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## What's New

**The Hierarchical Event Descriptor (HED) system.** Events should have HED tags: "What did 'Event code 17' mean??" Traditionally, software systems for event-related EEG data collection and analysis have used simple numeric codes (2,17, 253 ...) whose meaning is hopefully saved with the data somewhere, or else given a brief text label ('Target'). But with the creation and availability of new analysis methods for extracting information, EEG data are valuable long after their first publication, and will in near future become even more so as public *data, tool, and compute resources* (DATCORS) become active and available. Archiving data in private or public DATCORS allows further, intensive data analyses as well as meta-analyses across studies with different designs. All of this requires that the more exact nature of the recorded experimental events are saved and accessible in an agreed format. [Read more](#) »

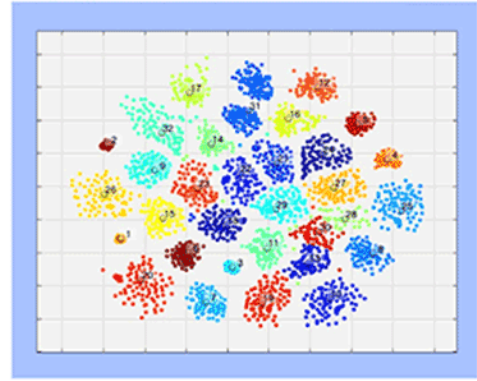


## Plug-ins

[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.](#)

**NSG-enabled RELICA plug-in.** RELICA (Artoni et al., 2014) now runs faster - or much faster still! RELICA, for 'RELIability of ICA', uses a stochastic approach to characterize the reliability of component processes identified by ICA decomposition of a multichannel dataset, by measuring the stability of the separated independent component processes under bootstrap resampling. To do this, RELICA performs repeated ICA decompositions of bootstrapped versions of the input data, then measures the stability of the returned ICs.

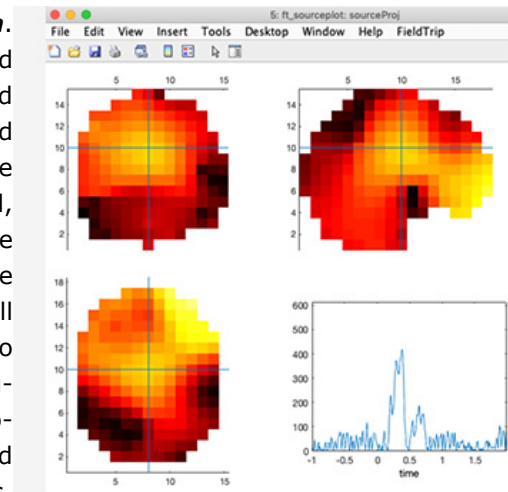
This process is highly computationally expensive, particularly for large datasets with many channels. (The figure shows RELICA IC replication clusters across multiple ICA decompositions of 100 bootstrap versions of an EEGLAB dataset, performed on NSG. Running time was 1/10 of the running time on a contemporary laptop). [Read more](#) »



### **Convert your Fieldtrip code to an EEGLAB plug-in.**

Recently, we strengthened the link between EEGLAB and Fieldtrip by reprogramming the functions `eeglab2fieldtrip` and `fieldtrip2eeglab` that allow users to convert data back and forth between EEGLAB and Fieldtrip data structures. Because of our long term collaboration with Robert Oostenveld, creator of Fieldtrip, EEGLAB channels locations may be conveniently aligned with Fieldtrip head models using the EEGLAB graphic interface, allowing users to apply the full capabilities of Fieldtrip source reconstruction methods to EEGLAB datasets. We have created a simple template plug-in, `erpsource`, that takes an EEGLAB dataset, performs co-registration with a standard Fieldtrip BEM head model, and applies eLoreta for low-resolution localization of ERP features. This template (<https://github.com/sccn/erpsource>)

can be easily modified to create other EEGLAB plug-ins using Fieldtrip source localization or other functions.



## Profiles

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



### **Julie Onton, Ph.D.**

As Associate Project Scientist at the Swartz Center for Cognitive Neuroscience, Dr. Onton uses Matlab and tools from the EEGLAB toolbox to study brain oscillations. Early on in her research, she became fascinated with the electrical signals that emanate from the brain: "I was especially interested in the oscillations that changed speed and amplitude depending on behavior or internal state." She started using EEG in a clinical population to investigate the neural signatures of post-traumatic stress disorder (PTSD) and mild traumatic brain injury (mTBI) in the military. Her goal is to better diagnose and treat these disorders. During one of her projects, something exciting happened. "In the course of this work," she recounts, "I began to analyze sleep EEG and came up with a novel

sleep visualization and scoring technique that I have been developing ever since." [Read more](#) »

## Elizabeth Milne, Ph.D.

As Professor of Cognitive Neuroscience at the University of Sheffield in South Yorkshire, England, Professor Milne studies how individual differences in neural oscillations are related to individual differences in human behavior and cognition. A main focus (among many) is on understanding neurodevelopmental conditions such as autism.

