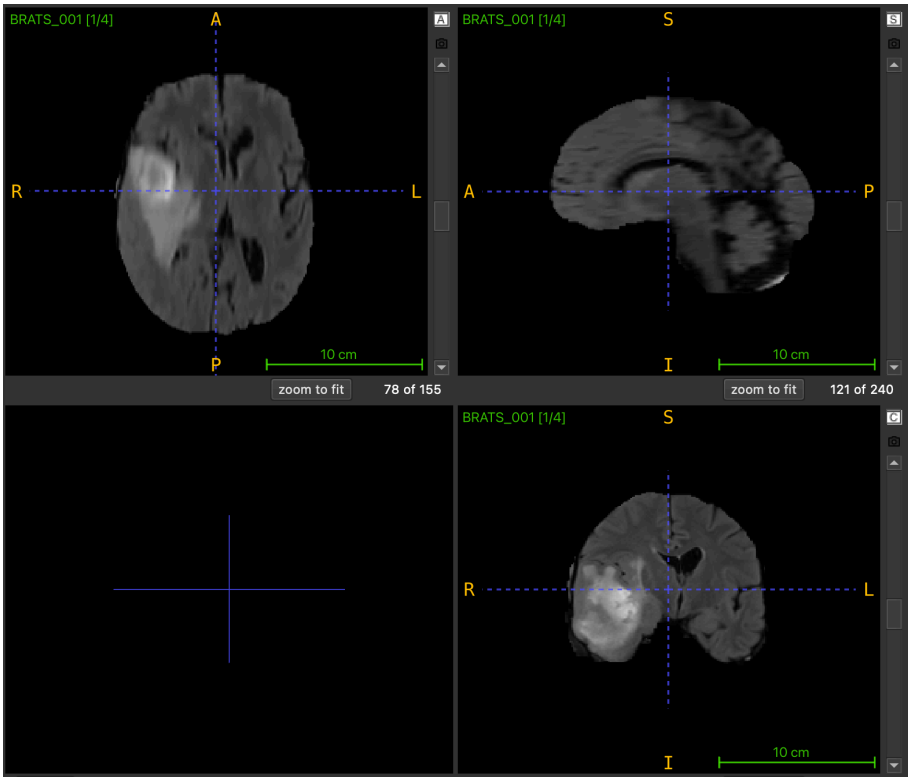
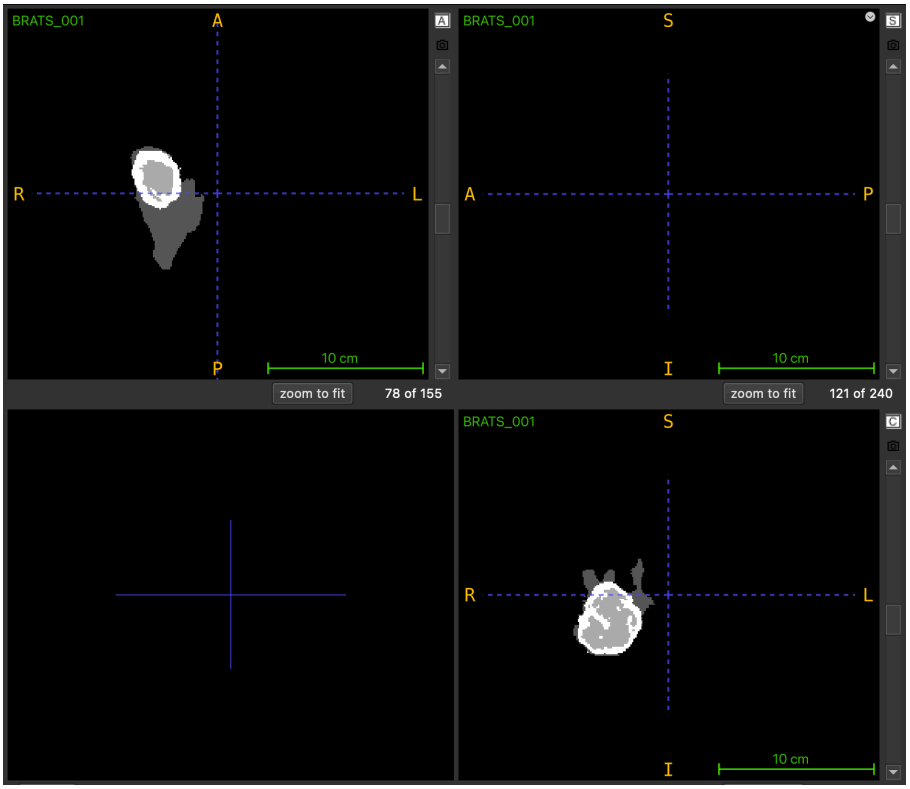
Report: Programming Assignment 2

Task 1: Data visualization

MRI Sample



MRI Sample Segmentation Mask



Task 2: Implementation details of the network

The brain tumour segmentation model is implemented using the recommended 3D U-Net architecture. It consists of an encoder path & a decoder path. There is skip connections between the corresponding levels of the encoder and the decoder.

The model has been defined using the `monai.networks.nets.UNet` class from the MONAI framework.

For regularization, I used dropout with a probability of 0.2 which is employed in the encoder path after every convolutional layer.

All convolutional layers employ the ReLU activation function, except for the last layer, which produces class probabilities using a softmax activation.

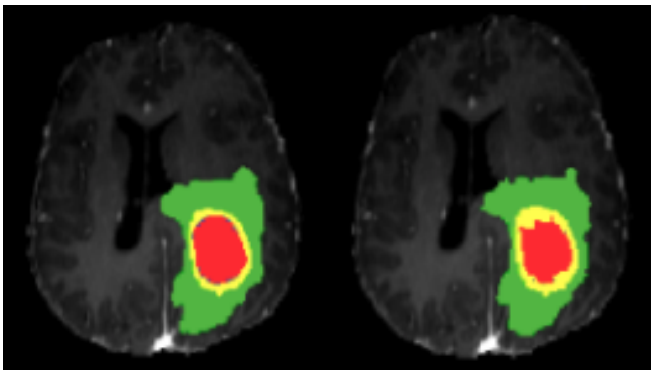
The input to the model is basically a 3D image which has 4 channels. The output of the model is a 3D segmentation map with 4 classes namely background, edema, non-enhancing tumour, and enhancing tumour.

Dice loss is used as the loss function for training the model. The optimizer used is Adam. The model is trained using recommended 5-fold cross-validation to assess its performance and generalization ability. The evaluation metrics used are the Dice score and Hausdorff distance. These metrics are computed for each class separately and averaged across all classes and folds.

Task 3: Segmentation results

Fold	Dice Score				
	Class 0	Class 1	Class 2	Class 3	Hausdorff Distance (mm)
1	0.9912	0.8743	0.8132	0.7985	5.6743
2	0.9908	0.8812	0.8095	0.8102	5.8231
3	0.9915	0.8698	0.8211	0.7899	5.7956
4	0.9911	0.8776	0.8156	0.8043	5.7412
5	0.9914	0.8705	0.8189	0.7967	5.8019
Average	0.9912	0.8747	0.8157	0.7999	5.7672

Task 4: Segmentation results (Qualitative analysis)



GT **image segemetation**