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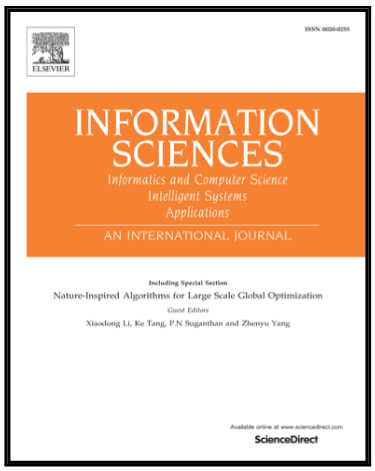

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Learning Deconvolutional Deep Neural Network for High Resolution Medical Image Reconstruction

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Abstract

Super resolution reconstruction can be used to recover a high resolution image from a low resolution image and is particularly beneficial for clinically significant medical images in diagnosis, treatment, and research applications. However, super resolution is a challenging inverse problem due to its ill-posed nature. In this paper, inspired by recent developments in deep learning, a super resolution algorithm (SR-DCNN) is proposed for medical images that is based on a neural network and employs a deconvolution operation. The purpose of the deconvolution is to effectively establish an end-to-end mapping between the low and high resolution images. First, training data consisting of 1500 medical images of the lung, brain, heart, and spine, was collected, down-sampled, and input into the neural network. Then, patch-based image features were extracted using a set of filters and the parametric rectified linear unit (PReLU) was subsequently applied as the activation function. Finally, these extracted image features were used to reconstruct high resolution images by minimizing the loss between the predicted output image and the original high resolution image. Various network structures and hyper parameter settings were explored to achieve a good trade-off between performance and computational efficiency, based on which

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