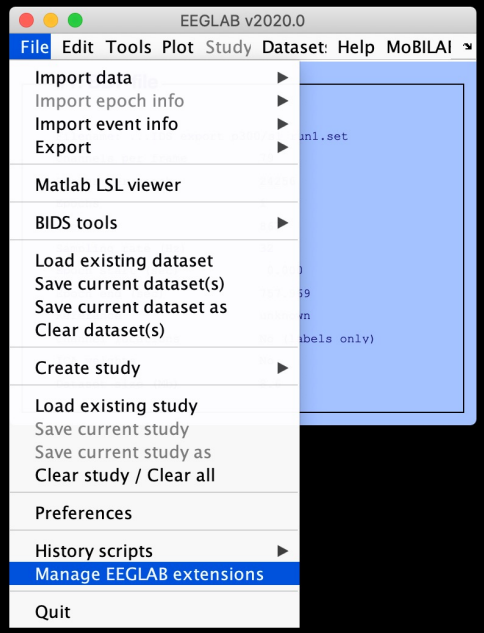
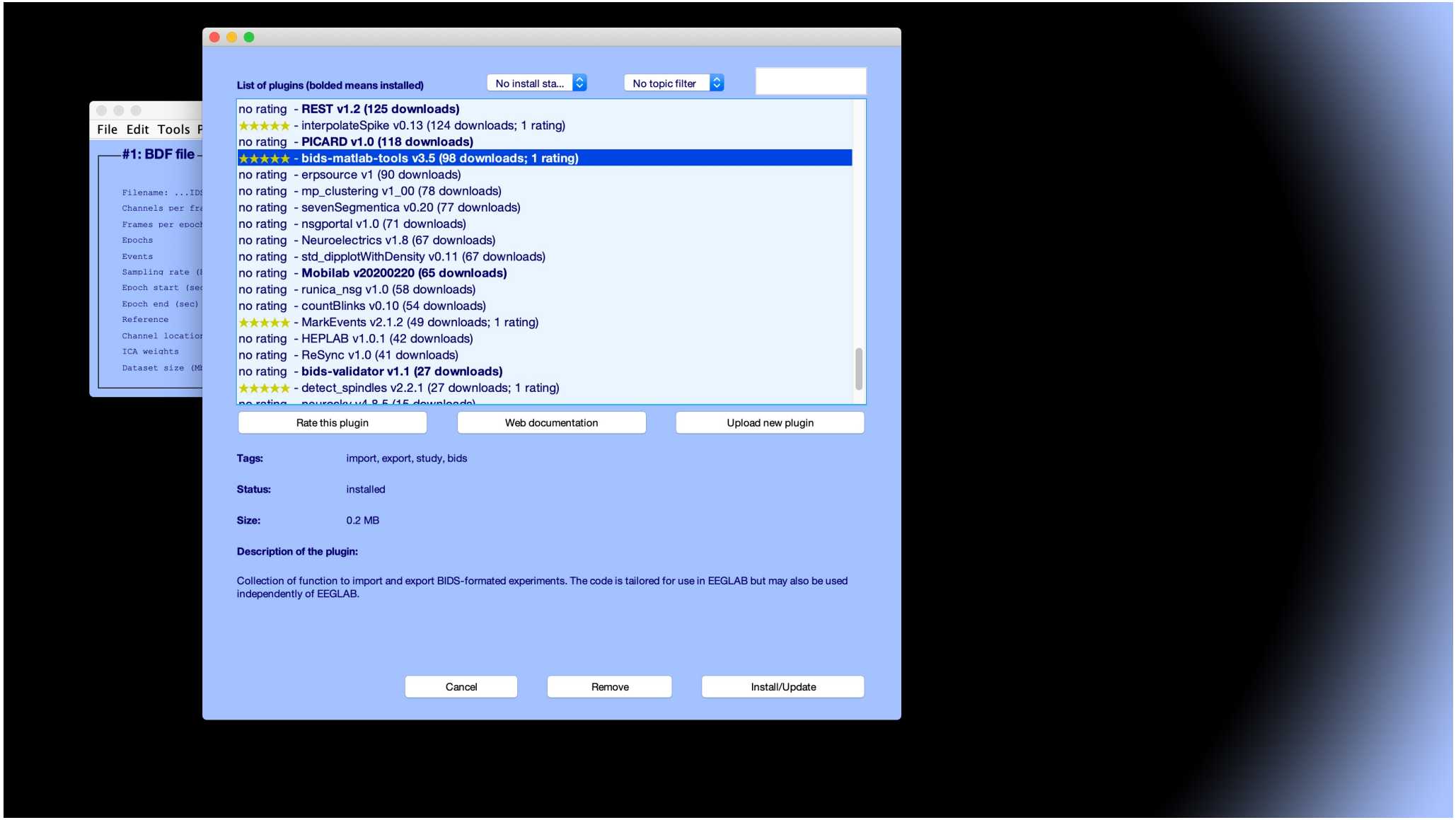
BIDS data format for Neuroimaging

Export/Import BIDS from EEGLAB

Arnaud Delorme

Installing the BIDS plugin

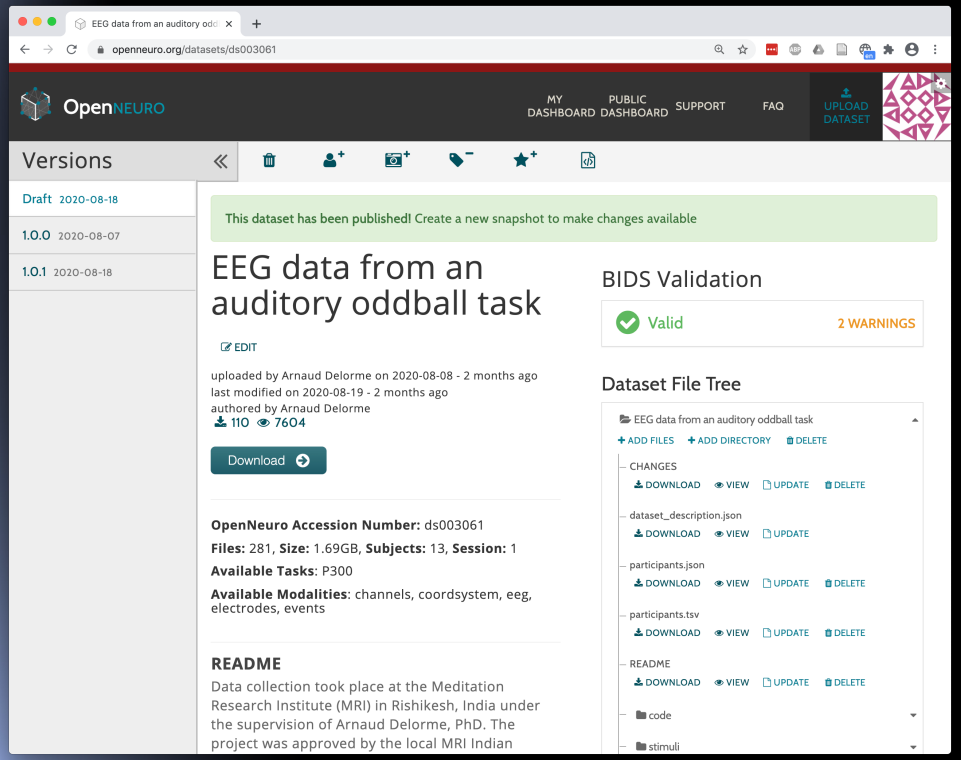



File Edit Tools
#1: BDF file
Filename:
Channels per
Frames per
Epochs
Events
Epoch start
Epoch end (sec)
Reference
ICA weights
List of plugins (bolded means installed)
No install sta...
No topic filter
no rating - REST v1.2 (125 downloads)
★★★★★ - interpolateSpike v0.13 (124 downloads; 1 rating)
no rating - PICARD v1.0 (118 downloads)
★★★★★ - bids-matlab-tools v3.5 (98 downloads; 1 rating)
no rating - erpsource v1 (90 downloads)
no rating - mp_clustering v1_00 (78 downloads)
no rating - sevenSegmentica v0.20 (77 downloads)
no rating - nsgportal v1.0 (71 downloads)
no rating - Neuroelectrics v1.8 (67 downloads)
no rating - std_dipplotWithDensity v0.11 (67 downloads)
no rating - Mobilab v20200220 (65 downloads)
no rating - runica_nsg v1.0 (58 downloads)
no rating - countBlinks v0.10 (54 downloads)
★★★★★ - MarkEvents v2.1.2 (49 downloads; 1 rating)
no rating - HEPLAB v1.0.1 (42 downloads)
no rating - ReSync v1.0 (41 downloads)
no rating - bids-validator v1.1 (27 downloads)
★★★★★ - detect_spindles v2.2.1 (27 downloads; 1 rating)
Rate this plugin
Web documentation
Upload new plugin
Tags: import, export, study, bids
Status: installed
Size: 0.2 MB
Description of the plugin:
Collection of function to import and export BIDS-formated experiments. The code is tailored for use in EEGLAB but may also be used independently of EEGLAB.
Cancel
Remove
Install/Update

