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Unsupervised deep learning for fast imaging: From DAE to generative model

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Reconstruction from very few sampling measurements has recently received a huge boost in performance using supervised deep learning methods. However, while they perform extremely well on data satisfying the conditions they were trained on, their performance deteriorates significantly once these conditions are not satisfied. In this talk, we will introduce two unsupervised deep learning schemes combined with classical iterative procedure for highly under-sampling MRI reconstruction, i.e., denoising autoencoder and flow-based generative model. On the basis of these two unsupervised learning schemes, by means of incorporating structural constraints like low-rank and multiple feature-images stacking, powerful image prior information can be formed. Integrating the learned prior knowledge into classical model-based reconstruction, comparable performance can be achieved under various sampling patterns and acceleration factors.

Keywords: Fast imaging reconstruction, Unsupervised deep learning, Denoising autoencoder, Flow-based generative model, Iterative procedure