Using fNIRS as a Tool for Real-Time Applications – Potentials and Implementations

Friday October 21st 8:45-10:10 am O.C. Marsh Lecture Hall

Chair: Franziska Klein, University of Oldenburg, RWTH Aachen University

Real-time applications such as online decoding of brain activation and neurofeedback (**NFB**) training based on hemodynamic brain signals have shown high promise for brain-based interaction (**BBI**) and modulating/normalizing brain activity resulting in desired behavioural changes. Several clinical trials of functional magnetic resonance imaging (**fMRI**) NFB have shown promising therapeutic effects. Besides, fMRI NFB, functional near-infrared spectroscopy (**fNIRS**) NFB gained increasing interest as it may overcome some of the limitations faced by fMRI (e.g., high costs and stationarity).

This symposium will start with a short introduction of fNIRS with a focus on challenges and available solutions for real-time fNIRS preprocessing and analysis (Dr. Michael Lührs). Then, the potential of fNIRS for robust and convenient motor-independent communication in real-world environments will be discussed (Dr. Bettina Sorger). Next, two fNIRS-guided NFB implementations will be introduced: (1) a NFB study aiming at alleviating motor symptoms in patients with Parkinson's disease (Franziska Klein) and (2) a proof-of-concept study validating fNIRS NFB as a tool to modulate right temporoparietal junction activation and related cognitive functions (Dr. Simon Kohl). Finally, ideas to develop a study design for emotion regulation based fNIRS NFB training and preliminary positive mental imagery fNIRS data will be presented (Dr. David Mehler).

- **8:45 am:** Dr. Michael Lührs, *Maastricht University*, **fNIRS as a Tool for Real-Time Applications - Methodological Challenges and Solutions**

- **9:02 am:** Dr. Bettina Sorger, *Maastricht University*: **A Reliable, Effective and Flexible Multiple-choice Brain-based Interaction System Relying on fNIRS Responses**

- **9:19 am:** Franziska Klein, *University of Oldenburg, RWTH Aachen University*: **fNIRS-guided Motor Imagery Neurofeedback to Alleviate Motor Symptoms in Parkinson's Disease: A Proof-of-Concept Study**

- **9:36 am:** Dr. Simon Kohl, *Jülich Research Center*, **Modulation of Temporoparietal Junction Activity by fNIRS-based Neurofeedback – A Randomized Controlled Proof-of-concept Study**

- **9:53 am:** Dr. David Mehler, *RWTH Aachen University*: **Development of fNIRS-guided Neurofeedback Training to Facilitate Emotion Regulation Capacities**