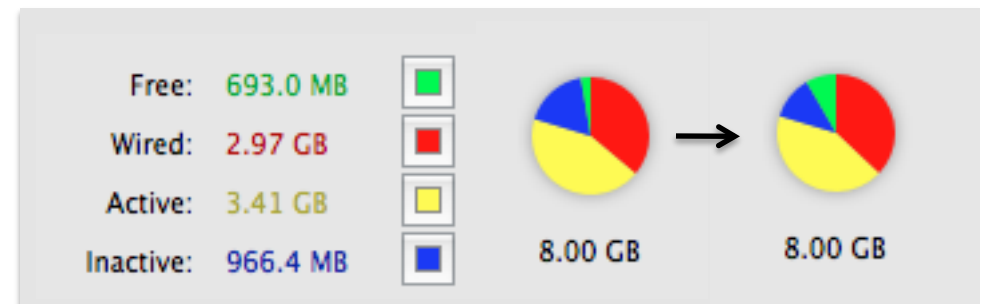


# Out of Memory



- Most affected system: Windows 32-bit with recent versions of Matlab
  - Buy more RAM
  - Use option “use memory mapped arrays”
  - Close all programs, remove Windows services (Adobe etc...), reboot
  - Try different memory manager “start Matlab from the DOS command line with *matlab -memmgr fast* option
  - Use older Matlab versions (how old?)
  - Change of OS (Windows 7 might have less problems than Win XP)
  - Look at <http://www.mathworks.com/support/tech-notes/1100/1107.html>
- OSX and Unix/Linux
  - Buy more RAM
  - Matlab cannot allocated inactive memory. To free it, type *du -sx /*



# Figure problem



# and export



For crashes, freezes, etc... use a non Open-GL renderer

At startup type in `set(0,'defaultrenderer','zbuffer' )` or `set(0,'defaultrenderer','painter' )`. Note that these cannot handle transparency and 3-D graphics or type “opengl software”

To export figures for publication, use .eps format (postscript) and edit for instance with adobe illustrator. Use “`set(gcf, 'renderer', 'painter')`” before exporting complex figures. Use the “plot2svg” matlab toolbox to export figure for transparency.

# EEGLAB documentation

EEGLAB Home Page

[sccn.ucsd.edu/eeglab/](http://sccn.ucsd.edu/eeglab/)

EEGLAB Tutorial Index

[sccn.ucsd.edu/wiki/EEGLAB](http://sccn.ucsd.edu/wiki/EEGLAB)

- 200 pages of tutorial (including “how to” for plugins) WEB or PDF
- Function documentation (next slide)
- Send questions to the mailing list [eeglablist@sccn.ucsd.edu](mailto:eeglablist@sccn.ucsd.edu)  
(or search mailing list archive using google)
- Bug submission <http://sccn.ucsd.edu/eeglab/bugzilla>
- Email us (suggestions) [eeglab@sccn.ucsd.edu](mailto:eeglab@sccn.ucsd.edu)
- Workshop with practicum every year

# Help message

Import dataset info - pop\_importdata()

EEGLAB dataset name (optional):

Data file/array (click on the selected option): **Matlab variable**

Number of channels (0->set from data):

Time points per epoch (0=continuous data):

Data sampling rate (Hz):

Optional epoch start time for data epochs (sec):

Channel locations file or array: **Help**

(note: use menu "Edit > Channel locations" to import specific file formats)

ICA weights array or text/binary file (if any): **Browse**

ICA sphere array or text/binary file (if any): **Browse**

**Cancel** **Help** **Ok**

>> help pop

M-File Help: pop\_importdata

File Edit View Go Debug Desktop Window Help

Location: M-File Help: pop\_importdata

M-File Help: pop\_importdata [View code for pop\\_importdata](#) [Default Topics](#)

**pop\_importdata**

**pop\_importdata()** - import data from a Matlab variable or disk file by calling `importdata()`.

Usage:

```
>> EEGOUT = pop_importdata(); % pop-up a data entry window
>> EEGOUT = pop_importdata('key', val,...); % no pop-up window
```

