

Modified U-Net for WMH Segmentation

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1 Pre-processing

All volumes were preprocessed before training and testing our system. Top four and bottom six slices of each subject were removed since those areas do not present WMH and only introduce noise. Voxel intensity was standardized first, then values were normalized between the range $[0, 1]$. Skull was extracted using HD-BET (6) on both FLAIR and T1 images.

More info on the pre-processing methods tried for this submission as well as detailed information on the standardization, skull extraction and normalization, can be found on (1).

2 Methods

2.1 Data augmentation

Data augmentation techniques were applied to augment the training set. Transformations applied were rotations, shifts, shears, zooms and flips.

Augmentation was only applied to slices with WMH, and those slices were augmented a total of five times each. Increasing the number of slices with WMH by 5 even though the total size of the dataset is not 5 times larger than the original.

2.2 Modified U-Net

We used the architecture idea of an attention gated U-Net proposed by (7) which is also based on (5). All convolutional filters are set to 5×5 and pooling layers are kept as 2×2 . A sigmoid activation function was used in the very last layer. It only has 3 maxpooling layers, therefore it is a 3 level U-Net. First level convolutions outputs have 100 feature maps, second level 112 and third level 224.

We made use of the Adam optimizer with a learning rate of 0.000001. Both FLAIR and T1 images are fed into the network as channels and it has a single channel as output.

References

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