



BIDS

BRAIN IMAGING DATA STRUCTURE

AN INTERNATIONAL STANDARD TO STRUCTURE DATA (EEG)

CRPN

CENTRE DE
RECHERCHE EN
PSYCHOLOGIE &
NEUROSCIENCES

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May 28th, 2026, CRPN



amU
Aix Marseille Université





<https://www.eeg101.eu/>

Daniel Brady (Univ. Sheffield) visiting CRPN
June 29th – June 3th

Goal : Work together to asses if/how to adapt the tools Dan developed in the context of the project EEGManyLabs

Outline

Context

The BIDS History

BIDS in Practice: basic principles

How to adopt BIDS: example workflow & resources

Outline

Context

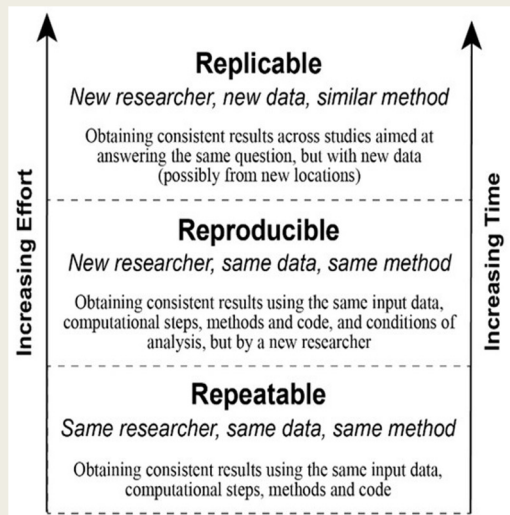
The BIDS History

BIDS in Practice: basic principles

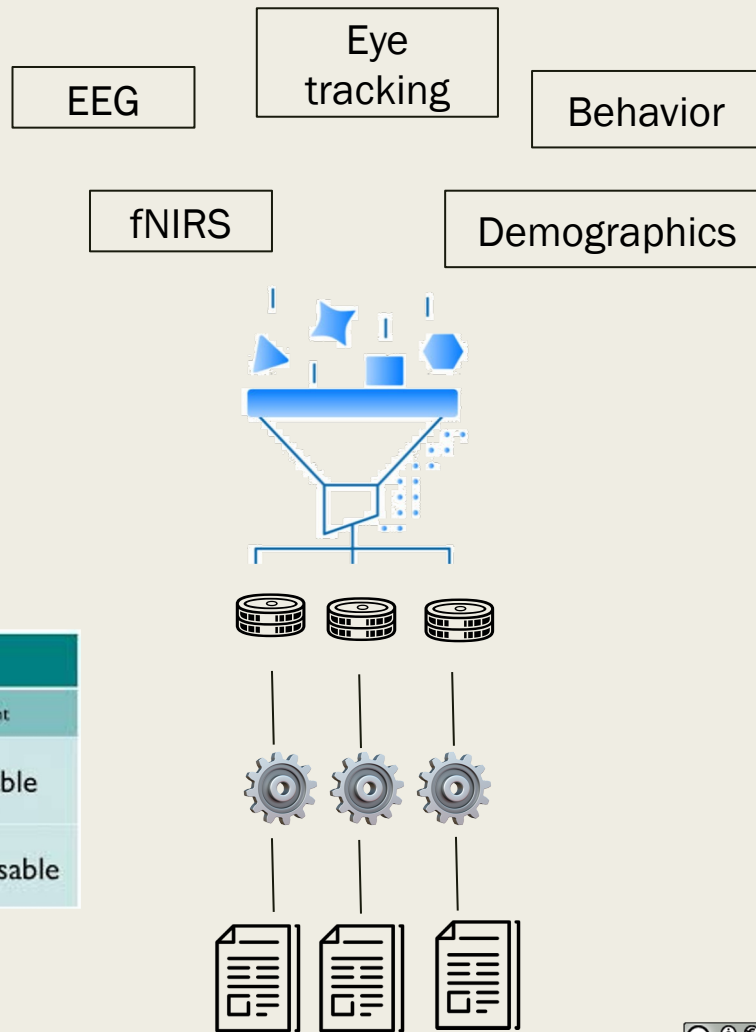
How to adopt BIDS: example workflow & resources

Context : Why BIDS

- A component of *reproducibility*
 - Overall goal : increase scientific rigor and reliability
- Various data type and format



