
Proceedings of the 7th Graz Brain-Computer Interface Conference 2017

From Vision to Reality

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Officially endorsed by the BCI Society



Edited by
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Welcome Note

From Vision to Reality

We have chosen our this year's conference title to summarize the current situation of BCI research in a very brief statement. On the one hand, we see that some of our ideas are still visions, far from any applications. Basic research is the state of those visions and we still need to lay the foundation to transform those visions into working systems. On the other hand, we see that first BCI systems come to patients in clinics and that they are used on regular basis. However, it is important to discuss the needs in the BCI field to bring more of our ideas, our visions into reality. Is it research funding? Do we have too few people in the field? Is it too interdisciplinary? Do we need big industry partners? All these questions are vivid and need to be addressed to achieve progress in the field of BCI research. This 7th Graz Brain-Computer Interface Conference (GBCIC2017) offers the opportunity for extensive discussions and exchange of ideas among BCI experts from more than 30 countries. We received more than 100 scientific contributions from roughly 300 authors. The scientific contributions have been peer-reviewed by at least two reviewers and collected in this present open access ebook.

For the Conference itself, we have been able to setup a colorful and multifaceted program. We are very happy that the GBCIC2017 has been officially endorsed by the BCI Society and that we will have an official Meeting of the BCI Society at the Conference. Further, we are lucky that outstanding experts in the field, Dr. A Bolu Ajiboye (Case Western Reserve University, & Louis Stokes Cleveland VA Medical Center, Cleveland, OH, USA), Prof. Benjamin Blankertz (Technische Universität Berlin, Germany), Dr. Fabien Lotte (Inria Bordeaux Sud-Ouest, France), and Dr. Natalie Mrachacz-Kersting (Aalborg University, Denmark), accepted our invitation to present keynote addresses at the Conference. As a special keynote, we present Prof. Fred D. Davis (Texas Tech University, Rawls College of Business, USA). He is a senior researcher in the field of user acceptance of information technology, technology supported decision making, skill acquisition, and NeuroIS. With his talk he will make a link between the BCI field and his research disciplines. Additionally, we have several Satellite Events prior and after the Conference. New in the program: the BCI Science Slam, an event where researchers can present their work in an entertaining way. Finally, we end the GBCIC2017 with a tour to the South Styrian Vineyards, like we did in the past years.

We hope that this conference contributes towards a strong scientific cooperation among our field, and we wish all participants an exciting, stimulating and productive Graz BCI Conference 2017!



Gernot R. Müller-Putz
Conference Chair

Editorial Board

Prof. Dr. **Gernot R. Müller-Putz** is head of the Institute of Neural Engineering and its associated Laboratory of Brain-Computer Interfaces. He received his MSc in electrical and biomedical engineering in 2000, his PhD in electrical engineering in 2004 and his habilitation and “*venia docendi*” in medical informatics from Graz University of Technology in 2008. Since 2014 he is full professor for semantic data analysis. He has gained extensive experience in the field of biosignal analysis, brain-computer interface research, EEG-based neuroprosthesis control, communication with BCI in patients with disorders of consciousness, hybrid BCI systems, the human somatosensory system, and BCIs in assistive technology over the past 16 years. He has also managed several national projects (State of Styria) and international projects (Wings for Life, EU Projects) and is currently coordinator of the EU Horizon 2020 project “MoreGrasp”. Furthermore, he organized and hosted six international Brain-Computer Interface Conferences over the last 13 years in Graz. He is review editor of *Frontiers in Neuroscience*, special section neuroprosthetics, associate editor of *IEEE Transactions in Biomedical Engineering* and associate editor of the *Brain-Computer Interface Journal*. In 2014/15 he was guest editor in chief of a special issue of the *Proceedings of the IEEE “The Plurality of Human Brain-Computer Interfacing”*. He has authored more than 135 peer reviewed publications and more than 100 contributions to conferences which were cited more than 10000 times (h-index 47). Recently he was awarded with an ERC Consolidator Grant “Feel your Reach” from the European Research Council. In May 2017 he received the Ludwig-Guttman Award from the German Medical Spinal Cord Injury Association (DMGP).

David Steyrl is teaching and research assistant at the Institute of Neural Engineering (BCI-Lab), Graz University of Technology, Austria. He received his M.Sc. in electrical engineering with focus on biomedical engineering from Graz University of Technology in 2012. He (co-) authored more than 20 peer-reviewed journal and conference articles. Among others, he is reviewer for *Journal of Neural Engineering*, *IEEE-TBME*, *IEEE-THMS*, and *Neuroimage*. David Steyrl co-organized two major BCI conferences in Graz and he is founding member of the Graz BCI Racing Team MIRAGE91. His research interests include biosignal processing and machine learning for simultaneous EEG-fMRI and brain-computer interfaces. Currently he is working towards his PhD degree in computer science.

Selina Christin Wriessnegger is assistant professor at the Institute of Neural Engineering (BCI-Lab), Graz University of Technology, Austria. From 2001 to 2005 she was PhD student at the Max-Planck-Institute for Human Cognitive and Brain Sciences and received her PhD from the Ludwig-Maximilians University. During that time, she spent one year in Rome as research assistant at IRCCS (Fondazione Santa Lucia), Laboratory for Human Psychophysiology. From 2005 to 2008 she was university assistant at the Karl-Franzens-University Graz, section neuropsychology. From 2009 until May 2016 she was senior researcher at the Institute of Neural Engineering (BCI-Lab). In 2017 she was visiting professor at SISSA (Scuola Internazionale Superiore di Studi Avanzati), Trieste. Her research interests are subliminal visual information processing, neural correlates of motor imagery, novel applications of BCIs for healthy users, passive BCIs and embodiment of language acquisition.

Reinhold Scherer is associate professor and deputy head of the Institute of Neural Engineering at the Graz University of Technology, Austria. He is member of the Laboratory for Brain-Computer Interfaces (BCI-Lab) at Graz University of Technology and of the Institute for Neurological Rehabilitation and Research at the rehabilitation center Judendorf-Strassengel, Austria. In 2008 he received his PhD in computer science from Graz University of Technology, where, beginning in 2001, he worked on non-invasive electroencephalogram-based (EEG) brain-computer interfacing (BCI). He spend the years from 2008 to 2010 as postdoctoral researcher at the Department for Computer Science & Engineering, University of Washington, Seattle, USA, and was member of the Neural Systems and the Neurobotics Laboratories at the University of Washington.

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