OpenNEURO

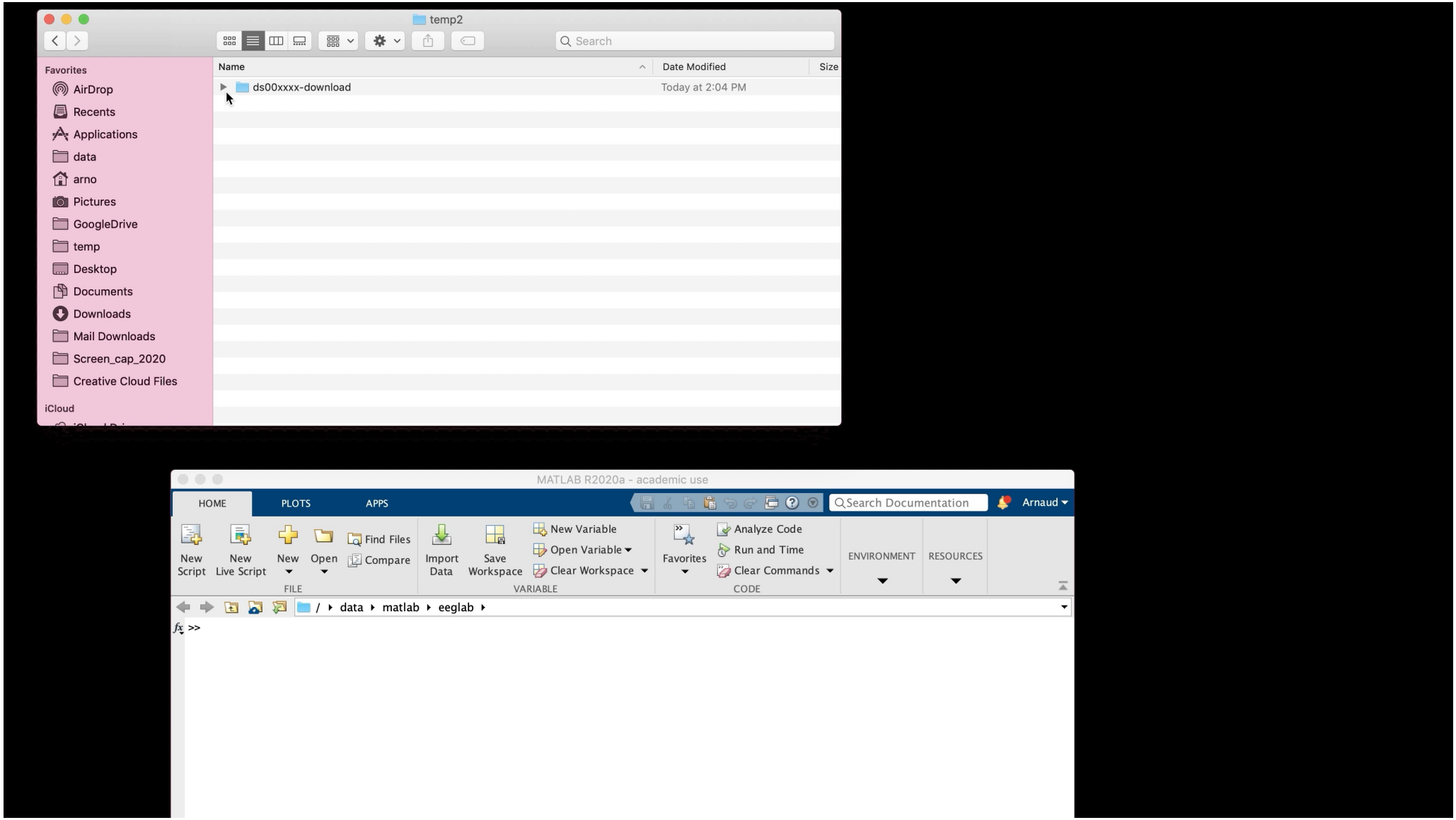
NEMAR

EEG dataset on OpenNeuro.org

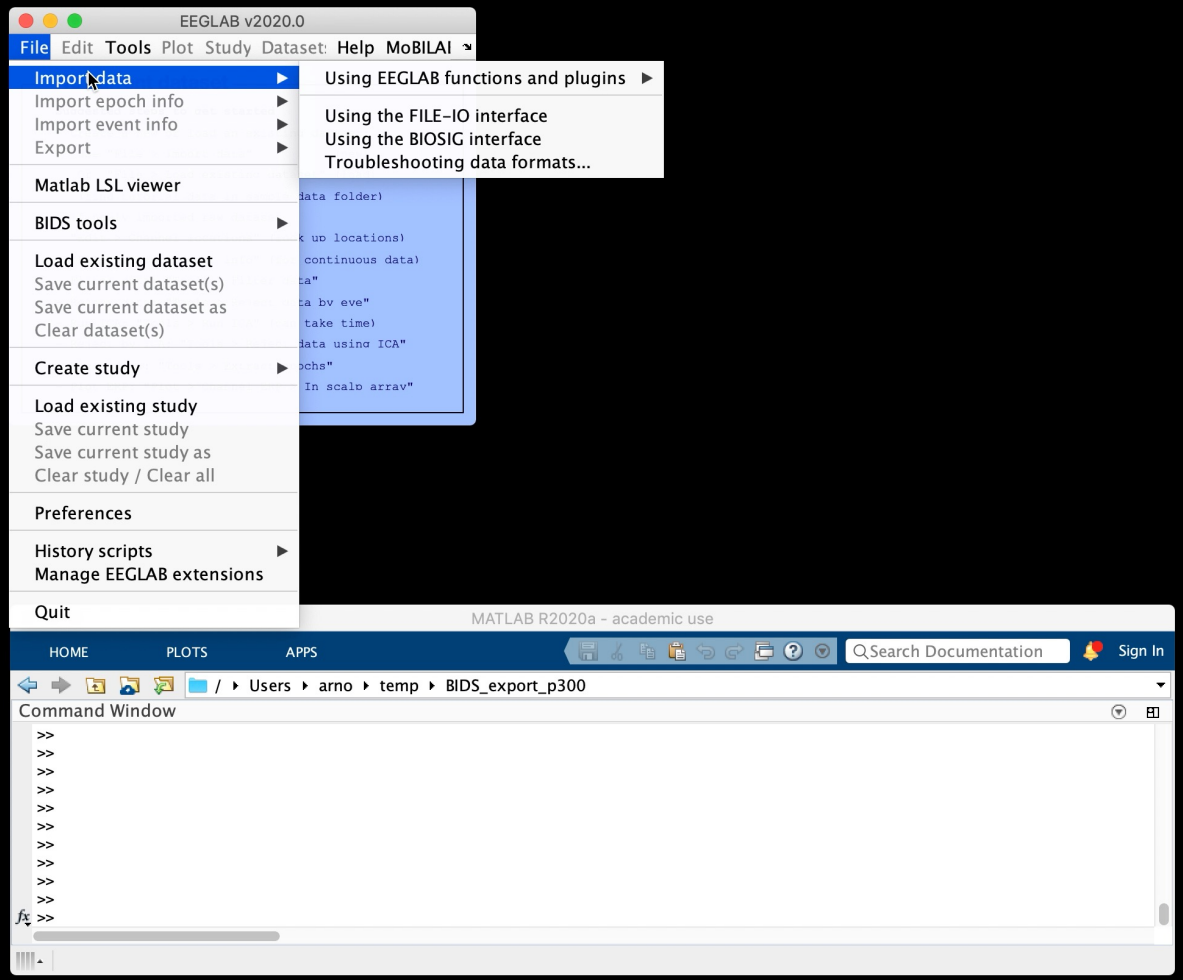


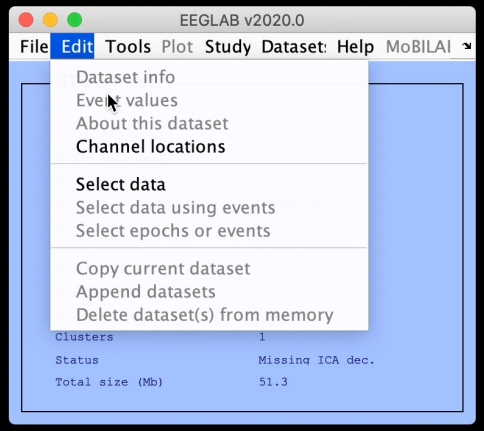
https://openneuro.org/datasets/ds003061

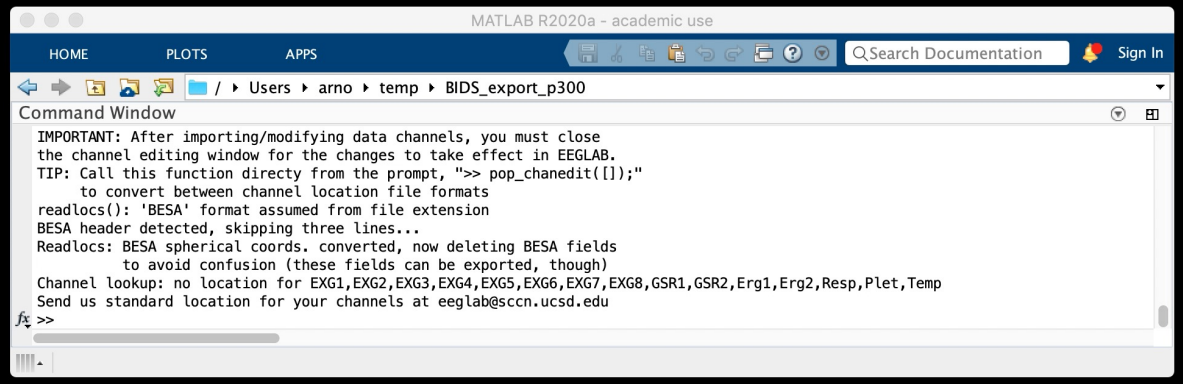
70% standard
15% oddball
15% noise

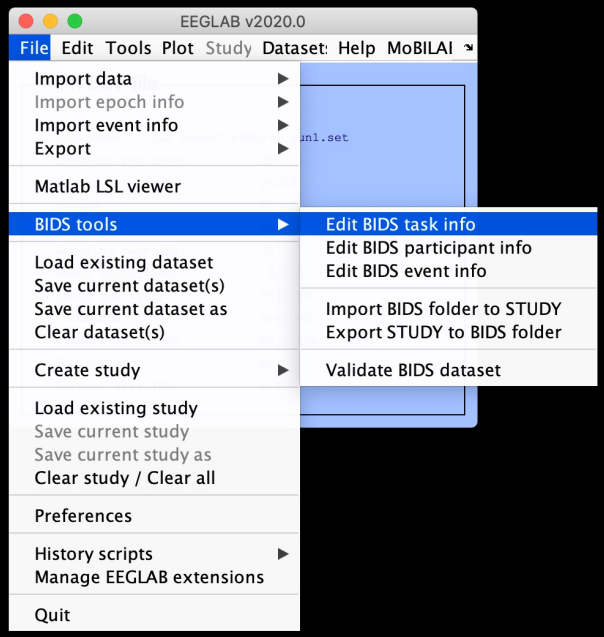

temp2
Search
Favorites
AirDrop
Recents
Applications
data
arno
Pictures
GoogleDrive
temp
Desktop
Documents
Downloads
Mail Downloads
Screen_cap_2020
Creative Cloud Files
iCloud
Name
Date Modified
Size
ds00xxxx-download
Today at 2:04 PM
MATLAB R2020a - academic use
HOME
PLOTS
APPS
Search Documentation
Arnaud
New Script
New Live Script
New
Open
