DEEP DENSE MULTIPATH NEURAL NETWORK FOR PROSTATE SEGMENTATION IN MAGNETIC RESONANCE IMAGING

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Abstract

Purpose

We propose an approach of 3D convolutional neural network to segment the prostate in MR images.

Methods

A 3D deep dense multi-path convolutional neural network that follows the framework of the encoder-decoder design is proposed. The encoder is built based upon densely connected layers that learn the high-level feature representation of the prostate. The decoder interprets the features and predicts the whole prostate volume by utilizing a residual layout and grouped convolution. A set of sub volumes of MR images, centered at the prostate, is generated and fed into the proposed network for training purpose. The performance of the proposed network is compared to previously reported approaches.

Results

Two independent datasets were employed to assess the proposed network. In quantitative evaluations, the proposed network achieved 95.11 and X Dice coefficients for the two datasets. The segmentation results were robust to variations in MR images. In comparison experiments, the segmentation performance of the proposed network was comparable to the previously reported approaches. In qualitative evaluations, the segmentation results by the proposed network were well matched to the ground truth provided by human experts.

Conclusions

The proposed network is capable of segmenting the prostate in an accurate and robust manner. This approach can be applied to other types of medical images.

Key words: deep learning, prostate segmentation, magnetic resonance imaging, dense connections, grouped convolution