

# 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 discs, 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, DXA, bone scans, CT, 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 the 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 the state-of-the-art techniques, sharing the novel and emerging analysis and visualization techniques, and discussing the 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 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 modeling for spine and vertebra, spine and vertebra localization.

This is the second MICCAI workshop on this particular topic. This year we add a challenge on “Vertebra segmentation on CT.” We received many high quality submissions addressing many of the above-mentioned 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 22 papers including 10 oral presentations, 6 poster presentations, and 6 challenge presentations. The papers are organized into five sessions according to the topics. The sessions are Computer Aided Diagnosis and Intervention, Spine MRI Processing, Localization, Poster session, and Vertebra Segmentation Challenge.

In order to give deeper insights into the field and stimulate further ideas, we had invited lectures held during the workshop. We are very thankful to Dr. David R. Haynor from University of Washington to give a talk on “Towards quantitative diagnosis and measurement of chronic spinal diseases: the role of image processing,” and Dr. Nassir Navab from Technische Universitaet Muenchen and Johns Hopkins University to give a talk on “Domain Specific Simulation Environments for Accelerating Validation and Deployment of Novel Image-guided Spine Surgery Techniques.”

We hope that with this workshop we raised attention toward this important and interesting field of computational spine imaging and would like to finally thank all contributors for their efforts in making this workshop possible. We especially thank the following institutes for their sponsorship: Journal of Computerized Medical Imaging and Graphics, GE Healthcare, Microsoft Research, Digital Imaging group of London, Imperial College London, Philips Research, and National Institutes of Health.

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