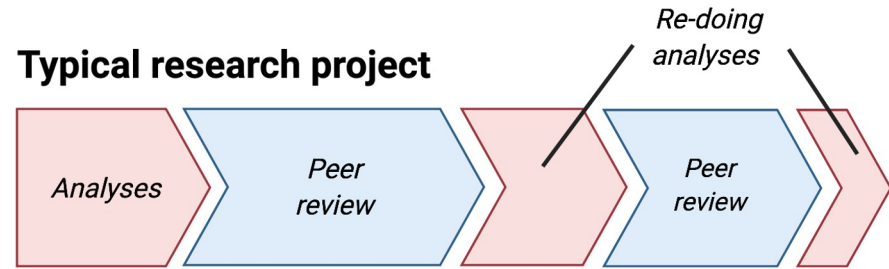
		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable



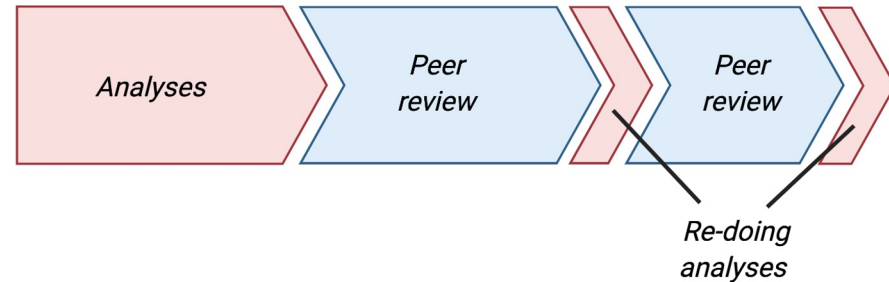
Advantages of working reproducibly

- An initial investment that pays off in the long run: You don't lose time doing reproducible science, you just relocate where you spend
- Forces you to double-check your stuff
- Your future-self will thank you
 - *during publication process*
 - *after publication*
 - *your past-self doesn't return emails, ever...*
- Increases credibility and reputation
- Reproducibility favors trust in science
- Faster scientific progress

Typical research project



Research project using reproducible practices



Example : old dataset



- Subject 3 did not perform both tasks, why?
- For 3 subjects, key metadata are missing
 - dominant hand? age? clinical information?
 - Need to search through paper notes stored somewhere in an office... but whose office?
- Data stored in obsolete or unreadable file formats
- Oh there's a trigger 123 in the data, what does it code for again?



- Loss of reproducibility
- Time-consuming data recovery
- Reduced reusability of the dataset (even by yourself!)
- Difficult integration into cutting edge pipelines/analysis

