

Project

Pipelines for the analysis of task-related Functional Connectivity Dynamics

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Abstract

The goal of the project is to develop pipelines for the analysis of large-scale cognitive brain networks and their dynamics. In particular, a key challenge will be to develop tools for the routine analyses of functional connectivity (FC) networks and their temporal evolution (the functional connectivity dynamics or FCD), in relation to the underlying anatomy and cognitive tasks. These tools will eventually help us uncover how brain areas of the language network coordinate dynamically during experimental manipulations. We will optimize current tools and develop new ones when needed for the extraction of FC and FCD from magnetoencephalographic (MEG) data recorded from healthy human participants. The tools will be based on existing Matlab codes developed in previous works (Brovelli et al., 2015; Auzias et al., 2016; Brovelli et al., 2017). In particular, the project will consist of two main Tasks. In Task 1 (approximately 3 months), we will develop routines to import single-subject cortical meshes and parcellation scheme (i.e., MarsAtlas) from BrainVisa software to generate source models in Fieldtrip software. Then, we will estimate source-level brain activity at the single-trial level using beamforming techniques both at cortical and subcortical regions. Both time- and frequency-domain beamforming techniques will be implemented. In Task 2 (approximately 3 months), we will implement functional connectivity metrics: i) undirected (e.g., linear correlation, phase coherence, etc.); ii) directional measures (e.g., Granger causality). We expect to provide the ILCB with automatized pipelines for atlas-based FC and FCD analysis, to be freely accessible to the collaborators of the consortium. At the end of the project, we plan to share the novel tools to the community and organise a one-day workshop and/or training course for all members of the ILCB.

Publications

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| Fiche-résumé contribution CREx