Find Files
Compare
FILE
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
VARIABLE
Favorites
Analyze Code
Run and Time
Clear Commands
CODE
ENVIRONMENT
RESOURCES
/ data matlab eeglab
fx >>

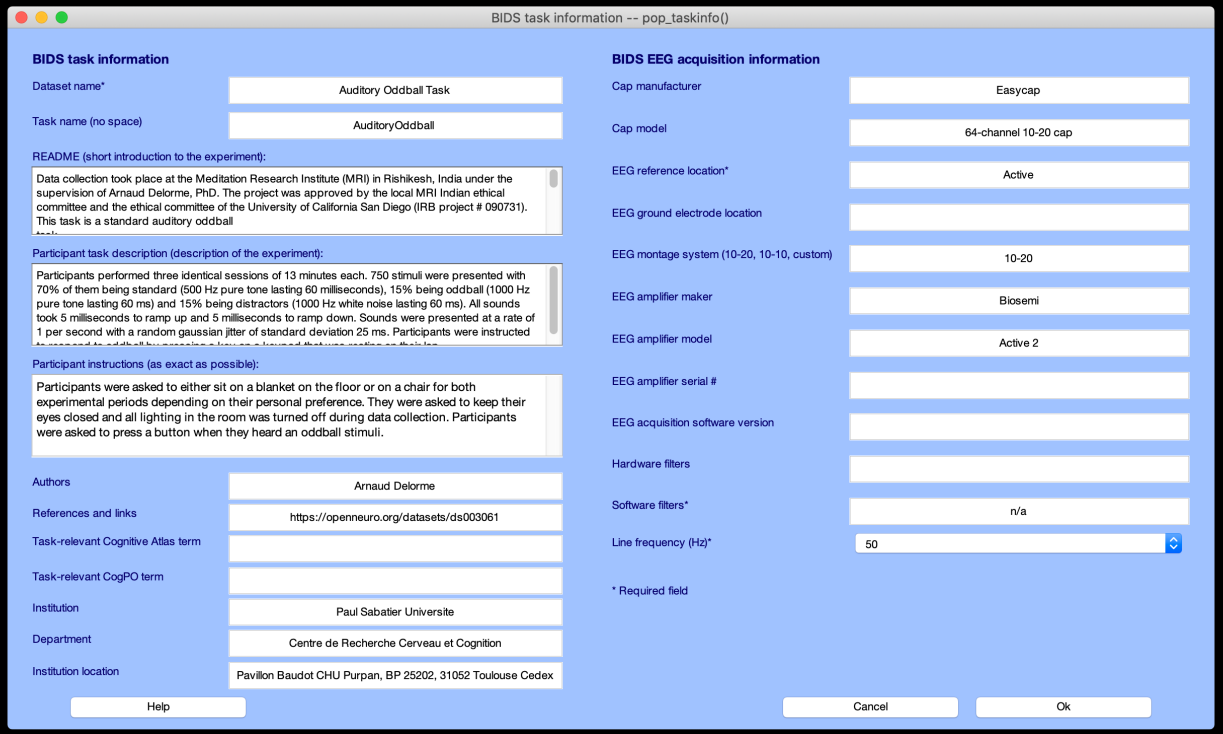
https://github.com/sccn/bids-matlab-tools-example

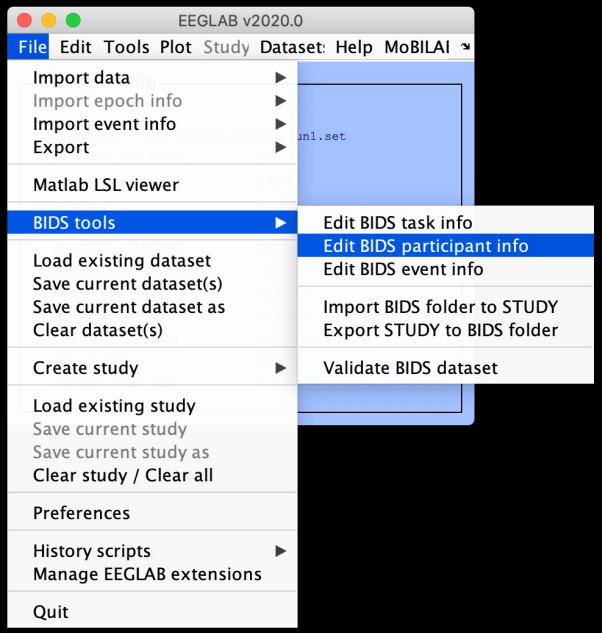


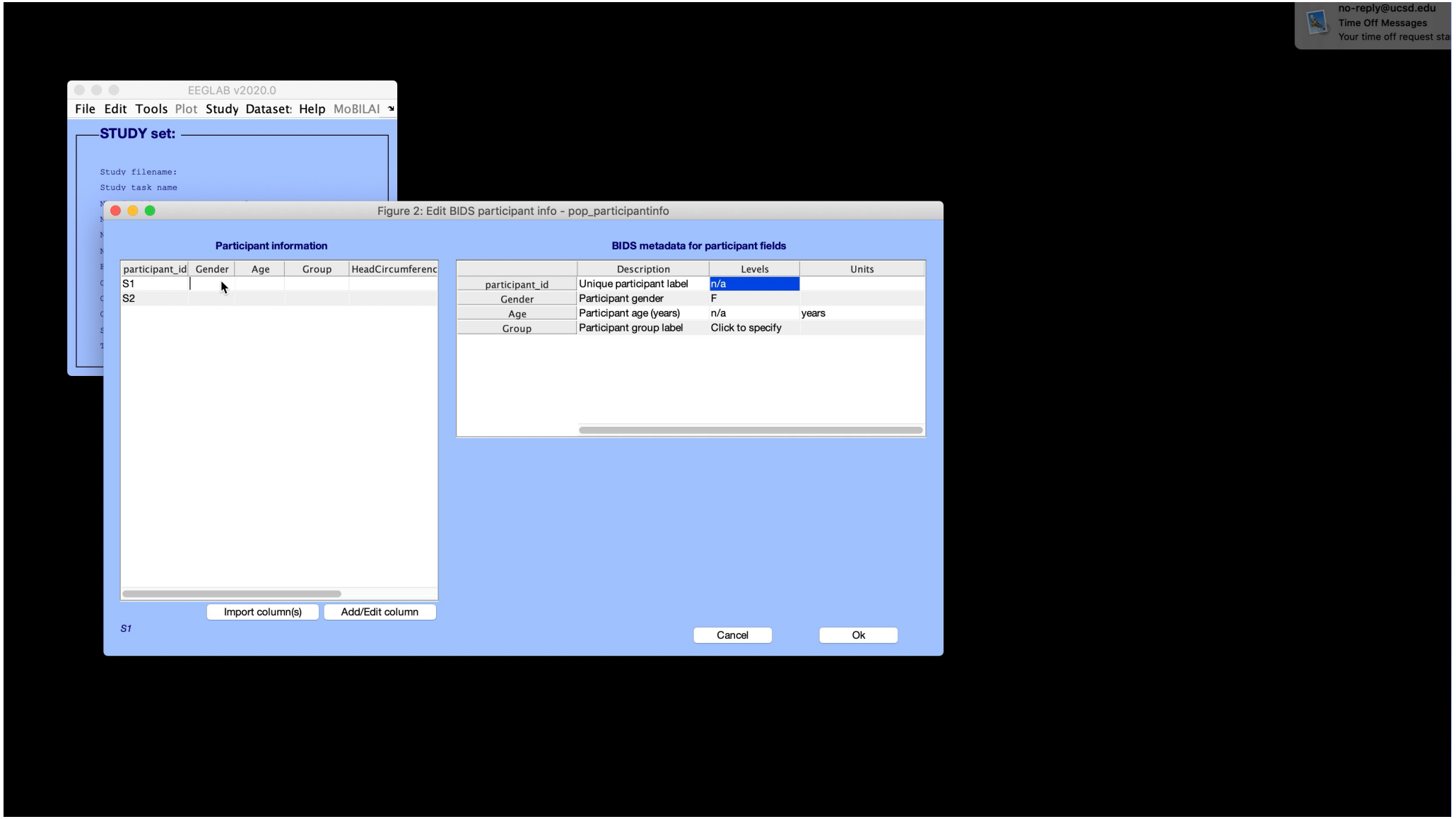

EEGLAB v2020.0
File Edit Tools Plot Study Dataset: Help MoBILAB
Dataset info
Event values
About this dataset
Channel locations
Select data
Select data using events
Select epochs or events
Copy current dataset
Append datasets
Delete dataset(s) from memory
Clusters 1
Status Missing ICA dec.
Total size (Mb) 51.3

