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Patch-Based Techniques in Medical Imaging

4th International Workshop, Patch-MI 2018
Held in Conjunction with MICCAI 2018
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Proceedings

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Preface

Patch-based techniques play an increasing 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 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 voxel representations. 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 aim of this workshop 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 aimed at identifying 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 submissions 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 of the design of biomedical image analysis systems that exploit the latest results in patch-based processing and exemplar-based methods. MICCAI-PatchMI 2018 featured a single-track workshop with keynote speakers, technical paper presentations, poster sessions, demonstrations of the state-of-the-art techniques, and concepts that are applied to analyzing medical images.

We received a total of 17 valid submissions. All papers underwent a rigorous double-blind review process by at least 2 members of the Program Committee composed of well-known experts in the field. The selection of the papers was based on significance of results, technical merit, relevance, and clarity of presentation. Based on the reviewing scores and comments, 15 papers were accepted for presentation at the workshop and chosen to be included in the present proceedings.

August 2018

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