BrainTrack : Dynamic identification of brain networks by Bayesian tracking of electrophysiological data

Narayan Subramaniyam[1] Filip Tronarp[2] Simo Särkkä[2] Lauri Parkkonen[1]

[1] Department of Neuroscience and Biomedical Engineering
[2] Department of Electrical Engineering and Automation

Aalto-yliopisto
Aalto-universitetet
Aalto University

Introduction

BrainTrack is an Academy of Finland funded project (2015-2019) with an overarching aim to develop a novel method to estimate **functional brain networks** from electroencephalographic (EEG) and magnetoencephalographic (MEG) recordings using **Bayesian tracking** [1].

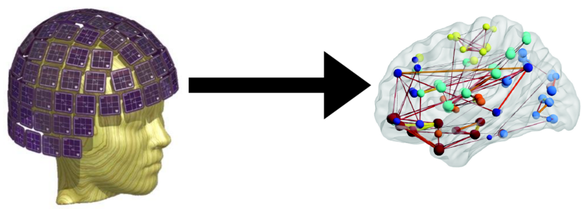


Figure 1 : Joint estimation of sources and network structure from non-invasive recordings MEG/EEG recordings

The computational core of BrainTrack is a **spatio-temporal marginalized particle filter** algorithm [1] that will estimate the network structure along with source parameters. The Bayesian model for the measurements is based on [2, 3].

Significance

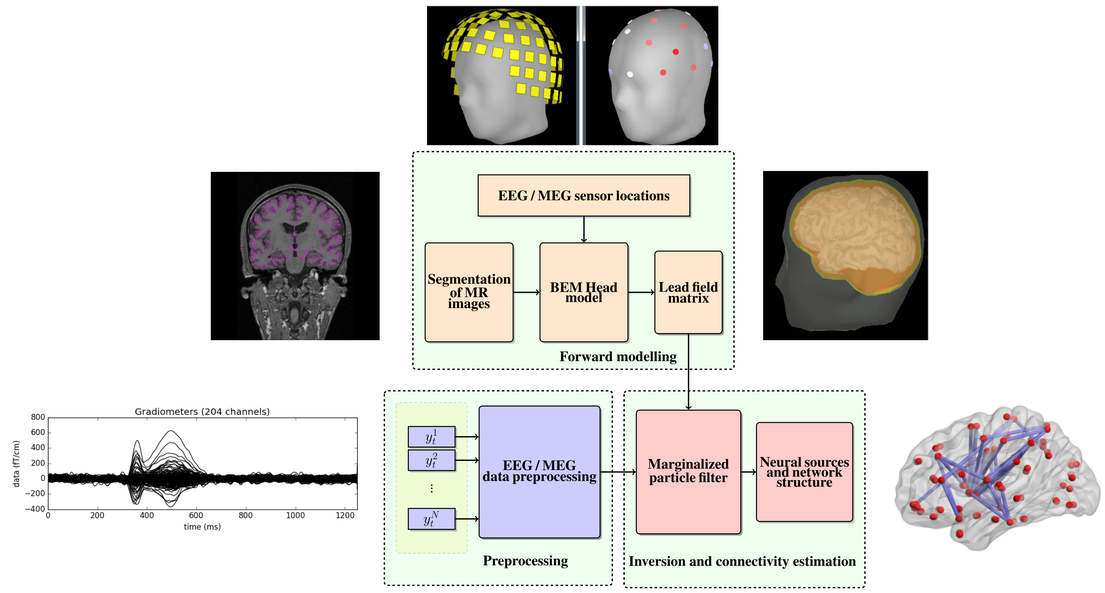
1. Tools for better characterization of epileptic activity as a **dynamic functional network** to aid the accurate **localization** of **epileptic foci**.
2. Real-time connectivity estimation for **neurofeedback** experiments.

International collaboration

The project will be done in collaboration with

- *Aashikawa Medical University*, Japan (Combined intracranial EEG and MEG recordings)
- *University of Cambridge*, UK (Bayesian methodology)
- *McGill University*, Canada (Interpretation of connectivity measures and neurofeedback experiments)
- *Université de Montré al*, Canada (Interpretation of connectivity in pathological conditions, intracranial EEG+MEG recordings)

Research Framework



Expected Results and Impact

1. An on-line platform for **accurate and real-time** estimation of functional brain connectivity from electrophysiological data.
2. **Better characterization** of spreading of pathological activity in **network disorders** like epilepsy.
3. The results of BrainTrack project will find quick acceptance within the EEG/MEG community, among **cognitive neuroscientists** and as well as **clinical researchers**.

References

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