

EEGDataPro Tutorial

Version 1.0

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Introduction

EEGDataPro is a toolbox that allows user to create their own processing routine for EEG data processing (mainly for transcranial magnetic stimulation (TMS) data, event-related potential (ERP) data and resting-state EEG). This toolbox was created in addition of the TMSEEG and ERPEEG toolboxes to offer an element of flexibility. We recommend users to get familiar with the TMSEEG and ERPEEG toolboxes first. The toolbox main idea is to give users the possibility to create a processing routine by selecting directly the different steps they want to do from a list of preprocessing options. In this first version, only the preprocessing options that were already included in the TMSEEG and ERPEEG toolboxes are available, but the list might be extended in the future. The toolbox allows also users to save and share a processing routine with another user which can help standardizing some EEG data processing.

Installation

Before loading the electrophysiological dataset into EEGDataPro, users must convert their dataset to .set format using the EEGLAB software suite (<http://sccn.ucsd.edu/eeglab/downloadtoolbox.php>). EEGDataPro is highly dependent of EEGLAB for many of its functionalities and therefore the EEGLAB toolbox must be installed prior to data processing.

EEGDataPro version 1.0 works with MATLAB v2013 and higher and can be found here (<https://github.com/EEGSignalProcessing/EEGDataPro/>).

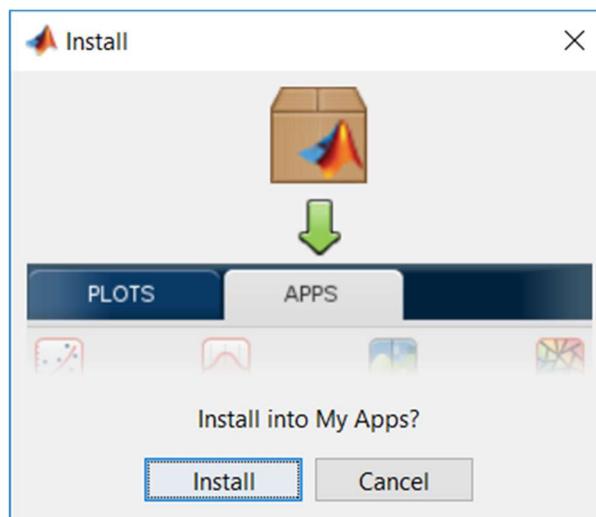
TMSEEG requires installation of **EEGLAB v12.0.2.6b** or higher. It also requires:

- MATLAB signal processing toolkit. Make sure to set the MATLAB signal toolbox as a higher path priority than other software such as field trip, as some functions may share common names. Or ideally, remove fieldtrip from your MATLAB path if errors persist.
- FASTICA is the current preferred algorithm for ICA in TMSEEG.
- More detail on the FASTICA algorithm can be found here: (<http://research.ics.aalto.fi/ica/fastica/code/dlcode.shtml>)

EEGDataPro creates multiple intermediate datasets at each processing step to allow easy reprocessing of the data. We highly recommend that each base dataset for processing is placed in its own folder to easily track datasets.

To install EEGDataPro:

1. Copy the .mlappinstall file to your current working folder in MATLAB.
2. Right click on the file and select 'Install'.



Choosing a processing routine

EEGDataPro is initialized by selecting the app from the MATLAB apps toolbar. Users can also open the tool by running the *eegdatapro_toolbox_main* function directly in the MATLAB command window (to do this ensure the software folder, under MATLAB -> APPS, has been added to the path). Running the program will display a first GUI.

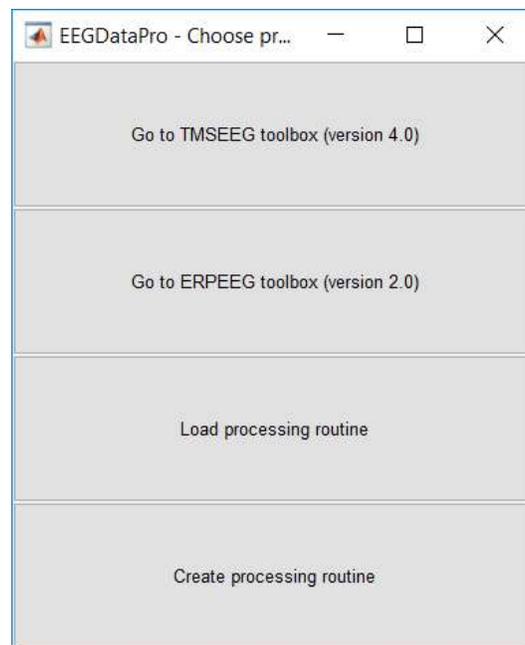


Figure 1: Choose processing routine GUI

From here, the user can:

1. Launch TMSEEG toolbox available here (<https://github.com/EEGSignalProcessing/TMSEEG/>). To learn more about this toolbox, please refer to the links you can find on GitHub.
2. Launch ERPEEG toolbox available here (<https://github.com/EEGSignalProcessing/ERPEEG/>). To learn more about this toolbox, please refer to the links you can find on GitHub.
3. Load a processing routine that has been previously saved.
4. Create a processing routine.

