

EMBC Workshop Proposal

Workshop Type (select one):

Full Day Workshop

Half Day Workshop

Workshop Title:

Brain-computer interface neurotechnology for control, rehabilitation, brain assessment and cortical function mapping.

Workshop Organizer Name & Affiliation:

Christoph Gueter, a.tec medical engineering GmbH

Workshop Organizer/Speaker Name & Affiliation 1:

Dean Krusienski, Virginia Commonwealth University

Workshop Organizer/Speaker Name & Affiliation 2:

Nuri Firat Ince, University of Houston

Workshop Organizer/Speaker Name & Affiliation 3:

Tomek Rutkowski, University of Tokyo

Workshop Organizer/Speaker Name & Affiliation 4:

Kai J Miller, Mayo Clinic

Workshop Organizer/Speaker Name & Affiliation 5:

Workshop Organizer/Speaker Name & Affiliation 6:

Theme (Select one):

- 01. Biomedical Signal Processing
- 02. Biomedical Imaging and Image Processing
- 03. Micro/ Nano-bioengineering; Cellular/ Tissue Engineering & Biomaterials
- 04. Computational Systems & Synthetic Biology; Multiscale modeling
- 05. Cardiovascular and Respiratory Systems Engineering
- 06. Neural and Rehabilitation Engineering
- 07. Biomedical Sensors and Wearable Systems
- 08. Biorobotics and Biomechanics
- 09. Therapeutic & Diagnostic Systems and Technologies
- 10. Biomedical & Health Informatics
- 11. Biomedical Engineering Education and Society
- 12. Translational Engineering for Healthcare Innovation and Commercialization

Workshop Synopsis— Max 2000 Characters

The Brain-Computer Interface (BCI) research area is a thriving and rapidly expanding field. BCIs have been developed during the last years for people with severe disabilities to improve their quality of life. However, BCI applications have recently been extended to different research areas, such as rapid functional mapping on the cortical level, virtual reality and rehabilitation & therapy after stroke. The workshop will discuss prerequisites to successfully perform both invasive and non-invasive BCI experiments, and discuss progress in relevant medical domains. Live demonstrations of BCI control will help attendees understand the technology.

Many studies over the past decade have shown that ECoG activity in the high gamma band is a reliable indicator of local task-related cortical activity, and could thus complement existing methods for functional mapping. Further highlights of the workshop are new approaches of semiautomatic mapping of the sensorimotor cortex using somatosensory evoked potentials and cortico-cortical evoked potentials for brain mapping in intraoperative scenarios. The workshop will also describe techniques for direct-brain stimulation in Parkinson patients to reduce tremor and to improve treatment opportunities.

Attendees will get insights into state-of-the-art hardware and software for BCI research enabling participants to run their own experiments. Advantages and disadvantages of dry and wet biosignal sensors will be discussed as well as differences between invasive and non-invasive BCI applications. Participants will be able to understand the most commonly used methodological approaches (auditory, visual, vibrotactile P300, SSVEP, motor imagery) underlying the design of BCIs and will have the opportunity to operate BCI based medical systems for neurorehabilitation, communication and consciousness assessment. The speakers of this workshop provide a competent mix between neurosurgery, neurology, scientific and technical expertise.