



**Category:** Application and clinical integration

**Workshop Title:** Enhancing Sensorimotor Recovery through Robot-aided Somatosensory Retraining: Perspectives, Challenges, and Opportunities

**Organizer(s):** Quentin Sanders

**Speaker(s):** Gassert, Roger, ETH Zurich  
Reinkensmeyer, David, University of California Irvine  
Semrau, Jennifer, University of Delaware  
Dukelow, Sean, University of Calgary  
Marchal-Crespo, Laura, TU Delft  
Konczak, Jurgen, University of Minnesota  
Seo, NaJin, Medical University of South Carolina

**Workshop Time:** 10:30 - 12:00

**Attendee Engagement:** The workshop organizers plan to engage the attendees through discussion rounds with the attendees with the goal of understanding what the best practices may be for implementing robotic devices in clinical practice for somatosensory retraining. The discussion rounds will also help elucidate what some of the key remaining questions are within this topic.

**Abstract:** Brain damage, such as that caused by stroke, often results in somatosensory impairment, disrupting the ability to process critical sensory information like tactile and proprioceptive cues. Sensory input is vital for engaging with the physical environment, and reduced feedback can severely affect key motor functions, including grasping, balance, walking, and reaching. Despite its importance, somatosensory retraining is frequently overshadowed by motor rehabilitation, likely due to the limited robust evidence supporting its effectiveness.

For instance, traditional sensory retraining methods, such as passive/active movement training where vision is occluded encouraging reliance solely on proprioceptive cues or tactile discrimination training lack standardization. Additionally, there is minimal research proving whether these interventions have significant impact on motor or somatosensory function, as measured by neurophysiological markers or clinical assessments. Robotic rehabilitation platforms offer a promising alternative. These platforms can deliver highly accurate and repeatable limb stimulation, precisely measure patient responses, increase therapy intensity, provide movement assistance, and enhance patient engagement through gamified exercises. Yet, their adoption remains limited due to device complexity and insufficient large-scale clinical trials.

Thus, the aim of this workshop is to explore the current state of robot-aided somatosensory retraining as a means of improving sensorimotor function in the upper or lower extremities. We will address the current challenges in implementing these approaches and explore

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opportunities to enhance their application in clinical practice through a panel discussion featuring invited speakers from both engineering and clinical fields.