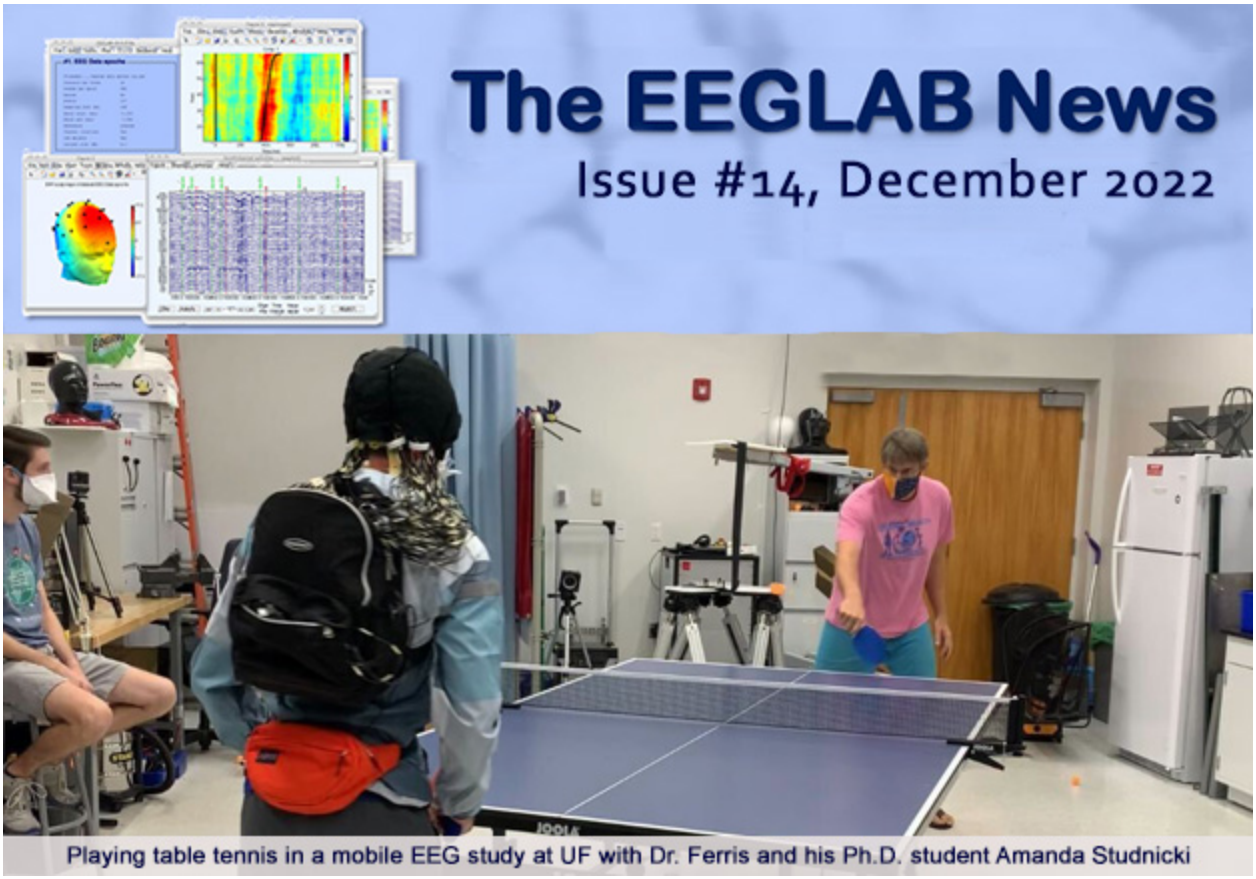

Playing table tennis in a mobile EEG study at UF with Dr. Ferris and his Ph.D. student Amanda Studnicki

