Brain State Decoding Lab / Dr. Tangermann

Deep brain stimulation (DBS) is an established therapy for Parkinson’s disease (PD) and essential tremor and is under research also for, e.g., chronic pain, major depression disorder and anxiety disorders. Stimulation parameters (for example, amplitude or frequency) are typically determined by hand by an expert clinician. This infrequent tuning has been found insufficient to adapt to fast changes in the disease progress or varying symptoms intensity due to e.g. medication or external factors.

These challenges are addressed by research on closed-loop DBS systems that allow to adapt stimulation parameters in real time as a function of both behavioral metrics and brain signals such as electroencephalogram, electrocorticogram and local field potentials. An important prerequisite for closed-loop control of DBS is the robust decoding of neural markers which provide information about the current state of the patient and which can serve as features to inform a controller. As neural markers and brain signals in general are very subject specific, machine learning methods play a central role for this decoding task. The research background of our group in the field of brain-computer interfaces provides us with both, experimental paradigms and decoding methods in order to investigate the building blocks of DBS-based closed-loop systems.

We conduct this research in collaboration with our partners at the University Medical Center Freiburg---where the DBS implantation surgeries and inpatient visits take place---and companies focussing on neural implant technology.

Working areas (among others):

- Conception, development and software implementation of experimental paradigms.
- Coordination of experimental sessions between clinicians, German speaking patients, and our research group.
- Execution of open- and closed-loop DBS experiments with patients and healthy subjects.
- Analysis of behavioral and neural signals.
- Scientific dissemination of results.
- Development of follow-up research questions and acquisition of funding.
- Supervision of PhD students.
Your background:

Requirements:
- Excellent doctoral degree in computational neuroscience, biology, biomedical engineering, computer science, or related fields.
- Profound mathematical knowledge, specially in the fields of statistics and linear algebra.
- High proficiency in the German language.
- Excellent interpersonal skills and cognitive empathy.
- Experience in the design and execution of in vitro or in vivo experiments involving the acquisition of physiological signals.
- Good knowledge of Python or Matlab.
- Knowledge about machine learning concepts.
- Knowledge about time series signal processing, ideally hands-on experience with brain signals (EEG-, EMG-, EOG-, ECoG, LFP data).
- Adequate record of peer-reviewed scientific publications.

Nice to have:
- Experience with brain-computer interfaces.
- Experience in dealing with patients.

The Brain State Decoding Lab:
The Brain State Decoding lab under the lead of Dr. Michael Tangermann has a profound history of brain-computer interface (BCI) research. It is embedded into the Computer Science Dept. and is part of the cluster of excellence BrainLinks-BrainTools (BLBT). The lab’s research activities range from method development to applications in the clinical context and for healthy users. The lab has tight collaborations with other labs of the Computer Science Dept., as machine learning / AI is one of the emphasized research directions in Freiburg. Common projects with the University Medical Center are the basis for investigating novel machine learning approaches for the real-time analysis of brain signals and their use in novel clinical applications.

Implementing an equal-chances policy and family-friendly working conditions, the Brain State Decoding lab explicitly encourages the application of female researchers with the above qualifications. Handicapped applicants will be given priority to non-handicapped applicants, if they have comparable qualifications.

(www.bsdlab.uni-freiburg.de, www.brainlinks-braintools.uni-freiburg.de)
The University:

The Albert-Ludwigs-University of Freiburg was founded in 1457. Alma mater of many famous philosophers, top researchers, and Nobel laureates, it offers undergraduate and graduate studies in all important disciplines for more than 21,000 students from over 100 nations. (www.uni-freiburg.de). The University Medical Center is one of the largest medical facilities in Europe and host of the Faculty of Medicine, a top ranking German medical school.

The position:

- Payment level: TV-L E13 or E14 (100%)
- Start date: immediately
- Duration: 24 months with possible prolongation

How to apply:

Please send your written application in the format of the download form (http://www.we-are.de/applications/postdoc_application_form.doc) via email to michael.tangermann@blbt.uni-freiburg.de stating the position code PostDoc-DBS.