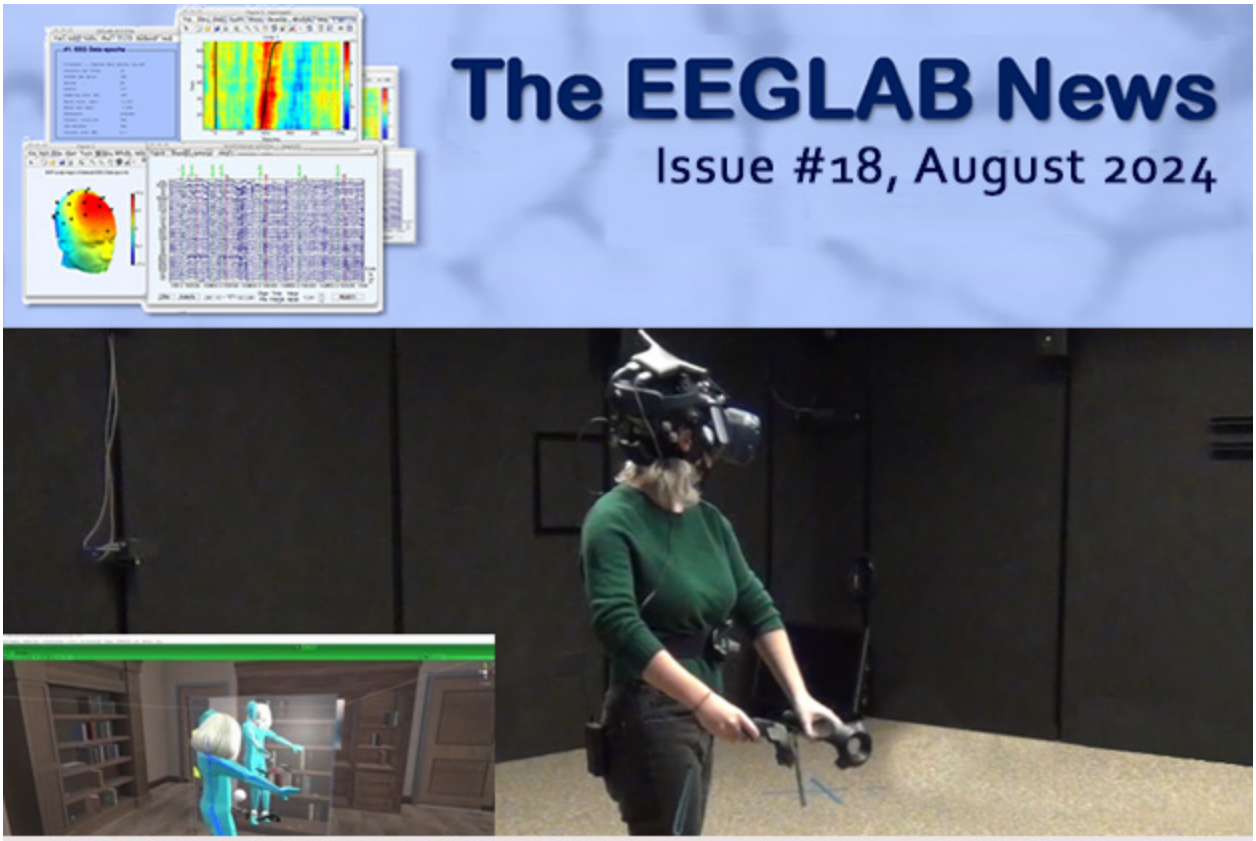


Multi-modal brain body imaging is combined with the immersive potential of virtual reality (Credit: MoBI Lab, UC San Diego)