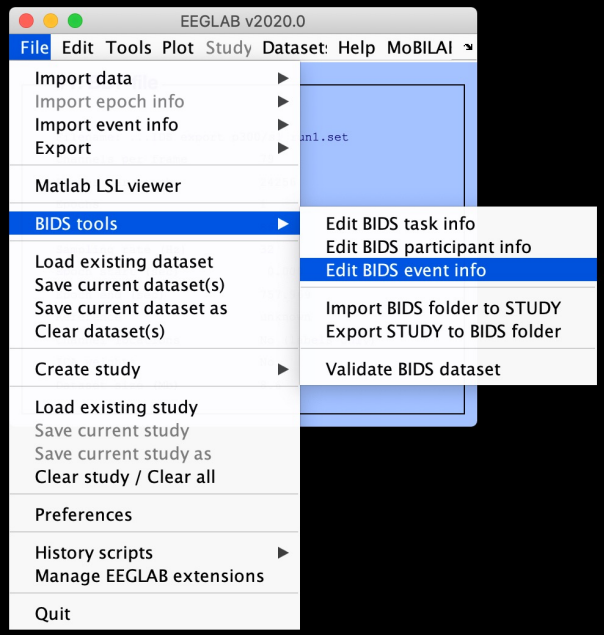

MATLAB R2020a - academic use
HOME PLOTS APPS
Search Documentation
Sign In
/ ▸ Users ▸ arno ▸ temp ▸ BIDS_export_p300
Command Window
IMPORTANT: After importing/modifying data channels, you must close
the channel editing window for the changes to take effect in EEGLAB.
TIP: Call this function directy from the prompt, ">> pop_chanedit([]);"
to convert between channel location file formats
readlocs(): 'BESA' format assumed from file extension
BESA header detected, skipping three lines...
Readlocs: BESA spherical coords. converted, now deleting BESA fields
to avoid confusion (these fields can be exported, though)
Channel lookup: no location for EXG1,EXG2,EXG3,EXG4,EXG5,EXG6,EXG7,EXG8,GSR1,GSR2,Erg1,Erg2,Resp,Plet,Temp
Send us standard location for your channels at eeglab@sccn.ucsd.edu
>>


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
Import data
Import epoch info
Import event info
Export
Matlab LSL viewer
BIDS tools
Load existing dataset
Save current dataset(s)
Save current dataset as
Clear dataset(s)
Create study
Load existing study
Save current study
Save current study as
Clear study / Clear all
Preferences
History scripts
Manage EEGLAB extensions
Quit
Edit BIDS task info
Edit BIDS participant info
Edit BIDS event info
Import BIDS folder to STUDY
Export STUDY to BIDS folder
Validate BIDS dataset


BIDS task information -- pop_taskinfo()
BIDS task information
Dataset name*
Auditory Oddball Task
Task name (no space)
AuditoryOddball
README (short introduction to the experiment):
Data collection took place at the Meditation Research Institute (MRI) in Rishikesh, India under the supervision of Arnaud Delorme, PhD. The project was approved by the local MRI Indian ethical committee and the ethical committee of the University of California San Diego (IRB project # 090731). This task is a standard auditory oddball
Participant task description (description of the experiment):
Participants performed three identical sessions of 13 minutes each. 750 stimuli were presented with 70% of them being standard (500 Hz pure tone lasting 60 milliseconds), 15% being oddball (1000 Hz pure tone lasting 60 ms) and 15% being distractors (1000 Hz white noise lasting 60 ms). All sounds took 5 milliseconds to ramp up and 5 milliseconds to ramp down. Sounds were presented at a rate of 1 per second with a random gaussian jitter of standard deviation 25 ms. Participants were instructed
Participant instructions (as exact as possible):
Participants were asked to either sit on a blanket on the floor or on a chair for both experimental periods depending on their personal preference. They were asked to keep their eyes closed and all lighting in the room was turned off during data collection. Participants were asked to press a button when they heard an oddball stimuli.
Authors
Arnaud Delorme
References and links
https://openneuro.org/datasets/ds003061
Task-relevant Cognitive Atlas term
Task-relevant CogPO term
Institution
Paul Sabatier Universite
Department
Centre de Recherche Cerveau et Cognition
Institution location
Pavillon Baudot CHU Purpan, BP 25202, 31052 Toulouse Cedex
Help
BIDS EEG acquisition information
Cap manufacturer
Easycap
Cap model
64-channel 10-20 cap
EEG reference location*
Active
EEG ground electrode location
EEG montage system (10-20, 10-10, custom)
10-20
EEG amplifier maker
Biosemi
EEG amplifier model
Active 2
EEG amplifier serial #
EEG acquisition software version
Hardware filters
Software filters*
n/a
Line frequency (Hz)*
50
* Required field
Cancel
Ok


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
Import data
Import epoch info
Import event info
Export
Matlab LSL viewer
BIDS tools
Load existing dataset
Save current dataset(s)
Save current dataset as
Clear dataset(s)
Create study
Load existing study
Save current study
Save current study as
Clear study / Clear all
Preferences
History scripts
Manage EEGLAB extensions
Quit
Edit BIDS task info
Edit BIDS participant info
Edit BIDS event info
Import BIDS folder to STUDY
Export STUDY to BIDS folder
Validate BIDS dataset


no-reply@ucsd.edu
Time Off Messages
Your time off request sta
EEGLAB v2020.0
File Edit Tools Plot Study Dataset: Help MoBILAI
STUDY set:
Study filename:
Study task name
Figure 2: Edit BIDS participant info - pop_participantinfo
Participant information
participant_id Gender Age Group HeadCircumferenc
S1
S2
Import column(s)
Add/Edit column
S1
BIDS metadata for participant fields
Description Levels Units
participant_id Unique participant label n/a
Gender Participant gender F
Age Participant age (years) n/a years
Group Participant group label Click to specify
Cancel
Ok


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
Import data
Import epoch info
Import event info
Export
Matlab LSL viewer
BIDS tools
Load existing dataset
Save current dataset(s)
Save current dataset as
Clear dataset(s)
Create study
Load existing study
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Save current study as
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Preferences
History scripts
Manage EEGLAB extensions
Quit
Edit BIDS task info
Edit BIDS participant info
Edit BIDS event info
Import BIDS folder to STUDY
Export STUDY to BIDS folder
Validate BIDS dataset

