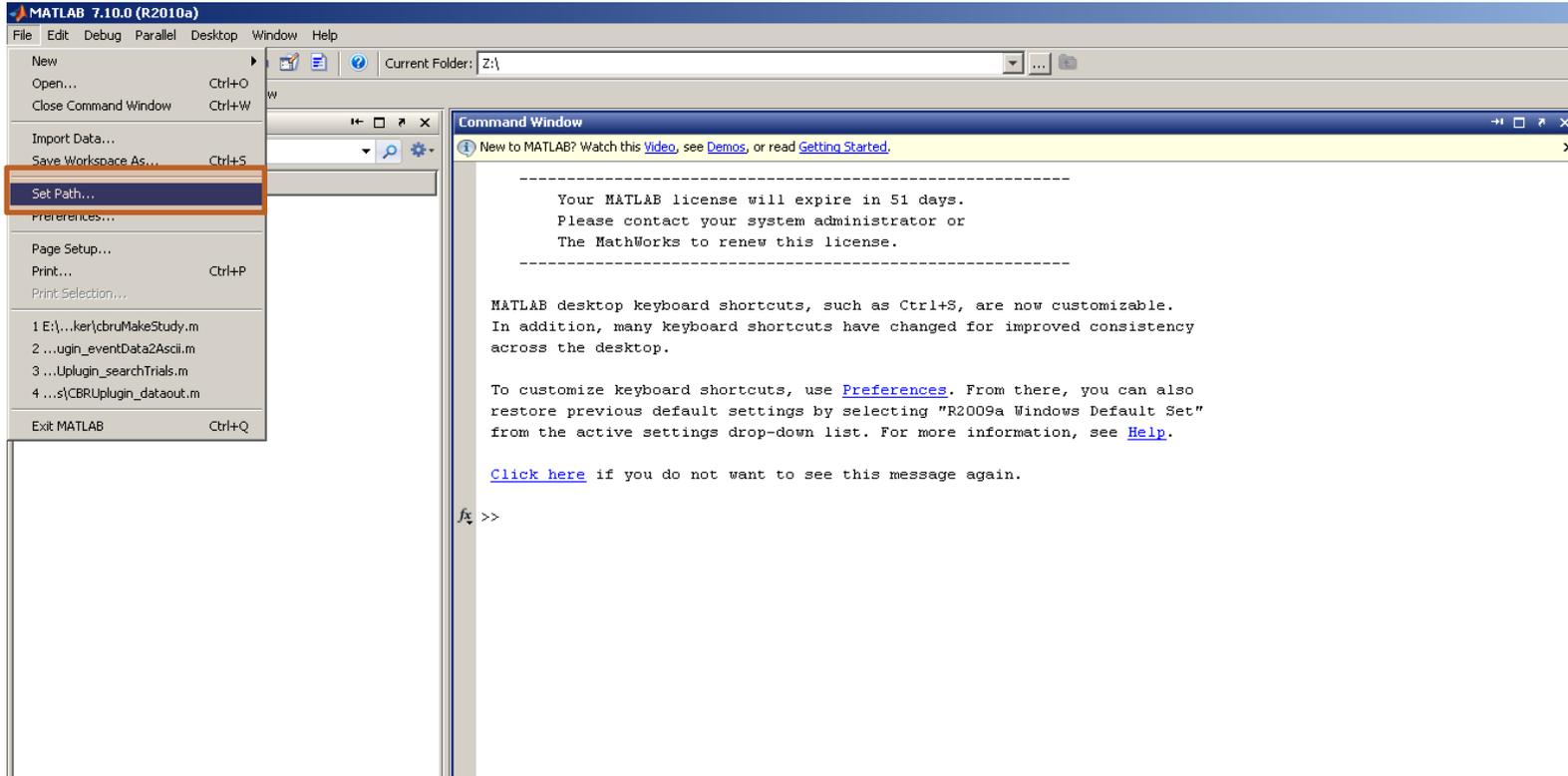


EEGLAB MEMORY OPTIONS

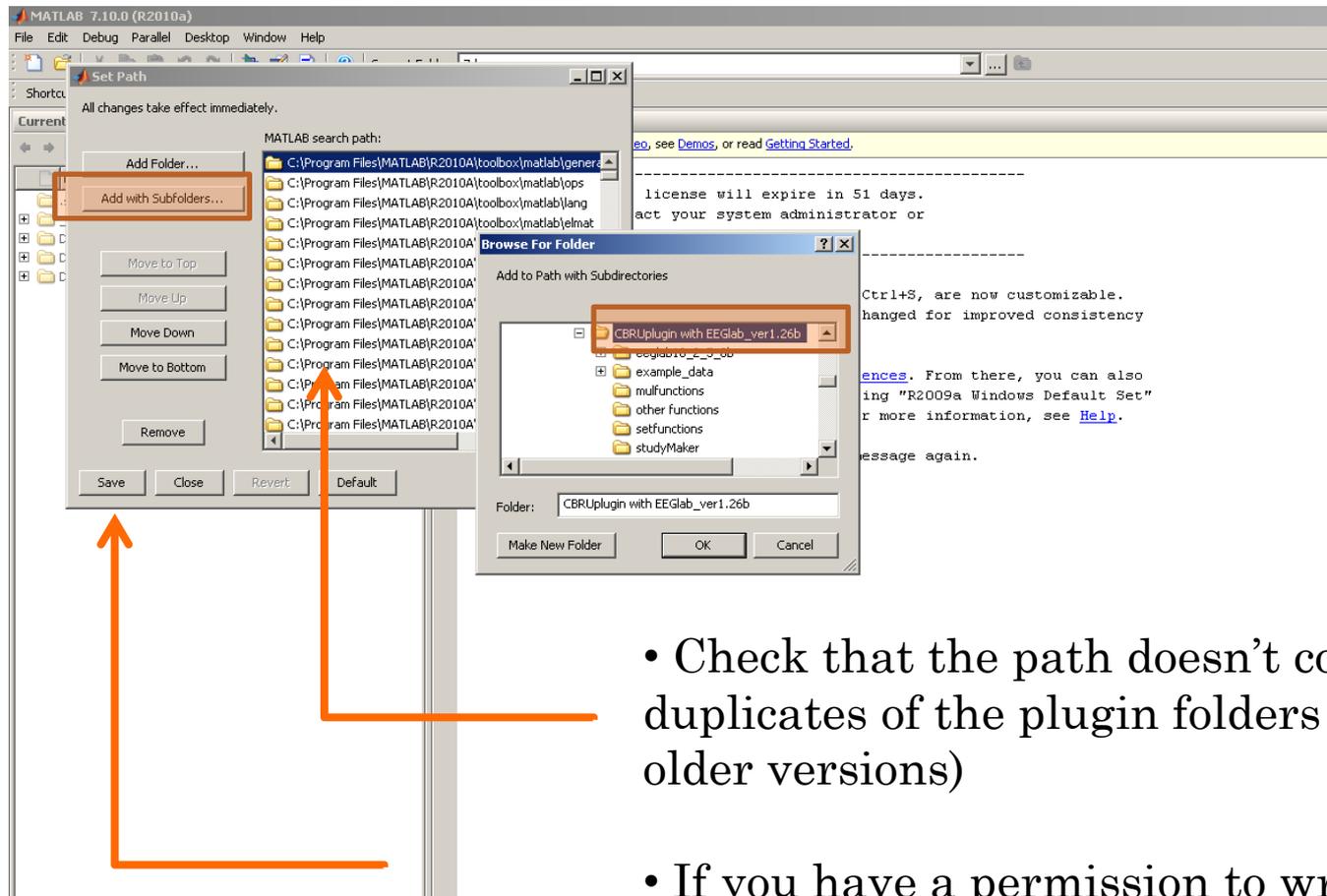
- While starting the plugin, a warning might occur. In this case, check the memory settings in EEGlab:
 - File – Memory and other options
 - All datasets in memory (Unset)



