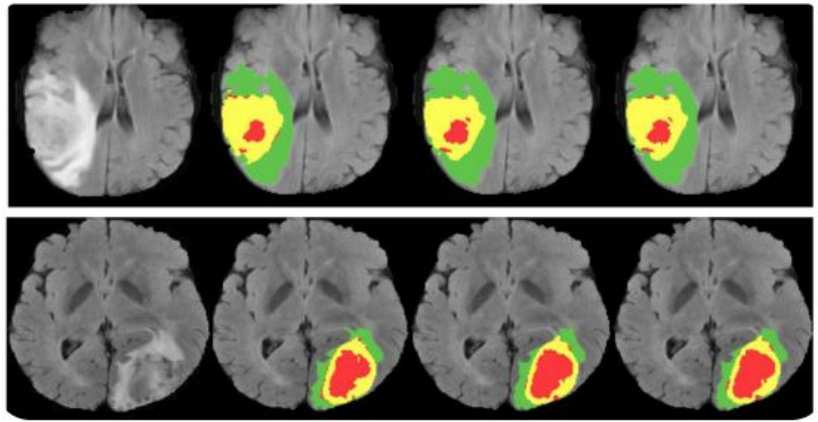
Brain Tumor Semantic Segmentation

Erik Mercado

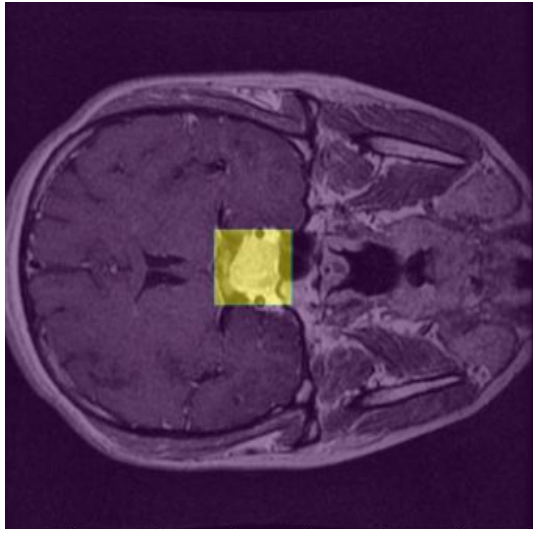
How can a model help?

- **Planning:** Surgery, Treatment, and Monitoring
- **Complex Structures**
- **Time Consuming**
- **Expensive:** $200 - $400 per hour

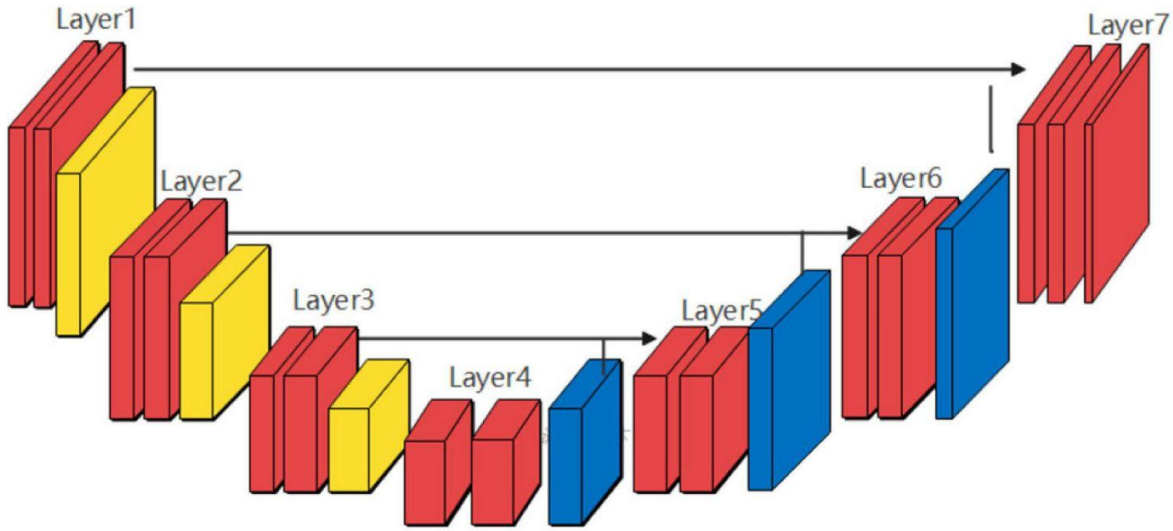


Dataset

- Dataset sourced from Kaggle
- Pixel Classes:
  - 0: Non-Tumor, 1: Tumor
- 2,146 Images
  - Size: 640x640
  - 1,502 Training
  - 429 Validation
  - 215 Test
- Preprocessing
  - Resize 320X320