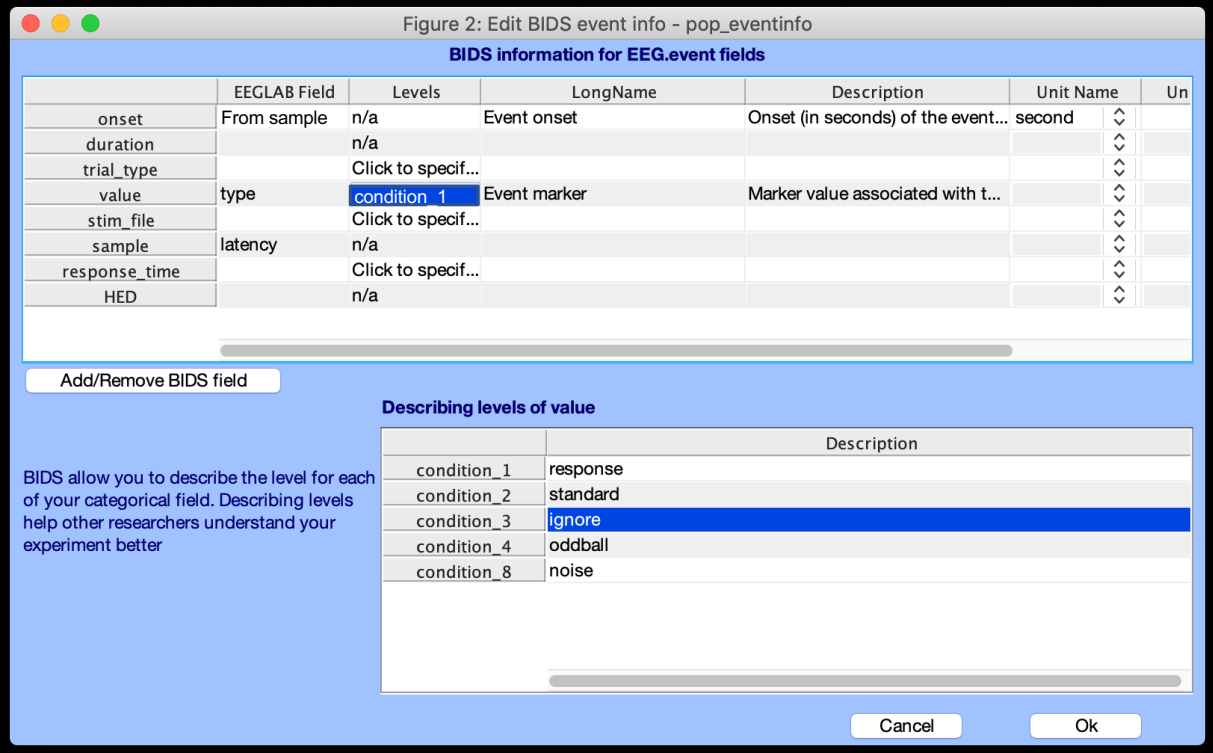


Figure 2: Edit BIDS event info - pop_eventinfo
BIDS information for EEG.event fields
EEGLAB Field
Levels
LongName
Description
Unit Name
Un
onset
From sample
n/a
Event onset
Onset (in seconds) of the event...
second
duration
n/a
trial_type
Click to specif...
value
type
condition_1
Event marker
Marker value associated with t...
stim_file
Click to specif...
sample
latency
n/a
response_time
Click to specif...
HED
n/a
Add/Remove BIDS field
Describing levels of value
Description
condition_1
response
condition_2
standard
condition_3
ignore
condition_4
oddball
condition_8
noise
BIDS allow you to describe the level for each of your categorical field. Describing levels help other researchers understand your experiment better
Cancel
Ok

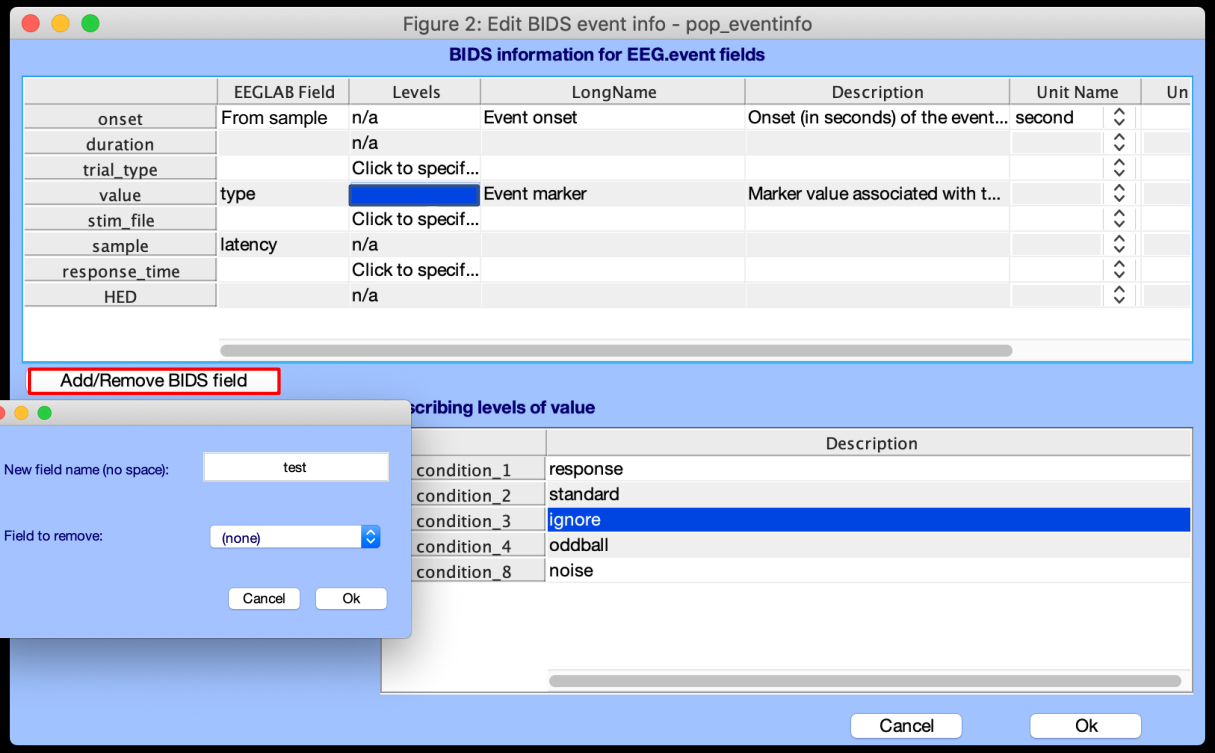


Figure 2: Edit BIDS event info - pop_eventinfo
BIDS information for EEG.event fields
EEGLAB Field
Levels
LongName
Description
Unit Name
onset
From sample
n/a
Event onset
Onset (in seconds) of the event...
second
duration
n/a
trial_type
Click to specif...
value
type
Event marker
Marker value associated with t...
stim_file
Click to specif...
sample
latency
n/a
response_time
Click to specif...
HED
n/a
Add/Remove BIDS field
scribing levels of value
Description
condition_1
response
condition_2
standard
condition_3
ignore
condition_4
oddball
condition_8
noise
New field name (no space):
test
Field to remove:
(none)
Cancel
Ok
Cancel
Ok

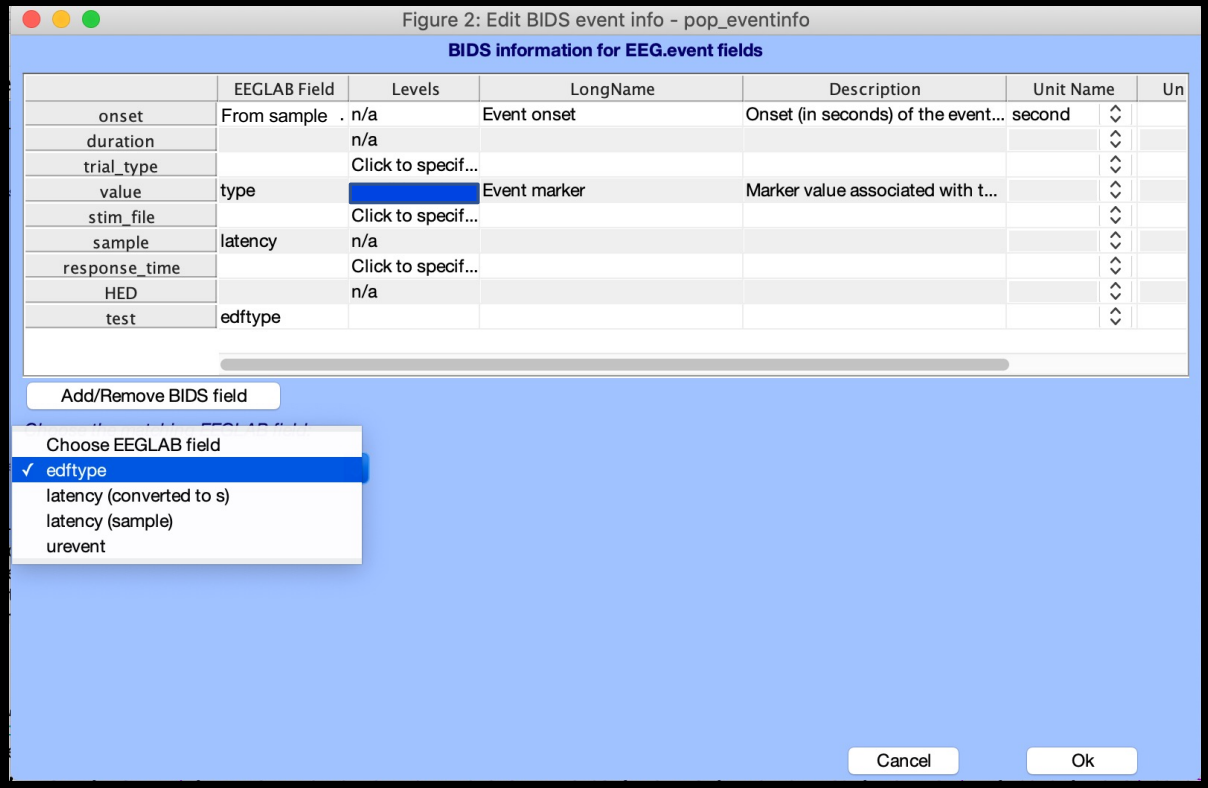
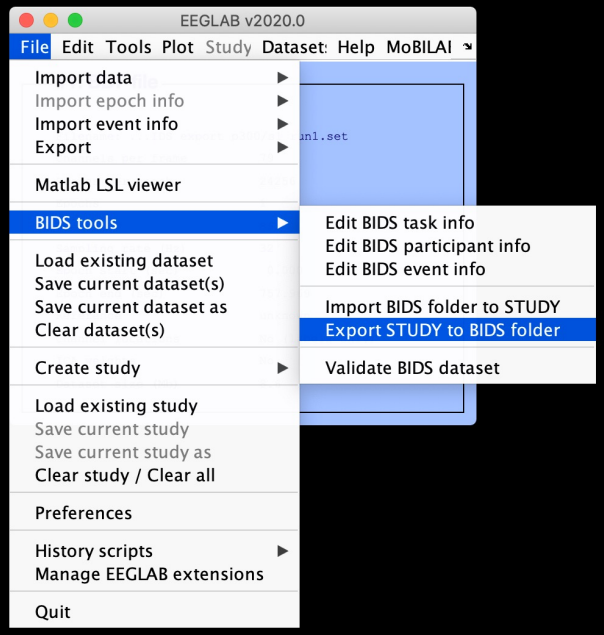


