Title (provisorio): Definition and validation of source localization methods in Stereotactical EEG recordings

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Description

Motivation and field of application

Stereotactical EEG is a highly invasive recording method used in the characterization of the epileptogenic zone in patients affected by partial epilepsy. SEEG records local field potentials from ~5 mm of cortical tissue. Recently, several lines of evidence suggest that LFPs are not “so local”, and they indeed rise concerns about the geometrical resolution yielded by linear shafts. These call for the usage of advanced methods for source reconstruction also in the case of intracerebral electrodes.

General and main objectives

The aim of the proposed thesis is to define, construct, and validate a pipeline to reconstruct neural sources from Stereotactical EEG recordings only. The project will:

- Explore state of the art forward and inverse problem solvers
- Define the set of tools that most reliably reconstruct real source locations
- Implement these tools in a standardized pipeline
- Validate the pipeline using simulated as well as real data (with and without internal stimulation)

The thesis is expected to yield a validated set of tools that are able to perform source localization starting from resting-state SEEG data.

Learning objectives (technical and analytical tools, experimental methodologies)

The candidate will learn to handle publicly available source localization softwares largely used in the neuroscience community. He will also investigate the mathematical methods behind forward and inverse problem solutions (e.g. BEM and FEM-based methods or LORETA, sLORETA and MNE). The candidate will improve his programming skill using matlab.

Place(s) where the work will be carried out: Biolab - Unige

Additional information

Skills and abilities required: Matlab

Maximum number of students: 1