

# Tuesday 16 Oct

8:30 - 9:40

ICNR and WeRob registrations

## ICNR Sessions

## WeRob Sessions

## INBOTS Sessions

9:40 - 11:10

WS1. BCIs for stroke rehabilitation and for assessment in disorders of consciousness

WS5. Artificial Supernumerary Limbs for Clinical Neuroscience

WS6. The RONDA project: a robotic gym for stroke rehabilitation

WeR2. Soft Wearable Robotics

INBOTS1 Promote entrepreneurship and non-technical support to SMEs: success stories and new opportunities

11:10-11:30

Coffee break

11:30-12:20

WS1. BCIs for stroke rehabilitation and for assessment in disorders of consciousness

WS5. Artificial Supernumerary Limbs for Clinical Neuroscience

WS6. The RONDA project: a robotic gym for stroke rehabilitation

INBOTS1 Promote entrepreneurship and non-technical support to SMEs: success stories and new opportunities

12:20-13:00

Poster Session

13:00-14:10

Lunch

14:10-15:00

ICNR- WeRob Plenary #1 - Marco Santello: Sensorimotor hand function: Bridging the gap between control mechanisms and clinical translation

15:00-16:30

WS2. Worldwide consensus of NeuroRehabilitation

WS3. State of the art and recent advances in HD-sEMG: prospects in neurorehabilitation

WS4. Advances and Challenges on the Development, Testing and Assessment of Myo-Control for Prostheses and Assistive/Rehabilitation Robots

WeR3. Subject-centered based approaches for controlling Wearable Robots

INBOTS2 Debate on legal, ethics & socio-economic aspects

16.30-17:00

Coffee break

17:00-18:30

WS2. Worldwide consensus of NeuroRehabilitation

WS3. State of the art and recent advances in HD-sEMG: prospects in neurorehabilitation

WS4. Advances and Challenges on the Development, Testing and Assessment of Myo-Control for Prostheses and Assistive/Rehabilitation Robots

WeR4. Robotic and neuroprosthetic balance management approaches for walking assistance

INBOTS2 Debate on legal, ethics & socio-economic aspects

18:30-20:00

Welcome party and official opening

## ICNR- WS1. BCIs for stroke rehabilitation and for assessment in disorders of consciousness – Room Auditorium

### Organizer

Begonya Ota, Clinical R&D | Technical Sales Management

### Authors

### Title

Alexander Heilinger

Introduction to major methodological approaches of BCI for stroke rehabilitation, coma assessment and communication – 20 minutes

Strategies to run motor recovery training with BCI systems – 20 minutes

Cognitive assessment with BCI technology of DOC and locked-in patients – 20 minutes

Practical session with a live demonstration of stroke rehabilitation system using BCI technology – recoveriX – 45 minutes

Practical session with a live demonstration of an assessment system for DOC patients using BCI technology – mindBEAGLE – 45 minutes

## ICNR- WS2 - Worldwide consensus of NeuroRehabilitation – Room Auditorium

### Organizers

Shingo Shimoda, Juna Moreno, Fady Alnajjar , Hitoshi Hirata, Jose-Luis Pons

### Authors

### Title

Hitoshi Hirata

Opening Remarks

Marco Molinari

EU attitude of Neurorehabilitation from Medical viewpoint

Juan Moreno

EU attitude of Neurorehabilitation from Engineering viewpoint

William Z Rymer

US Clinical Experience with Wearable Exoskeletons as Therapeutic Rehabilitation Devices Following Injury to the CNS: An Evolving Story

TBD

US attitude of Neurorehabilitation from Engineering viewpoint

Ichiro Miyai

Asian attitude of Neurorehabilitation from Medical viewpoint

Shingo Shimoda

Role of engineering technique for neurorehabilitation

Fady Alnajjar

Middle East attitude of Neurorehabilitation from Engineering viewpoint

Panel discussion

Chair: Prof. Hitoshi Hirata NeuroRehabilitation Consensus for worldwide collaboration