Figure 2: Edit BIDS event info - pop_eventinfo
BIDS information for EEG.event fields
EEGLAB Field
Levels
LongName
Description
Unit Name
Un
onset
From sample
n/a
Event onset
Onset (in seconds) of the event...
second
duration
n/a
trial_type
Click to specif...
value
type
Event marker
Marker value associated with t...
stim_file
Click to specif...
sample
latency
n/a
response_time
Click to specif...
HED
n/a
test
edftype
Add/Remove BIDS field
Choose EEGLAB field
edftype
latency (converted to s)
latency (sample)
urevent
Cancel
Ok


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
Import data
Import epoch info
Import event info
Export
Matlab LSL viewer
BIDS tools
Load existing dataset
Save current dataset(s)
Save current dataset as
Clear dataset(s)
Create study
Load existing study
Save current study
Save current study as
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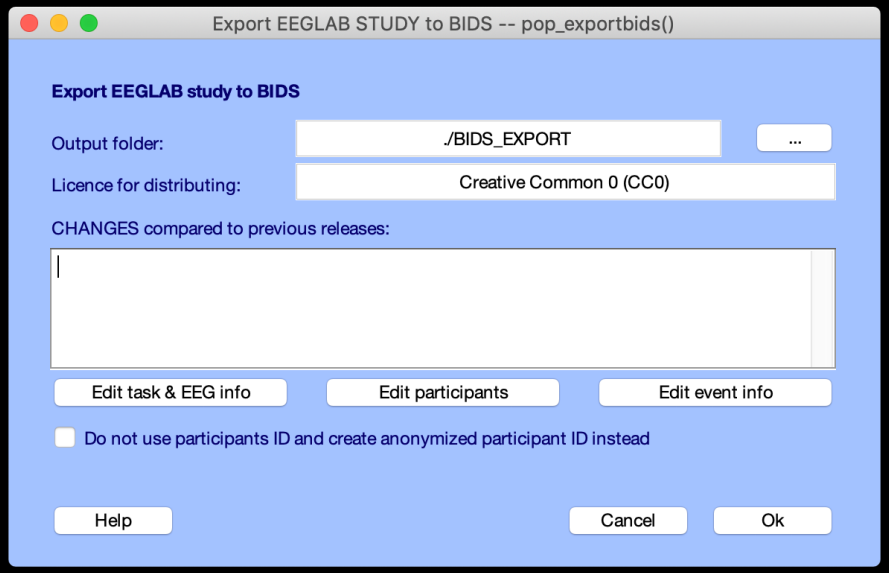
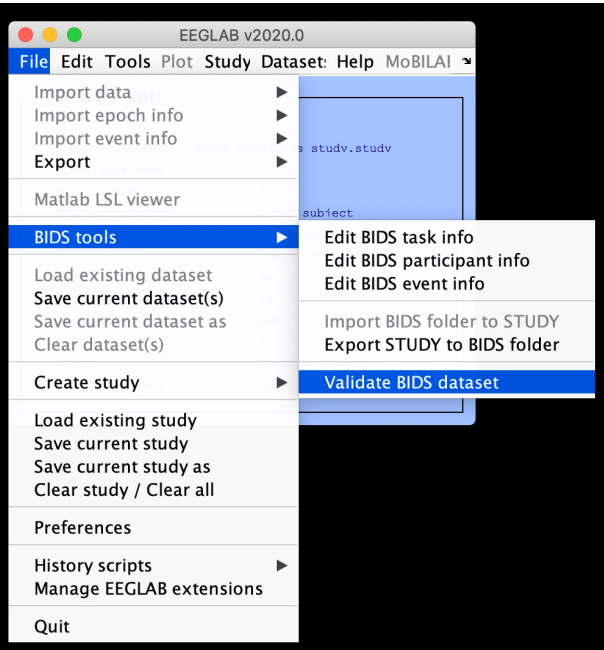
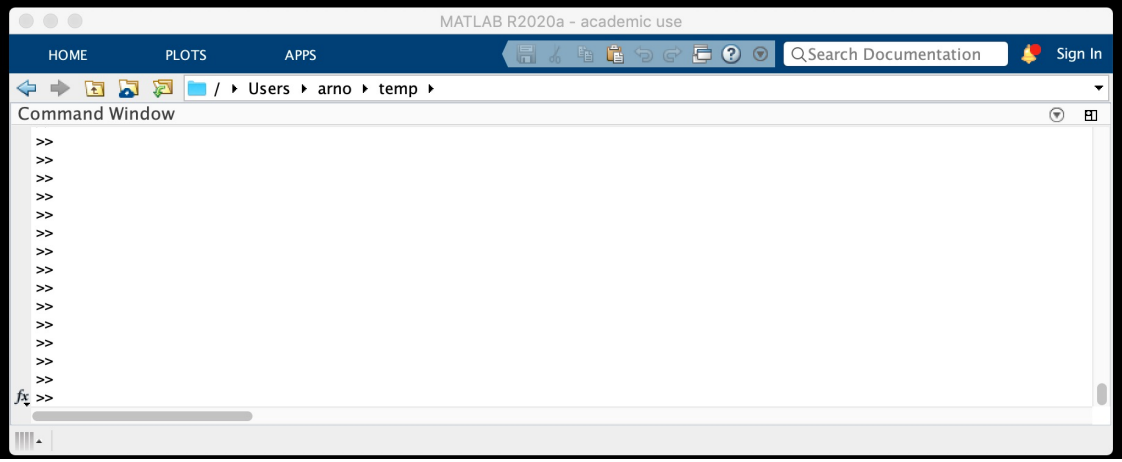
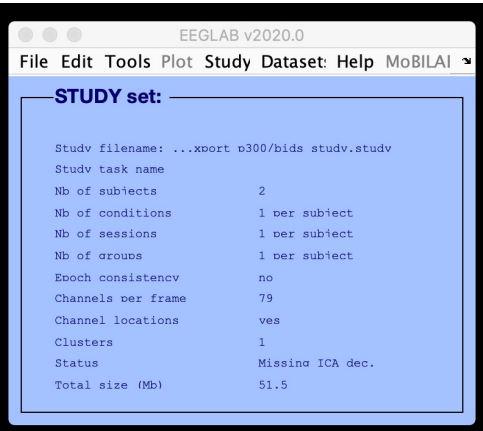
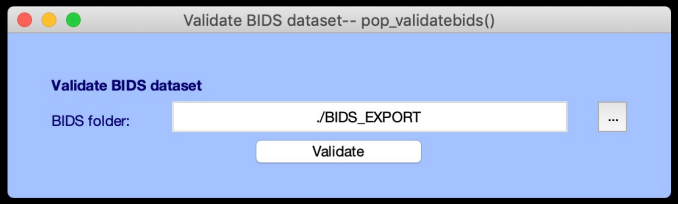
Preferences
History scripts
Manage EEGLAB extensions
Quit
Edit BIDS task info
Edit BIDS participant info
Edit BIDS event info
Import BIDS folder to STUDY
Export STUDY to BIDS folder
Validate BIDS dataset

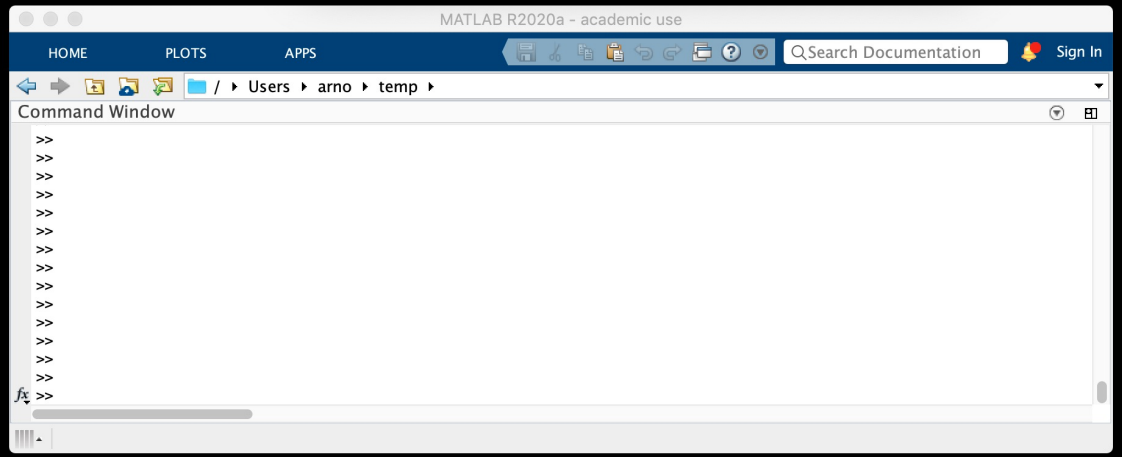

Export EEGLAB STUDY to BIDS -- pop_exportbids()
Export EEGLAB study to BIDS
Output folder:
./BIDS_EXPORT
...
Licence for distributing:
Creative Common 0 (CC0)
CHANGES compared to previous releases:
Edit task & EEG info
Edit participants
Edit event info
Do not use participants ID and create anonymized participant ID instead
Help
Cancel
Ok

