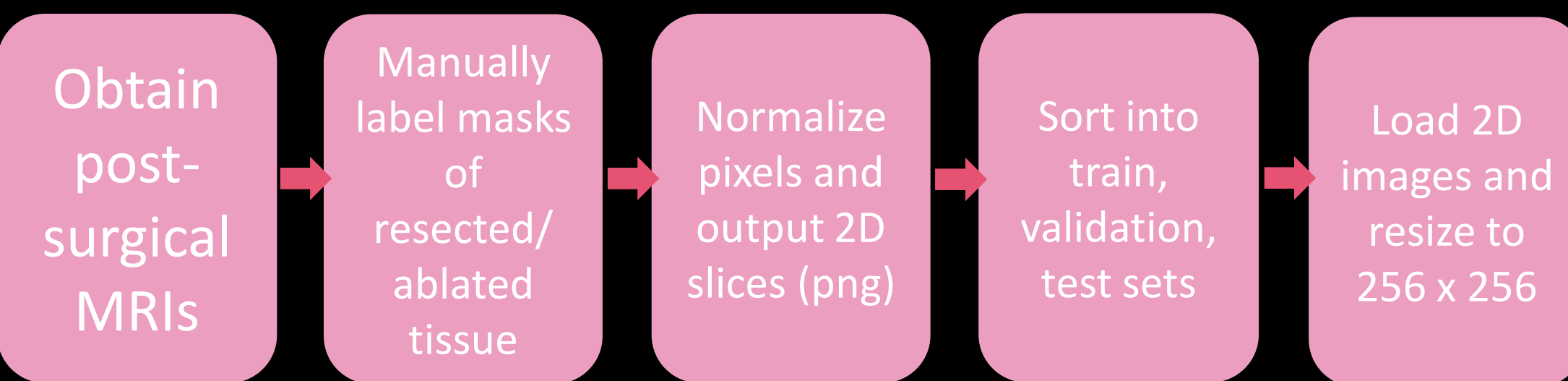


Problem Statement

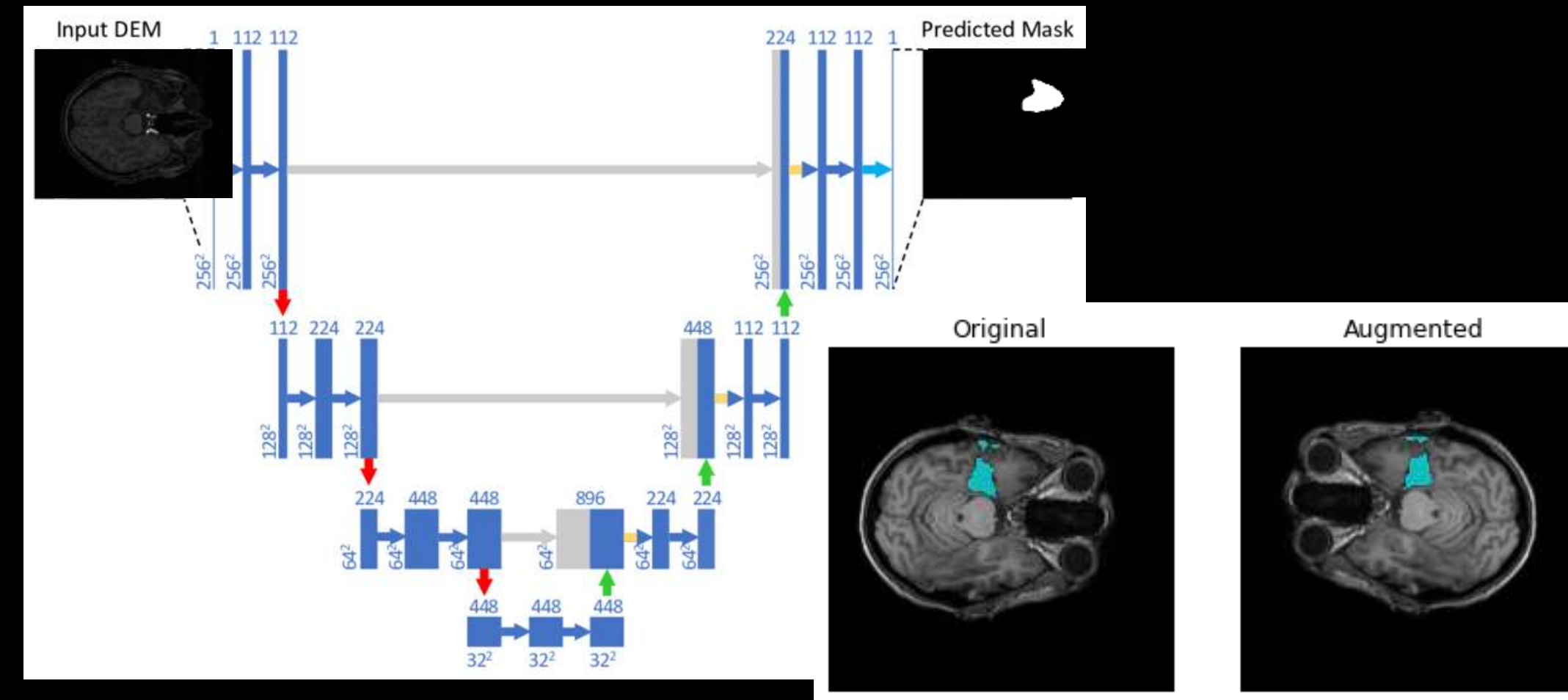
- Patients with localized drug-resistant epilepsy (DRE) are candidates for surgery or laser ablation to prevent or reduce seizures
- After surgery, physicians must go through brain MRI scans and manually label resected/ablation tissue for analysis
- To save time, can we automate this process?

