NeuroML team: Brief description of the solution

Data

We did not apply any further preprocessing to the data presented by the organizers. For our solution we used aligned Flair and T1 MRI modalities (from "/pre" folder) and inerpreted them as a single 3D image with 2 channels.

Since the competition validation metrics are computed only for the white matter hyperintensity (WMH) lesion, we converted the given masks to binary ones, containing information about the corresponding lesioned region.

Model

As a model for segmentation, we used DeepMedic [1] neural network architecture. The network consists of two parallel convolutional branches that process the input image at two different scales. This approach broadens the network's receptive field as well as gives additional contextual information around the region of interrest.

During the learning stage we used inputs of shapes $57 \times 57 \times 57$ and $27 \times 27 \times 27$ which yielded an output of shape $9 \times 9 \times 9$ corresponding to the center of the input images.

Learning strategy

The original training images are substantially large than the network's input, that's why we trained the model on 3D patches - small cubic crops of the input image. Every epoch 100 patches were extracted from each image in such a manner, that 60% of them contained a lessioned region.

We optimize a pixel-wise sigmoid binary cross-entropy loss and train our neural network using SGD (with nesterov momentum equal to 0.9) with learning rate by 0.09 and with learning rate decreasing schedule (if 5 epoches there will be no relative change on validation loss by more than 0.03 we multiply learning rate by 0.55).

Using cross validation strategy we selected a threshold for the binarization of the predicted probability map to maximize the dice score.

Prediction

To obtain a mask we predict the probability map for a given image and then binarize it with the selected threshold, so the final output is a binary mask.

References

[1] Konstantinos Kamnitsas, Enzo Ferrante, Sarah Parisot, Christian Ledig, Aditya V Nori, Antonio Criminisi, Daniel Rueckert, and Ben Glocker. Deepmedic for brain tumor segmentation. In *International Workshop on*

Brainlesion: Glioma, Multiple Sclerosis, Stroke and Traumatic Brain Injuries, pages 138–149. Springer, 2016.