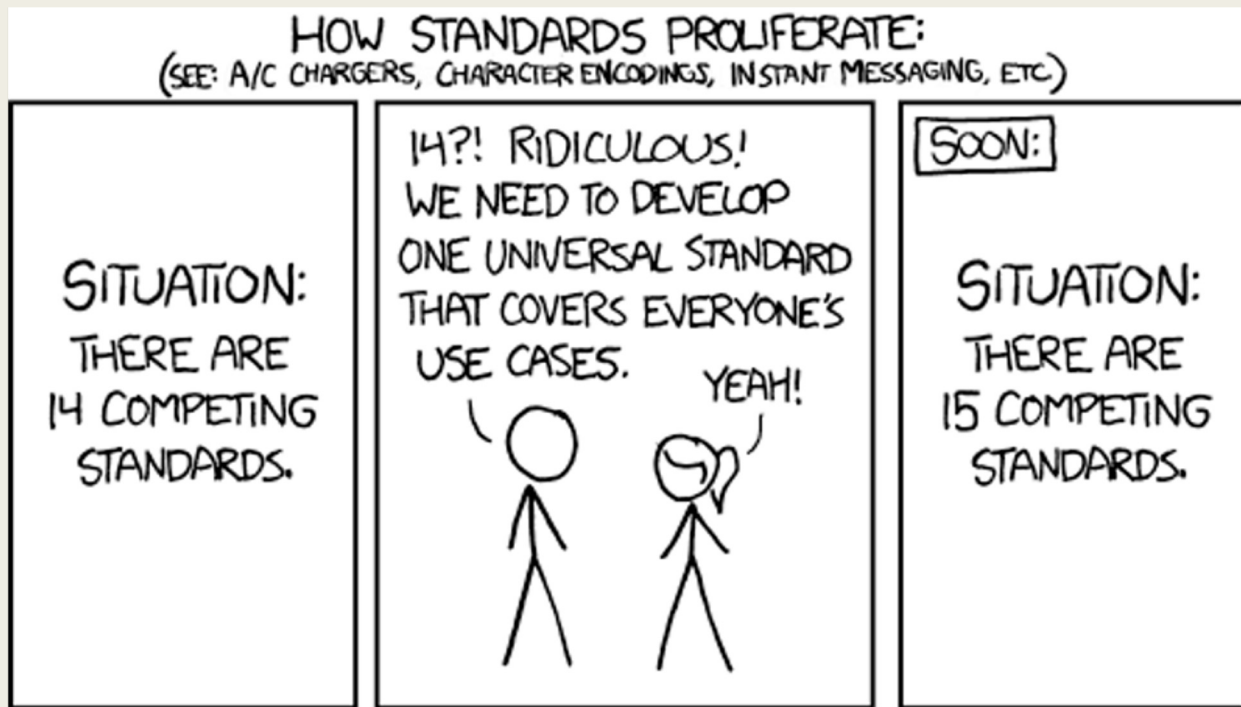
Stored dataset
≠
(re)usable
dataset



FAIR dataset
=
(re)usable
dataset

Why adopting an International standard?

“Mind your own business! I document my data the way I want!” Yes, please do! There are many ways to work reproducibly [...] and you can pick whatever suits you best.



*Five selfish reasons to work reproducibly.
Florian Markowetz. 2015.*

Outline

Context

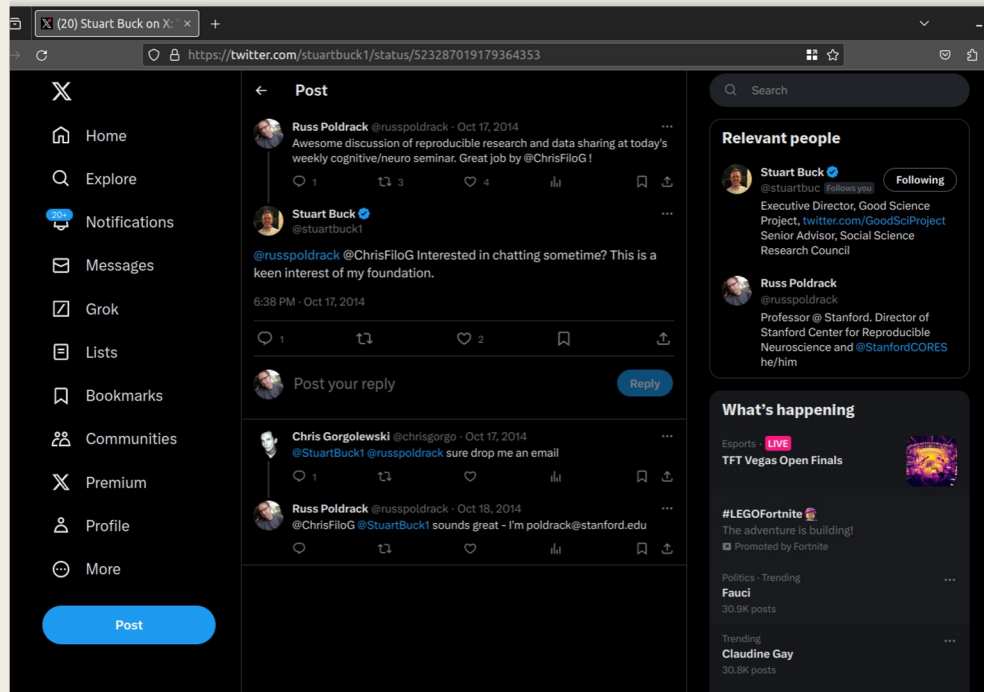
The BIDS History

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The BIDS History

- Birth of BIDS: a social media post by Russ Poldrack in October 2014
- BIDS was first envisioned in a follow-up meeting held in Stanford in January 2015
- A few other meetings during 2015 (e.g. at OHBM 2015 conference)
- September 2015:
 - BIDS specifications and 22 examples were disseminated to the community
- October 2015:
 - a BIDS leaflet was distributed at SFN



Brain Imaging Data Structure

An easy way to avoid getting
lost in your data!

bids.neuroimaging.io

What is BIDS?