U-Net



Conv+BatchNormalization+ReLU

Pooling operation

Upsampling Layer

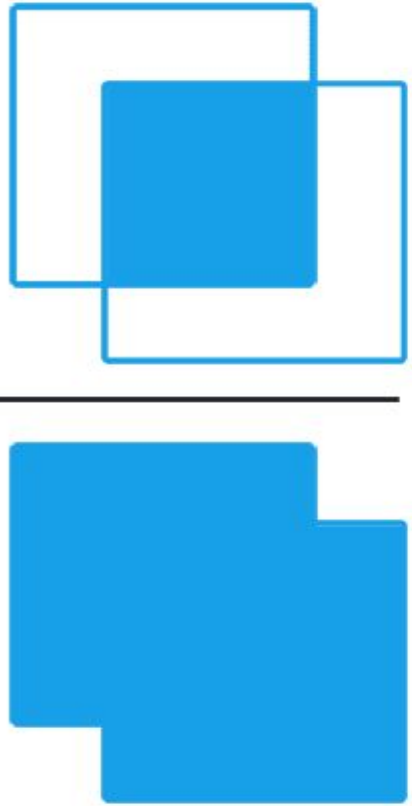
Skip-Connection

Training Set-Up

- **Batch Size:** 32
- **Optimizer**: Adam (lr: 0.001)
- **Loss Function:** Cross Entropy Loss
- **Early Stopping**: Patience: 7, Delta: 0.001

Eval Metric: Intersection over Union

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$



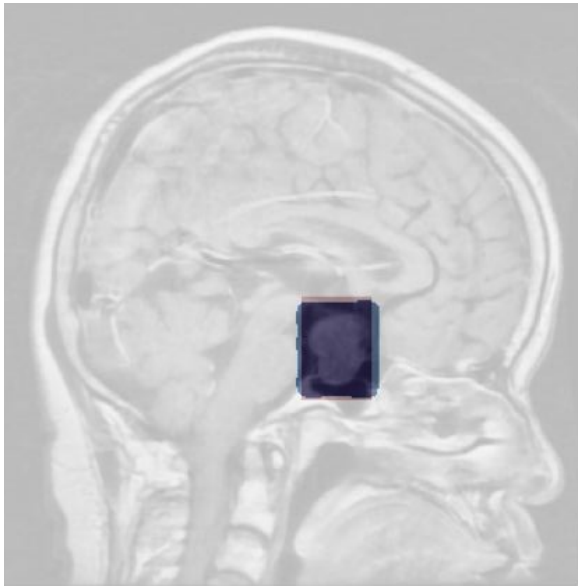
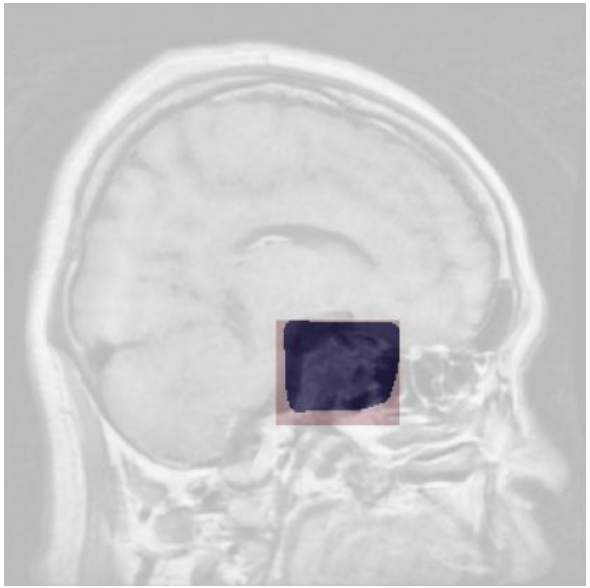
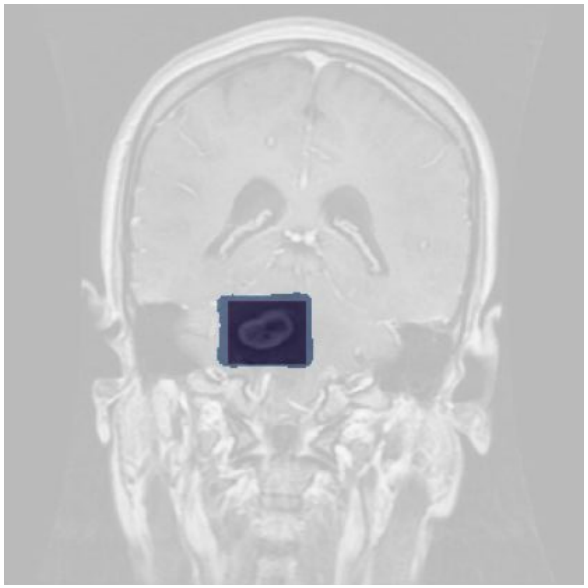
Results

Train Loss: 0.00802 | Train IoU: 0.95407

Val Loss: 0.06470 | Val IoU: 0.81

Test Loss: 0.07201 | Test IoU: 0.80568

Visualization

Conclusion

Pros using model	Cons using model
Cheaper	Small sample size
Faster	Not 100% accurate

Hybrid approach: Model makes initial segmentation and a specialist adjusts the rest

Thank You