

Discovering Connectivity in the Brain



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Conceptual background

- In order to understand how cognitive processes take place, one has to reveal how different functional regions in the brain communicate
- Identify whether an activation in one part of the brain causes activations in other parts of the brain (with a certain small delay)
- Activity in the brain is mainly characterized by rhythmic activity and transients. This rhythmic activity is often divided in various frequency bands (alpha, beta, delta, gamma, theta), which have different interpretations
- These frequency bands each have their own relevance and interpretation and connectivity might exist between different frequency bands

The Research Project

- **Aim:**

to investigate the causal relations between different brain regions at different frequency bands

- **Data:**

2100 independent trials from two subjects are available. During each trial, test subjects are provided with an external stimulus in the form of changes on the display in front of the test subject.

Parameters of this test are orientation of the stimulus on the screen, reward, and contrast of the artefact. The sampling frequency for all trials is 1000 Hz.

For each trial, recordings from the V1, V2 and V4 areas in the visual cortex are done by a single depth probe per visual area with 16 recording channels.

- **Challenges:**

- most frequency methods make assumption of linearity of the data
- nonlinear approaches exist, but provide only overall information about causality
- moreover, data are likely highly non-stationary

What we expect from you

- Literature review and explore possibilities.
- Start with a well-defined workplan!

Questions?

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