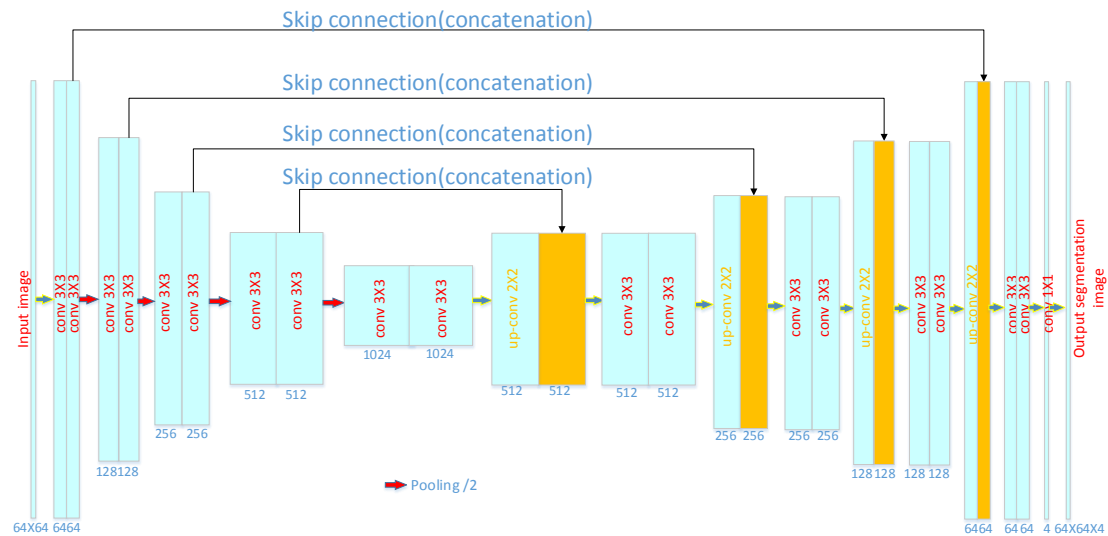


MR Brain Tissue Segmentation With Modified U-Net

THUnity

We use modified U-Net to segment CSF、GM and WM， the network is below.



The input size to the network is 64×64 and the output is $64 \times 64 \times 4$, where the four channel corresponds to the background, CSF, GM, and WM.

In the analysis path, each layer contains two 3×3 convolutions each followed by a rectified linear unit (ReLU), and then a 2×2 max pooling with strides of 2 for down-sampling. In the synthesis path, each layer consists of an upconvolution of 2×2 by strides of one in each dimension, followed by two 3×3 convolutions each followed by a ReLU. To keep the same shape after convolution, we use padding. Shortcut connections from layers of equal resolution in the analysis path provide the essential high-resolution features to the synthesis path. In the last layer, a 1×1 convolution reduces the number of output channels to the number of labels which is 4 in our case. The architecture has 31030788 parameters in total.

Different from the purely U-net, our network can segment CSF, GM and WM three tissues at once because we use our own loss function which will be detailed in section 3. At the same time, the shape of output is the same as input owing to the use of padding.

We use only T1 sequence and segment data size of $240 \times 48 \times 240$ taking less than 90 second on single CPU.