SETTING UP THE PATH IN MATLAB 1/2



SETTING UP THE PATH IN MATLAB 2/2



- Check that the path doesn't contain duplicates of the plugin folders (e.g. older versions)

- If you have a permission to write on disk, you can save the path for the next session



CREATE STUDY/MUL LIST VIEW

Path to the folder of all .set/.mul files

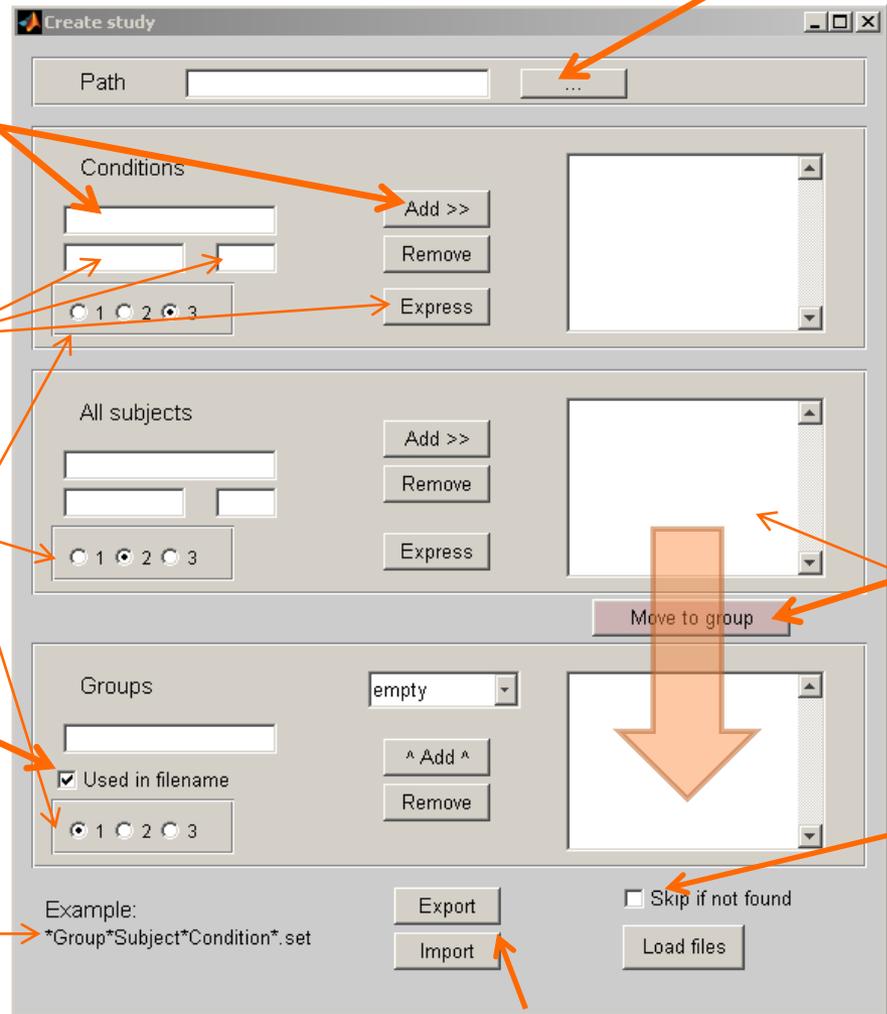
Add conditions normally with the upper field

Use base name + vector numbering (E.g *subj* in first field 1:10 in second; Express method)

Change the order of fields in the filename structure

If set, the group name will be added to the filename under search

An example on how your filename should look



Moves the listed subjects into the active group ('empty')

Use only if you are sure that all the needed files will be found by the study creator

Save and load your study design (this doesn't save the EEGLab study)