**ICNR- WS3. State of the art and recent advances in HD-sEMG: prospects in neurorehabilitation – Room Pacinotti**

**Organizers**

Marco Gazzoni, Alberto Botter and Taian Vieira

**Authors**

**Title**

Marco Gazzoni	Introduction to the workshop
Taian Vieira	Interpretation of Surface Electromyograms: The Spatial Localisation of Muscle Activity
Alberto Botter	Integration of HD-sEMG and ultrasounds for the assessment of muscle function
Giacinto Luigi Cerone	Wearable and Wireless HD-sEMG Acquisition Systems: Recent advances
Ales Holobar	Cumulative spike train outperforms the root-mean-square metric in muscle excitation estimation from dynamic high-density EMG
Dario Farina	High-Density EMG: Neurophysiology meets Biomechanics

**ICNR- WS4. Advances and Challenges on the Development, Testing and Assessment of Myo-Control for Prostheses and Assistive/Rehabilitation Robots – Room Fermi**

**Organizers**

Michele Barsotti, Domenico Buongiorno, Andrea D'Avella, Antonio Frisoli

**Authors**

**Title**

Domenico Buongiorno, Michele Barsotti	Introduction: Advances and challenges on MyoControl systems
Ivan Vujaklija	Translating Advanced Myocontrol from the Laboratory to Clinics
Andrea Turolla	Referral-to-therapy and treatment of upper limb using closed-loop Myo-Control, in neurological disorders
Strahinja Dosen	Closed-loop myoelectric interfacing in assistive robotics
Christian Cipriani	Classification of Transient Myoelectric Signals for the Control of Multi-Grasp Hand
Claudio Castellini	Interactive (machine) learning, a key component of the HRI of the future
Vittorio Sanguineti, Nicola Lotti	EMG-driven force fields: toward a myoprocessor for 'virtual biomechanics

**ICNR- WS5. Artificial Supernumerary Limbs for Clinical Neuroscience – Room Pacinotti**

**Organizers**

Domenico Prattichizzo, Gionata Salvietti

**Authors**

**Title**

Etienne Burdet

Motor control of 6-fingered hand

Domenico Prattichizzo and Simone Rossi  
(tandem talk)

The Robotic Sixth Finger: A wearable device for grasp compensation and augmentation

Tamar Makin

Neural correlated of hand augmentation

Antonio Bicchi

An Active Supernumerary Hand for Grasping Assistance: the SoftHand X

**ICNR- WS6. The RONDA project: a robotic gym for stroke rehabilitation – Room Fermi**

**Organizers**

Silvestro Micera, Guido Giudetti

**Authors**

**Title**

Silvestro Micera

Introduction to the RONDA project

Cristina Spalletti

Robotic Rehabilitation and Neuromodulation after stroke: novel approaches in a mouse model

Emilio Trigili

Design and control of upper-limb exoskeletons for rehabilitation and assistance in daily-life activities

Antonio Frisoli - Michele Barsotti- Fabio  
Stroppa

Improved exoskeleton robotic training in post-stroke upper limb rehabilitation: toward a motor learning paradigm

Federico Posteraro

RONDA: a classification of upper limb robotic device to be used in clinical practice

Carmelo Chisari - Giuseppe Lamola

RONDA: Neurophysiological correlates of motor learning using upper limb robotic devices in stroke patients

## WeR2. Soft Wearable Robots – Room Galilei

**Organizers** Conor J. Walsh, SEAS Harvard; Jesús Ortiz, IIT-ADVR; Eduardo Rocon, CSIC; Lucia Beccai, IIT-CMBR; Chris Baten, RRD; Freygardur Thorsteinsson, Össur; Julia Götz, Acceloment

### Authors

### Title

Michele Xiloyannis, Domenico Chiaradia, Antonio Frisoli and Lorenzo Masia

Characterisation of pressure distribution at the interface of a soft exosuit: towards a more comfortable wear

Allan J Veale, Kyrian Staman and Herman van der Kooij

Realizing Soft High Torque Actuators for Complete Assistance Wearable Robots

Valerie Power, Adam de Eyto, Bernard Hartigan, Jesús Ortiz and Leonard O'Sullivan

Application of a User-Centered Design Approach to the Development of XoSoft – a Lower Body Soft Exoskeleton

Ali Sadeghi, Alessio Mondini and Barbara Mazzolai

A Preliminary Experimental Study on Variable Stiffness Structures Based on Textile Jamming for Wearable Robotics

