

ISVR

NEWSLETTER

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Editorial

September 2016 Newsletter 8

We are pleased to announce the results of the first ISVR Early Career Investigator Award. We had a number of high quality nominations. The first place has been awarded to Monica Cameirao, Assistant professor and researcher at the University of Madeira and the Madeira Interactive Technologies Institute in Portugal. Second place was awarded to Sebastian Koenig, CEO of Katana Simulations in Adelaide, Australia.

In this edition of the ISVR newsletter, we have included three profiles in this edition of the newsletter. The Technology Profile features ISVR Early Career Award winner, Monica Cameirao's work as part of the NeuroRehabLab. The Clinical Profile highlights a number of commercial and research technologies used in the Virtual Rehabilitation Lab located at Sunnaas Rehabilitation Hospital in Oslo, Norway. Our Rehabilitation Startup profile highlights the MindMaze solutions for rehabilitation in the hospital and home setting.

We have listed a number of upcoming conferences that may be of interest to you, including the upcoming ICDVRAT conference on September 20-22 in Los Angeles, California, and the Call for Papers for ICVR 2017 in Montreal, Canada.

We are always looking for interesting news from our membership, so if you have something exciting to share, such as a meeting announcement or news from your clinic or lab, please pass it on to our newsletter team (newsletter@isvr.org). If you are interested in writing a Technology, Clinical or Rehabilitation startup profile, please contact the newsletter team.

Finally, in our ISVR Society News section, we would like to draw your attention to the membership for clinicians category. We are reaching out to rehabilitation clinicians who have been using or want to use VR technology in their clinical practice. We encourage clinicians to join the society (membership is free for the first year!) and to enter into a dialog with researchers and technology developers to share experiences and work together to facilitate technology uptake in the clinical milieu, through our ISVR forums, Facebook and Twitter.

Happy reading and hope to see you all this fall at the 11th ICDVRAT in September!

Belinda Lange, Kynan Eng and Sergi Bermudez i Badia, ISVR

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NeuroRehabLab

Mónica Cameirão

Assistant professor, Universidade da Madeira / Research fellow, Madeira Interactive Technologies Institute

<http://neurorehabilitation.m-iti.org>

Where is your lab located?

Our lab, the NeuroRehabLab, is located in the island of Madeira in Portugal, and hosted by the Madeira Interactive Technologies Institute, a not-for-profit innovation institute of the University of Madeira.

How did it start, how long has it been around?

The NeuroRehabLab started in 2011 when we joined the Madeira Interactive Technologies Institute, a Human-Computer Interaction institute, and arose from the need of having a brand that identified us with the work that we are doing in the field of interactive technologies for rehabilitation.

Who are the members?

The founding members are Sergi Bermúdez and myself, but we have quickly grown and we currently are 15+ members: 2 assistant professors, 6 PhD students, 1 programmer and 1 occupational therapist, and multiple master and bachelor students doing their theses with us. Our team is very interdisciplinary. We have members with diverse and complementary backgrounds such as engineering, physics, design, psychology and occupational therapy. We also collaborate closely with several clinics and universities in Portugal and abroad.

What research interests does your lab have?

In the NeuroRehabLab, we are working on several approaches to develop a new generation of neuroscientifically grounded interactive technologies to promote the recovery of motor



Motor Imagery driven upper limb training through immersive VR, BCI and haptic feedback.

and cognitive deficits after stroke. One of our priorities is to assess the impact of these technologies with stroke survivors. Hence, we have well-established collaborations with clinical partners at Madeira (through SESARAM, the Madeiran health service) and also in the mainland, allowing us to run controlled clinical studies. Another more recent branch of research relates to using physiological computing and exergames for fitness and the promotion of active life styles in the elderly population.

What problem does your system solve?

Our prototypes are mainly based on the use of Virtual Reality (VR), Serious Games and Brain-Computer-Interfaces (BCI) for promoting fitness and/or the recovery of motor and cognitive deficits. In the motor rehabilitation domain, we use adaptive VR systems for upper limb training that pose challenges adapted to the particular capacities of each user. This means that, for instance,

users with limited range of movement are able to complete the proposed tasks, improving self-efficacy. In cases where users are not able to move their paretic upper extremity, we propose solutions based on the use of BCIs. In the cognitive domain, we address the rehabilitation of attention, memory and executive functions, among others, through VR environments that recreate the performance of Activities of Daily Living (ADL) to improve transfer with real life task performance. In addition, we always make an effort to ground the design of our training tasks to maximally exploit specific neuroscientific principles of recovery through technology.

