Waves GPS: A modular Python package for the detection and analysis of cortical traveling waves

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Résumé

Cortical oscillatory activity of narrow frequency bands has been found to display monotonic phase shifts over space, i.e., to form traveling waves within and across cortical regions. Finding and characterizing those spatio-temporally consistent patterns in data recorded with invasive as well as non-invasive techniques requires multiple consecutive, but sometimes interchangeable processing and analysis steps. The current literature on cortical traveling waves lacks a clear consensus of which methods can and should be applied in specific empirical contexts. Here, we introduce Waves GPS, an open source, modular detection and analysis tool implementing a range of different options to detect, describe and statistically evaluate traveling waves. In addition, a simulation module allows researchers to model different types of waves embedded in realistic background conditions to generate synthetic data. Together, Waves GPS allows researchers to generate benchmark analyses tailored to their experimental paradigm and model experimental outcomes in silico. This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 852139 - Laura Dugué).

Mots-Clés: Traveling waves, data simulation, Python package

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