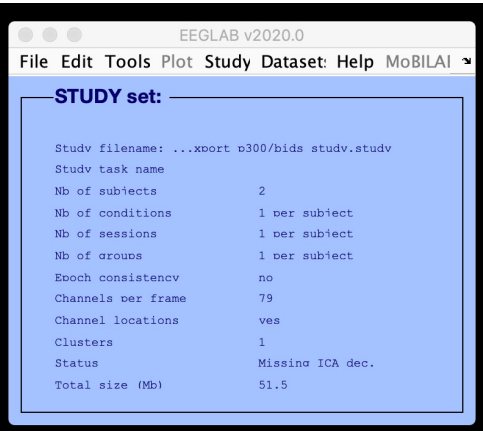

EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
Import data
Import epoch info
Import event info
Export
Matlab LSL viewer
BIDS tools
Load existing dataset
Save current dataset(s)
Save current dataset as
Clear dataset(s)
Create study
Load existing study
Save current study
Save current study as
Clear study / Clear all
Preferences
History scripts
Manage EEGLAB extensions
Quit
Edit BIDS task info
Edit BIDS participant info
Edit BIDS event info
Import BIDS folder to STUDY
Export STUDY to BIDS folder
Validate BIDS dataset
studv.studv
subject

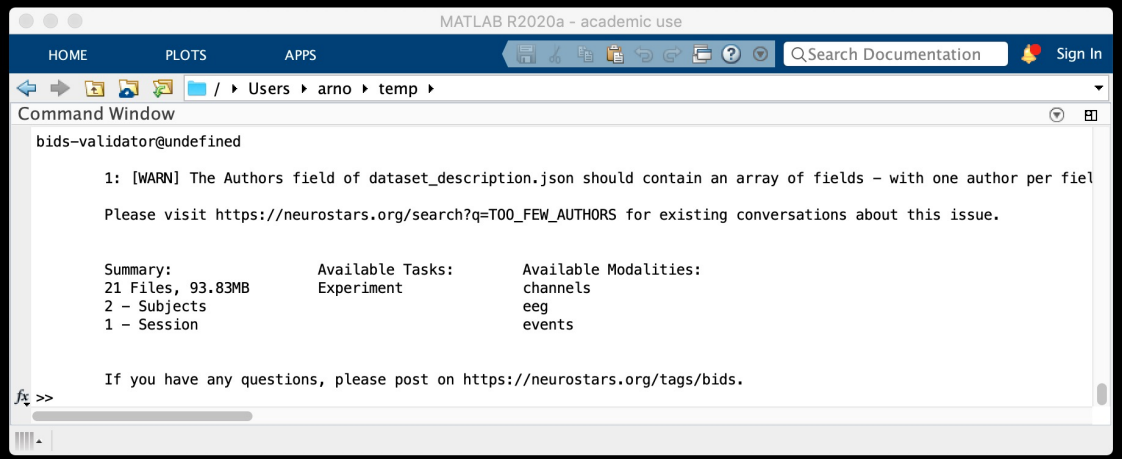

MATLAB R2020a - academic use
HOME
PLOTS
APPS
Search Documentation
Sign In
/ Users arno temp
Command Window
>>


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
STUDY set:
Study filename: ...xport p300/bids study.study
Study task name
Nb of subjects 2
Nb of conditions 1 per subject
Nb of sessions 1 per subject
Nb of groups 1 per subject
Epoch consistency no
Channels per frame 79
Channel locations yes
Clusters 1
Status Missing ICA dec.
Total size (Mb) 51.5

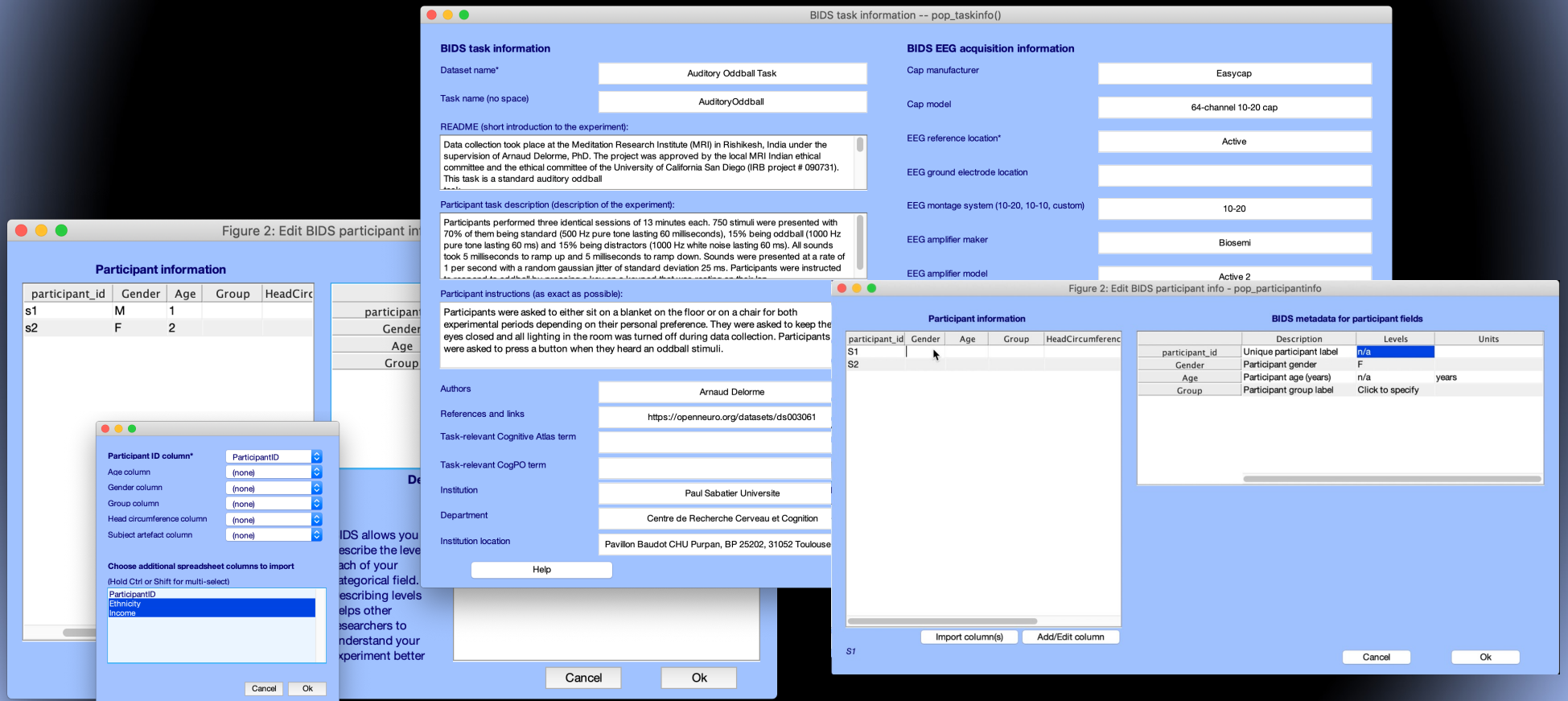

Validate BIDS dataset-- pop_validatebids()
Validate BIDS dataset
BIDS folder:
./BIDS_EXPORT
...
Validate


MATLAB R2020a - academic use
HOME
PLOTS
APPS
Search Documentation
Sign In
/ Users arno temp
Command Window
>>


EEGLAB v2020.0
File Edit Tools Plot Study Dataset Help MoBILAB
STUDY set:
Study filename: ...xport p300/bids study.study
Study task name
Nb of subjects 2
Nb of conditions 1 per subject
Nb of sessions 1 per subject
Nb of groups 1 per subject
Epoch consistency no
Channels per frame 79
Channel locations yes
Clusters 1
Status Missing ICA dec.
Total size (Mb) 51.5


MATLAB R2020a - academic use
HOME PLOTS APPS
Search Documentation
Sign In
/ Users arno temp
Command Window
bids-validator@undefined
1: [WARN] The Authors field of dataset_description.json should contain an array of fields - with one author per fiel
Please visit https://neurostars.org/search?q=TOO_FEW_AUTHORS for existing conversations about this issue.
Summary:
21 Files, 93.83MB
2 - Subjects
1 - Session
Available Tasks:
Experiment
Available Modalities:
channels
eeg
events
If you have any questions, please post on https://neurostars.org/tags/bids.
>>