What makes it unique?

Key characteristics of our systems are a high degree of personalization to users' needs, and that we address the rehabilitation of motor and cognitive deficits together. For example, for attention training we recreate a cancellation task where target stimuli

TECHNOLOGY PROFILE

(continued from page 2)

have to be selected through the displacement of the paretic upper extremity. This means that with this task we are training both, motor and cognitive competences simultaneously through very controlled motor and cognitive challenges. As another example, we are currently working on the Reh@City V2, the second generation of a virtual city for training attention, memory, executive functions and language, in the context of ADLs. Again, training can be customized to require the execution of motor actions to navigate and to complete the cognitive tasks.

How is it better than other existing systems?

One important difference is that the adaptation of our systems is based on computational models that inform us on how the specific details of our VR tasks, such as the number of target elements, distractors, their size or the choice of physical interface, impact the training of motor and cognitive domains. This enables us to have very precise control over task personalization. Further, a limitation of many existing approaches is that they are exclusively addressing the rehabilitation of motor deficits or of cognitive deficits. In fact, we also frequently observe this strategy in conventional rehabilitation. However, if we think about our daily life, most activities that we perform throughout the day are not purely motor or

cognitive; it is a combination of both. Hence, we believe that deficits in these domains should be addressed together.

Tell us about the development process?

This is a multi-stage process. The whole development process follows HCI methodology, with clinicians and patients acting as informants for our technologies. The idea of a new prototype to be developed usually arises from the need to address shortcomings observed in previous studies with our systems. For example, when we started to work in the domain of cognitive rehabilitation, our first prototype consisted on a virtual cancellation task using abstract targets. We shortly realized that we should move to a context that resembles real life task execution. This was the onset of Reh@City. After the first deployment of the prototypes, we enter a cycling stage of piloting with end-users and improving the system according to the results of these pilots. At the final stage, when we believe that our system is ready, we run a controlled clinical trial to assess its impact in comparison to standard rehabilitation.

At what level of readiness is the technology now?

We have technology at different stages, and for different purposes. Our

goal is that all of our VR applications are interface independent, and that the interface and interaction mode is chosen according to what fits best the needs of each particular patient. For this reason, our research and development tools that enable us to interface multiple hardware devices to our VR environments is continuously evolving and improving with new devices available. These tools are rather solid since they constitute the technological basis of most of our projects. At this moment we support a large variety of technologies such as Kinect V1 and V2, Wiimote, Leap Motion, head mounted displays, eye tracking systems, brain-computer interfaces, physiological recording devices and others. On the other hand, VR environments and intervention tools to target specific deficits are being developed continuously, as new research questions arise. At this moment we have multiple systems for cognitive and motor rehabilitation that have already been deployed in the clinic for impact assessment.

Is it available to the community? How to have access to it?

Yes, many of our tools are available and can be downloaded from this website (<http://neurorehabilitation.m-iti.org/tools/>). On our tools webpage one can find two types of applications: tools for researchers and VR developers; and some intervention applications that target specific cognitive (such as the [Task Generator](#), a paper-and-pencil cognitive training generator; or [Reh@City V.1](#), for simulated ADLs) or motor domains (such as the [Neurorehabilitation Training Toolkit](#), an upper limb VR training system for at-home rehabilitation).



A VR motor-cognitive cancellation task example.

Sunnaas rehabilitation hospital/ Virtual Rehabilitation lab

Anne-Marthe Sanders

Senior Occupational Therapist

<http://www.sunnaas.no/>

Where is your lab located?