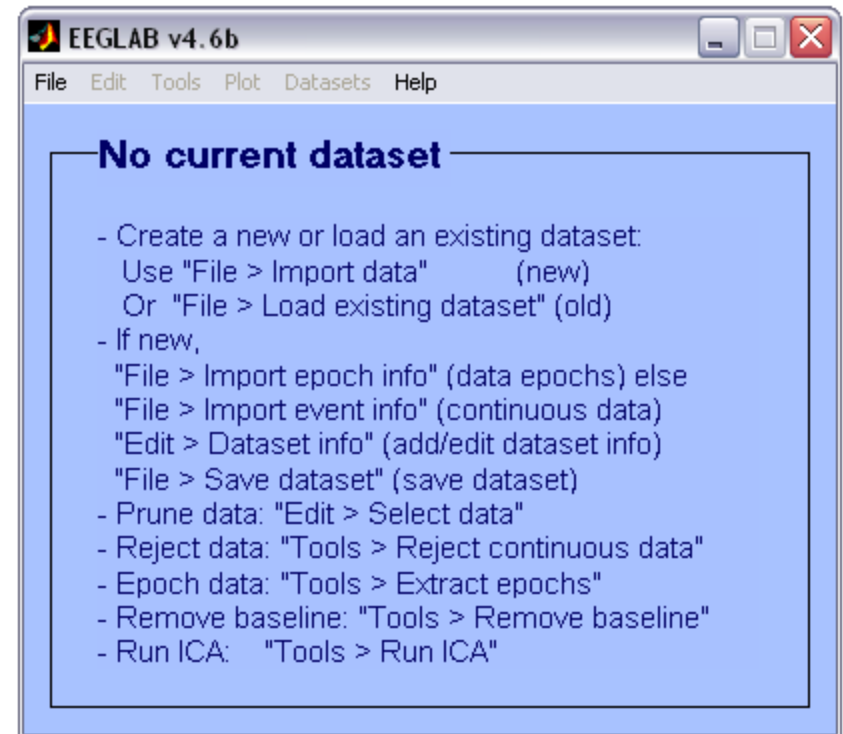
Graphic interface (refer to a previous version of the GUI):

- "Data file/array" - [Edit box] Data file or Matlab variable name to import to EEGLAB. Command line equivalent: 'data'
- "Data file/array" - [list box] select data format from listbox. If you browse for a data file, the graphical interface might be able to detect the file format from the file extension and his list box accordingly. Note that you have to click on the option to make it active. Command line equivalent is 'dataformat'
- "Dataset name" - [Edit box] Name for the new dataset. In the last column of the graphic interface, the "EEG.setname" text indicates which field of the EEG structure this parameter is corresponding to (in this case 'setname'). Command line equivalent: 'setname'.
- "Data sampling rate" - [Edit box] In Hz. Command line equivalent: 'srate'
- "Time points per epoch" - [Edit box] Number of data frames (points) per epoch.

# EEGLAB Plugins

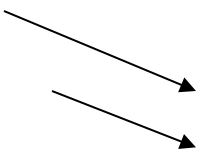
## Starting EEGLAB

```
>> eeglab
eeglab: options file is /Volumes/donnees/data/STUDYst
Adding path to all EEGLAB functions
Adding path to eeglab/external/bioelectromagnetism_lig
Adding path to eeglab/external/biosig-partial
Adding path to eeglab/external/fieldtrip-partial
Adding path to eeglab/external/fieldtrip-partial subfolders
EEGLAB: adding plugin function "eegplugin_VisEd"
EEGLAB: adding "eepimport1.02" plugin (see >> help ee
EEGLAB: adding "bdfimport" plugin (see >> help eegplu
EEGLAB: adding "brainmovie0.1b" plugin (see >> help e
EEGLAB: adding "ctfimport1.03" plugin (see >> help eeg
EEGLAB: adding "dipfit2.2" plugin (see >> help eegplugi
EEGLAB: adding "EEG toolbox ERP plotting" plugin (see >> help eegplugin_eeg_toolbox)
EEGLAB: adding "erpssimport1.00" plugin (see >> help eegplugin_erpssimport)
EEGLAB: adding "fmrib1.21" plugin (see >> help eegplugin_fmrib)
EEGLAB: adding "iirfilt1.01" plugin (see >> help eegplugin_iirfilt)
EEGLAB: adding "eepimport1.02" plugin (see >> help eegplugin_ascinstep)
EEGLAB: adding "loreta1.0" plugin (see >> help eegplugin_loreta)
EEGLAB: adding "Butter1.0" plugin (see >> help eegplugin_ERPLAB_filters)
EEGLAB: adding "Measure_Product1.0" plugin (see >> help eegplugin_mp_clustering)
EEGLAB: adding plugin function "eegplugin_miclust"
EEGLAB: adding "4dneuroimaging1.00" plugin (see >> help eegplugin_4dneuroimaging)
>>
```



