Dario Farina, Professor and Chair in Neurorehabilitation Engineering, Department of Bioengineering, Imperial College London, London, UK

Dario Farina received Ph.D. degrees in automatic control and computer science and in electronics and communications engineering from the Ecole Centrale de Nantes, Nantes, France, and Politecnico di Torino, Italy, in 2001 and 2002, respectively. He is currently Full Professor and Chair in Neurorehabilitation Engineering at the Department of Bioengineering of the Imperial College London, UK. He has previously been Full Professor at Aalborg University, Aalborg, Denmark, (until 2010) and at the University Medical Center Göttingen, Georg-August University, Germany, where he has been founding Director of the Institute of Neurorehabilitation Systems (2010-2016) and the Chair in Neuroinformatics of the Bernstein Focus Neurotechnology Göttingen (2010-2015). Among other awards, he has been the recipient of the Royal Society Wolfson Research Merit Award, of the 2010 IEEE Engineering in Medicine and Biology Society Early Career Achievement Award, in 2012 he has been elected Fellow of the American Institute for Medical and Biological Engineering (AIMBE), and in 2014-2015 he has been Distinguished Lecturer IEEE. His research focuses on biomedical signal processing, neurorehabilitation technology, and neural control of movement. Within these areas, he has (co)-authored more than 400 papers in peer-reviewed Journals, which have currently received cumulatively more than 19,000 citations, and over 500 among conference papers/abstracts, book chapters, and encyclopaedia contributions. Professor Farina has been the President of the International Society of Electrophysiology and Kinesiology (ISEK) (2012-2014) and is currently the Editor-in-Chief of the official Journal of this Society, the Journal of Electromyography and Kinesiology. He is also currently an Editor for IEEE Transactions on Biomedical Engineering and for the Journal of Physiology, and previously covered editorial roles in several other Journals.

MAN-MACHINE INTERFACING FOR THE CONTROL OF UPPER LIMB PROSTHESES

Dario Farina

Upper limb prostheses require a man-machine interface that establishes a link between the user's nervous system and the robotic limb. This interfacing is commonly done with the remnant muscles above the amputation, either through their physiological innervation or using the surgical approach of targeted muscle reinnervation. Muscle interfacing or myoelectric control consists in the recording of electromyographic (EMG) signals for extracting control signals to command prostheses. In commercial systems, the intensity of muscle activity is extracted from the EMG and used for single degree of freedom activation (direct control). Over the past decades, the academic research has progressed to more sophisticated approaches, although, surprisingly, none of these academic achievements has been implemented in commercial systems so far. In this lecture I will describe various advanced methods for myocontrol, based on EMG regression as well as on the integration of EMG with other sources of information. The talk will also discuss the major challenges in filling the gap between commercial/clinical and academic methods for myocontrol. Finally, a longer-term vision on interfacing spinal motor neurons by decoding multi-channel EMG signals for prosthesis control will also be discussed.