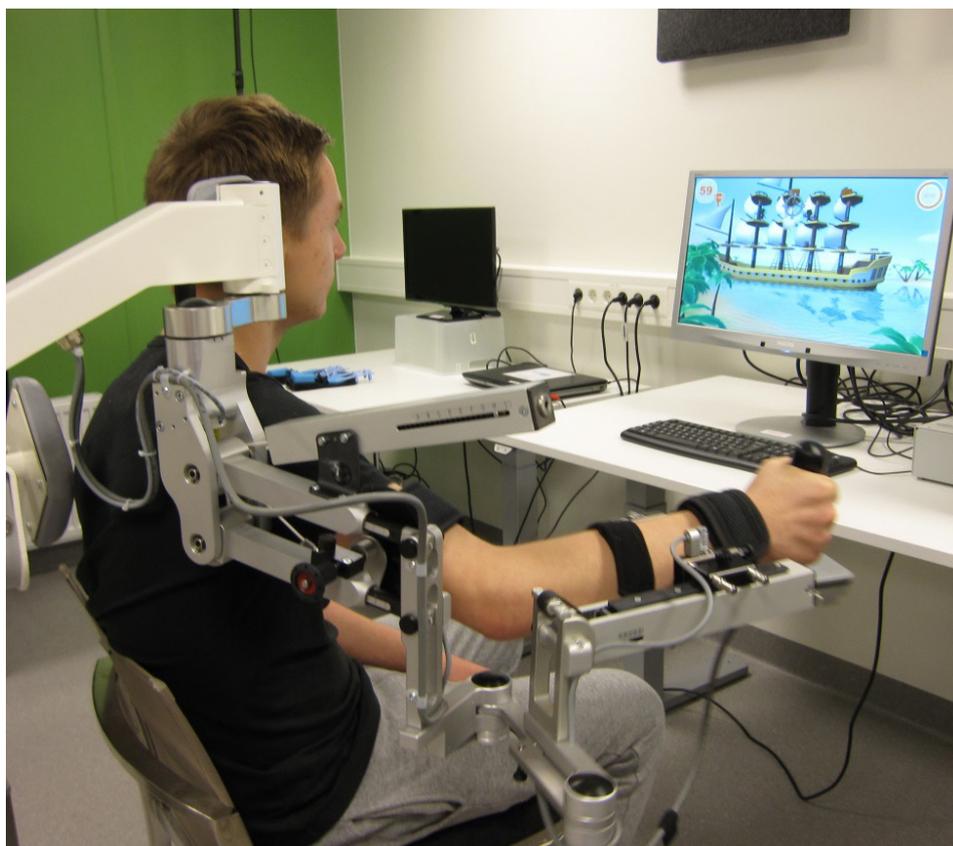
Sunnaas Rehabilitation Hospital is located on Nesodden right outside of Oslo in Norway.

What patient populations do you serve? How many per year?

Sunnaas Rehabilitation Hospital offers multidisciplinary rehabilitation to children and adults with complex functional impairments following illness or injury. We have approximately 160 beds, 750 employees and discharge about 3000 patients annually.

What VR rehab system(s) do you have installed?

In our Virtual rehabilitation lab we have both commercial available consoles and consoles that are developed for rehabilitation purpose. PlayStation4 (Sony Computer Entertainment®), Microsoft® Xbox One and 360, Nintendo® Wii and Wii U, 3DS, and computers are systems currently being used. We are also exploring the different possibilities regarding VR-goggles (Head Mounted Displays) and rehabilitation. Of the more specialized developed rehabilitation systems we have installed is the YouGrabber® (YouRehab). This is a data glove with integrated movement tracking. We have also installed the Armeo®Spring (Hocoma). This is a robotic arm with the possibility to make an arm weightless. Both systems allow the patient to use residual muscular activity in arms to play games, and might be used to train movements in the shoulder, elbow and different grips. In addition, we use the interactive screen Touch



Armeo® Spring (Hocoma)

and Play (Applikator). This is a 65" touchscreen with games that are primary developed for people with dementia and autism. We are currently testing the system with patients suffering from cognitive deficits after injury.

What benefits do you gain from using this VR rehab system?

Rehabilitation after serious injury can be both demanding and time-consuming. It takes a lot of energy and effort from the patients in every part of the rehabilitation process. High intensity and many repetitions are important factors for regaining function, and additional exercising

without therapist involvement is therefore preferable. In addition, the traditional methods being used to obtain enough repetition and intensity can be, after a while, both monotone and boring for the patients. Videogames may provide intensity and repetitions as needed to regain functions, it gives some of our patients the possibility to train without therapist involvement, and simultaneously being fun and motivating. The systems also monitor progress in a systematic manner.

CLINICAL PROFILE

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What problems did/do you have with using these systems?

We have had some challenges regarding implementation of the different systems. Being to some degree advanced, the therapists are required to have some knowledge of it to ensure a good experience for the patients. One of the challenges has been to teach all the therapists the different systems. We have also had some technical issues with the commercial systems. For instance, the Kinect sensor does not always manage to scan people in wheelchairs or people with prosthesis. Another issue is that there are thousands of games that may challenge different functions in the body and brain, but as a clinician or patient it can be difficult to know which games to choose.

