INSTITUT FÜR SIGNALVERARBEITUNG
UND SYSTEMTHEORIE
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Several theses in the field of Quantum Brain Computer Interface (BA/FA/MA, german/english)

Area: A brain-computer interface (BCI) is a technology that allows communication between the human brain and a computer system. Brain-computer interfaces (BCIs) have shown great promise in the field of neurorehabilitation, which involves the use of technology to help individuals recover from neurological injuries or disorders. BCIs can be used to help patients with motor disabilities, such as those caused by stroke or spinal cord injuries, to regain control over their movements. By detecting and interpreting brain signals, BCIs can be used to control prosthetic limbs or other assistive devices, allowing patients to perform activities of daily living more independently.

MEG stands for magnetoencephalography, which is a non-invasive neuroimaging technique used to measure the magnetic fields produced by electrical activity in the brain. MEG measures the tiny magnetic fields generated by the electrical activity of neurons in the brain, providing a highly sensitive and accurate method for mapping brain activity.

Quantum sensors are a type of sensor that utilizes quantum properties to measure physical phenomena with high precision and accuracy. In the field of BCIs, quantum sensors have shown promise in detecting and measuring brain activity with greater sensitivity than traditional sensors.

Topic 1: Advanced Signal Processing Methods for MEG Decoding (BA)

Short description: Application and comparison of advanced signal processing methods for Motor Imagery MEG Decoding.

Requirements:

- Interest in the topic and a high degree of independence
- Ability and interest to learn and try new things
- Programming experience (ideally with Python or MATLAB)
- Basic knowledge of signal processing (DSV lecture)

Topic 2: Deep Learning Methods for MEG Decoding (FA/MA)

Short description: Application and comparison of modern Deep Learning methods for Motor Imagery MEG Decoding.

Topic 3: Deep Learning for Source Reconstruction (FA/MA)

Short description: Research and application of modern Deep Learning methods for MEG Source Reconstruction (i.e. solving the inverse problem).

Requirements (Topic 2/3):

- Interest in the topic and a high degree of independence
- Ability and interest to learn and try new things
- Programming skills in Python
- Basic knowledge of Deep Learning (DL lecture) and signal processing (DSV lecture)

All topics can be adapted somewhat to your interests and ideas if wanted.
If you are interested, please send me an email with your CV and your transcript of records.