Dataset



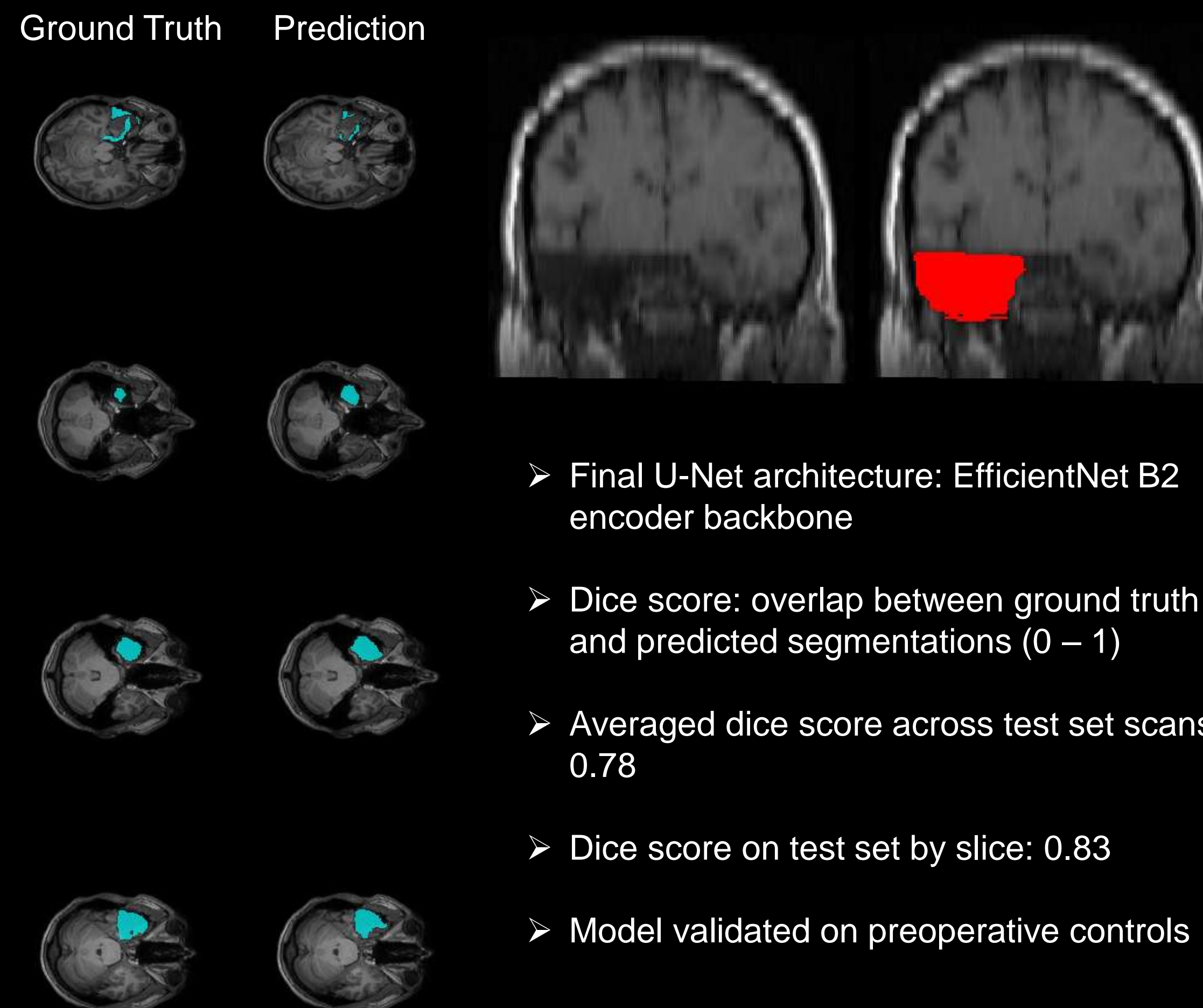
28 Training patients	9 Validation patients	9 Test patients
23 VUMC patients	23 HUP patients	
46 patients		