Are you involved in clinical research using VR rehab systems? If so, please describe briefly.

At Sunnaas Rehabilitation Hospital we have many projects involving the use of VR in rehabilitation after injury

or illness. The following are some examples. We have currently two projects on the clinical usefulness of VR-goggles. One project investigates the effects of VR on patients with chronic pain, and the other is an exploratory study on the possible use of VR in cognitive rehabilitation. A project called "Better health through gaming!" looks at how we can use commercial videogames such as Nintendo® Wii and Xbox Kinect in rehabilitation of people with neurological diseases. Sunnaas Rehabilitation Hospital is also part of a multicenter, international, RCT study comparing VR training with the YouGrabber® system with regular intensive training (VIRTUES). In addition, a recent study with the Armeo® Spring compared robotic training in patients with spinal cord injury with standard occupational therapy.

What do you see as the most important challenge for VR rehab research and development?

We need a deeper understanding on the clinical usefulness of the VR systems on different patient-groups

and different disabilities. Research is being done on rehabilitation of physical disabilities using VR systems, but there is a lack of studies investigating the effects on cognitive functioning. We also need more knowledge about the generalization of the results from rehabilitation conducted with VR systems. We can observe that the patients are getting better in playing the games, but do they get any better in their everyday life like remembering everything they need at the store or getting dressed in the morning? It is also a major challenge, in both clinical practice and health research, to keep up with the fast development in systems and games.



Microsoft® Xbox



YouGrabber® (YouRehab)

REHABILITATION STARTUPS

MindMaze SA

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mindmaze

What product are you offering?

Mindmaze have developed the MindMotionPRO, a European CE marked hospital-based solution for early motor rehabilitation, and IOMI, a follow-on system for chronic rehabilitation.

The MindMotion Pro offers a series of simple upper limb training games (exercises) developed based on standardized neurorehabilitation principles for upper limb rehabilitation & cognitive paradigms, adapted to the acute and sub-acute setting.

IOMI is our follow-up portable solution for outpatient rehabilitation. It provides a wide collection of engaging games appropriate to the later recovery stage, designed to keep patients training longer, covering upper and lower limbs and trunk.

What is unique about your product?

MindMaze rehabilitation solutions are designed to make rehabilitation simple and accessible as early as 1-6 weeks post stroke (MindMotionPro), and then to allow the patient to follow-through to outpatient, and eventually home therapy (IOMI).

Our early clinical experience suggests that MindMaze rehabilitation solutions keep patients engaged in training games, allowing for greater number of repetitions and encouraging longer practice.

Simple set-up lets hospitals decouple therapist time from desired rehabilitation time, allowing for greater efficiencies and reduced cost.

The IOMI solution enables therapists and patients to continue early rehabilitation therapy consistent with the hospital therapy in an outpatient environment.

How does your product help patients and therapists?

Our portable virtual reality technology motivates patients and reduces the need for constant supervision and transport, limiting costs and interference in the family's daily routine. Moreover, we provide a virtual link between the treating physician, the rehabilitation therapist and the patient. Our remote bridge creates a real time connection between the healthcare team's recommendations and the patient's performance.

How can one obtain your product and how much does it cost?

You can obtain more information about our virtual reality stroke solutions by visiting our website at www.mindmaze.ch or contacting our commercial team at clinical@mindmaze.ch.



IOMI



MindMotion Pro

The website at <http://www.isvr.org> acts as a portal for information about the society. We are keen to enhance the community aspects of the site as well as to make it the first port of call for people wanting to know what is going on in the field of virtual rehabilitation and its associated technologies and disciplines. Please do visit the site and let us know details of any upcoming events or conferences or news items you would like us to feature on the site. We intend to add further features in the coming year including member profiles; a directory of journals who publish virtual rehabilitation related work; and a list of Masters and PhD level theses completed or currently being undertaken in the field. As well as sending us details of events and news for display, we would welcome suggestions from members about what else they would like to see on the site, or ideas for how we can further develop the virtual rehabilitation community through it.

Please mail webdec@isvr.org with any information/ideas using ISVR INFO in the subject header.