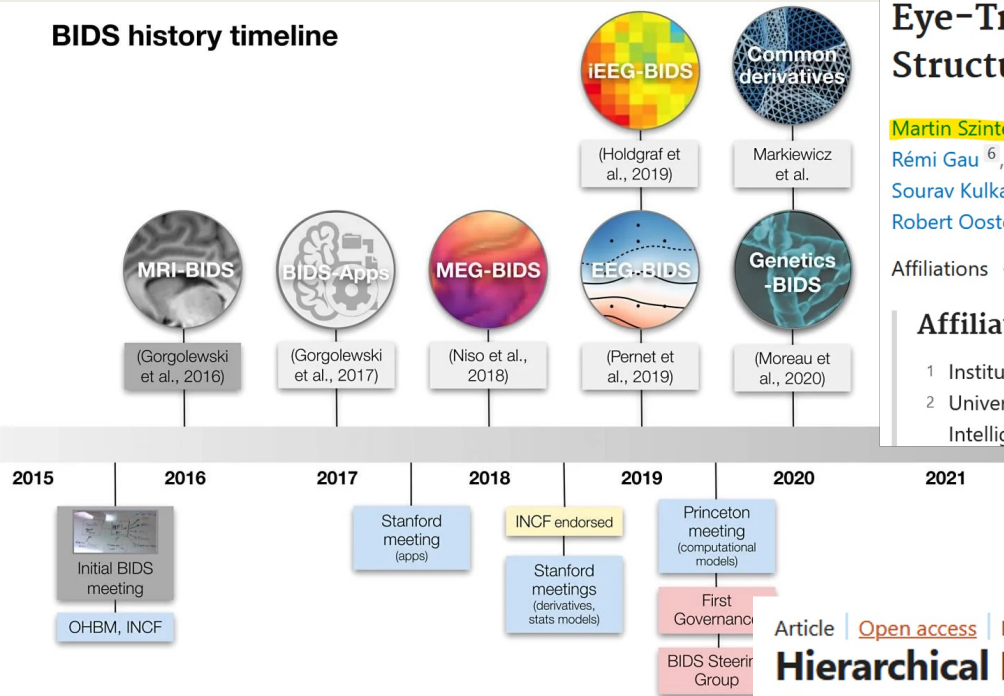
- Brain Imaging Data Structure (BIDS) is a specification for how to **organize and describe** human neuroimaging datasets.
- We provide an easy to follow **guide** on how to convert your dataset to BIDS, over 20 **example datasets** and a **validation tool**.
- BIDS makes it easy to work with a growing set of neuroimaging tools (Nipype, Automatic Analysis, PyMVPA etc.)



Principles behind BIDS

1. **Adoption is crucial.**
2. **Don't reinvent the wheel.**
3. **Some metadata is better than no metadata**
4. **Don't rely on external software** (databases) or complicated file formats (RDF).
5. **Aim to capture 80% of experimental designs** but give the remaining 20% space to extend the standard.

BIDS history timeline



[More to come \(BIDS extension proposals\)](#)

> bioRxiv [Preprint]. 2026 Feb 5:2026.02.03.703514. doi: 10.64898/2026.02.03.703514.

Eye-Tracking-BIDS: the Brain Imaging Data Structure extended to gaze position and pupil data

Martin Szinte¹, Dominik R Bach², Dejan Draschkow³, Oscar Esteban⁴, Benjamin Gagl⁵, Rémi Gau⁶, Klaus Geyer⁷, Yusef Q. Habekost⁸, Scott Makeig^{9, 10}, Finn M. Kluge¹, Sourav Kulkarni¹, Robert Oostenveld¹

Affiliations

Affiliations

1 Institut
2 Univers
Intellig

The Brain Imaging Data Structure

BEP 032: Microelectrode electrophysiology

Pull request: <https://github.com/bids-standard/bids-specification/pull/2307>

Content

• raw

Article | [Open access](#) | Published: 19 August 2025

Hierarchical Event Descriptor library schema for EEG data annotation

[Dora Hermes](#) [✉](#), [Tal Pal Attia](#), [Sándor Beniczky](#), [Jorge Bosch-Bayard](#), [Arnaud Delorme](#), [Brian Nils Lundstrom](#), [Christine Rogers](#), [Stefan Rampp](#), [Seyed Yahya Shirazi](#), [Dung Truong](#), [Pedro Valdes-Sosa](#), [Greg Worrell](#), [Scott Makeig](#) & [Kay Robbins](#)

[Scientific Data](#) **12**, Article number: 1448 (2025) | [Cite this article](#)

What makes BIDS so successful?

