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Machine Learning for Medical Image Reconstruction

Third International Workshop, MLMIR 2020
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Proceedings

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Preface

We are proud to present the proceedings for the Third Workshop on Machine Learning for Medical Image Reconstruction (MLMIR 2020) which was held on October 18, 2020, online, as part of the 23rd Medical Image Computing and Computer Assisted Intervention (MICCAI 2020) conference.

Image reconstruction commonly refers to solving an inverse problem, recovering a latent image of some physical parameter from a set of noisy measurements assuming a physical model of the generating process between the image and the measurements. In medical imaging two particular widespread applications are computed tomography (CT) and magnetic resonance imaging (MRI). Using those two modalities as examples, conditions have been established under which the associated reconstruction problems can be solved uniquely. However, in many cases there is a need to recover solutions from fewer measurements to reduce the dose applied to patients or to reduce the measurement time. The theory of compressed sensing showed how to pursue this while still enabling accurate reconstruction by using prior knowledge about the imaged objects. A critical question is the construction of suitable models of prior knowledge about images. In recent years, research has departed from constructing explicit priors for images and moved towards learning suitable priors from large datasets using machine learning (ML).

The aim of this workshop series is to provide a forum for scientific discussion on advanced ML techniques for image acquisition and image reconstruction. After two previous successful workshops, we observe that the interest of the scientific community in this topic has not diminished, and a scientific meeting to foster joint discussions about the topic of image reconstruction is in great demand. Its cross-modality approach brings together researchers from various modalities ranging from CT and MRI to microscopy. We hope that this joint discussion fosters the translation of mathematics and algorithms between those modalities.

We were fortunate that Gitta Kutyniok (LMU Munich, Germany) and Dinggang Shen (United Imaging Intelligence, China) accepted our invitation as keynote speakers and presented fascinating keynote lectures about the state of the art in this emerging field. Despite the special circumstances of the COVID-19 pandemic, we received 19 submissions and accepted 15 papers for inclusion in the workshop. The topics of the accepted papers cover a broad range of medical image reconstruction problems. The predominant ML technique used for reconstruction problems continues to be deep neural networks.

September 2020

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Contents

Deep Learning for General Image Reconstruction