Membership information

Membership of ISVR is open to all qualified individual persons, organizations, or other entities interested in the field of virtual rehabilitation and/or tele-rehabilitation. Membership (regular, student or clinician) entitles the member to receive reduced registrations at ISVR sponsored conferences and affiliated meetings (see webpages for more details). There is also an active ISVR facebook page, which is another source of useful information, currently with 1108 members.

Call for Contributed Articles

- If you are a technology expert in virtual rehabilitation or you have experience in the clinical use of virtual rehabilitation technologies, and would like to be featured in an upcoming ISVR newsletter issue
- If you would like to submit a contributed article relevant to the ISVR community
- If you have any news, summaries of recent conferences or events, announcements, upcoming events or publications

We are looking forward to your contribution! Please contact us at newsletter@isvr.org.



Join our mailing list: <http://isvr.org/join-our-mailing-list/>

UPCOMING EVENTS

11th International Conference on Disability, Virtual Reality & Associated Technologies

September 20 - 22, 2016, Los Angeles, California, USA

Pre-Conference Workshop on Pain Management

September 19, 2016

<http://www.icdvrat.org/>

Maintien des personnes à domicile : Télééducation, Téléadaptation et e-Santé

September 29, 2016, Paris - France

<http://ifr-handicap.inserm.fr/>

International Conference on Neurorehabilitation

October 18-21, Segovia, Spain

<http://www.icnr2016.org/>

10th World Stroke Congress

October 26-29, 2016, Hyderabad, India

<http://www.wsc.kenes.com/>

Neurotechnix 2016 - 4th International Congress on Neurotechnology, Electronics and Informatics

November 7-8, 2016, Porto, Portugal

<http://www.neurotechnix.org/>

11th International Society of Physical and Rehabilitation Medicine (ISPRM) World Congress

April 30-May 4, 2017, Buenos Aires, Argentina

<http://www.isprm2017.com/>

International Conference on Virtual Rehabilitation 2017

June 19-22, 2017, Montreal, Canada

<https://virtual-rehab.org/2017/>

ISVR Early Career Investigator Award



We are pleased to announce the results of the 2016 ISVR Early Career Investigator Award. The purpose of this award is to recognize and acknowledge outstanding contributions by early career scientists whose research relates to virtual rehabilitation.

The award committee awarded the first place to [Monica Cameirão](#) from the Madeira Interactive Technologies Institute and the University of Madeira, Portugal, and the second place to [Sebastian Koenig](#), CEO of Katana Simulations UG, Adelaide, Australia.



Mónica Cameirão

Mónica is an Invited Assistant Professor and researcher at the University of Madeira (UMa) and the Madeira Interactive Technologies Institute (Madeira-ITI) in Portugal. Mónica holds a PhD in ICT by the Universitat Pompeu Fabra (Spain) and a MSc in Applied Physics by the Universidade de Aveiro (Portugal). She is currently the Portuguese coordinator of the Professional Masters on Human-Computer Interaction program that UMa/Madeira-ITI offers in conjunction with Carnegie Mellon University. In the past she worked as research assistant at the SPECS Laboratory of the Universitat Pompeu Fabra and at the Institute of Neuroinformatics, ETH-Zürich, Switzerland; and was visiting scholar at the Quality of Life Technologies center of the Carnegie Mellon University in Pittsburgh, USA.

During the last years, Mónica has been involved in the development and clinical assessment of virtual reality technologies for promoting recovery and alleviating the burden of disease in stroke survivors. Since Mónica arrived in Madeira in 2011, she is co-principal investigator and co-founder of the NeuroRehabLab research group (<http://neurorehabilitation.m-iti.org>), a research group created in the context of the Madeira-ITI with over 15 members, including PhD students, technicians, MSc students and other faculty members. The NeuroRehabLab is an interdisciplinary research group that investigates at the intersection of technology, neuroscience and clinical practice to find novel solutions to increase the quality of life of those with special needs. The group capitalizes on Virtual Reality, Serious Games, and Brain Computer Interfaces to exploit specific brain mechanisms that relate to functional recovery to approach motor and cognitive rehabilitation by means of non-invasive and low-cost technologies. While in Madeira, Mónica has been awarded a personal postdoctoral grant in competitive calls (FCT) and participates as investigator in 2 competitive projects with international consortiums.



