Standardizing and Sharing EEG

Intro to the Brain Imaging Data Structure and OpenNeuro

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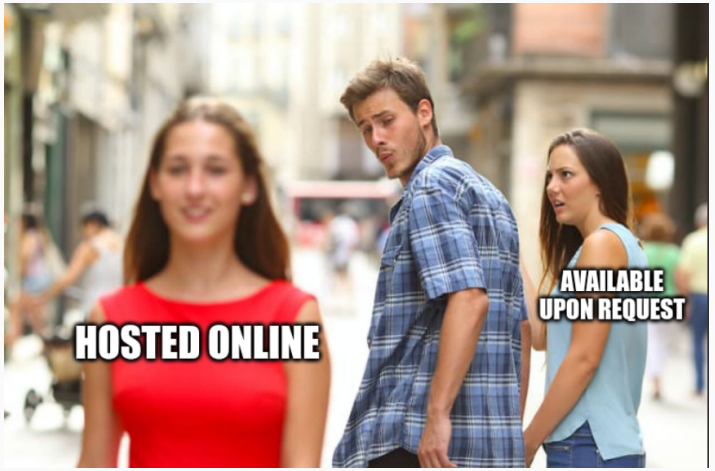
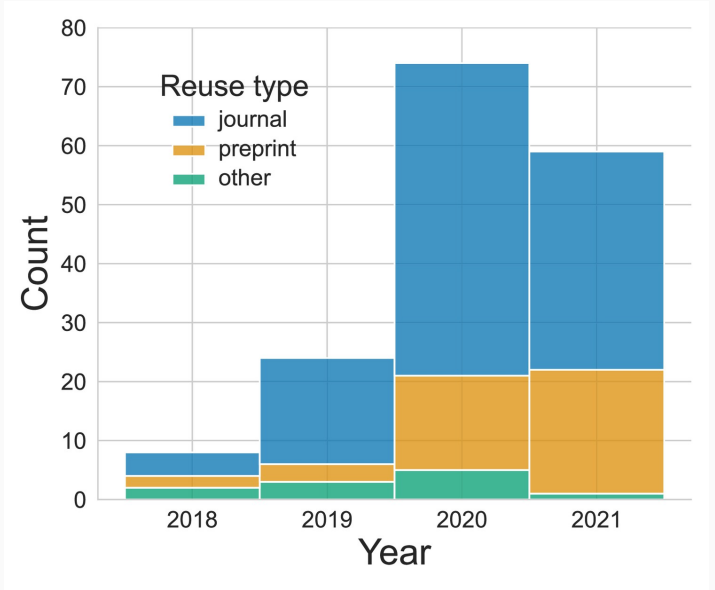
Sharing data benefits ...

- **You** because it makes research more trustworthy and you can get credit for your data
- **Others** who do not have to financial means to acquire the data themselves
- **Machines** that need large and diverse training sets





Published reuses of OpenNeuro data (Markiewicz et al., 2021)

The FAIR principles

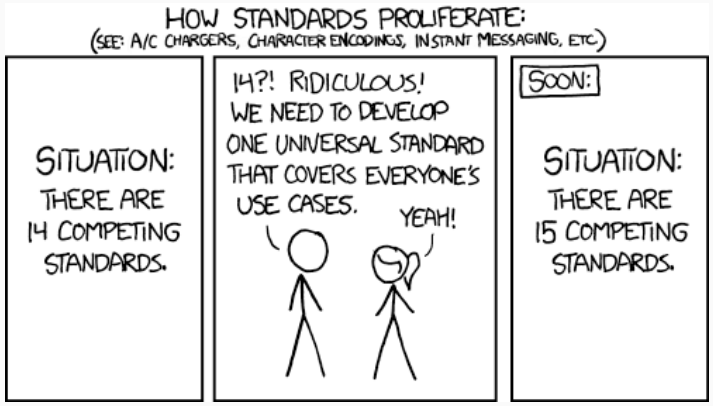
- Data should be FAIR: **F**indable, **A**ccessible, **I**nteroperable and **R**eusable (Wilkinson et al., 2016), requiring:
- Unique **identifiers**, permanent storage with **versioning** and public **metadata** that is indexed and searchable (OpenNeuro)
- Standardized data formats that use **general-purpose** open source technologies (BIDS)

