

# Preface

The MICCAI community needs data with known ground truth to develop, evaluate, and validate image analysis and reconstruction algorithms. Since synthetic data are ideally suited for this purpose, over the years, a full range of models underpinning image simulation and synthesis have been developed: (a) simplified mathematical models to test segmentation and registration algorithms; (b) detailed mechanistic models (top–down), which incorporate priors on the geometry and physics of image acquisition and formation processes; and (c) complex spatio temporal computational models of anatomical variability, organ physiology, or disease progression. Recently, cross-fertilization between image computing and machine learning gave rise to data-driven, phenomenological models (bottom–up) that stem from learning directly data associations across modalities, resolutions, etc. With this, not only has the application scope been expanded but the underlying model assumptions have also been refined to increasing levels of realism.

The goal of the Simulation and Synthesis in Medical Imaging (SASHIMI) Workshop is to gather all those interested in these problems in the same room, for the purpose of invigorating research and stimulating new ideas on how to best proceed and bring these two worlds together. The objectives were to: (a) hear from invited speakers in the areas of transfer learning and mechanistic models and cross-fertilize across fields; (b) bring together experts of synthesis (via phenomenological machine learning) and simulation (via explicit mechanistic models) to raise the state of the art; and (c) identify challenges and opportunities for further research. We also wanted to identify how we can best evaluate synthetic data and if we could collect benchmark data that can help the development of future algorithms.

Following the success from last year, the second SASHIMI<sup>1</sup> workshop was held in conjunction with the 20th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI 2017) as a satellite event in Quebec City, Quebec, Canada, on September 10, 2017. Submissions were solicited via a call for papers that was circulated by the MICCAI organizers, through known mailing lists (e.g., ImageWorld, MIUA) but also by directly e-mailing several colleagues and experts in the area. Each submission underwent a double-blind review by at least two members of the Program Committee consisting of researchers who actively contribute in the area. At the conclusion of the review process, 11 papers were accepted. Overall, the contributions span the following broad categories in alignment with the initial call for papers: cross modality (PET/MR, PET/CT, CT/MR, etc.) image synthesis, simulation and synthesis from large-scale image databases, automated techniques for quality assessment images, and several applications of image synthesis and simulation in medical imaging such as image interpolation and segmentation, image reconstruction, cell imaging, and blood flow. The accepted papers were divided into two general topics

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<sup>1</sup> <http://www.cistib.org/sashimi/>.

of “Synthesis and Its Applications in Computational Medical Imaging” and “Simulation and Processing Approaches for Medical Imaging” and presented during two oral and one poster sessions, overall covering eight and three papers, respectively.

Finally, we would like to thank everyone who contributed to this second workshop: Helena Margarida Faria and Filipa Castro, members of the Organizing Committee, for their assistance; the authors for their contributions; the members of the Program Committee for their review work, promotion of the workshop, and general support; the invited speaker (Dr. Hugo Larochelle, Google Brain) for sharing his expertise and knowledge; and the MICCAI society for the general support.

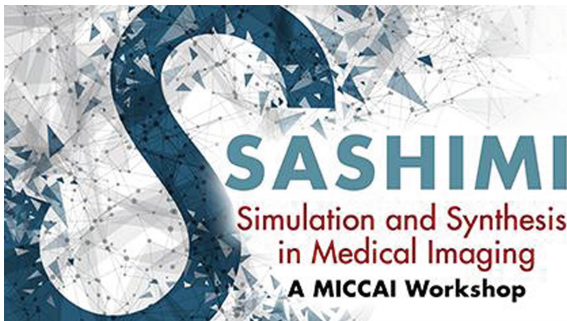
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