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Computational Methods and Clinical Applications for Spine Imaging

Third International Workshop and Challenge, CSI 2015
Held in Conjunction with MICCAI 2015
Munich, Germany, October 5, 2015
Revised Selected Papers

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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 and conditions, such as degenerative disc disease, spinal stenosis, scoliosis, osteoporosis, herniated discs, fracture/ligamentous injury, infection, tumor, and spondyloarthropathy, are common and cause a huge burden of morbidity as well as cost to society. Treatments vary with the disease, and the clinical scenario can be nonspecific. As a result, imaging is often required to help make the diagnosis, and studies include plain radiographs, dual-energy X-ray absorptiometry (DXA), bone scans, computed tomography (CT), magnetic resonance (MR), ultrasound (US), 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 still a number of challenges in both methodology and clinical applications.

The goal of the workshop series on “Computational Methods and Clinical Applications for Spine Imaging (CSI)” is to bring together scientists, clinicians, and industrial vendors in the field of spine imaging, for presenting and reviewing the state-of-art techniques, sharing the novel and emerging analysis and visualization approaches, and discussing the clinical challenges and open problems in this rapidly growing field. Contributions are welcome on all major aspects related to spine imaging, including clinical applications of spine imaging, computer-aided diagnosis of spine conditions, computer-aided detection and emerging computational imaging techniques for spine-related diseases, fast three-dimensional (3D) reconstruction of the spine, feature extraction, multiscale analysis, pattern recognition and image enhancement of spine imaging, image-guided spine intervention and treatment, multimodal image registration and fusion for spine imaging, novel visualization and segmentation techniques, statistical and geometrical modeling of spinal structures, and localization of the spine and vertebrae.

The Third Workshop and Challenge on Computational Methods and Clinical Applications for Spine Imaging, MICCAI–CSI2015¹, was held on October 5, 2015, in Munich, Germany, as a satellite event of the 18th International Conference on Medical Image Computing and Computer-Assisted Intervention — MICCAI 2015. After the success of the first workshop, and the second workshop and challenge, this was the third consecutive MICCAI event on this particular topic, inviting general “workshop” papers as well as contributions for the “Automatic Intervertebral Disc Localization and Segmentation from 3D T2 MRI Data” computational challenge. Each submission underwent a double-blind review by three members of the Scientific Review Committee consisting of researchers who actively contributed to the field of spine imaging

¹ <http://csi2015.weebly.com>

in the past. Overall, 15 papers were accepted that are grouped in these final proceedings into “workshop” contributions (9) and “challenge” contributions (6), while one paper was rejected. In order to give a deeper insight into the field of spine imaging and stimulate further ideas, three invited talks were held during the workshop: “Osteoporosis Imaging at the Spine: Clinical Needs and Technical Challenges” by Dr. Thomas Baum from Technische Universität München, Germany, “Spinal Imaging in Surgical Planning and Navigation” by Dr. Martin Haimerl from Brainlab AG, Germany, and “Vertebral Fracture Identification Using Dual Energy X-Ray Absorptiometry” by Dr. Margaret Paggiosi from University of Sheffield, UK.

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.

May 2016

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

³ <http://www.brainlab.com>

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