

Preface

The spine represents both a vital central axis for the musculoskeletal system and a flexible protective shell surrounding the most important neural pathway in the body, the spinal cord. Spine-related diseases or conditions are common and cause a huge burden of morbidity and cost to society. Examples include degenerative disc disease, spinal stenosis, scoliosis, osteoporosis, herniated disks, fracture/ligamentous injury, infection, tumor, and spondyloarthropathy. Treatment varies with the disease entity, and the clinical scenario can be nonspecific. As a result, imaging is often required to help make the diagnosis. Frequently obtained studies include plain radiographs, dual-energy X-ray absorptiometry (DXA), bone scans, computed tomography (CT), magnetic resonance (MR), ultrasound, and nuclear medicine. Computational methods play a steadily increasing role in improving speed, confidence, and accuracy in reaching a final diagnosis. Although there has been great progress in the development of computational methods for spine imaging over recent years, there are a number of significant challenges in both methodology and clinical applications.

The goal of this workshop on “Computational Methods and Clinical Applications for Spine Imaging” was to bring together clinicians, computer scientists, and industrial vendors in the field of spine imaging, for reviewing state-of-art techniques, sharing novel and emerging analysis and visualization techniques, and discussing clinical challenges and open problems in this rapidly growing field. We invited papers on all major aspects of problems related to spine imaging, including clinical applications of spine imaging, computer-aided diagnosis of spine conditions, computer-aided detection of spine-related diseases, emerging computational imaging techniques for spinal diseases, fast 3D reconstruction of the spine, feature extraction, multiscale analysis, pattern recognition, image enhancement of spine imaging, image-guided spine intervention and treatment, multimodal image registration and fusion for spine imaging, novel visualization techniques, segmentation techniques for spine imaging, statistical and geometric modelling for spine and vertebra, spine and vertebra localization.

This was the fourth MICCAI workshop on Computational Methods and Clinical Applications for Spine Imaging — MICCAI–CSI2016¹, which was held on October 17, 2016, in Athens, Greece, as a satellite event of the 19th International Conference on Medical Image Computing and Computer-Assisted Intervention — MICCAI 2016. We received many high-quality submissions addressing many of the aforementioned issues. All papers underwent a thorough double-blinded review with each paper being reviewed by three members of the paper reviewing committee. The Program Committee consisted of researchers who had actively contributed to the field of spine imaging in the past. From all submissions, we finally accepted 13 papers. The papers were grouped into three sessions: Segmentation (4), Localization (5), and Computer-Aided Diagnosis and Intervention (4).

¹ <http://csi2016.wordpress.com>.

In order to give deeper insights into the field and stimulate further ideas, we had invited lectures during the workshop. We are very thankful to Dr. Tim Cootes from the University of Manchester, UK, for giving a talk on “Systems for Locating Vertebral Fractures in X-Ray Images,” and Dr. Franjo Pernuš from the University of Ljubljana, Slovenia, for a talk on “Image-Guided Spine Intervention.”

Finally, we would like to thank everyone who contributed to this joint workshop and challenge: the authors for their contributions; the members of the program and scientific review committee for their review work, promotion of the workshop, and general support; the invited speakers for sharing their expertise and knowledge; and the MICCAI society for the general support. The event was supported by the SpineWeb² initiative, a collaborative platform for research on spine imaging and image analysis, and sincere gratitude goes to Brainlab AG, Germany,³ for the financial support.

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² <http://spineweb.digitalimaginggroup.ca>.

³ <http://www.brainlab.com>.

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