## EEGLAB plugins


<b>eepimport1.02</b>	Data importing for EEprobe data (Oostenveld & ANT company)
<b>bva_io1.30</b>	Brain vision analyzer import/export plugin (Widmann & Delorme)
<b>ctfimport1.01</b>	MEG CTF import plugin (Carver, Weber & Delorme)
<b>dipfit2.0</b>	4-shell and BEM (Oostenveld & Delorme)
<b>fmrib1.2b</b>	Removal of artifact from simultaneously EEG/fMRI recording (Niazi)
<b>icaclust1.00</b>	Clustering ICA components (Serby, Delorme, Makeig)
<b>iirfilt1.0</b>	Non-linear IIR filtering (Pozdin)
<b>loreta1.0</b>	Interface to LORETA-KEY (Delorme)
<b>newtimefreq1.00</b>	Time-freq. decomposition (Delorme)



**Better than FIR  
Coregistration...**

## Matlab toolboxes interfaced

<b>BIOSIG</b>	Data importing for rare data binary format (Schloegl)
<b>Fieldtrip</b>	Source localization and time-freq. decompositions (Oostenveld)
<b>ICALAB</b>	20 ICA algorithms (automatically detected by EEGLAB)
<b>SPM2</b>	Spatial normalization of anatomical MRI



home

- SCCN web site
- EEGLAB Wiki
- MoBI Lab Wiki
- SCCN Wiki Home

eeglab wiki pages

- EEGLAB web page
- EEGLAB Wiki
- EEGLAB Tutorial
- Online EEGLAB Workshop
- Download EEGLAB
- Revision history
- Help EEGLAB