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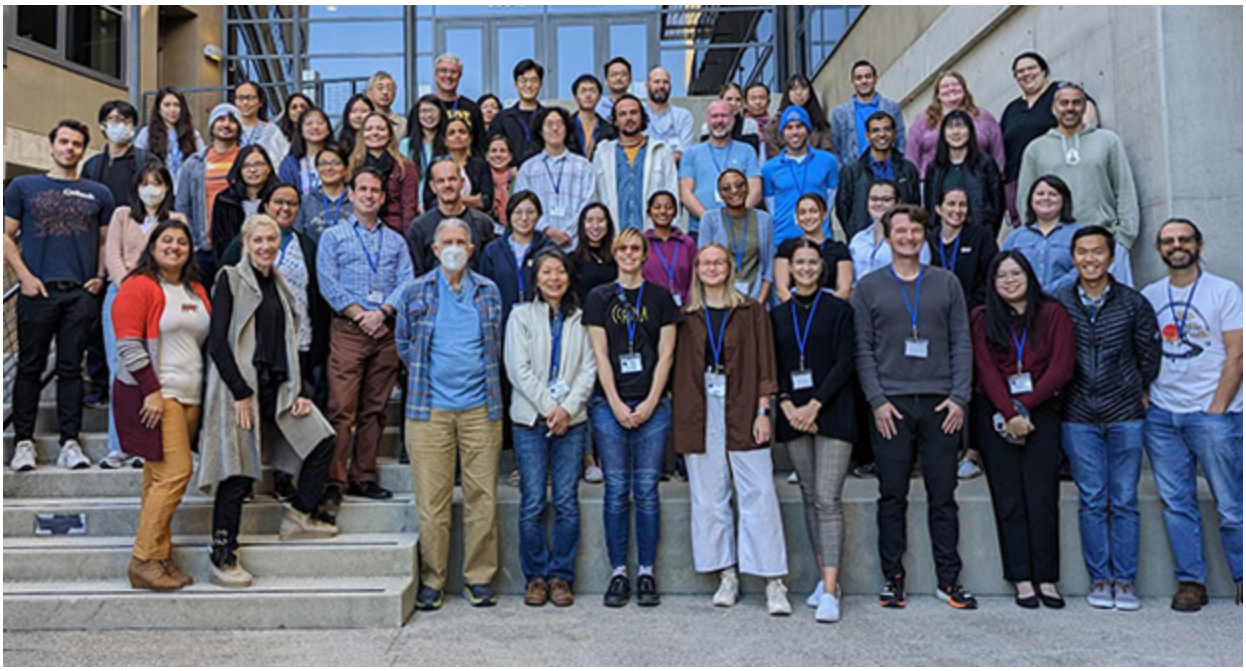
What's New

The 34th EEGLAB Workshop - UC San Diego, November 2022. The 34th EEGLAB Workshop was recently held in person at the UC San Diego Supercomputer Center in La Jolla, California (Nov. 18 - 21), following the Society for Neuroscience Meeting (Nov. 12-16). The workshop introduced and demonstrated the use of EEGLAB and EEGLAB plug-in tools for analysis of EEG and related data with overview talks on principles of EEG data analysis, detailed method expositions, and practical exercises. It also included a Lab-Streaming Layer (LSL) mini-symposium explaining how the LSL software framework enables and controls acquisition of multi-modal brain and behavioral imaging data. The workshop was preceded on Thursday afternoon and evening (Nov. 17) by a free symposium on Advanced EEG Signal Processing, followed by the INC Rockwood Memorial Lecture by Jonathan Wolpaw, M.D. ("Brain-Computer Interfaces Create Synthetic Heksors"), and an open-house reception and poster sharing session.

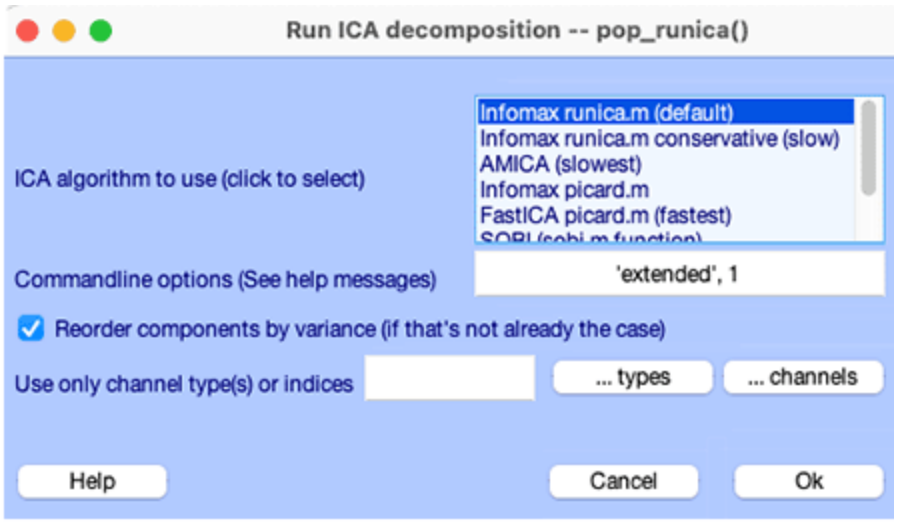


EEGLAB 2022 group photo, in front of the UC San Diego Supercomputer Center

EEGLAB was also featured at Practical MEEG in Aix En Provence, December 14-16, 2022, along with other open-source M/EEG software. Johanna Wagner and Ramon Martinez-Cancino gave the EEGLAB tutorials.

