

# Preface

Patch-based techniques play an increasingly important role in the medical imaging field, with various applications in image segmentation, image de-noising, image super-resolution, super-pixel/voxel-based analysis, computer-aided diagnosis, image registration, abnormality detection, and image synthesis. Dictionaries of local image patches are increasingly being used for example in the context of segmentation and computer-aided diagnosis. Patch-based dictionaries are commonly used in conjunction with pattern recognition techniques to model complex anatomies in an accurate and easy way. The patch-level representation of image content is between the global image and localized voxels. This level of representation is shown to be successful in areas such as image processing (e.g., enhancement and de-noising) as well as image feature extraction and classification (e.g., convolution kernels and convolutional neural networks).

The main aim of this workshop series is to help advance scientific research within the broad field of patch-based processing in medical imaging. It focuses on major trends and challenges in this area, and it presents work aiming to identify new cutting-edge techniques and their use in medical imaging. We hope that this workshop series will become a new platform for translating research from bench to bedside and for presenting original, high-quality papers on innovative research and development in the analysis of medical image data using patch-based techniques.

Topics of interests include but are not limited to patch-based processing dedicated to:

- Image segmentation of anatomical structures or lesions (e.g., brain segmentation, cardiac segmentation, MS lesions detection, tumor segmentation)
- Image enhancement (e.g., de-noising or super-resolution dedicated to fMRI, DWI, MRI, or CT)
- Computer-aided prognostic and diagnostic (e.g., for lung cancer, prostate cancer, breast cancer, colon cancer, brain diseases, liver cancer, acute disease, chronic disease, osteoporosis)
- Mono and multimodal image registration
- Multi-modality fusion (e.g., MRI/PET, PET/CT, projection X-ray/CT, X-ray/ultrasound) for diagnosis, image analysis, and image-guided interventions
- Mono and multi modal image synthesis (e.g., synthesis of missing a modality in a database using an external library)
- Image retrieval (e.g., context-based retrieval, lesion similarity)
- Dynamic, functional, physiologic, and anatomic imaging
- Super-pixel/voxel-based analysis in medical images
- Sparse dictionary learning and sparse coding
- Analysis of 2D, 2D+t, 3D, 3D+t, 4D, and 4D+t data.

An academic objective of the workshop is to bring together researchers in medical imaging to discuss new techniques using patch-based approaches and their use in

clinical decision support and large cohort studies. Another objective is to explore new paradigms in the design of biomedical image analysis systems that exploit the latest results in patch-based processing and exemplar-based methods. MICCAI-PMI 2017 featured a single-track workshop with keynote speakers, technical paper presentations, poster sessions, and demonstrations of state-of-the-art techniques and concepts that are applied to analyzing medical images.

We received a total of 26 submissions. All papers underwent a rigorous double-blind review process by at least 2 members (mostly 3 members) of the Program Committee composed of 38 well-known experts in the field. The sélection of the papers was based on significance of results, technical merit, relevance, and clarity of presentation. Based on the reviewing scores and critiques, the 18 best papers were accepted for presentation at the workshop and chosen to be included in the present proceedings.

Authors of selected papers will be invited to submit an extended version to the PatchMI Special Issue in the *Computerized Medical Imaging and Graphics Journal*.

July 2017

G. Wu  
B. Munsell  
Y. Zhan  
W. Bai  
G. Sanroma  
P. Coupé

Patch-Based Techniques in Medical Imaging

Third International Workshop, Patch-MI 2017, Held in  
Conjunction with MICCAI 2017, Quebec City, QC, Canada,  
September 14, 2017, Proceedings

Wu, G.; Munsell, B.C.; Zhan, Y.; Bai, W.; Sanroma, G.;  
Coupé, P. (Eds.)

2017, XI, 168 p. 59 illus., Softcover

ISBN: 978-3-319-67433-9