View this email in your browser

What's New

EEGLAB 2024.2 has been released. Compared to 2024.0, the latest release includes 70 file changes with 1,480 additions and 228 deletions (EEGLAB 2024.1 had a minor GUI issue which was fixed in 2024.2). Key new features are: Updated EEGLAB colormap, (MATLAB *turbo*, an equiluminance version of *jet*), the ability for the compiled version of EEGLAB to execute scripts from a command line, support for critical plug-in updates, a new K-means clustering option for *pop_clust()* that determines an optimal number of independent component (IC) clusters to identify in a STUDY, and better handling IC clustering of STUDY structures that include multiple task conditions and/or sessions. The *bids-matlab-tools* plug-in is now renamed as *EEG-BIDS.* The MATLAB plug-in calls the standalone (compiled) version of EEGLAB*,* and includes options to export eye-tracking data. Bug fixes address issues with STUDY cache clearing, better detection of user-modified datasets, and independent component (IC) clustering across a STUDY. The ICLabel plug-in (new default version 1.6) now included in EEGLAB fixes a bug introduced in EEGLAB 2024.0.

EEGLAB Documentation. The EEGLAB website now includes a search feature that allows users to search the documentation of a collection of plug-ins stored on GitHub. The EEGLAB website uses lunr.js to provide a client-side search interface, enabling users to easily find information within the plug-ins' documentation. The documentation for these plug-ins can be found either in the *README.md* file or the Wiki tab of the respective GitHub repository. This documentation is automatically pulled and incorporated into the EEGLAB documentation. If you have a plug-in hosted on GitHub and would like it to be included on the EEGLAB website, please let us know.

The Art of Brainwaves: A Survey on Event-Related Potential Visualization Practices. This

independent survey publication finds that as of 2024, EEGLAB continues to be the most widely used tool for processing EEG data. Below is a graph from the publication.

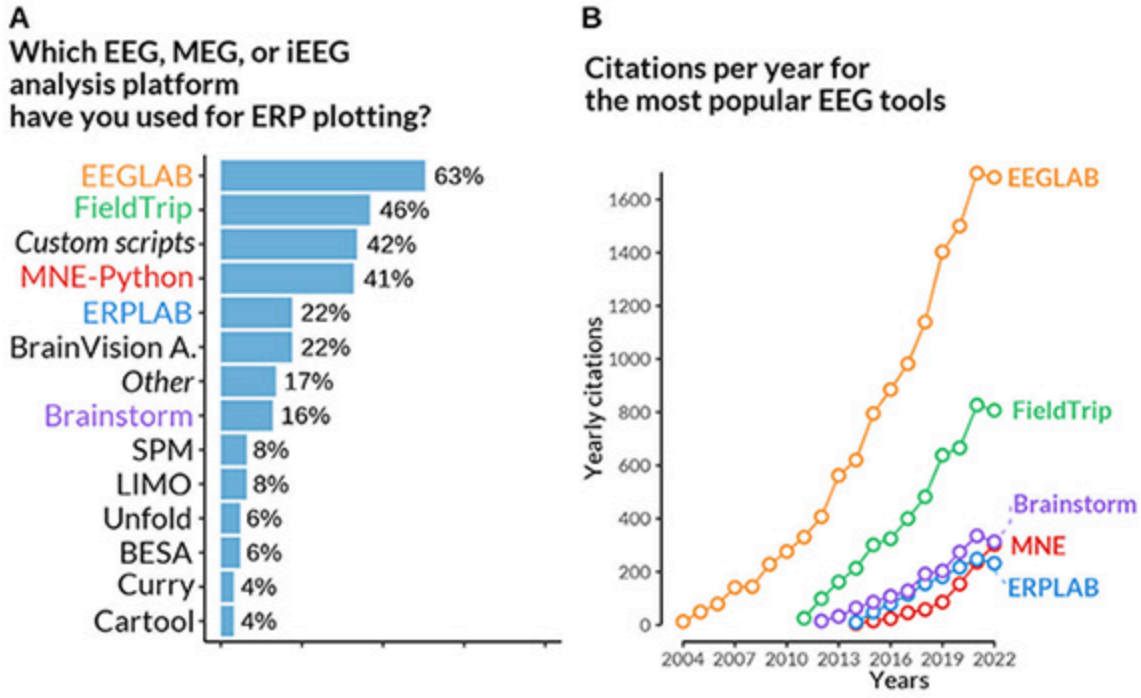
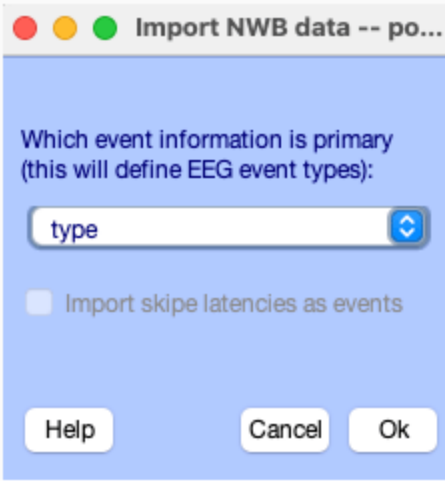