Standards are not just for sharing

- Using a standardized data format is useful, even if you don't plan on publishing your data because ...
- ... it enforces clear **data organization** and management
- ... it facilitates **reuse** of data by your lab and future self
- ... it makes it easy to use **existing code** (e.g. BIDS-Apps)

The Brain Imaging Data Structure

- BIDS is a **community-driven** standard of formats and file structures (Poldrack et al., 2024)
- Originally developed for fMRI, it was successively **expanded** to other modalities



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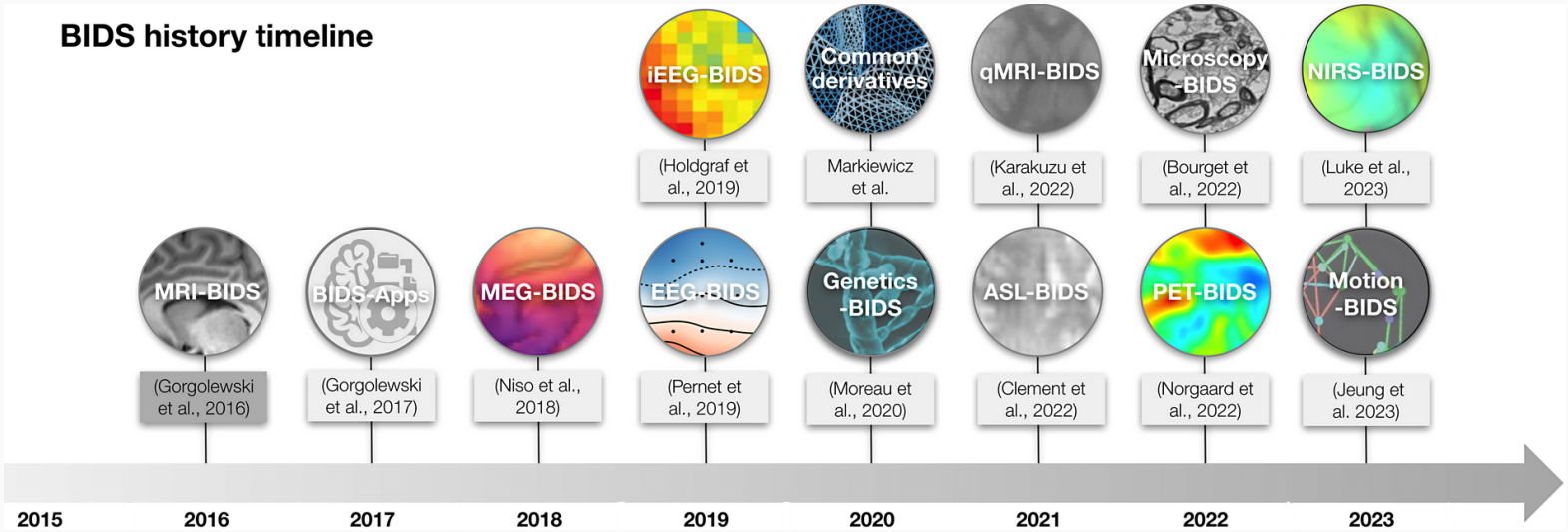