Plug-Ins

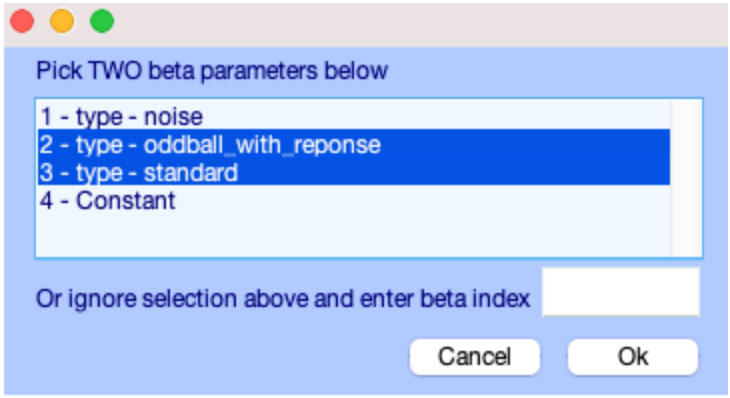
Here we highlight new EEGLAB plug-ins of possible wide interest to EEGLAB users. Please send descriptions of new plug-ins for consideration. These should have a brief lead introduction, and further text and images to be published on a continuation page.



Amica and Picard Plug-ins. AMICA 1.7 has been released. It has better documentation and several default parameter fixes. You may now launch AMICA decomposition from the EEGLAB '**Tools/RunICA**' menu item (as well as from the AMICA interface). Extended Infomax (runica.m) remains the default ICA decomposition method. However, there is a new 'runica conservative' option suggested by Makoto Miyakoshi and colleagues. Also, there are two new Picard decomposition options. 'Infomax Picard' uses the Newton descent method for efficient operation (as does AMICA), while still using the simpler source PDF model of Runica. 'FastICA Picard' runs quickly, though with a separation performance penalty.

LIMO. The LIMO EEGLAB plug-in menus have been reworked for better clarity, enabling selection of variables by name. In the attached screen capture, after pre-computing first-level measures and

selecting a 'paired t-test' to be performed at the second level, the new interface allows the user to select two beta parameters to use in computing the t-test. The display to show results and to correct for multiple comparisons has also been reworked. It is planned for release in January 2023 in EEGLAB 2023.1, but is available for testing now using the "limo_gui_improved" branch on the LIMO repository.



Open Science

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

Public data repository NEMAR connected to free EEGLAB supercomputing. The UC San Diego EEGLAB team has been collaborating with the UC San Diego Supercomputer Center on a project called NEMAR, as described in the journal *Database* in a new article entitled *NEMAR: An Open Access Data, Tools, and Compute Resource Operating on NeuroElectroMagnetic Data*. The paper discusses how neuroscientists working with cyberinfrastructure (CI) developers are creating a forum for visualizing, analyzing, data mining NeuroElectroMagnetic (NEM) imaging data (EEG, MEG, iEEG) contributed to the OpenNeuro.org neuroimaging archive from many laboratories. EEGLAB chief software architect Arnaud Delorme and team are working to help data authors to format, upload, and share their EEG, MEG, and iEEG data through the OpenNeuro.org website from which NEMAR copies its data, then offers users additional information and visualizations to help them to select data for analysis. NEMAR.org currently hosts 130 human neuroelectromagnetic brain data studies totaling 5.2TB of data from 6,937 participants. Any of the NEMAR datasets may be downloaded from the web and processed directly in EEGLAB as described in the EEGLAB tutorial. [Read the SDSC press release]. In addition, any not-for-profit researcher anywhere in the world may use the online NSGportal to process NEMAR data on the SDSC supercomputer 'Expanse' using their own EEGLAB script. As the NEMAR data are mirrored at SDSC, NEMAR users can directly process the NEMAR data through NSG without having to download then again upload it for processing. EEGLAB users may also use the NSGportal plug-in to launch, monitor, and retrieve results from NSG jobs from the EEGLAB desktop. For more information, visit this site.

