

## **STATISTICAL ANALYSIS OF BRAIN SIGNALS**

24 January 2023    13h – 15h

Design of Neuroscience Experiments  
Introduction to EEGs and fMRI  
EEG Signal Artifacts: principles, simulations and removal

25 January 2023    10h – 12h

Simulating EEGs  
Bandpass Filtering  
Introduction to Spectral Analysis

26 January 2023    13h30 – 15h30

Spectral Estimation  
Connectivity Analysis

27 January 2023    14h – 16h

Overview of Statistical Inference  
Regression Models  
Statistical Models for Group Analysis

31 January 2023    10h – 12h

Models for comparing experimental conditions and populations  
Fitting causality models

## REFERENCES

### General content

Ombao, H., Lindquist, M., Thompson, W., & Aston, J. (2017). *Handbook of neuroimaging data analysis*.

### EEG simulation

Granados-Garcia, G., Fiecas, M., Babak, S., Fortin, N. J., & Ombao, H. (2022). Brain waves analysis via a non-parametric Bayesian mixture of autoregressive kernels. *Computational Statistics & Data Analysis*, 174, 107409.  
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### Artifact identification and removal

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Shams, T., Rahi, F., Mir, M., & Nasor, M. (2009). Home ECG system: Signal processing and remote transmission. *2009 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT)*, 254–258.  
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### Spectral analysis

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Ombao, H. (2019). Spectral Approach to Modeling Dependence in Multivariate Time Series. *Journal of Physics: Conference Series*, 1417, 012007.

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Ombao, H., & Bellegem, S. V. (2006). *Coherence Analysis of Nonstationary Time Series: A Linear Filtering Point of View*. 24.

### Connectivity models

Ting, C.-M., Skipper, J. I., Noman, F., Small, S. L., & Ombao, H. (2022). Separating Stimulus-Induced and Background Components of Dynamic Functional Connectivity in Naturalistic fMRI. *IEEE Transactions on Medical Imaging*, 41(6), 1431–1442.

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Degras, D., Ting, C.-M., & Ombao, H. (2022). Markov-switching state-space models with applications to neuroimaging. *Computational Statistics & Data Analysis*, 174, 107525. <https://doi.org/10.1016/j.csda.2022.107525>

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