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Appendix E1

3D-Unet (39) and V-Net (40) networks were evaluated for disease segmentation using similar parameters as in the rest of our experiments. Due to memory issues, patches of 64 × 64 × 64 and 96 × 96 × 96 size were used for both networks. For the training phase, we randomly selected 32 patches per patient using a weighted strategy ensuring that all the classes will be represented due to the very small extent of the disease (covering around 1.3% of the training volume). In each epoch, different patches from the same patient were selected. Similar data augmentation techniques as used for the rest of the networks were applied to the extracted 3D patches from the 17 patients that we used for training. Still due to the extreme low percentage of disease coverage, we used weighted loss for the training. More specifically, we used weighted cross entropy loss with Adam optimizer and a learning rate of 0.0001. From our experiments we found that the 64 × 64 × 64 size of patches worked better for the disease segmentation while both *3D U-Net* (39) and *V-Net* (40) performed similarly with the 3D U-Net reporting a slightly better performance.

The plot of the training and validation progress for the 3D U-Net with the 64 × 64 × 64 size of patch is summarized in Figure E1. The training loss seems to stop decreasing after 400 epochs, while also the validation loss seems to be quite unstable after this point. The mean dices for our best model were 0.66 for the training set, 0.60 for the validation set and 0.55 for the test set.

References

39. Çiçek Ö, Abdulkadir A, Lienkamp SS, Brox T, Ronneberger O. 3D U-Net: Learning Dense Volumetric Segmentation from Sparse Annotation. In: Ourselin S, Joskowicz L, Sabuncu MR, Unal G, Wells W, eds. Medical Image Computing and Computer-Assisted Intervention – MICCAI 2016. MICCAI 2016. Lecture Notes in Computer Science, vol 9901. Cham, Switzerland: Springer, 2016; 424–432 https://doi.org/10.1007/978-3-319-46723-8_49.

40. Milletari F, Navab N, Ahmadi SA. V-Net: Fully Convolutional Neural Networks for Volumetric Medical Image Segmentation. In: 2016 Fourth International Conference on 3D Vision (3DV), Stanford, CA, October 25–28, 2016. Piscataway, NJ: IEEE, 2016; 565–571.