# SEEG/EEG Signal Processing

## Publications&Papers

* [Stereo-electroencephalography identifies N2 sleep and spindles in human hippocampus](http://files.laurent-koessler.webnode.fr/200000099-4f8df5089e/Carpentier_2017.pdf)
* Carpentier, N., Cecchin, T., Koessler, L., Louis-Dorr, V., Jonas, J., Vignal, J. P., ... & Maillard, L. (2017). Stereo-electroencephalography identifies N2 sleep and spindles in human hippocampus. *Clinical Neurophysiology*, *128*(9), 1696-1706. \*
* [Effect of sleep stage on interictal high-frequency oscillations recorded from depth macroelectrodes in patients with focal epilepsy](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1528-1167.2008.01784.x)
* Bagshaw, A. P., Jacobs, J., LeVan, P., Dubeau, F., & Gotman, J. (2009). Effect of sleep stage on interictal high‐frequency oscillations recorded from depth macroelectrodes in patients with focal epilepsy. *Epilepsia*, *50*(4), 617-628.
* [A deep learning approach for real-time detection of sleep spindles](https://iopscience.iop.org/article/10.1088/1741-2552/ab0933/meta)
* Kulkarni, P. M., Xiao, Z., Robinson, E. J., Jami, A. S., Zhang, J., Zhou, H., ... & Chen, Z. S. (2019). A deep learning approach for real-time detection of sleep spindles. \*Journal of neural engineering
* [Randomised controlled trial of WISENSE, a real-time quality improving system for monitoring blind spots during esophagogastroduodenoscopy](https://gut.bmj.com/content/early/2019/03/11/gutjnl-2018-317366.abstract)
* Wu, L., Zhang, J., Zhou, W., An, P., Shen, L., Liu, J., ... & Lv, X. (2019). Randomised controlled trial of WISENSE, a real-time quality improving system for monitoring blind spots during esophagogastroduodenoscopy. *Gut*, gutjnl-2018.
* [Classifying multiple types of hand motions using electrocorticography during intraoperative awake craniotomy and seizure monitoring processes—case studies](https://www.frontiersin.org/articles/10.3389/fnins.2015.00353)
* Xie, T., Zhang, D., Wu, Z., Chen, L., & Zhu, X. (2015). Classifying multiple types of hand motions using electrocorticography during intraoperative awake craniotomy and seizure monitoring processes—case studies. *Frontiers in neuroscience*, *9*, 353.
* [Automatic sleep stage classification based on sparse deep belief net and combination of multiple classifiers](https://journals.sagepub.com/doi/abs/10.1177/0142331215587568)
* Zhang, J., Wu, Y., Bai, J., & Chen, F. (2016). Automatic sleep stage classification based on sparse deep belief net and combination of multiple classifiers. *Transactions of the Institute of Measurement and Control*, *38*(4), 435-451.
* [Coordination of cortical and thalamic activity during non-REM sleep in humans](https://www.nature.com/articles/ncomms15499)
* Mak-McCully, R. A., Rolland, M., Sargsyan, A., Gonzalez, C., Magnin, M., Chauvel, P., ... & Halgren, E. (2017). Coordination of cortical and thalamic activity during non-REM sleep in humans. *Nature communications*, *8*, 15499.
* [Deep Feature Learning Using Target Priors with Applications in ECoG Signal Decoding for BCI](https://www.aaai.org/ocs/index.php/IJCAI/IJCAI13/paper/download/6680/6965)
* Wang, Z., Lyu, S., Schalk, G., & Ji, Q. (2013, June). Deep feature learning using target priors with applications in ECoG signal decoding for BCI. In *Twenty-Third International Joint Conference on Artificial Intelligence*.
* [[Global and local complexity of intracranial EEG decreases during NREM sleep](https://academic.oup.com/nc/article-abstract/2017/1/niw022/2957408)]
* Schartner, M. M., Pigorini, A., Gibbs, S. A., Arnulfo, G., Sarasso, S., Barnett, L., ... & Barrett, A. B. (2017). Global and local complexity of intracranial EEG decreases during NREM sleep. *Neuroscience of consciousness*, *2017*(1), niw022.
* [Human cortical–hippocampal dialogue in wake and slow-wave sleep](https://www.pnas.org/content/113/44/E6868.short)
* Mitra, A., Snyder, A. Z., Hacker, C. D., Pahwa, M., Tagliazucchi, E., Laufs, H., ... & Raichle, M. E. (2016). Human cortical–hippocampal dialogue in wake and slow-wave sleep. *Proceedings of the National Academy of Sciences*, *113*(44), E6868-E6876.
* [[Optimizing the detection of wakeful and sleep-like states for future electrocorticographic brain computer interface applications](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0142947)]
* Pahwa, M., Kusner, M., Hacker, C. D., Bundy, D. T., Weinberger, K. Q., & Leuthardt, E. C. (2015). Optimizing the detection of wakeful and sleep-like states for future electrocorticographic brain computer interface applications. *PloS one*, *10*(11), e0142947.
* [Sleep spindles in human prefrontal cortex: an electrocorticographic study](https://www.sciencedirect.com/science/article/pii/S0168010203000075)