BIDS EEGLAB plugin (export/import)



```m
% Matlab script to export to BIDS - tutorial and unit test case
% Arnaud Delorme - Oct 2020
clear

data = [];
data(end+1).file = {'s1_run1.bdf' 's1_run2.bdf' 's1_run3.bdf'};
data(end  ).session = [1 1 1];
data(end  ).run     = [1 2 3];
data(end  ).notes   = { 'She changed push button hands during the experiment (in the middle of trials)' };

data(end+1).file = {'s2_run1.bdf' 's2_run2.bdf' 's2_run3.bdf'};
data(end  ).session = [1 1 1];
data(end  ).run     = [1 2 3];
data(end  ).notes   = { 'First ~120 seconds did not have push button triggers because the USB cable was not

% Content for README file
README = [ 'Data collection took place at the Meditation Research Institute (MRI) in Rishikesh, India under
'Participants sat either on a blanket on the floor or on a chair for both experimental periods depending on
'Participants performed three identical sessions of 13 minutes each. 750 stimuli were presented with 70% of
];

% general information for dataset_description.json file
generalInfo.Name = 'P300 sound task';
generalInfo.ReferencesAndLinks = { 'No bibliographic reference other than the DOI for this dataset' };
generalInfo.BIDSVersion = 'v1.2.1';
generalInfo.License = 'CC0';
generalInfo.Authors = {'Arnaud Delorme' };

% Task information for xxxx-eeg.json file
tInfo.InstitutionAddress = 'Pavillon Baudot CHU Purpan, BP 25202, 31052 Toulouse Cedex';
tInfo.InstitutionName = 'Paul Sabatier Universite';
tInfo.InstitutionalDepartmentName = 'Centre de Recherche Cerveau et Cognition';
tInfo.PowerLineFrequency = 50;
tInfo.ManufacturersModelName = 'Biosemi Active 2';

% participant information for participants.tsv file
pInfo = { 'gender' 'age' 'Ethnicity' 'Air_conditioning';
 'F' 44 'Indian'        'on';
 'F' 32 'Indian'        'on' };

% participant column description for participants.json file
pInfoDesc.participant_id.LongName    = 'Participant identifier';
pInfoDesc.participant_id.Description = 'Unique participant identifier';

pInfoDesc.gender.Description = 'Sex of the participant';
pInfoDesc.gender.Levels.M    = 'male';
pInfoDesc.gender.Levels.F    = 'female';

pInfoDesc.age.Description = 'age of the participant';
pInfoDesc.age.Units       = 'years';

pInfoDesc.Air_conditioning.Description = 'Ethnicity of participants';
pInfoDesc.Ethnicity.Levels.Indian        = 'Participant of Indian origin';
pInfoDesc.Ethnicity.Levels.Non_indian    = 'Participant of non-Indian origin (Caucasian, etc...)';

pInfoDesc.Air_conditioning.Description = 'Air Conditioning - could create interference so noted here';
pInfoDesc.Air_conditioning.Levels.on   = 'Air Conditioning was on  - temperature at or below 25C';
pInfoDesc.Air_conditioning.Levels.off  = 'Air Conditioning was off - temperature at or above 25C';
```

Raw data files, session info, run info, and notes

README

Dataset description

Task information

Participant information and associated column description

https://github.com/sccn/bids-matlab-tools-example

```m
% event column description for xxx-events.json file (only one such file)
eInfo = {'onset'         'latency';
         'sample'        'latency';
         'value'         'type' };

eInfoDesc.onset.Description = 'Event onset';
eInfoDesc.onset.Units = 'second';

eInfoDesc.response_time.Description = 'Latency of button press after auditory stimulus';
eInfoDesc.response_time.Levels.Units = 'millisecond';

eInfoDesc.trial_type.Description = 'Type of event';
eInfoDesc.trial_type.Levels.stimulus = 'Auditory stimulus';
eInfoDesc.trial_type.Levels.responses = 'Behavioral response';

eInfoDesc.value.Description = 'Value of event';
eInfoDesc.value.Levels.response   = 'Response of the subject';
eInfoDesc.value.Levels.standard   = 'Standard at 500 hz for 60 ms';
eInfoDesc.value.Levels.ignore     = 'Ignore - not a real event';
eInfoDesc.value.Levels.oddball    = 'Oddball at 1000 hz for 60 ms';
eInfoDesc.value.Levels.noise      = 'White noise for 60 ms';

renameTypes = { 'condition 1' 'response';
                'condition 2' 'standard';
                'condition 3' 'ignore';
                'condition 4' 'oddball';
                'condition 8' 'noise' };

trialTypes = { 'condition 1' 'response';
               'condition 2' 'stimulus';
               'condition 3' 'n/a';
               'condition 4' 'stimulus';
               'condition 8' 'stimulus' };

% Code Files used to preprocess and import to BIDS
codefiles = { fullfile(pwd, mfilename) fullfile(pwd, 'oddball_psychotoolbox.m') };

% Content for CHANGES file
CHANGES = sprintf([ 'Version 1.0 - 4 Aug 2020\n' ...
                    ' - Initial release\n' ]);

% call to the export function
targetFolder =  '../BIDS_export';
dipfitdefs;
bids_export(data, ...
    'targetdir', targetFolder, ...
    'taskName', 'P300',...
    'gInfo', generalInfo, ...
    'pInfo', pInfo, ...
    'pInfoDesc', pInfoDesc, ...
    'eInfo', eInfo, ...
    'eInfoDesc', eInfoDesc, ...
    'README', README, ...
    'CHANGES', CHANGES, ...
    'codefiles', codefiles, ...
    'trialtype', trialTypes, ...
    'chanlookup', template_models(2).chanfile, ...
    'renametype', renameTypes, ...
    'checkresponse', 'condition 1', ...
    'tInfo', tInfo, ...
    'copydata', 1);
```

Event information and associated column description

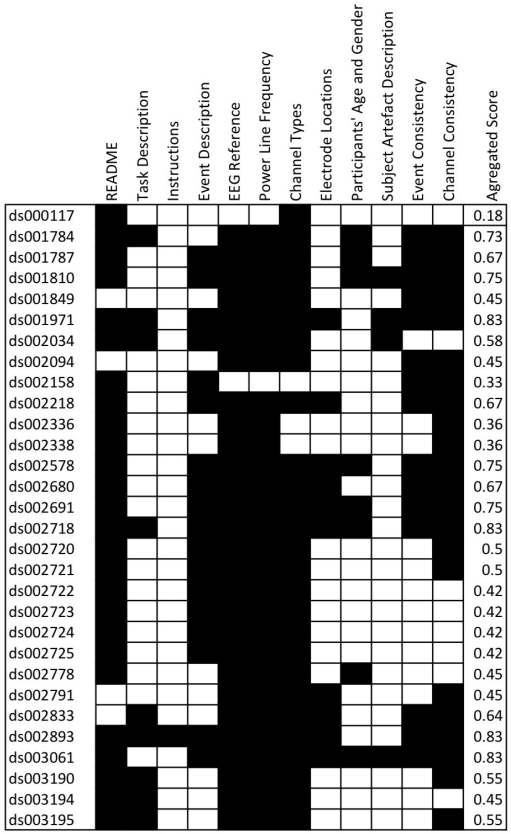
Renaming events

Code

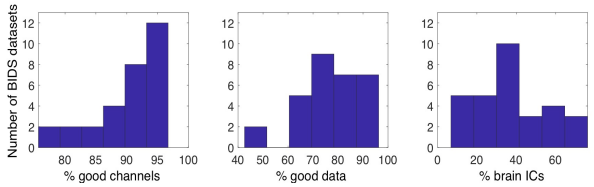
Canges

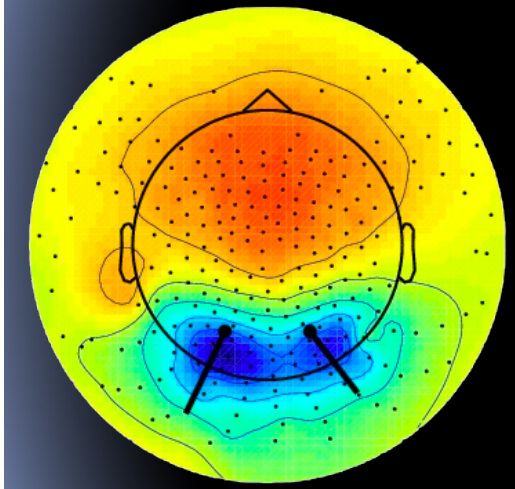
Calling bids_export.m

https://github.com/sccn/bids-matlab-tools-example



Dataset	n	Flat	Chan.	Good chan.	Good data	Brain ICs
ds000117	84	-	74	89 - 90	68 - 78	28 - 32
ds001784	30	-	60	85 - 92	63 - 77	5 - 11
ds001787	40	-	64	93 - 95	85 - 90	24 - 30
ds001810	263	-	64	78 - 80	71 - 74	35 - 37
ds001849	120	-	30	86 - 88	66 - 70	41 - 45
ds001971	273	-	112*	91 - 95	81 - 84	8 - 10
ds002034	167	21	62	95 - 98	47 - 52	29 - 33
ds002094	43	-	30	88 - 93	66 - 77	37 - 45
ds002158	8	-	63	80 - 86	19 - 66	11 - 23
ds002218	18	-	32	94 - 97	66 - 78	35 - 46
ds002336	54	1	63	81 - 83	74 - 89	33 - 39
ds002338	85	-	63	74 - 77	87 - 95	24 - 28
ds002578	2	-	18	78 - 89	96 - 97	46 - 60
ds002680	350	-	19	92 - 93	81 - 84	53 - 56
ds002691	20	-	32	93 - 97	82 - 87	30 - 40
ds002718	18	-	74	95 - 96	58 - 76	20 - 28
ds002720	165	-	19	93 - 95	68 - 72	52 - 56
ds002721	185	-	19	95 - 96	67 - 72	45 - 49
ds002722	94	-	32	92 - 95	63 - 70	36 - 39
ds002723	44	-	32	95 - 97	66 - 76	36 - 40
ds002724	96	-	32	94 - 96	72 - 77	35 - 39
ds002725	105	-	31	90 - 94	80 - 85	53 - 58
ds002778	46	-	32	90 - 95	68 - 78	41 - 48
ds002791	92	-	256	90 - 92	62 - 70	6 - 7
ds002833	80	-	256	91 - 94	82 - 88	6 - 8
ds002893	55	12	36	89 - 93	76 - 83	29 - 37
ds003061	39	-	64	84 - 89	86 - 92	22 - 28
ds003190	384	2	8	81 - 83	89 - 91	74 - 78
ds003194	29	-	19	93 - 97	90 - 95	72 - 79
ds003195	20	-	19	90 - 97	89 - 94	65 - 76





OpenNEURO

NEMAR