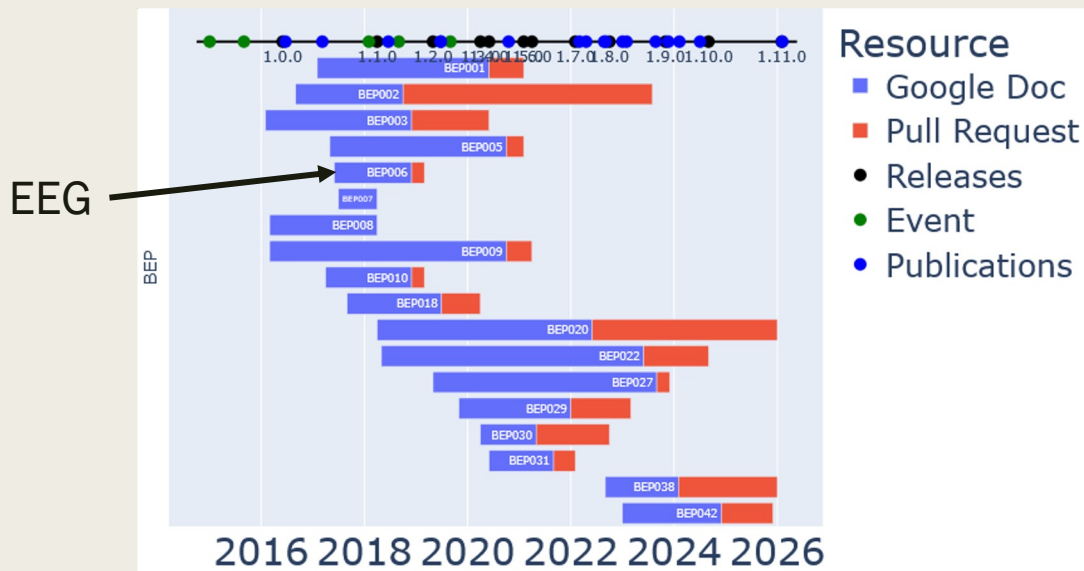
- Right timing
- 100% community-driven, everybody can contribute!



New BEP process:

- 1- Google doc
- 2- GitHub

[Examples](#)



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The BIDS History

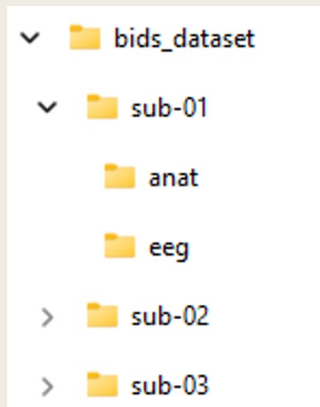
BIDS in Practice: basic principles

How to adopt BIDS: example workflow & resources

BIDS, kezaiko ?

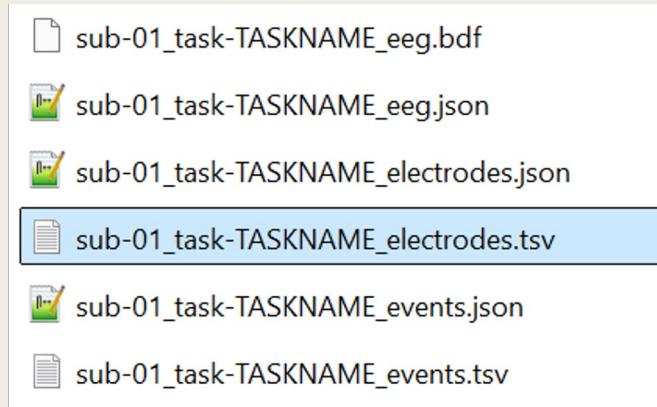
→ Not a format ! It is a style of **research data management** (RDM)

1) Folder-based organization



- Fixed folders hierarchy
- Fixed naming convention

2) Data files and sidecar files



- Defined file formats
- Fixed naming convention

BIDS specifies:

- in which file stored which metadata
- which metadata is **REQUIRED**, **RECOMMENDED**, or **OPTIONAL**

Sidecar JSON (*_eeg.json)

Those fields SHOULD be present:

For consistency between studies a these fields from the actual raw da

Those fields MUST be present:

Key name	Requirement Level
EEGReference	REQUIRED
SamplingFrequency	REQUIRED
PowerLineFrequency	REQUIRED

Key name	Requirement Level	Data type	Description
----------	-------------------	-----------	-------------

CapManufacturer

CapManufacturersModelI

EEGChannelCount

ECGChannelCount

EMGChannelCount

number or
"n/a"

These fields MAY be present:

Key name	Requirement Level	Data type	Description
ElectricalStimulation	OPTIONAL	boolean	Boolean field to specify if electrical stimulation was done during the recording (options are true or false) Parameters for event-like stimulation should be specified in the events.tsv file.
ElectricalStimulationParameters	OPTIONAL	string	Free form description of stimulation parameters, such as frequency or shape. Specific onsets can be specified in the

