Analysis of Brain Responses in Cognitive Tasks Using Statistical Quantifiers from Information Theory

Helena Bordini de Lucas[1,2], Steven Bressler[3], Fernanda Selingardi Matias[1] and Osvaldo Anibal Rosso[1]

[1] Universidade Federal de Alagoas, Maceió, Brasil;
[2] Universitat de les Illes Balears, Palma de Mallorca, España;
[3] Florida Atlantic University, Boca Raton, United States of America.

How the brain processes information from external stimuli in order to perceive the world and act on it is one of the greatest questions in neuroscience. To address this question, different time series analyses techniques have been employed to characterize the statistical properties of brain signals during cognitive tasks. Typically, response-specific processes are addressed by comparing the time course of average event-related potentials in different trials type. Here, we analyze monkey local field potentials data during visual pattern discrimination called Go/No-Go task in the light of information theory quantifiers. We show that the Bandt–Pompe symbolization methodology to calculate entropy and complexity of data is a useful tool to distinguish response-related differences between Go and No-Go trials. We propose to use an asymmetry index to statistically validate trial-type differences. Moreover, by using a multi-scale approach and embedding time delays to downsample the data we can estimate the important time scales in which the relevant information has been processed. This study has been published in *Nonlinear Dynamics* journal and is fully accessible through reference [1].

References

[1] Lucas, H. B., Bressler, S. L., Matias, F. S. and Rosso, O. A. - (2021). A symbolic information approach to characterize response-related differences in cortical activity during a Go/No-Go task. *Nonlinear Dynamics*, 104(4), 4401–4411. Available at: https://doi.org/10.1007/s11071-021-06477-1.

Type

ORAL