sccn toolboxes

- EEGLAB
- NFT
- BCILAB
- SIFT
- MoBILAB
- MPT

wiki tools

- Sandbox
- Basic Wiki Syntax
- Wiki Help
- New Users

# Plugin list process

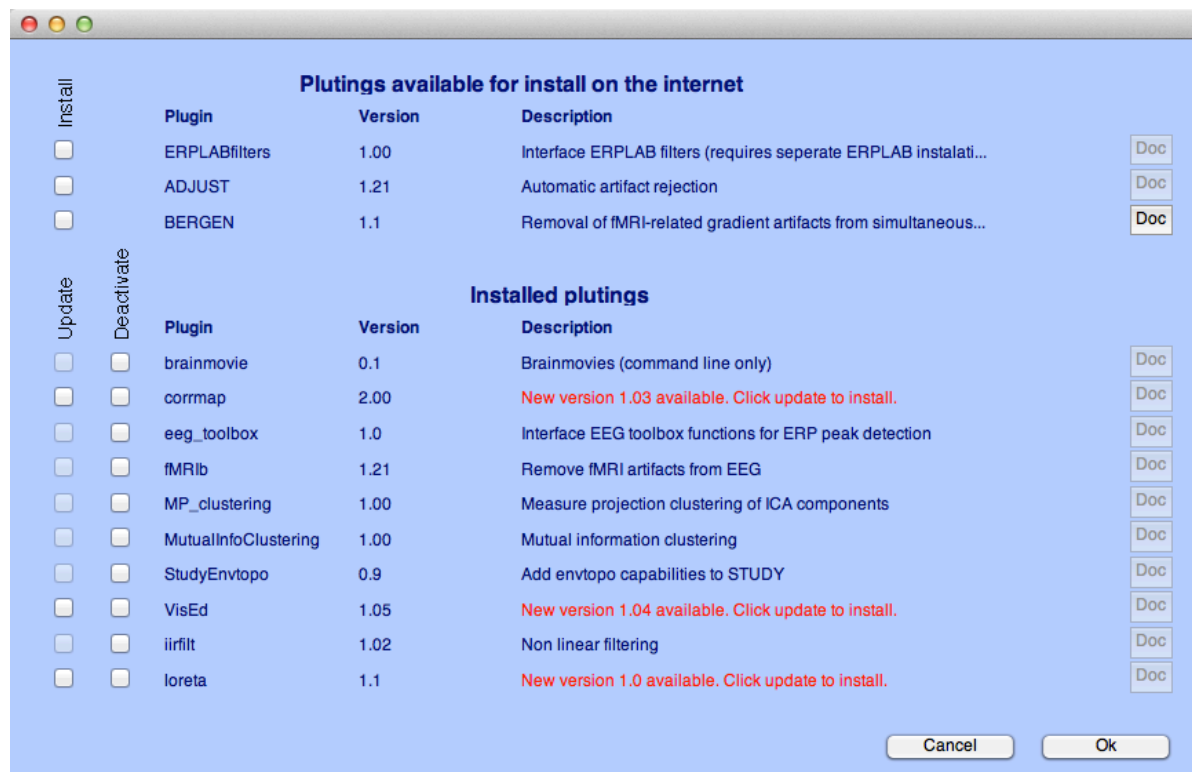
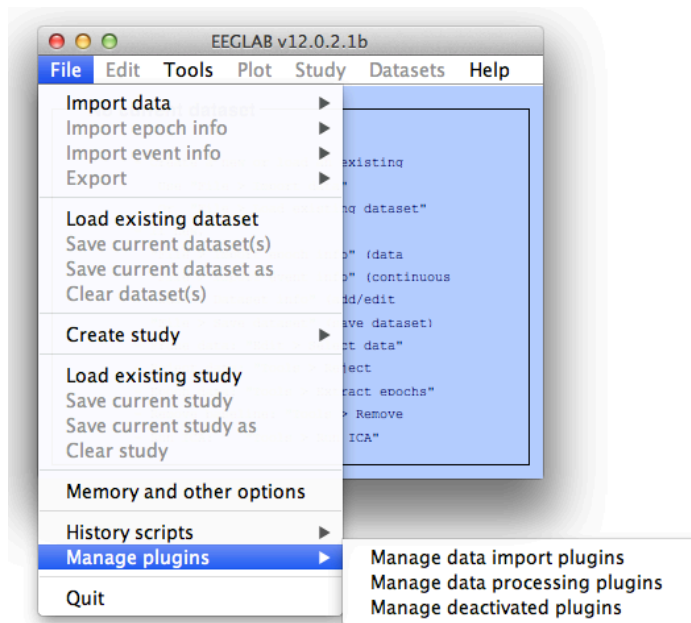
Plugin name	Version	Short plugin description	Link	Comments
brainmovie	0.1	Brainmovies (command line only)	<a href="#">Download</a>	<a href="#">User comments</a>
corrmap	1.03	Import BIOPAC data files	<a href="#">Download</a>	<a href="#">User comments</a>
eeg_toolbox	1.0	Interface EEG toolbox functions for ERP peak detection	<a href="#">Download</a>	<a href="#">User comments</a>
ERPLABfilters	1.00	Interface ERPLAB filters (requires seperate ERPLAB instalation)	<a href="#">Download</a>	<a href="#">User comments</a>
fMRib	1.21	Remove fMRI artifacts from EEG	<a href="#">Download</a>	<a href="#">User comments</a>
MP_clustering	1.00	Measure projection clustering of ICA components	<a href="#">Download</a>	<a href="#">User comments</a>
MutualInfoClustering	1.00	Mutual information clustering	<a href="#">Download</a>	<a href="#">User comments</a>
StudyEnvtopo	0.9	Add envtopo capabilities to STUDY	<a href="#">Download</a>	<a href="#">User comments</a>
VisEd	1.04	Add/Edit dataset events	<a href="#">Download</a>	<a href="#">User comments</a>
ADJUST	1.21	Automatic artifact rejection	<a href="#">Download</a>	<a href="#">User comments</a>
iirfilt	1.02	Non linear filtering	<a href="#">Download</a>	<a href="#">User comments</a>
loreta	1.0	Export and import data to/from LORETA software	<a href="#">Download</a>	<a href="#">User comments</a>
<a href="#">BERGEN</a>	1.1	Removal of fMRI-related gradient artifacts from simultaneous EEG-fMRI data	<a href="#">Download</a>	<a href="#">User comments</a>

