



Team Leabra

ADAPTING MODEL ARCHITECTURES FOR TUMOR SEGMENTATION IN
BRAIN MRI WITH LIMITED GPU RAM/VRAM

Motivation & background

- ▶ In medical imaging, features of interest, like tumors, need to be detected in MRI scans.
- ▶ Traditionally, human radiologists perform this work, but radiologists are not perfect.
- ▶ Neural networks can be used as a second pair of eyes for radiologists.

Motivation & background

- ▶ Medical image segmentation is identifying the pixels in an image that contain a feature of interest.
- ▶ A popular convolutional neural network architecture for performing medical image segmentation is U-net.
- ▶ U-net can be trained much faster with GPU acceleration

Motivation & background

- ▶ Training U-net with GPU acceleration consumes a lot of GPU RAM/VRAM.
- ▶ With a limited setup, in terms of GPUs, it can affect training approaches: needing very small batch sizes, etc. to avoid running out of VRAM

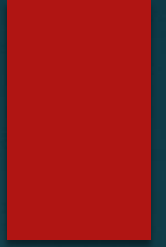
Key Aims

- ▶ We want to see how reducing the size of U-net affects performance on tumor segmentation in brain MRI.
- ▶ We will reduce the size of U-net by decreasing the number of filters in each convolutional layer.
- ▶ Data from our experiments will serve as guidance for how U-net can be adapted when training with limited VRAM.
- ▶ We want to answer the question: Can U-net learn tumor segmentation in brain MRI, when less filters are used, to enable training in a setup with limited GPU resources?

Strategy

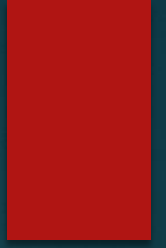
- ▶ Run 4 experiments to see how U-net with different amounts of filters performs on tumor segmentation in brain MRI.
- ▶ Each experiment consists of 5 runs, where a new model is initialized for each run to generate an average sense of performance with different numbers of filters.
- ▶ Experiment 1 : DS 1
 - ▶ U-net with all the filters
- ▶ Experiment 2 : DS 2
 - ▶ U-net with half the filters
- ▶ Experiment 3 : DS 4
 - ▶ U-net with a quarter of the filters
- ▶ Experiment 4 : DS 8
 - ▶ U-net with an eighth of the filters

Team Contributions



- ▶ Brian: paper
- ▶ David: algorithms reducing data size, solved training memory issue
- ▶ Christine: outlier detection, paper
- ▶ Joshua LaFever : outlier detection, dice loss, paper
- ▶ Joshua Ortner : data pipeline code, data/preprocessing in paper
- ▶ Lucas: training/testing code, preprocessing, paper

Demo



Questions