Massimo Totaro, Eliza Bottenberg, Richard Groeneveld, Laura Erkens, Alessio Mondini, Ger Brinks and Lucia Beccai

Towards embroidered sensing technologies for a lower limb soft exoskeleton

Conor Walsh

Recent Results from Evaluation of Soft Wearable Robots in Clinical Populations

## WeR3. Subject-centered based approaches for controlling Wearable Robots – Room Galilei

**Organizers** Samer Mohammed, Université Paris-Est Créteil (UPEC), France; Mohamed Bouri, EPFL, Lausanne, Switzerland

### Authors

### Title

Randa Kaddaj Mallat, Vincent Bonnet, Mohamad Khalil and Samer Mohammed

Toward an Affordable Multi-Modal Motion Capture System Framework for Human Kinematics and Kinetics Assessment

Mehmet C. Yildirim, Ahmet Talha Kansizoglu, Polat Sendur and Barkan Ugurlu

High Power Series Elastic Actuator Development for Torque-Controlled Exoskeletons

Amalric Ortlieb, Peter Lichard, Florin Dzeladini, Romain Baud, Auke Ijspeert, Hannes Bleuler and Mohamed Bouri

Investigation on Variable Impedance Control for Modulating Assistance in Walking Strategies with the AUTONOMYO exoskeleton

Fabian Just, Daniel Gunz, Jaime Duarte, Davide Simonetti, Robert Riener and Georg Rauter

Improving Usability of Rehabilitation Robots: Hand Module Evaluation of the ARMin Exoskeleton

Simon Gallo

Wearable and multimodal haptic feedback for restoring human body perception

**WeR4. Robotic and neuroprosthetic balance management approaches for walking assistance – Room Galilei****Organizers**

Antonio del Ama, National Spinal Cord Injury Hospital, Spain; Juan Moreno, Cajal Institute, Spain; and Jan Veneman, Hocoma AG.

**Authors****Title**

Zlatko Matjacic, Matjaž Zadavec, Nataša Bizovičar, Nika Goljar and Andrej Olenšek

Novel perturbation-based approaches using pelvis exoskeleton robot in gait and balance training after stroke

Eva Swinnen, Jean-Pierre Baeyens, Nina Lefeber, Emma De Keersmaecker, Stieven Henderix, Marc Michielsen and Eric Kerckhofs

Balance during bodyweight supported and robot-assisted walking

Eleonora Croci, Roger Gassert and Camila Shirota

Maintaining gait balance after perturbations to the leg: kinematic and electromyographic patterns

Mariangela Filosa, Ilaria Cesini, Elena Martini, Giacomo Spigler, Nicola Vitiello, Calogero Maria Oddo and Simona Crea

A vibrotactile sensory feedback system for lower-limb amputees

Federica Barberi, Federica Aprigliano, Emanuele Gruppioni, Angelo Davalli, Rinaldo Sacchetti, Alberto Mazzoni and Silvestro Micera

Fast online decoding of motor tasks with single sEMG electrode in lower limb amputees

Ilaria Cesini, Giacomo Spigler, Sahana Prasanna, Domitilla Taxis, Filippo Dell'agnello, Elena Martini, Simona Crea, Nicola Vitiello, Alberto Mazzoni and Calogero Maria Oddo

A wearable haptic feedback system for assisting lower-limb amputees in multiple locomotion tasks