## Add your plugin to the list

You may add your plugin to the list so users can download it automatically from within EEGLAB. There are 5 tabs:

- Plugin name:** this tab should contain the abbreviated name of your plugin and if necessary a link to the plugin documentation. The plugin documentation may be stored on this wiki.
- Version:** this tab should contain the version of your plugin. The version listed on this page and the one made available in the eegplugin\_xxx.m file must be consistent. This allows EEGLAB to automatically check for newer versions of your plugin.
- Short plugin description:** this tab should contain a short plugin description (no more than one line). Additional documentation may be provided as a link in tab 1.





# Writing EEGLAB plugins

- Assuming that you have a signal processing function called xxxxx → Process any Input data Timef()
- a pop\_xxxxx function will interface your signal processing function → Process EEG structure Pop\_timef()
- a eegplugin\_xxxxx function will add the menu to the main interface (and history etc...)

# Pop functions

- Called with the EEG structure only pop\_xxxx(EEG), they pop-up a GUI asking for more arguments
- Called with enough arguments, they simply call the signal processing function

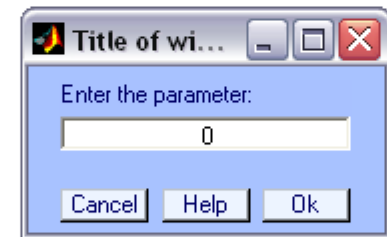
```
function [EEG, com] = pop_sample( EEG, param1 );

com = ""; % empty history
if nargin < 2
    % pop up window if less than 2 arguments
    result = inputdlg( { 'Enter the parameter:' }, 'Title of window', 1, { '0' } )
    if length( result ) == 0 return; end;

    param1 = eval( [ '[' result{1} ']' ] ); % the brackets allow to process matlab arrays
end;

sample( EEG.data, param1); % run sample function

com = sprintf('pop_sample(EEG, %d );', param1); % return history
```



# eegplugin functions

- eegplugin\_xxxx function

```
% eegplugin_erp() - plot ERP plugin
```

```
function eegplugin_erp( fig, try_strings, catch_strings);
```

```
% create menu
```

