MISS 2018

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Medical Imaging meets Deep Learning

Daniel Rueckert

Imperial College London, United Kingdom

Deep Learning for medical image reconstruction, super-resolution and segmentation

This talk will introduce framework for reconstructing MR images from undersampled data using a deep cascade of convolutional neural networks to accelerate the data acquisition process. We show that such a method can outperforms state-of-the-art compressed sensing approaches, such as dictionary learning-based MRI (DLMRI) reconstruction, both in terms of image quality and reconstruction speed. We will also discuss image super-resolution approaches that are based on residual CNNs and which can reconstruct high resolution 3D volumes from 2D image stacks for more accurate image analysis and visualisation. In addition, we will present neural networks for medical image segmentation. More specifically, we will discuss unsupervised domain adaptation using adversarial neural networks to train a segmentation method which is more invariant to differences in the input data (across different scanners and acquisition protocols), and which does not require any annotations on the test domain. Finally, the talk will ensemble methods for segmentation, (Ensembles of Multiple Models and Architectures – EMMA) which provide robust performance through aggregation of predictions from a wide range of methods. EMMA can be seen as an unbiased, generic deep learning model which is shown to yield excellent performance, winning the first position in the BRATS 2017 competition among 50+ participating teams.