Frequency (in Hz) of the power grid at the geographical location of the instrument (for

```
{
  "TaskName": "Seeing stuff",
  "TaskDescription": "Subjects see various images for which phase, amplitude spectrum",
  "Instructions": "Your task is to detect images when they appear for the 2nd time, c",
  "InstitutionName": "The world best university, 10 Beachfront Avenue, Papeete",
  "SamplingFrequency": 2400,
  "Manufacturer": "Brain Products",
  "ManufacturersModelName": "BrainAmp DC",
  "CapManufacturer": "EasyCap",
  "CapManufacturersModelName": "M1-ext",
  "EEGChannelCount": 87,
  "EOGChannelCount": 2,
  "ECGChannelCount": 1,
  "EMGChannelCount": 0,
  "MiscChannelCount": 0,
  "TriggerChannelCount": 1,
  "PowerLineFrequency": 50,
  "EEGPlacementScheme": "10 percent system",
  "EEGReference": "single electrode placed on FCz",
  "EEGGround": "placed on AFz",
  "SoftwareFilters": {
    "Anti-aliasing filter": {
      "half-amplitude cutoff (Hz)": 500,
      "Roll-off": "6dB/Octave"
    }
  },
  "HardwareFilters": {
    "ADC's decimation filter (hardware bandwidth limit)": {
      "-3dB cutoff point (Hz)": 480,
      "Filter order sinc response": 5
    }
  }
}
```

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How to adopt BIDS: example workflow & resources

Data management : Example workflow

Organize Recorded Files

- Collect all files from all devices
- Convert proprietary to open formats if needed (e.g., .mff → .bdf)
- Scan paper lab notes → PDF
- Rename files & organize into BIDS directory structure

Add Metadata & Sidecars Files

- Add .json/.tsv (dataset description, channels, acquisition parameters, stimulation material/code, hardware specs, etc.)
- Extract event timings → *_events.tsv
- Define relative timing of all recordings to each other → *_scans.tsv
- Digitize structured paper lab notes → Enter into .tsv/.json (e.g., participants.tsv)

BIDS Validator

- Validate folder structure & metadata consistency

✓ Validated BIDS Dataset

EEG Formats handled in BIDS

Format	Extension(s)
European data format	.edf
BrainVision Core Data Format	.vhdr, .vmrk, .eeg
EEGLAB	.set, .fdt
Biosemi	.bdf

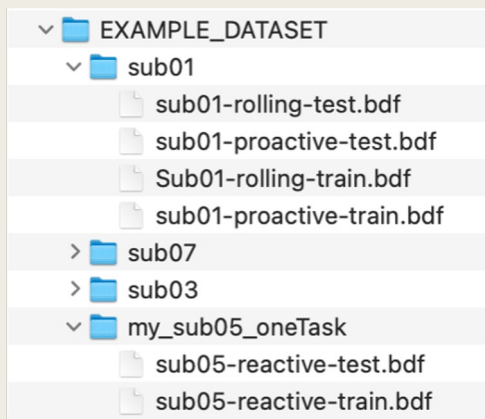
BIDS Validator

Select a BIDS dataset to validate.

Select Dataset Files

BIDSIF example : Input data

1/ Structured dataset



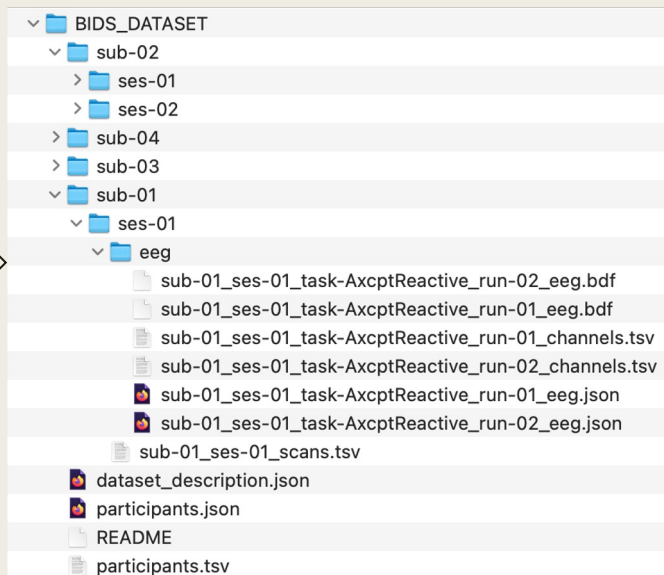
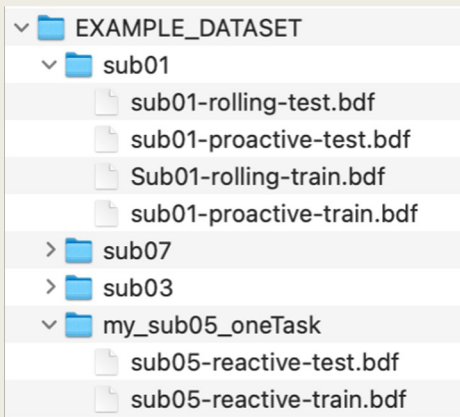
2/ Metadata + input/output path in a config file

```
3 [DEFAULT]
4 # Input and Output Directories
5 input_path = /Users/annesophiedubarry/SynologyDrive/in_progress/BIDSIF/data/EXAMPLE_DATASET
6 output_path = /Users/annesophiedubarry/SynologyDrive/in_progress/BIDSIF/data/BIDS_DATASET
7
8 # General Information to be Added Manually
9 # *****
10
11 [DATASET_DESCRIPTION]
12 Name = "ADOEFFORT"
13 Authors = "A. Adeli-Koudehi , A.-S Dubarry , M Teschl, M-H Grosbras, S. Luchini"
14
15 # EEG Configuration
16 InstitutionName = "CRPN - UMR 7077"
17 InstitutionAddress = "Aix-Marseille University / CNRS, CRPN - UMR 7077, Equipe DISC, 3 Place Victo
18 ManufacturersModelName = "ActiveTwo"
19
```