Deep Learning



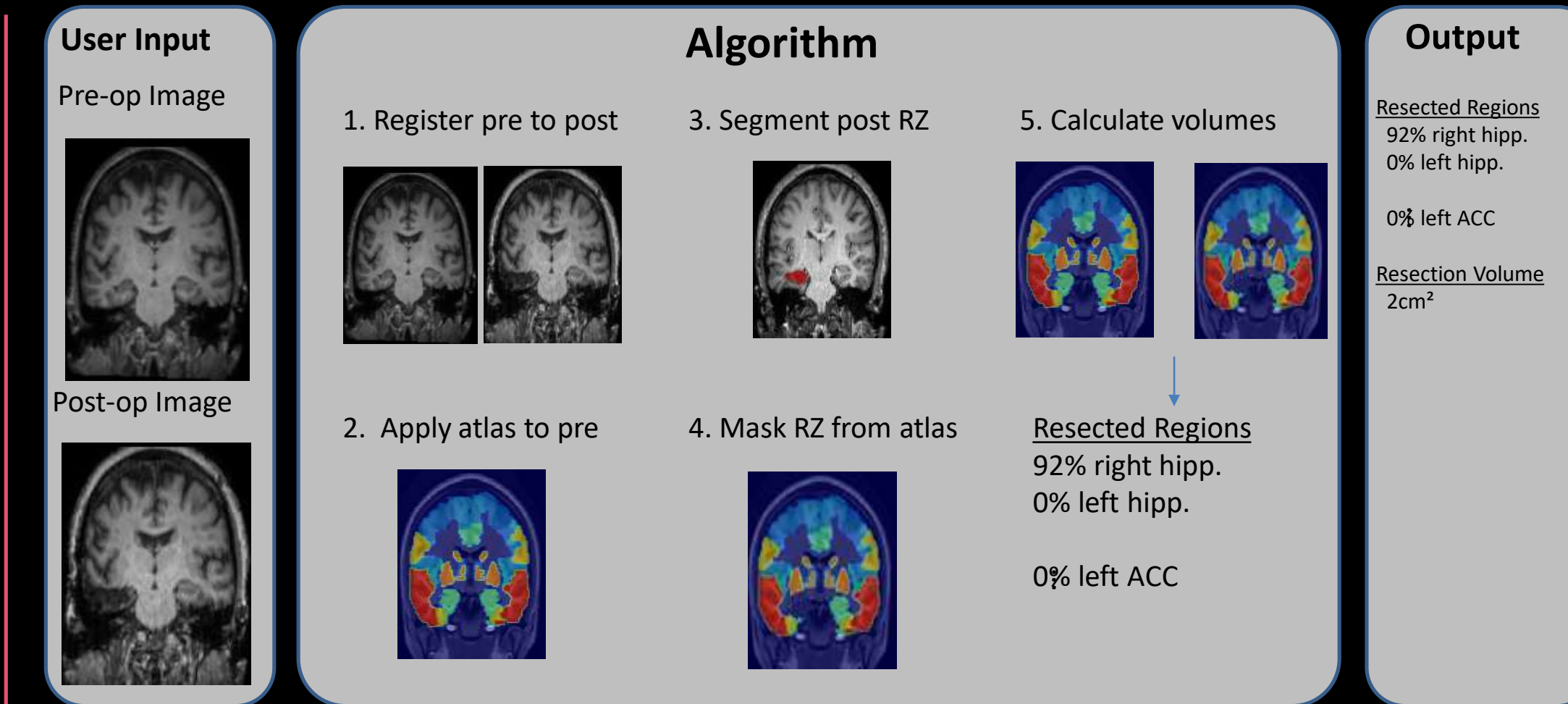
- Segmentation: classifying each pixel in the image as resected or non-resected tissue
- U-Net model for segmentation (see above)
- Data augmentation (random flips, rotations, etc.) on training images to avoid overfitting

Results



- Final U-Net architecture: EfficientNet B2 encoder backbone
- Dice score: overlap between ground truth and predicted segmentations (0 – 1)
- Averaged dice score across test set scans: 0.78
- Dice score on test set by slice: 0.83
- Model validated on preoperative controls

Applications



- Can be used to quantify hippocampal remnant, which has been linked to important factors such as seizure reduction and neuropsychological behavior
- Other potential applications include
 - a neurosurgery tool to assess accuracy of resection
 - a research tool to account for resections when applying atlases to postoperative imaging

Future Directions

- Package the tool into an open-source codebase that clinicians and researchers can use
- Generalize model to include laser ablations and non-temporal lobe epilepsies

References

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3. Mikolajczyk A, Grochowski M. Data Augmentation for Improving Deep Learning in Image Classification Problem. International Interdisciplinary PhD Workshop. 2018; 117-122.