Profiles

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

Dr. Daniel Ferris and his Ph.D. student Amanda Studnicki research brain dynamics supporting human action and mobility at Dr. Ferris' Human Neuromechanics Laboratory at the University of Florida

"A main goal of the Human Neuromechanics Laboratory is to push the limit on the type of

physical activity that our subjects can perform while we record their electrocortical activity with EEG. Some of our most recent studies have subjects running, jumping obstacles, and playing table tennis, while we study their brain activity," states Dr. Daniel Ferris. His Ph.D. student, Amanda Studnicki, would love to answer questions such as, "*Why do some athletes perform better than others? What causes that rush of adrenaline during competition? How does your brain and body coordinate movements?*" Read more about the research of Dr. Ferris and Amanda Studnicki »

Upcoming Events

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

- There may be an EEGLAB workshop in Aspet, France this summer (pending budget approval).

From the EEGLABLIST

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

Q: Does removing eye movement artifact from EEG recordings using ICA decomposition reduce error in EEG brain measures, or increase it!? In 2014 Robert Thatcher posted a YouTube video on his claim that removing eye movement artifact from EEG data by subtracting out ICA components accounting for these artifacts (negatively) affects 'phase' measures of the data delivered by his proprietary (NeuroGuide) software: [https://www.youtube.com/watch?v=BfqCh2UeJik]. In 2017, Arnaud Delorme posted an EEGLAB wiki response. The thread below is excerpted from a long discussion that took place at the time on the EEGLABLIST about whether and how removing artifacts using ICA decomposition methods distorts "phase" measures of the EEG (as computed by Thatcher's software product). Spoiler alert: the artifacts themselves, when added to the actual brain source signals summed at the scalp electrodes, change the phase dynamics of the recorded scalp signals. Removing the artifact processes identified by ICA decomposition can (in some large part) restore the phase dynamics of the summed brain sources, as well as revealing the phase dynamics of the individual effective source signals that dominate the cortical contribution to the scalp EEG. In the following, Scott and Arnaud have expanded the posts of Arnaud and Jason Palmer somewhat for added clarity. Other contributions have not been edited except to correct typos or clarify punctuation.

A: Arnaud Delorme (with additions by Scott Makeig): We get asked often about a 2014 YouTube video by Robert Thatcher [with 5k views as of 12/22] that makes a claim that ICA adulterates EEG channel phase & coherence, and claims that we at the Swartz Center, UCSD, acknowledge this. The facts are these: ICA decomposition learns one-sample, purely spatial filters that separate out (non-brain) artifact activity from various sources (eye movements, EMG, line noise, etc.) which can be then removed from the data by subtracting the relevant independent components (ICs) from the data. It also separates the brain-generated (artifact-free) data into IC processes that typically have simple scalp projection patterns (scalp maps) compatible with generation in a single (or sometimes, a bilaterally symmetric pair of) cortical area (or areas).

[Read more of this thread here.]

In Print

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

Delorme A, Truong D, Youn C, Sivagnanam S, Stirm C, Yoshimoto K, Poldrack RA, Majumdar A, Makeig S. NEMAR: an open access data, tools and compute resource operating on neuroelectromagnetic data. *Database*, Volume 2022, 2022, baac096, https://doi.org/10.1093/database/baac096

Studnicki A, Downey RJ, Ferris DP. Characterizing and Removing Artifacts Using Dual-Layer EEG during Table Tennis. *Sensors* (Basel). 2022 Aug 5;22(15):5867. doi: 10.3390/s22155867. PMID: 35957423; PMCID: PMC9371038.

Peterson SM, Ferris DP. Human electrocortical, electromyographical, ocular, and kinematic data during perturbed walking and standing. *Data Brief*. 2021 Nov 25;39:107635. doi: 10.1016/j.dib.2021.107635. PMID: 34988270; PMCID: PMC8711048.

Richer N, Downey RJ, Hairston WD, Ferris, DP and Nordin AD. Motion and Muscle Artifact Removal Validation Using an Electrical Head Phantom, Robotic Motion Platform, and Dual Layer Mobile EEG. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 28, no. 8, pp. 1825-1835, Aug. 2020, doi: 10.1109/TNSRE.2020.3000971.

Online

MoBI data cleaning – too much or not enough?
Dr. Klaus Gramann, TwinBrain Workshop (2/7/22)