

Kidney Segmentation Framework using 3D CNN

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Abstract. Two 3D CNN was used to detect the location of kidney and separate kidney and tumor respectively.

1 Network structure

The CNN structure we used is V-net [1]. The left side of the network is divided in different stages that operate at different resolutions. Each stage comprises one to three convolutional layers. The convolutions performed in each stage use volumetric kernels having size $5 \times 5 \times 5$ voxels. As the data proceeds through different stages along the compression path, its resolution is reduced. This is performed through convolution with $2 \times 2 \times 2$ voxels wide kernels applied with stride 2. Since the second operation extracts features by considering only non overlapping $2 \times 2 \times 2$ volume patches, the size of the resulting feature maps is halved.

2 Kidney detection

One V-net was training using patches extracted from whole CT images. In testing stage, it was used firstly detect where are the kidney.

3 Kidney and tumor segmentation

Another V-net was training using patches extracted around kidneys. In testing stage, it was used to separate kidney and tumor based on previous detection.

References

1. Fausto Milletari¹,: V-Net: Fully Convolutional Neural Networks for Volumetric Medical Image Segmentation.