Nakamura, M., Uchida, S., Maehara, T., Kawai, K., Hirai, N., Nakabayashi, T., ... & Shimizu, H. (2003). Sleep spindles in human prefrontal cortex: an electrocorticographic study. *Neuroscience research*, *45*(4), 419-427.

## Program & Coding

* [EasyEEG](https://github.com/ray306/EasyEEG)
* EasyEEG: The toolbox for agile EEG data analysis.
* Electroencephalography (EEG) provides high temporal resolution cognitive information from non-invasive recordings. However, one of the common practices–using a subset of sensors in ERP analysis is hard to provide a holistic and precise dynamic results. Selecting or grouping subsets of sensors may also be subject to selection bias, multiple comparison, and further complicated by individual differences in the group-level analysis. More importantly, changes in neural generators and variations in response magnitude from the same neural sources are difficult to separate, which limit the capacity of testing different aspects of cognitive hypotheses. We introduce EasyEEG, a toolbox that includes several multivariate analysis methods to directly test cognitive hypotheses based on topographic responses that include data from all sensors. These multivariate methods can investigate effects in the dimensions of response magnitude and topographic patterns separately using data in the sensor space, therefore enable assessing neural response dynamics. The concise workflow and the modular design provide user-friendly and programmer-friendly features. Users of all levels can benefit from the open-sourced, free EasyEEG to obtain a straightforward solution for efficient processing of EEG data and a complete pipeline from raw data to final results for publication.
* [EEGLearn](https://github.com/pbashivan/EEGLearn)

EEGLearn

A set of functions for supervised feature learning/classification of mental states from EEG based on "EEG images". This code can be used to construct sequence of images (EEG movie snippets) from ongoing EEG activities and to classify between different cognitive states through recurrent-convolutional neural nets. More generally it could be used to discover patterns in multi-channel timeseries recordings with known spatial relationship between sensors. Each color channel in the output image can contains values for a specific features computed for all sensors within a time window.

* [Functional Brain Tractography Project](https://f-tract.eu/)
* The Functional Brain Tractography project (F-TRACT) aims at improving our knowledge on large scale human brain connectivity from intracortical stimulations at low frequency performed in epileptic patients who are candidates to resective surgery. F-TRACT is funded by the [European Research Council](https://erc.europa.eu/) through a Consolidator Grant awarded to [Olivier David](https://www.researchgate.net/profile/Olivier_David), team leader at [Grenoble Institute of Neuroscience](https://neurosciences.ujf-grenoble.fr/search/team-david-brain-stimulation-systems-neuroscience?language=en), France. F-TRACT started in August 2014 and is expected to end in July 2019.