Figure 7. A: User experience with EEG analysis tools (multiple choice, N of respondents - 213). B: The yearly (not cumulative) number of citations for the four most popular tools.

Plug-Ins

Here we highlight new EEGLAB plug-ins of possible wide interest to EEGLAB users. Please send descriptions of new plug-ins for consideration. These should have a brief lead introduction, and further text and images to be published on a continuation page.



NWB-io plug-in: This plug-in imports data from the Neuroscience Without Borders (NWB) data format. NWB is a new format for electrophysiology data, primarily used for iEEG data and animal electrophysiology. Time series, channel information, and event information are imported. Use the EEGLAB import/export menus to import/export files, or use the command line function *pop_nwbimport.m/pop_nwbexport.m*. In addition to regular trial information, spike timing (when present) may also be imported in EEGLAB.

EEG-BIDS. The *BIDS-matlab-tools* plug-in has been renamed *EEG-BIDS*. It now includes new functionality for importing and exporting behavioral data, eye tracking, etc. Even for internal data analysis, packaging your data according to BIDS is the most sensible solution to save time and insure dataset readability. BIDS allows you to, (1) release your data to archives, and (2) use prepackaged BIDS pipelines (check out this one and also this other one). BIDS can thus neatly separate the data preparation stage from the data processing stage - during processing of both archived and new datasets. This plug-in is also available as a standalone program (a separate executable file in the compiled EEGLAB release).

TDT utils. This EEGLAB plug-in allows the computation of measures provided by the Lexicor

Neurofeedback company. It is a valuable resource for Neurofeedback users. Please note that the Lexicor TDT data format is also compatible with the Neuroguide format. Therefore, this plug-in can also replot measures computed using Neuroguide. See the documentation here.

Include your plug-in here. If you have a plug-in you would like to feature in the newsletter, please send us an email at eeglab@sccn.ucsd.edu. For a plug-in to be featured, you need at least some documentation and a test dataset that people can try it out on.

Open Science

Here we highlight news of open EEG and related data, tools, and other resources.

The NEMAR project continues to accumulate new, publicly available human 'neuroelectromagnetic' (EEG, MEG, iEEG) datasets (319 to date, from over 15k participants, occupying a total of more than 31 TB of disk space), and offers new data and data measure visualization options concerning data quality (see this dataset, for example). Warning messages on dataset result pages, as well as text entries in the forums for deach dataset, share problems encountered in trying to process the data meaningfully. This includes, in particular, warnings about missing event descriptions. A new route to fix problems with some datasets using pull requests has also been put in place. NEMAR is also working with OpenNeuro to release BIDS 'derivative' (e.g., preprocessed) versions of OpenNeuro datasets.

Profiles

This section contains personal profiles of EEGLAB developers and/or users, with a description of how they use EEGLAB in their research.