Note that installing TMSEEG and ERPEEG toolboxes is not required to use EEGDataPro. If these toolboxes are not installed, the **Go to TMSEEG toolbox** and **Go to ERPEEG toolbox** buttons will appear red and only options 3 and 4 will be accessible.

Loading a processing routine

To load a processing routine, select the **Load processing routine** button, calling a 'select file' window. Once the processing routine (.mat) is selected, it will open a new GUI from where it will be possible to load some EEG dataset and process it.

Creating a processing routine

By selecting the **Create processing routine** button, it will open a new GUI (**Figure 2**).

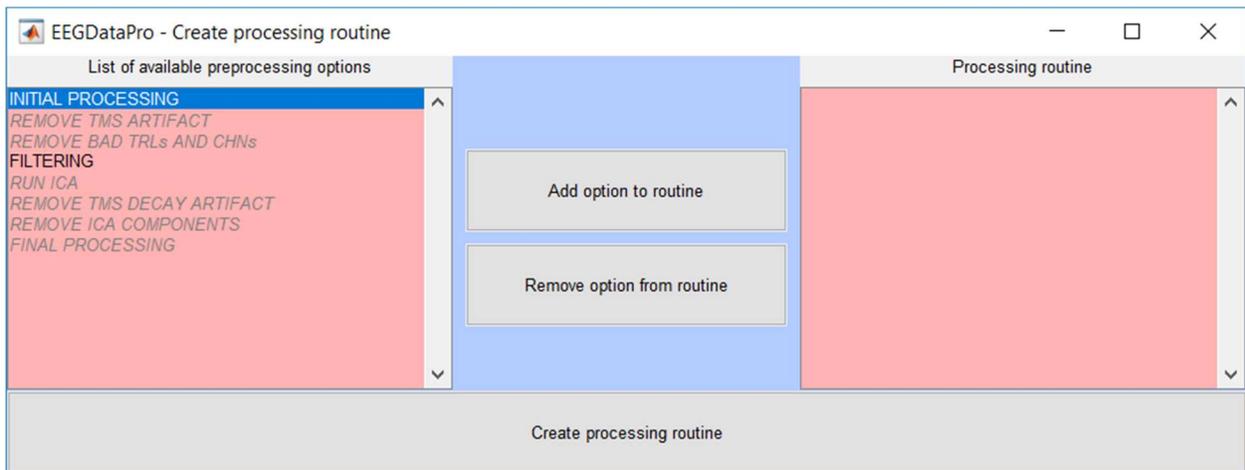


Figure 2: Create processing routine GUI

On the left, all the preprocessing options available are listed. The user can find all the preprocessing options that were used in the TMSEEG and ERPEEG toolboxes, but the user can also create new options if needed. To do so, the user will have to modify the code, so it is only recommended for users with strong Matlab coding experience. Future versions might include an easier way to add an option to that list.

To add an available option to the processing routine, select the **Add option to routine** button, and the option will now appear on the right list with its step number.

On the left, if an option appears in grey, it can't be selected, either because the user needs to select another option first or because this option can be added only once in a routine. For example, some options are only available after doing the initial processing step.

If the user adds an option that can be done more than once in a routine, a number showing the occurrence of this option will appear with its name on the right list (**Figure 3**).

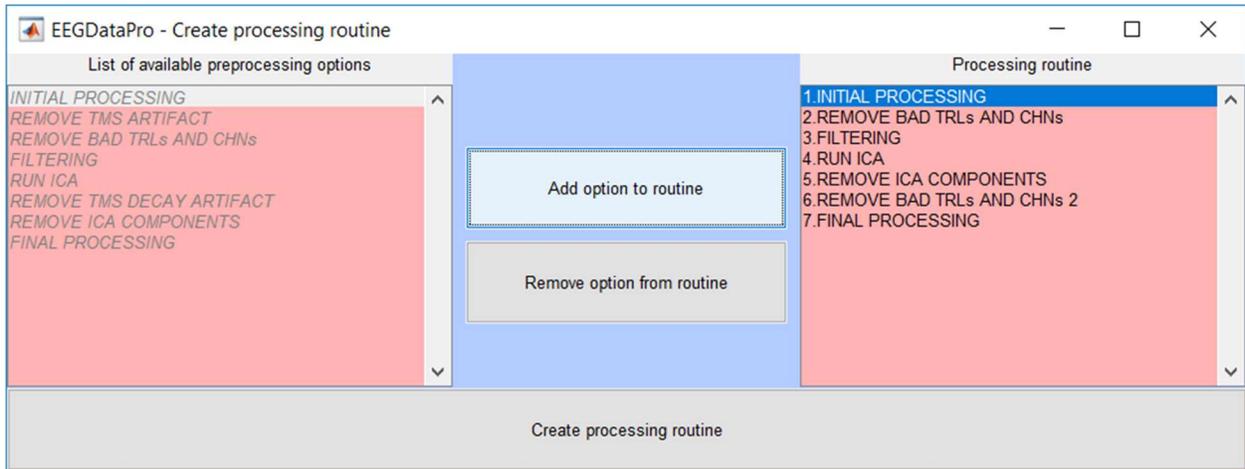


Figure 3: Example of a processing routine with 7 steps and the option REMOVE BAD TRLs AND CHNs have been added twice.

