In her master’s thesis, Susanna Aro describes an open-source code library that enables analysis of functional connections in the human brain based on magnetoencephalography (MEG) data. MEG is a non-invasive brain-imaging technique that records real-time neurophysiological signalling in the brain. She demonstrates the successful use of the analysis pipeline on a real dataset measured at the Department of Neuroscience and Biomedical Engineering (NBE), Aalto University, Finland.

Analysis of functional connectivity inspects interactions between two brain regions, which is a conceptually and computationally challenging task. The pipeline described in the master’s thesis uses beamforming to focus on specific cortical regions, while suppressing signals from other regions. Aro applied this pipeline to a dataset where MEG data of participants was measured on two different days, which allowed Aro to use the pipeline to analyse the data of each day separately and to compare those results. In her master’s thesis, Aro considers the effect of the dataset and the pipeline on these results. She concludes that the pipeline is a good method for analysing the interactions between brain regions, but points out the importance of preprocessing and removal of noise from the data.

The pipeline uses a computationally efficient and stable coherence calculation that maximises coherence between two points in the brain. This pipeline is a straightforward tool that researchers can use to analyse interactions between different brain regions. The python code library is freely available to everyone, and the users can contribute to the code to add even more functionality, allowing the code library to develop flexibly to suit the needs of its users.

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Analysis of functional connectivity between anatomically distant brain areas can deepen our understanding of the human brain. In her master’s thesis, Susanna Aro describes an open-source python code library and a pipeline for analysing oscillatory power and connectivity from MEG data. She demonstrates the functionality of the pipeline by applying it to a MEG dataset measured at Aalto University.