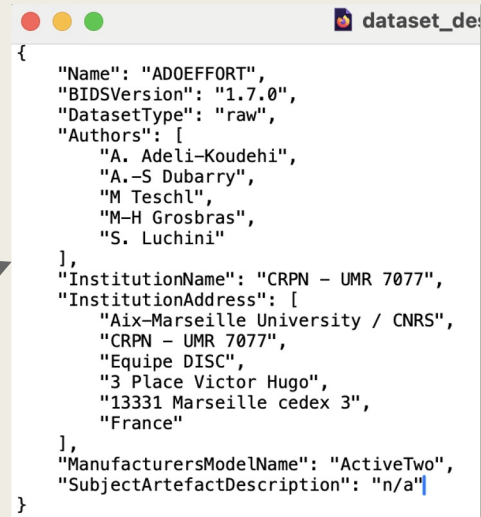
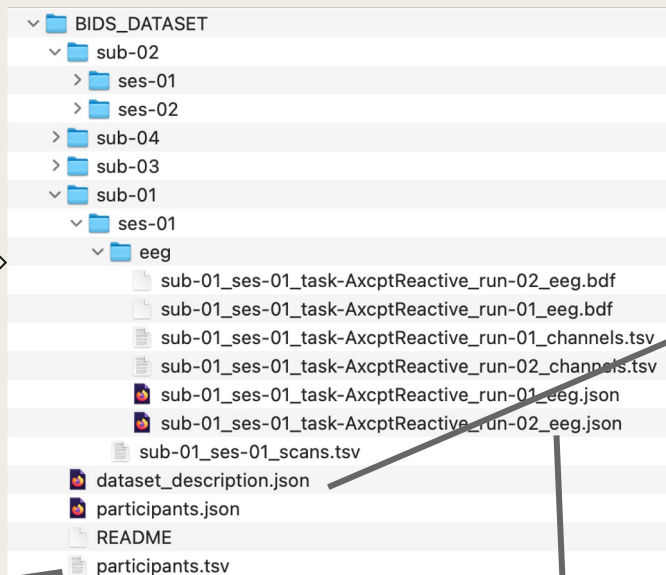
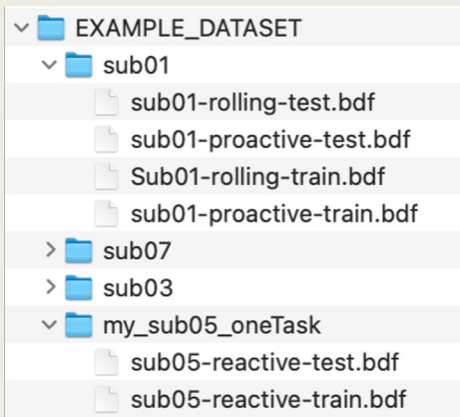
```
30 # --- Tasks --- WARNING : prevent using special characters in task names (Unallowed `-, `_, or `/' )
31 [task_NbackRolling]
32 description = N-back task with rolling startegy
33 keywords = rolling
34
```

```
40
41
42 # --- Runs --- WARNING : prevent using special characters in task names (Unallowed `-, `_, or `/' )
43
44 [run_1]
45 description = Training session
46 keywords = train
47
48 [run_2]
49 description = Testing session
50 keywords = test
```