Ying Choon Wu, Ph.D.
Associate Project Scientist, Institute of Neural Computation, UC San Diego

Dr. Ying Choon Wu and her team at the Institute for Neural Computation explore higher order cognition at the intersection between mind, brain, and body. She has a passion for collaboration and for recording data in the real world. "I love learning new things and crossing boundaries," she explains, "... designing science experiments that can double as art experiments and vice versa, exploring new domains, such as opera or laparoscopy, and learning new techniques." Her work is diverse, exploring topics such as how artificial intelligence (AI), augmented and virtual reality, and wearable biosensing can promote ecological literacy and art, and how this technology can encourage and support creativity, learning, teamwork, community, and connection. Read more! »

Upcoming Events

This section contains announcements of future events of possible interest to EEGLAB users. Please submit brief descriptions.

- **Cutting EEG Paris** In October has a great line up of speakers. We recommend it. https://cuttingeegx.org/

- **EEGLAB workshops.** The next EEGLAB workshop dates have not been set yet. There will be a summer workshop at a holiday camp in Aspet, France (June, 2025), and another workshop in San Diego (November, 2025) following the Society for Neuroscience meeting.

Ongoing weekly SCCN office Hours: Sign up here for free (EEGLAB/data analysis) Office Hour chats with SCCN scientist and EEGLAB developer Yahya Shirazi.

From the EEGLABLIST

(… the EEGLABLIST email list) *This section contains questions and answers from the eeglablist archives or elsewhere.*

Question 1: We are conducting a Heart-Evoked Potential (HEP) study using EEG signals that are time-locked to R-peak via ECG. Our preprocessing pipeline is being implemented with EEGLAB, including the ERPLAB and HEPLAB plugins. As part of this process, we employ Independent Component Analysis (ICA) and ICLabel to identify ocular and cardiac field artefacts (CFA). A key question has arisen regarding including the ECG channel in the ICA and ICLabel steps. Our preliminary findings show that when we include it, CFA classification is much higher. We are seeking your insights on whether the inclusion of the ECG channel is aiding in the identification of CFA components or if it might be compromising EEG information of interest by focusing on identifying and removing CFA. Thank you for your time and assistance.

Best regards,
Sofia Amaoui

A1: Read responses here

Question 2: Dear List, Is there anyone who has experience with EEGLAB on data from premature infants, and can suggest a preprocessing pipeline or relevant published articles where EEGLAB tools have been used to preprocess the data? Any suggestions more than welcome.

Dr. Efthymios Papatzikis
Infant Brain Development
Oslo Metropolitan University, Norway

A2: Read responses here

In Print

Here we list recent papers highlighting EEGLAB function and plug-in capabilities. Please submit suggested papers, including a one-sentence summary description.

Mushtaq F, Welke D, Gallagher A, et al. One hundred years of EEG for brain and behaviour research. *Nat Hum Behav* (2024). https://doi.org/10.1038/s41562-024-01941-5

Lay R, Bhutada R, Lobo A, Twomey R, Eguchi A, Wu YC. Embodied Code: Creative Coding in Virtual Reality. *Proceedings of the 55th ACM Technical Symposium on Computer Science Education,* V.2, March 2024, Pages 1926, ttps://doi.org/10.1145/3626253.3635428

Cummings AE, Wu YC, Ogiela DA. Phonological Underspecification: An Explanation for How a Rake Can Become Awake. *Front Hum Neurosci*. 2021 Feb 17;15:585817. doi: 10.3389/fnhum.2021.585817. PMID: 33679342; PMCID: PMC7925882.

Wu, Y. C., Maymon, C., Paden, J., & Liu, W. (2023). Launching your VR neuroscience laboratory. In Virtual Reality in Behavioral Neuroscience: New Insights and Methods (pp. 25-46). Cham: Springer International Publishing.

Makeig, S. and Robbins, K., 2024. Events in context — The HED framework for the study of brain, experience and behavior. *Frontiers in Neuroinformatics*, *18*, p.1292667.

Online

What is the best ERP baseline?

Arnaud Delorme, May 2023