Sebastian Koenig

Dr. Sebastian Koenig received his PhD in Human Interface Technology from the University of Canterbury, New Zealand, developing a framework for individualized virtual reality cognitive rehabilitation. He obtained his diploma in psychology from the University of Regensburg, Germany, in the areas of clinical neuropsychology and virtual reality rehabilitation.

Dr. Koenig is the founder and CEO of Katana Simulations, where he oversees the design, development, and evaluation of cognitive assessment and training simulations. His professional experience spans over ten years of clinical work in cognitive rehabilitation and virtual reality research, development, and user testing. Dr. Koenig has extensive experience as a speaker at international conferences and as a reviewer of scientific publications in the areas of rehabilitation, cognitive psychology, neuropsychology, software engineering, game development, games user research, and virtual reality.

Dr. Koenig has developed numerous software applications for cognitive assessment and training. For his work on the Virtual Memory Task, he was awarded the prestigious Laval Virtual Award in 2011, for the Medicine and Health category. Other applications include the virtual reality executive function assessment in collaboration with the Kessler Foundation, NJ, USA, and the patent-pending Microsoft Kinect-based motor and cognitive training JewelMine/Mystic Isle at the USC Institute for Creative Technologies, CA, USA.

Dr. Koenig maintains the website www.virtualgamelab.com about his research and his software development projects. His website also contains a comprehensive list of tutorials for the game engine Unity.

The award will be officially announced at the International Conference on Disability Virtual Reality and Associated Technologies in Los Angeles, California in September this year.

11th INTERNATIONAL CONFERENCE ON VIRTUAL REHABILITATION

<http://www.virtual-rehab.org>

Montreal, Canada – June 19-22, 2017

Affiliated with the International Society for Virtual Rehabilitation - www.isvr.org

ICVR is an international conference series that provides an in-depth presentation of novel technologies and clinical developments in the field of virtual reality and associated topics applied to rehabilitation. Researchers, clinicians and technology experts meet, share experiences, and plan for the future. We invite submissions for papers, posters, demonstrations and workshops related to:

- Motor and/or cognitive rehab
- Sensory rehabilitation
- Gaming / low cost systems
- Haptic interfaces
- Tele-rehabilitation
- Knowledge translation
- Brain computer interfaces
- Vestibular and balance rehab
- Rehabilitation robotics
- Virtual / Mixed / Augmented reality
- Psychological and environmental rehabilitation
- Communication / Language
- Regulatory, educational, sociological, demographic, legal aspects of VR

Timelines

- Paper, Poster and Workshop submission deadline: **January 6, 2017**
- Notification of the review decision: **March 17, 2017**
- Final camera-ready paper due and deadline for registration of at least one author: **April 14, 2017**

Paper Format Guidelines

- Papers should describe original and unpublished work with substantial results or novel methods or techniques.
- Papers should be 6-8 pages long including images, figures, tables and references, double column, formatted according to IEEE conference proceedings template (see below). Papers should include the title, abstract, 4-6 keywords, author names, affiliations, postal & e-mail addresses and contact author.
- Submissions not accepted as papers will be considered as a poster & must adhere to poster format guidelines.

Poster Format Guidelines

- Posters should describe original, unpublished work, or describe work in progress.
- Poster abstracts should be 1-2 pages, including images, figures, tables and references, double column and formatted according to IEEE poster template (see below).
- Posters should include the title, abstract, author names, affiliations, postal & e-mail addresses and contact author.

Submission Guidelines for Papers and Posters

- Authors must use the IEEE conference proceedings format obtainable at: http://www.ieee.org/conferences_events/conferences/publishing/templates.html
- Papers and posters should be submitted on the conference web site: www.virtual-rehab.org/

Publications

- Proceedings will be made available to conference attendees. Papers and posters will become part of the IEEE Online Library, carrying the IEEE © notice, provided that at least one author has registered for the conference by April 14, 2017. We aim to organize one or more special issues in relevant journal (s).

Workshop submissions

- Submit via email in pdf format to icvr2017workshops@gmail.com
- Workshop sessions (either 3 or 6 hours) will be held on June 19th, 2017.
- Workshop outlines should be a maximum of 2 pages in length including title, names and contact information of the workshop organizer(s), name and short biography of each workshop presenter, description of intended participants, description of workshop goals, and format and timeline of the workshop content: a template is available at: <http://virtual-rehab.org/2017/wp-content/uploads/2014/08/Workshop-Website-Template.docx>