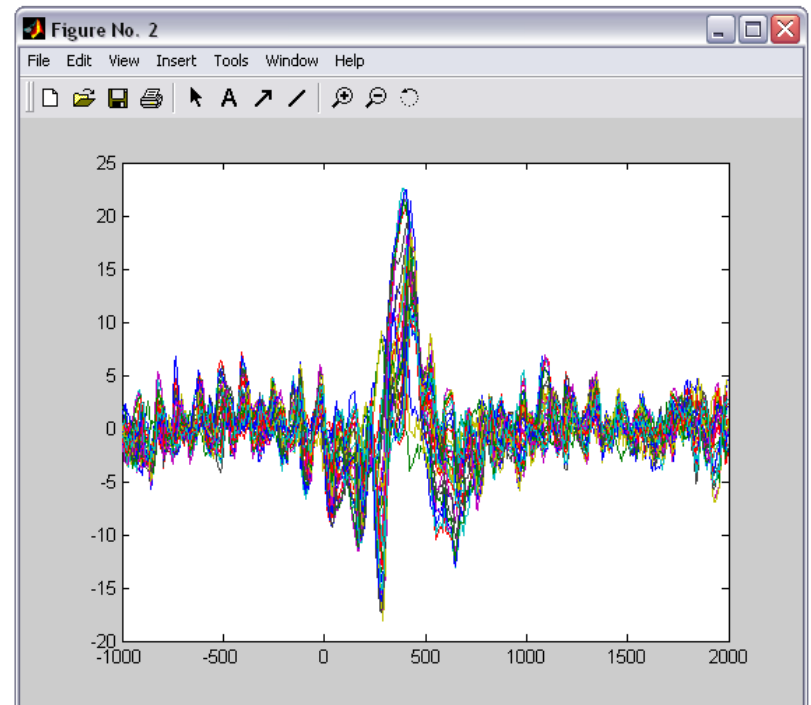
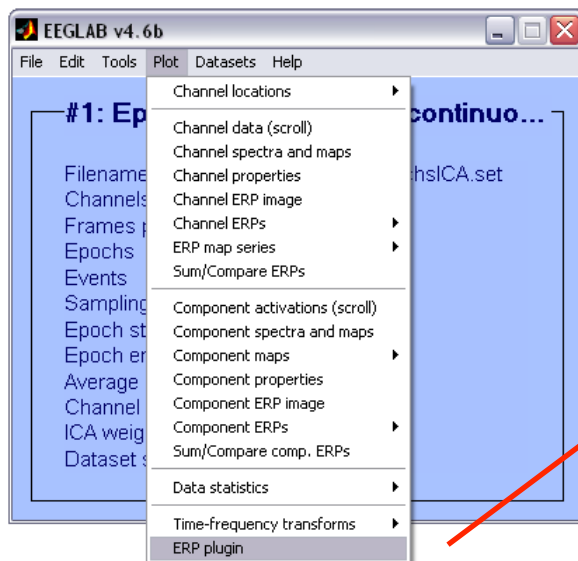
```
plotmenu = findobj(fig, 'tag', 'plot'); % find plot menu
```

```
% create submenu
```

```
uimenu( plotmenu, 'label', 'ERP plugin', ...  
        'callback', 'figure; plot(EEG.times, mean(EEG.data,3));');
```

# eegplugin functions

```
>> eeglab
eeglab: adding "BIOSIGv0.86" plugin
eeglab: adding "eepimport1.02" plugin (see >> help eegplugin_eepimport)
eeglab: adding "bva_io1.30" plugin (see >> help eegplugin_bva_io)
eeglab: adding "ctfimport1.01" plugin (see >> help eegplugin_ctfimport)
eeglab: adding "dipfit2.0" plugin (see >> help eegplugin_dipfit2_0)
eeglab: adding plugin function "eegplugin_erp"
eeglab: adding "fmrib1.2b" plugin (see >> help eegplugin_fmrib)
eeglab: adding "icacust1.00" plugin (see >> help eegplugin_icacust)
eeglab: adding "iirfilt1.0" plugin (see >> help eegplugin_iirfilt)
eeglab: adding "loreta1.0" plugin (see >> help eegplugin_loreta)
eeglab: adding "newtimefreq1.00" plugin (see >> help eegplugin_ne
>>
```



# PCA plugin

```
function vers = eegplugin_pca(fig, trystrs, catchstrs)
```

```
vers = 'pca1.00';  
if nargin < 3, error('eegplugin_pca requires 3 arguments'); end;
```

```
% add icacust folder to path  
if ~exist('eegplugin_pca')  
    p = which('eegplugin_pca');  
    p = p(1:findstr(p,'eegplugin_pca.m')-1);  
    addpath( p );  
end;
```

```
% find tools menu  
menu = findobj(fig, 'tag', 'tools');
```

```
% PCA command  
cmd = [ '[tmp1 EEG.icawinv] = runpca(EEG.data(:,:));' ];  
cmd = [ cmd 'EEG.icaweights = pinv(EEG.icawinv);' ];  
cmd = [ cmd 'EEG.icasphere = eye(EEG.nbchan);' ];  
cmd = [ cmd 'clear tmp1;' ];
```

```
% create menu  
uimenu( menu, 'Label', 'Run PCA', 'Callback', cmd, 'separator', 'on');
```

*'import data'* -> File > import data menu  
*'import epoch'* -> File > import epoch menu  
*'import event'* -> File > import event menu  
*'export'* -> File > export  
*'tools'* -> tools menu  
*'plot'* -> plot menu

# Exercise

Write a plugin to plot ERPs