BIDSIF Output



BIDSIF Output



participants.tsv

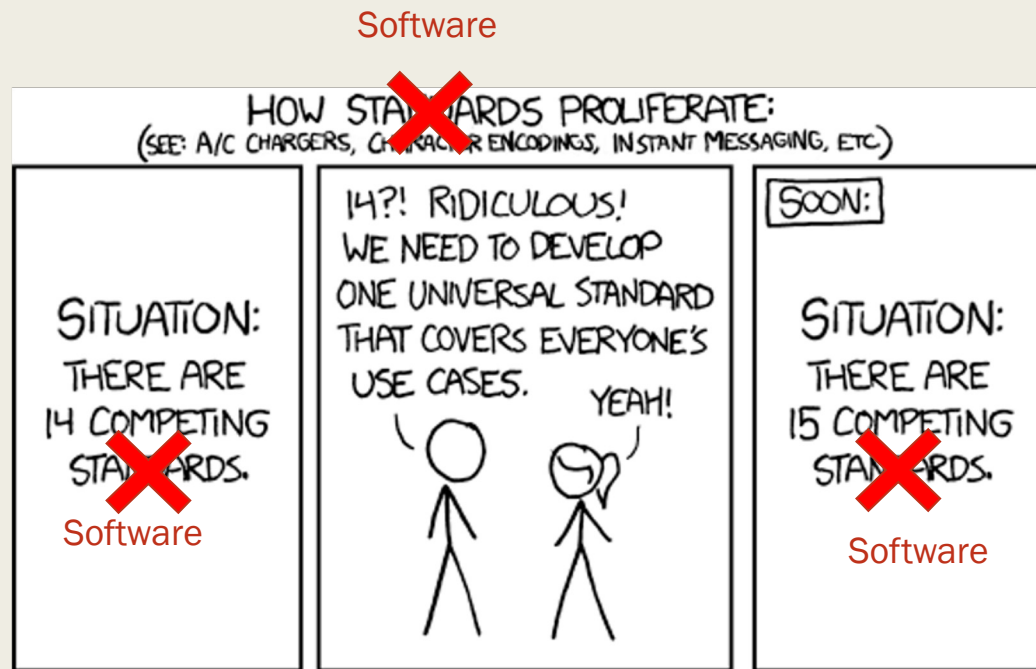
participant_id	original_folder	age	sex	hand
sub-01	my_sub05_oneTask	n/a	n/a	n/a
sub-02	sub01	n/a	n/a	n/a
sub-03	sub03	n/a	n/a	n/a
sub-04	sub07	n/a	n/a	n/a

sub-02_ses-02_task-AxcptProactive_run-02_eeg.json

```
{
  "TriggerChannelCount": 1,
  "OriginalFilename": "sub01-proactive-test.bdf",
  "TaskDescription": "AX-CPT task with proactive strategy",
  "RunDescription": "Testing session"
}
```

Existing conversion tools for EEG data



- EEGLAB, FIELDTRIP, MNE-Python, Brainstorm
- BIDS-Manager (Karel L. Vilaret)
- EEG2BIDS
- [sovaBIDS](#)
- [RS-BIDSify](#)
- BIDS Manager-Pipeline ([Jegou et al. 2022](#))
- BIDSIF (CRPN)



May 02 2025

Cycling on the Freeway: The perilous state of open-source neuroscience software



Britta U. Westner , Daniel R. McCloy , Eric Larson , Alexandre Gramfort , Daniel S. Katz , Arfon M. Smith ,
Arnaud Delorme , Vladimir Litvak , Scott Makeig , Robert Oostenveld , Jan-Matthijs Schoffelen , Tim M. Tierney 

Conclusion

Let's talk about our current practices and our needs
.... and shape the future of our practices together!



What we can do : support workflow implementation, support for using conversion tools, interact with the international community for finding the best solutions that best fits your need.

What we'd like to encourage : adoption of a common framework for being able to better support and address faster specificities of CRPN projects and potentially make the CRPN a contributor of the definiton international standards while fullfiling your needs in the long run.

Thank you for your attention & feedback!

Resources and References

[BIDS Validator](#)

[BIDS specification](#)

[The Past, Present, and Future of the Brain Imaging Data Structure \(BIDS\)](#). Poldrack et al. 2024

[Five selfish reasons to work reproducibly](#). Florian Markowetz. 2015

<https://osf.io/dztvq/files/2jt9u> Daniel S. Quintana.

[EEG-BIDS, an extension to the brain imaging data structure for electroencephalography](#). Pernet et al. 2019.

[HED: hierarchical event descriptor](#)

Special thanks to Robert Oostenveld for sharing super [useful material](#) on Data Sharing and Open science