At any time, the user can select an option added on the right list and remove it from the processing routine by selecting the **Remove option from routine** button.

Once the processing routine is done, by selecting the **Create processing routine** button, the user will have the choice to save the processing routine and/or directly create it which will open a new GUI from where it will be possible to load some EEG dataset and process it according to the routine.

EEGDataPro Main GUI

By loading or creating a processing routine, it will open the EEGDataPro main GUI which is similar to TMSEEG and ERPEEG main GUIs. For more information about this main GUI and/or for a better understanding of the different preprocessing options, please refer to TMSEEG and/or ERPEEG tutorials. Links for the tutorials are available on GitHub. Please note that the EEGDataPro main GUI depends on the processing routine, so can be different than the example shown in **Figure 4**.

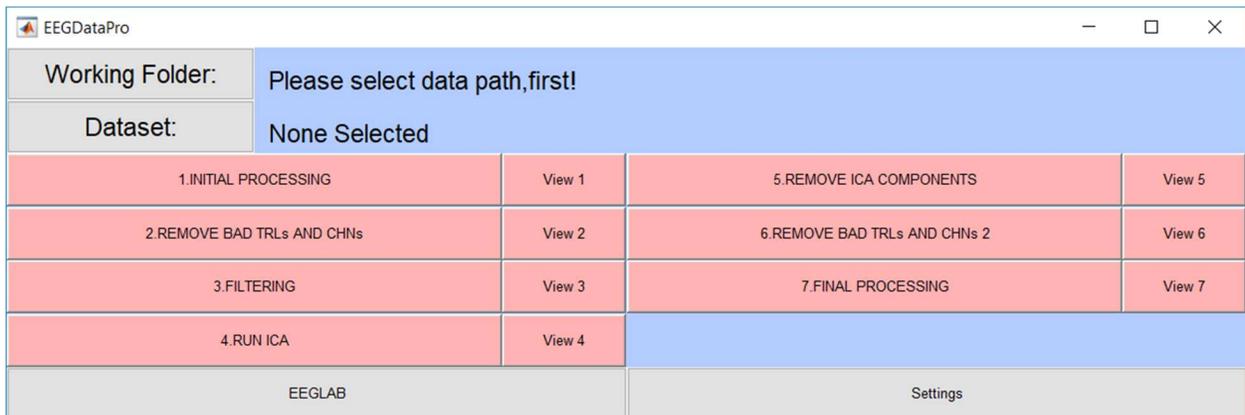


Figure 4: EEGDataPro main GUI with routine created in Figure 3

Settings

Parameters for data processing that can be changed in the settings tab also depend on the options selected in the processing routine. Changes of these parameters are done with the help of another GUI (Figure 5).

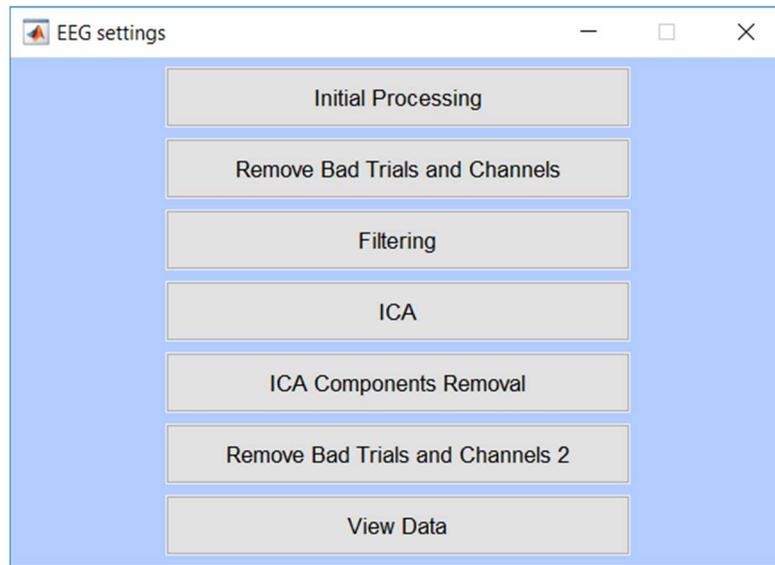


Figure 5: Settings GUI for routine created in Figure 3

Due to the sequential nature of the EEGDataPro workflow, if the settings are changed for a specified step, the workflow will reset to that step (i.e., all data processing from the specified step and onwards will be erased). We highly recommend users to specify all parameters in the setting tab before processing the data to avoid unnecessary resets of the processing workflow.