

# Deep learning approaches in medical image analysis focusing on MRI reconstruction

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## **Abstract**

Magnetic resonance imaging (MRI) is widely used due to its high resolution and low radiation, but a fully-sampled MRI scan requires lots of time for patients. Therefore, MRI data is usually under-sampled in the Fourier domain to improve the scan efficiency. MRI acquires data in the spatial-frequency domain (the so-called k-space) and the MR images need to be reconstructed from the k-space data before further analysis. We consider an MRI reconstruction problem with input of k-space data at a very low under-sampled rate. We also focus on dynamic MRI reconstruction problem since temporal correlation in dynamic MRI, such as cardiac MRI, is informative and important to understand motion mechanisms of body regions. Modeling such information into the MRI reconstruction process produces temporally coherent image sequence and reduces imaging artifacts and blurring. To solve these problems, we propose different data-driven approaches. Extensive experiments have demonstrated the effectiveness of our proposed methods.

Examination Committee: Prof. Dimitris Metaxas (Chair), Prof. Georgios Moustakides, Prof. Desheng Zhang, Prof. Shubhangi Saraf