ADAM Challenge

IBBM group

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Introduction

The method incorporated by our team for the ADAM challenge for task 2, segmentation, is similar to that of the BtrflyNet architecure as in [1]. The Maximum-Intensity-Projection (MIP) of the MRA-TOF volume is taken, and all three view of the volume are saved as images. These 3 views are all used to train the network, which has 3 input arms and 3 output arms, outputting segmentation masks in each view. Inference is done similarly by taking the MIP of the input TOF-MRA volume, obtaining the output segmentation slices, and combining them all into one volume.

Network

To circumvent having to use 3D volumes, a 2D network closely relating to the BtrflyNet – but with 3 input and output arms – in the figure 1 is used. The network encodes the axial, coronnal and sagittal images, concatenates them, and eventually the network decodes into segmentaion masks using high-res features inherited from the previous encoding layers of the network. A loss function combining dice loss and binary cross entropy loss is used, along with an Adam optimizer with a learning rate and weight decay of 0.001.

Data

The MIP of each TOF-MRA volume is taken, which creates approximately 15000 images in each view in total. The number of axial and sagittal images is restricted by the number of axial images. As the images are not the same size, e.g. TOF volume is $512 \times 512 \times 140$, so axial image is 512×512 and sagittal and coronal images are 512×140 and 140×512 respectively, the images have to be padded before using them for training them on the network. All the images are padding to 1024 as this is the size of the largest axial image.

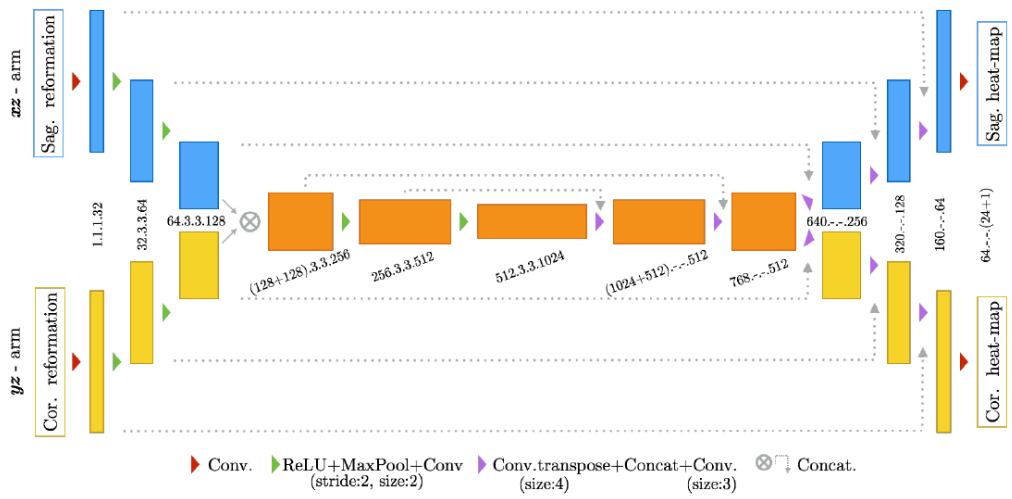

Figure 1: The Btrfly architecture. The architecture used for this case involves a third input and output arm involving the axial view.

References

[1] Akinobu Shimizu, Hayato Wakabayashi, Takumi Kanamori, Atsushi Saito, Kazuhiro Nishikawa, Hiromitsu Daisaki, Shigeaki Higashiyama, and Joji Kawabe. Automated measurement of bone scan index from a whole-body bone scintigram. *International Journal of Computer Assisted Radiology and Surgery*, 15(3):389–400, 2020.