

# EMBC Workshop Proposal

## Workshop Type (select one):

Full Day Workshop

Half Day Workshop

## Workshop Title:

Current and future trends in neuro-robotics for motor relearning and functional recovery

### Workshop Organizer Name & Affiliation:

Marianna Semprini, Istituto Italiano di Tecnologia (Italy)

### Workshop Organizer Name & Affiliation 1:

Michela Chiappalone, Istituto Italiano di Tecnologia (Italy)

### Workshop Organizer Name & Affiliation 2:

Lorenzo De Michieli, Istituto Italiano di Tecnologia (Italy)

### Workshop Speaker Name & Affiliation 3:

Matteo Laffranchi, Istituto Italiano di Tecnologia (Italy)

### Workshop Speaker Name & Affiliation 4:

Stanisa Raspopovic, ETH (Switzerland)

### Workshop Speaker Name & Affiliation 5:

Ander Ramos Murquialday, University of Tübingen (Germany)

### Workshop Speaker Name & Affiliation 6:

Azorin Jose M., Universidad Miquel Hernandez de Elche (Spain)

### Workshop Speaker Name & Affiliation 7:

José del R. Millán, University of Texas at Austin (USA)

## 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

Motor disabilities can be due to diverse causes, such as trauma or neurological disease, but they all severely affect everyday life of injured individuals. Within this framework, neurotechnologies based on robotics devices have come into play. Although conceived with the primary goal of recovering the reduced or missing motor function, these technologies revealed themselves as valuable tools to promote and shape neuroplasticity, thus enhancing the overall recovery.

It is the purpose of this workshop to explore the main application contexts of these tools and to describe the opportunities and challenges that they face. Specifically, we will present cutting-edge prostheses and exoskeletons both for upper and lower limbs, particularly focusing on those systems that also make use of neurotechnologies in order to boost neuroplastic changes occurring during device use. Moreover, we will discuss the use of brain-computer interface systems for rehabilitation.

We invited experts in the field to share their research at the boundary between robotics, neuroscience and rehabilitation. We asked them to present their current and future activities, detailing which challenges must be taken in order to fill the gap between smart technology development and fruitful clinical use.

We will then engage all the attendees in a panel discussion addressing where are we now with robotics neurorehabilitation, where do we want to go and which achievements are to be met. Addressing these questions will highlight next directions and challenges of neuro-robotic research.

#### Organizers:

Marianna Semprini  
Michela Chiappalone  
Lorenzo De Michieli

#### List of confirmed speakers:

Matteo Laffranchi, IIT  
Stanisa Raspopovic, ETH  
Ander Ramos-Murquialday, Eberhard Karls University of Tübingen/TECNALIA  
Jose Azorin, Universidad Miquel Hernandez de Elche  
José del R. Millán, University of Texas at Austin