

## ENB Elite Master Program Neuroengineering (MSNE) Invited Presentation

**Mikhail A. Lebedev, PhD**

# Brain-machine interfaces for restoration of movements and sensations

**Abstract:** Brain-machine interfaces (BMIs) connect the nervous system to various external devices, with the goal of restoring and/or enhancing motor, sensory and cognitive functions, and neurorehabilitation. BMIs can be used by patients with different neurological conditions as assistive devices or by healthy individuals as tools for brain augmentation. Over the past half-century, BMIs have advanced significantly from the early ideas that sounded like science fiction to the modern high-tech implementations. In particular, invasive recordings using multichannel implants have enabled real-time control of artificial limbs by nonhuman primates and human subjects. Furthermore, neural prostheses can provide artificial sensory feedback, allowing users to perceive the movements of prosthetic limbs and their haptic interaction with external objects. Recently, neuroprosthetic approach was employed to build brain-nets that incorporate several brains exchanging information or performing cooperative tasks. Notwithstanding these achievements, even more spectacular developments are expected in the future.



**Biography:** Mikhail Lebedev, a Senior Research Scientist at Duke University, works in the fields of Neurophysiology and Neuroprosthetics. He received a Master's degree in Physics from Moscow Institute of Physics and Technology (1986), and a PhD in Neurobiology from the University of Tennessee, Memphis (1995). His early research was on human sensorimotor integration. Since 1991, Lebedev works in the field of primate and rodent neurophysiology; he has studied neuronal mechanisms of cortical and basal ganglia circuits. Lebedev has investigated neuronal encoding of movements, somatic sensation, spatial attention and working memory. Since 2003, Lebedev works with Miguel Nicolelis; he supervises the primate laboratory at Duke University. The major focus of his current research is on BMIs, such as BMIs for reaching and grasping, BMIs that reproduce bipedal locomotion patterns, and sensorized BMIs that both extract motor command from the brain and deliver sensory information back to the brain. Lebedev is an editor of several journals, books and special issues.

Talk is hosted by the Institute for Cognitive Systems (Prof. Cheng).

**Tuesday, February 6<sup>th</sup> 2018, 4 p.m.**  
**Theresienstr. 90, 80333 Munich, room N1135**

All talks in the MSNE Invited Speaker Series are open to students, staff, and members of the public. Attendance is free.

Contact: [msne@ei.tum.de](mailto:msne@ei.tum.de) / [www.msne.ei.tum.de](http://www.msne.ei.tum.de)  
MSNE is supported by the Elite Network of Bavaria.

**MS  
NE**



Elitenetzwerk  
Bayern