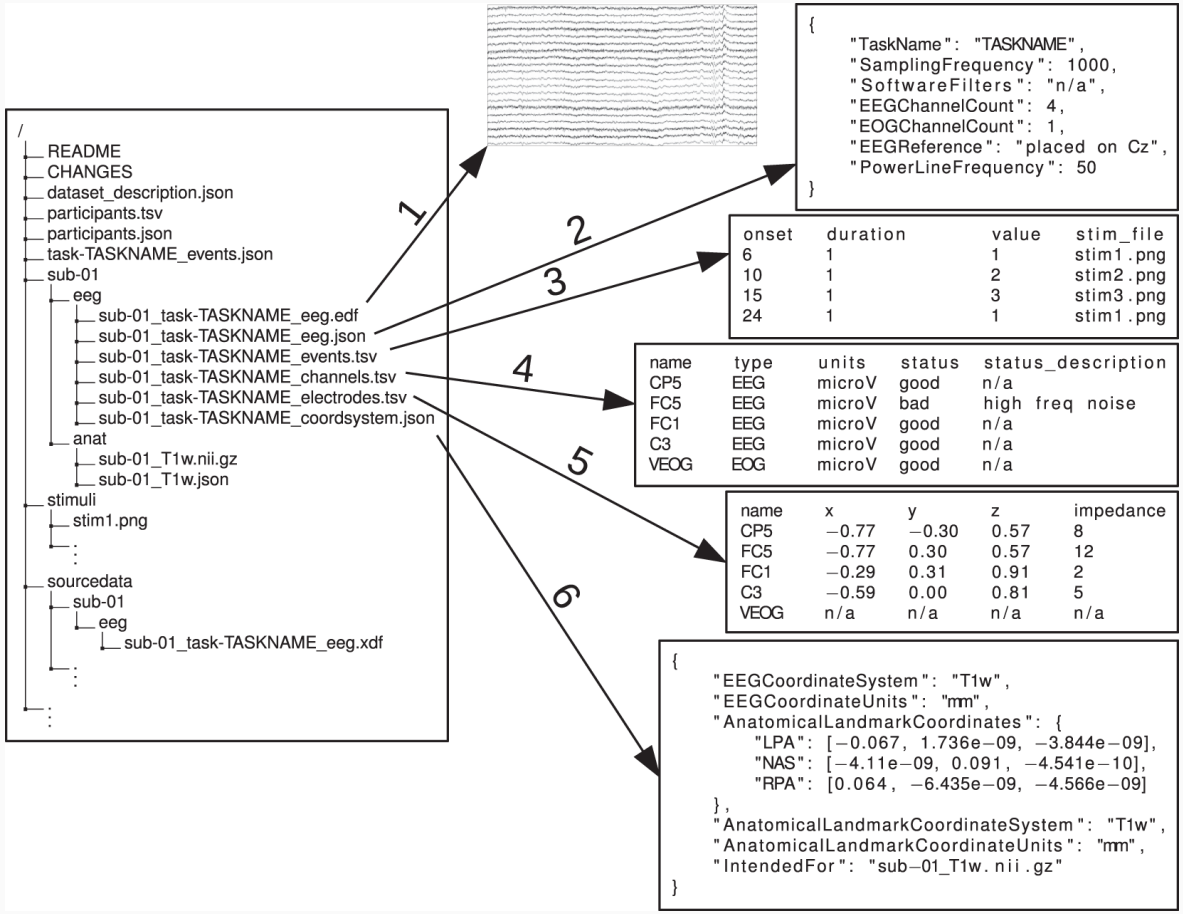
EEG-BIDS

Mandatory

- eeg.edf
- eeg.json
- events.tsv
- channels.tsv

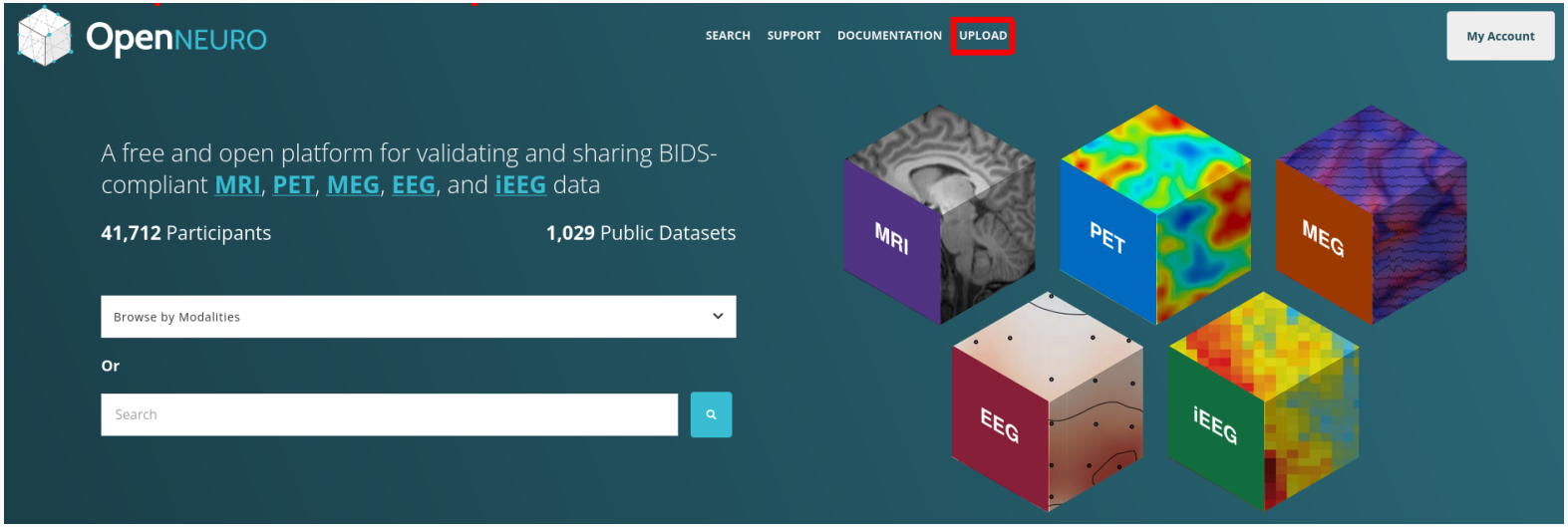
Optional

- electrodes.tsv
- coordinates.json
- anat/
- stimuli/
- sourcedata/



Exemplary EEG-BIDS dataset with file previews (Pernet et al., 2019)

- On OpenNeuro, **sign** in with ORCID or Google
- Click on **upload** and select your data set's root directory from the drop-down menu
- The site will automatically **verify** that you data set is BIDS-compliant
- Once the data is uploaded, create a **version** for publication.



Resources

- The BIDS **starter kit** is a collection of resources to help you getting started with creating BIDS-compliant data sets: https://bids-standard.github.io/bids-starter-kit/
- A **tutorial** on converting EEG data to the BIDS format and checking its compliance: https://colab.research.google.com/drive/1C_WS2G8TgQtPoPmxb14pVQupTmuGN0eM?usp=sharing
- **Slides** for this talk can be found online: https://olebialas.github.io/publications/#presentations

References

- Markiewicz, C. J., Gorgolewski, K. J., Feingold, F., Blair, R., Halchenko, Y. O., Miller, E., et al. (2021).**The openneuro resource for sharing of neuroscience data.** *Elife*, *10*, e71774.
- Pernet, C. R., Appelhoff, S., Gorgolewski, K. J., Flandin, G., Phillips, C., Delorme, A., & Oostenveld, R. (2019).**EEG-BIDS, an extension to the brain imaging data structure for electroencephalography.** *Scientific data*, *6*(1), 103.
- Poldrack, R. A., Markiewicz, C. J., Appelhoff, S., Ashar, Y. K., Auer, T., Baillet, S., Bansal, S., Beltrachini, L., Benar, C. G., Bertazzoli, G., et al. (2024).**The past, present, and future of the brain imaging data structure (bids).** *Imaging Neuroscience*, *2*, 1–19.
- Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., et al. (2016).**The FAIR guiding principles for scientific data management and stewardship.** *Scientific data*, *3*(1), 1–9.