**INBOTS1. The RONDA project: a robotic gym for stroke rehabilitation – Room D****Authors****Title**

Roberto Conti, Sarah Terreri

Brief introduction of the workshop objectives

Nicola Vitiello, IUVO

IUVO: a successful spin-off company on wearable robotics technologies

Francesco Ferro, PAL Robotics

PAL robotics: Humanoid robotics vision

Jody Saglia, Movendo

Movendo: an IIT spin-off company

Andrea Bisson, Comau

Comau Robotics: interactive robotics in the industrial field

Andrea Bisson, Comau

Key Intellectual Property Aspects of Robotics

Sebastian Weide, VDI/VDE

Database tools for analysing the market

Roberto Conti, Sarah Terreri

Final discussion about the two sessions

**INBOTS2. Debate on legal, ethics & socio-economic aspects: TBD – Room D**

## Tuesday 16 Oct - Poster session

Authors	Title	Session
Daniele Borzelli	Consistency of myoelectric control across multiple sessions	ICNR- WS4. Advances and Challenges on the Development, Testing and Assessment of Myo-Control for Prostheses and Assistive/Rehabilitation Robots
Masashi Sekine, Kazuya Kawamura and Wenwei Yu	Optimizing body thickness of watchband-type soft pneumatic actuator for feedback of prosthesis grasping force	WeR2. Soft Wearable Robots
John Nassour, Sidhdharthkumar Vaghani and Fred Hamker	Design of Soft Exosuit for Elbow Assistance Using Butyl Tubes Rubber and Textile	WeR2. Soft Wearable Robots
Domenico Chiaradia, Michele Xiloyannis, Massimiliano Solazzi, Lorenzo Masia and Antonio Frisoli	Comparison of a Soft Exosuit and a Rigid Exoskeleton in an Assistive Task	WeR2. Soft Wearable Robots
Ivanka Veneva, Dimitar Chakarov, Michail Tsveov and Pavel Venev	Exoskeleton with Soft Actuation and Haptic Interface	WeR2. Soft Wearable Robots
Yi Sun, Aaron Jing Yuan Goh, Miao Li, Hui Feng, Jin Huat Low, Marcelo H. Ang. Jr and Raye Chen Hua Yeow	Improved Fabrication of Soft Robotic Pad for Wearable Assistive Devices	WeR2. Soft Wearable Robots
Rainier Natividad, Tiana Miller-Jackson, Wai Hong Sin and Chen-Hua Yeow	The Exosleeve: A Soft Robotic Exoskeleton for Assisting in Activities of Daily Living	WeR2. Soft Wearable Robots
Jong-Won Lee, Juwhan Bae, Chilyong Kwon and Gyoosuk Kim	The Effect of Negative Damping at the Hip Joint during Level Walking: A Preliminary Testing	WeR3. Subject-centered based approaches for controlling Wearable Robots
Maria Lazzaroni, Stefano Toxiri, Darwin Caldwell, Elena De Momi and Jesús Ortiz	Overview and challenges for controlling back-support exoskeletons	WeR3. Subject-centered based approaches for controlling Wearable Robots
Nicola Secciani, Matteo Bianchi, Alessandro Ridolfi, Federica Vannetti and Benedetto Allotta	Assessment of a hand exoskeleton control strategy based on user's intentions classification starting from surface EMG signals	WeR3. Subject-centered based approaches for controlling Wearable Robots
Olivier Bordron, Clément Huneau, Eric Le Carpentier and Yannick Aoustin	Contribution of a Knee Orthosis over Walking	WeR3. Subject-centered based approaches for controlling Wearable Robots
Titus Hanson, Chris Bitikofer, Bahram Sobbi and Joel Perry	Design of Mobile Digit Assistive System (MIDAS): A Passive Hand Extension Exoskeleton for Post Stroke Rehabilitation	WeR3. Subject-centered based approaches for controlling Wearable Robots
Marko Jamšek and Jan Babič	Human trunk stabilization with hip exoskeleton for enhanced postural control	WeR4. Robotic and neuroprosthetic balance management approaches for walking assistance



Amre Eizad, Muhammad Raheel Afzal, Hosu Lee, Sung-Ki Lyu and Jungwon Yoon	Development of a Wearable Haptic Feedback System for Limb Movement Symmetry Training	WeR4. Robotic and neuroprosthetic balance management approaches for walking assistance
Arantxa Rentería	Medical robotics and the daunting certification process	INBOTS
Aníbal Monasterio, Daniel López, Manuel Aparicio, Ricardo Morte, Txetxu Ausín y Mario Toboso	Conceptual Analysis: technology, machine and robot	INBOTS
Mario Toboso, Ricardo Morte, Aníbal Monasterio, Txetxu Ausín, Manuel Aparicio y Daniel López	Robotics as an instrument for social mediation	INBOTS
Giuseppe Cotugno, Dario Turchi, Duncan Russell and Graham Deacon	Second Hands: A collaborative maintenance robot for automated warehouses. Implications for the industry and the workforce	INBOTS
Eduard Fosch Villaronga and Christopher Millard	Loud and Cloud: Human Responsibility for Cloud Robotics Ecosystems	INBOTS