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Neurons in action: Applied Neurotechnology

Abstract

In this workshop various leaders in the field of neurotechnology will present recent revelations on how neurons enable us to interact with our environment. Starting with discussing basic functionalities of nerve cells of the central nervous system, the workshop participants will be introduced to the way of how our senses receive and process information from our surroundings. Specific focus will be put on the mechanisms of perceiving auditory and visual stimuli. In the further progress of the workshop, the principles of body movement will be outlined and how we can exploit our knowledge about these fundamental mechanisms to extract movement information for human machine interfaces. At the cortical level, recordings from the brain can directly be used to interface neuroprosthetic control. Movement intents projected via the spinal cord to the end-effectors - the muscles - can be recorded and used to drive prosthetic devices or enable speech recognition solely based on activations of the oropharyngeal muscles. In addition to such observational approaches, modelling approaches of neural activities and their applications are presented. Such models can be used to improve our understanding of physiological and pathological neurological processes as well as to implement a scaled model on a computer processor to drive complex, self-learning robots.

The participants of this workshop will get a broad overview of current challenges and advances in neurotechnology. Applications of our theoretical understandings of neural activities are presented: From the basic functional mechanisms of seeing and hearing, to self-learning robots, mimicking the learning process of the human brain.

Schedule

Tuesday, September 2

13:30 Marcus Jeschke, BFNT - Georg-August-University Göttingen Medical Faculty, Germany
Optogenetic stimulation of the auditory pathway

14:15 Andreas Neef, BFNT - MPI for Dynamics and Self-Organization, Germany
Interrogating neurons with light – Continuous Dynamic Photostimulation

15:00 ---Coffee break---

15:30 Shubodeep Chakrabarti, BFNT - German Primate Center, Germany
Adaptive multi-electrode monitoring of cortical movement plans for neuroprosthetic control

16:15 Frank Rattay, TU Vienna, Austria
Neuron Modeling for Neuroprosthetic Applications

Wednesday, September 3

9:00 Sebastian Amsüss, BFNT - Georg-August-University Göttingen Medical Faculty, Germany

Dexterous control of multifunctional upper limb myoprostheses

9:45   Michael Wand, Karlsruher Institute of Technology, Germany
       Decoding Silent Speech using High-density Myoelectric Signals

10:30 ---Coffee break---

       Poramate Manoonpong, SDU, Denmark
11:00 *Neural Control, Memory, & Learning for Complex Behaviors in Multi Sensori-Motor Robotic Systems*

11:45 Peter Göbel, Otto Bock Vienna, Austria
       Visual Object Modeling by Stochastic Grammar Using Different Object Views

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