

# EG VCBM 2018

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## Keynote

### Large-scale Precision Imaging: From Imaging Phenomics to in Silico Trials

*Alejandro Frangi*

#### Abstract

This talk will overview current progress in imaging phenomics and in silico clinical trials that make use of precision imaging, i.e. the use of advanced image-based analysis and modelling rendering more descriptive, integrative and predictive imaging. We illustrate how the convergence of computational image analytics and modelling methods that process large health databases open new challenges and opportunities for the MICCAI and VCBM communities. The speaker will introduce various examples from his research lab spanning cerebrovascular, cardiovascular and bone diseases.

#### Biographical Note

Prof. Frangi is Diamond Jubilee Chair in Computational Medicine at the University of Leeds, Leeds, UK, with joint appointments at the Schools of Computing and Medicine. He leads the Centre for Computational Imaging and Simulation Technologies in Biomedicine (CISTIB, [www.cistib.org](http://www.cistib.org)). His main research interests lay at the crossroad of medical image analysis and modelling with emphasis on machine learning (phenomenological models) and computational physiology (mechanistic models). He has particular interest in statistical methods applied to population imaging phenomics and in silico clinical trials. His highly interdisciplinary work has been translated to the areas of cardiovascular, musculoskeletal and neuro sciences. He been principal investigator or scientific coordinator of over 25 national and European projects, both funded by public and private bodies. Prof. Frangi has edited several books, published 7 editorial articles and over 200 journal papers in key international journals of his research field and more than over 230 book chapters and international conference papers with an h-index 53 and ca. 19,400 citations according to Google Scholar. He is also the General Chair of MICCAI 2018 held in Granada, Spain.

## Capstone

### Visual Computing for Neurosciences - Recent Trends and Challenges

*Katja Bühler and Torsten Kuhlen*

#### Abstract

Understanding how the brain works is one of the most fascinating and complex research questions in life sciences today. Several large scale brain research initiatives worldwide focus on revealing fundamental mechanisms of the brain to support better understanding of brain disorders, disease and the development of cure, but also to advance brain inspired computing. The availability of sophisticated genetic tools, novel imagining and simulation technology makes neuroscience an extremely data intensive research discipline where data acquisition, data interpretation and experiment design build a closed loop. Thus, fast and intuitive access to data is crucial to accelerate research, as data analytics generates not only publishable insights in an end-to-end manner, but is also a substantial part of the daily workflow to design the next wave of experiments and to generate new - refined - data. Our talks will give a brief insight in the neuroscience data universe and recent work of our groups on creating Visual Computing solutions for managing, visualizing, mining and analyzing a wide variety of neuroscientific data across different scales, data types and research questions (from drosophila larvae to humans). Reflecting the recent Virtual Reality hype, we will have a look at the potential of VR as a tool in Neurosciences, and discuss how an “ultimate display” for neuroscientific data analysis might look like.

#### Biographical Notes

**Katja Bühler** is head of the Biomedical Image Informatics Group at the VRVis Research Center in Vienna, Austria, coordinator of the VRVis Research Area Complex Systems and part of the management board of the Austrian Correlated Multi Modal Imaging Node. Her group ameliorates expertise in image processing, machine and deep learning, high performance computing, data mining, visualization and human computer interaction to novel visual computing solutions for medicine and life science. Focus is on applied research in close cooperation with industry and future users. Several image analysis and machine learning solutions emerged from the groups’ research and have been patented and/or integrated into clinical workstations. Visual Computing for supporting neurosciences is a continuous topic of research since 2007. One result of these efforts is the e-science platform Brain\* ([braingazer.org](http://braingazer.org)) used by several research groups in Europe to manage, mine and publish brain related data.

**Torsten W. Kuhlen** is professor in the Computer Science Department at RWTH Aachen University, Germany, and head of the University’s Virtual Reality & Immersive Visualization Group. His research interests include all areas of Virtual Reality with a focus on the design and evaluation of 3D, multimodal human computer interfaces, as well as immersive data analysis in scientific and technical applications. Application domains comprise production technology, simulation science, medicine, and neuroscience. Among others, his group is involved in the EU Flagship “Human Brain Project”. In Aachen, the group operates the aixCAVE, one of the largest VR installations worldwide. Torsten has co-authored about 250 research papers and served as program chair, program committee member, and general chair for various renowned international conferences in the field of Virtual Reality, Computer Graphics and Visualization.