She explains how she found out about EEGLAB: "While presenting a poster at a conference, a visitor tactfully mentioned that I could glean greater insights from my EEG data if I used more advanced analysis methods. He mentioned EEGLAB and research at the Swartz Center for Cognitive Neuroscience (SCCN). I downloaded EEGLAB as soon as I got back to my hotel room, and I've never looked back." [Read more](#) »



## Upcoming Events

*This section contains announcements of future events of possible interest to EEGLAB users. [Please submit brief descriptions.](#)*

**May-June 2020 will be busy for the EEGLAB team, as we will organize, host, and/or deliver a series of workshops.**



➤ **First Long-format 31st EEGLAB Workshop (May 27 - June 5).** The 31st EEGLAB workshop, presented at SCCN, will be the first to feature a two-day **Pre-Workshop Course** on the basics of EEG and using MATLAB (The Mathworks, Inc.) and EEGLAB to load and process EEG data. Workshop attendees who might otherwise not be able to keep up with the main Workshop are encouraged to attend. The main EEGLAB Workshop, beginning with an Open House reception and poster show on Sunday, May 29, and ending at noon on Tuesday, June 2, will follow the format of previous workshops at UCSD, with new material incorporated when/as time and need permit. Following the Workshop, we will offer another new feature, a two-and-a-half day Data Collaboratory workshop in which Workshop attendees with data to analyze will work with Workshop faculty to build analysis pipelines to process their data. The Collaboratory will be limited to 20 participants. [Click here](#) for more information!

➤ **The 2nd Hands-on LSL Workshop (June 7).** A second Hands-on Workshop on the **Lab Streaming Layer** software framework will be held at the San Diego Supercomputer Center on the

UCSD campus preceding the Fourth International MoBI Workshop. Christian Kothe and other developers in the LSL community will give an overview of the LSL project and lead parallel sessions at the introductory, demonstration, and advanced coding (including LSL driver design) levels. [Click here](#) for more information! (photo: Hiroyuki Kambara)



➤ **The 4th International MoBI Conference (June 7-10).** The fourth **International Conference on Mobile Brain/Body Imaging** will take place at UCSD from Sunday, June 7 (evening) through Wednesday, June 10.

The successful third meeting in this series was held in Berlin in summer of 2018. Sessions on technology and analysis, and applications to cognitive neuroscience, biodynamics, education, arts, and biofeedback are planned. [Click here](#) for registration and program information!

➤ **A Group-EEG Recording Workshop** on recording and analysis of group EEG and other data streams (for example during musical performance) will be held on Thursday, June 11. For more information contact Dr. John Iversen ([jiversen@ucsd.edu](mailto:jiversen@ucsd.edu)).

➤ **The 32nd EEGLAB Workshop** will be held at the **John Paul II Catholic University of Lublin in Poland** beginning Monday, June 15. For more information, contact Dariusz Zapala ([d.zapala@gmail.com](mailto:d.zapala@gmail.com)). [Click here](#) for more information!

## From the eeglalist

*This section contains brief questions and answers from the eeglalist archives or elsewhere.*

**Q: ICLabel: "source" explanation of "channel noise" independent components in the absence of obviously bad data?**

**A:** For background (to the uninitiated), the ICLabel plug-in returns a row of probabilities for each independent component that its source "class" is, respectively, brain, muscle, eye, heart, line noise, channel noise, or 'other' non-brain noise. Upon ICLabel returning source class probabilities for each component, there is a question as to how to go about filtering one's data to only "brain" components (e.g., for downstream scalp or source analyses). I have been testing out different cutoffs ... to keep only "brain" components, but have found this to feel a bit arbitrary (e.g., keep components with 'brain' probability > .90? > .75?). So, the approach I've taken lately is to designate a component's class to be the class for which its probability is the greatest. [Click here](#) to read details. »

## In Print

*Here we list recent papers highlighting EEGLAB function and plug-in capabilities. [Please submit suggested papers, with a brief summary description.](#)*

Denis, D., Rowe, R., Williams, A.M. and Milne, E., 2017. "[The role of cortical sensorimotor oscillations in action anticipation.](#)" *Neuroimage*, 146, pp.1102-1114

Onton, J.A., Matthews, S.C., Kang, D.Y. and Coleman, T.P., 2018. "[In-home sleep recordings in military veterans with posttraumatic stress disorder reveal less rem and deep sleep < 1 Hz.](#)" *Frontiers in human neuroscience*, 12.

VB Perez, M Miyakoshi, SD Makeig, GA Light, "[Mismatch negativity reveals plasticity in cortical dynamics after 1-hour of auditory training exercises](#)", *International Journal of Psychophysiology* 2019

Pernet, C.R., Appelhoff, S., Gorgolewski, K.J., Flandin, G., Phillips, C., Delorme, A. and Oostenveld, R., 2019. "EEG-BIDS, an extension to the brain imaging data structure for electroencephalography." *Scientific Data*, 6(1), p.103.

## Online

**Big Data in Brain Science**

**Human Functional Brain Imaging**

Some human brain imaging milestones

- 1926—1<sup>st</sup> human EEG recordings
- EEG era**
- 1938—1<sup>st</sup> EEG spectral analysis
- 1962—1<sup>st</sup> computer ERP averaging (CA7)
- ERP era**
- 1979—1<sup>st</sup> event-related desynchronization
- 1993—1<sup>st</sup> fMRI BOLD recordings
- fMRI era**
- 1993—1<sup>st</sup> broadband ERSP
- 1995—1<sup>st</sup> multisource EEG filtering by ICA
- 2009—1<sup>st</sup> commercial dry electrode EEG toys
- fEEG / BMI / MoBI era ...**

**"Assessing Event Related and Spontaneous Brain Dynamics"**  
featuring Dr. Scott Makeig

Scott Makeig (UCSD), lecture on EEG Data Processing, CalIT2 @ UC Irvine, March, 2017

### Topics (links):

[EEG and Brain Research](#) 0:19

[EEGLAB History](#) 20:42

[Who Am I \(and What is my brain Doing\)?](#) 23:34

[What IS EEG?](#) 27:44

[EEG Effective Sources \(ICA\)](#) 55:32

[High-Resolution EEG source Imaging & Skull Conductance](#) 1:35:48

[Example: ERP features in schizophrenia](#) 1:40:19

[EEG Neuroinformatics - HED Tagging](#) 1:48:25

[So ...](#) 1:51:26

[Q&A](#) 1:53:34

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