Liver tumour detection and segmentation

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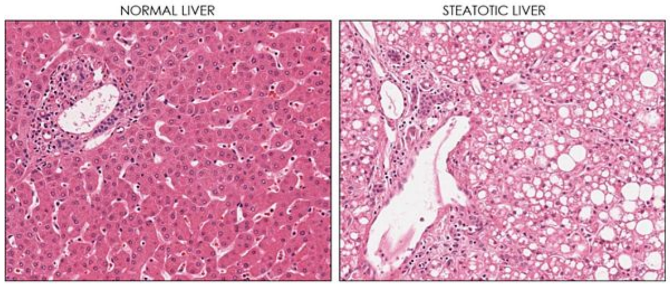
Introduction

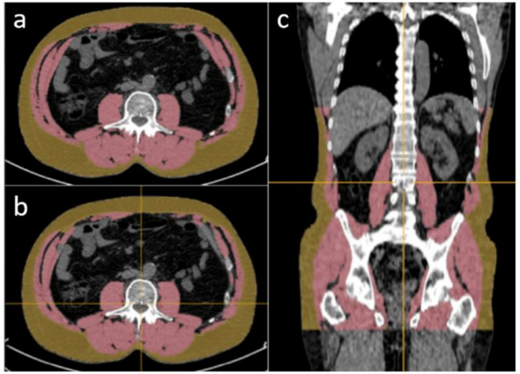
Problem Statement:

“How can we automate the classification and segmentation of liver tumors from CT images while ensuring precision and clinical reliability?”



Challenges :

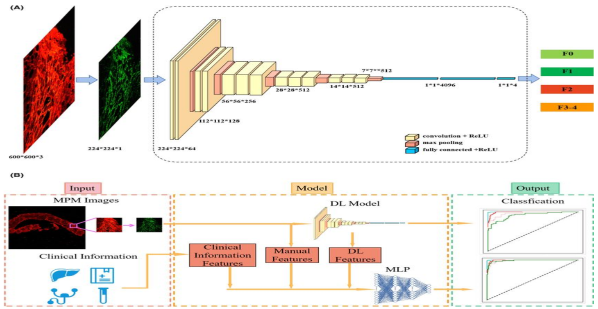
- CT image Variability
- Tumor Complexity
- Clinical Accuracy



Approach and Methodology

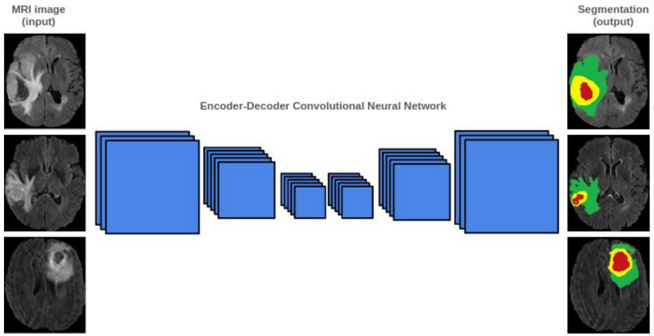
Approach

- Classification: Using VGG16 to identify healthy vs pathological livers.
- Segmentation:Using U-Net to precisely localize tumors

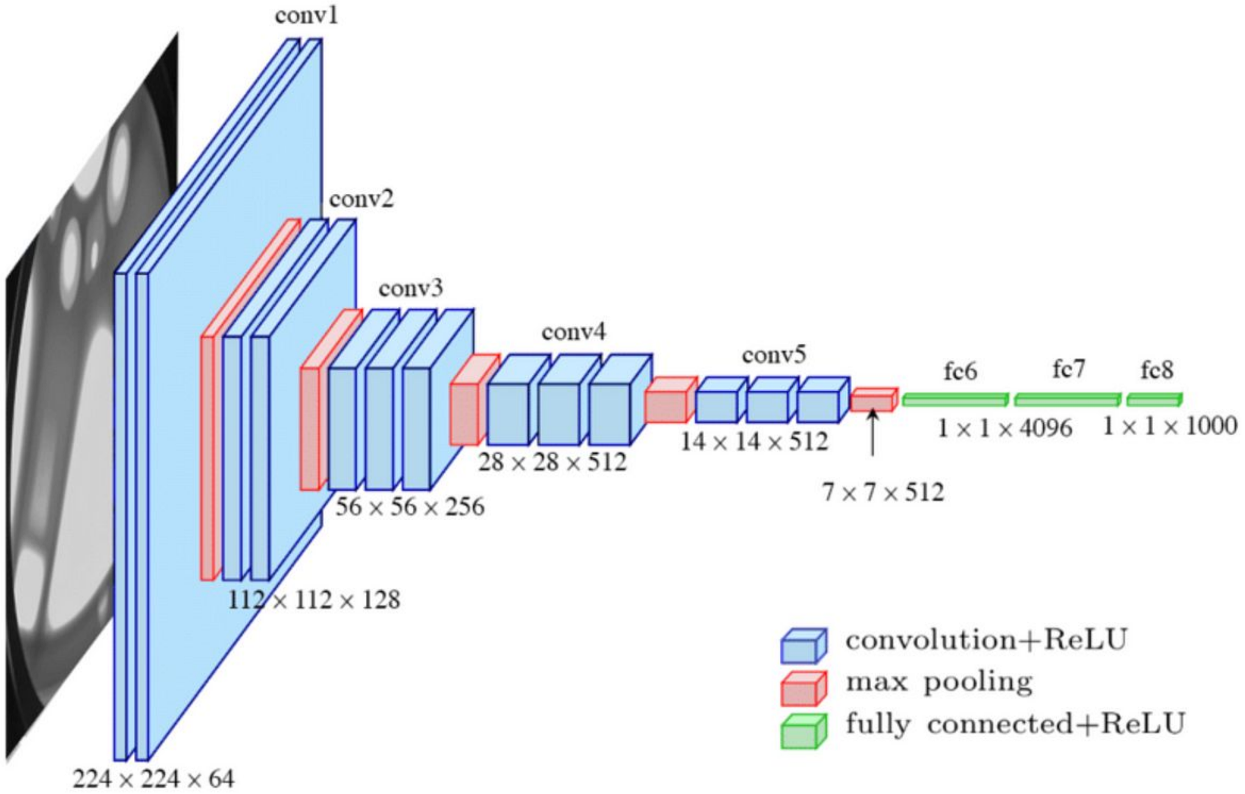


Expected Impact

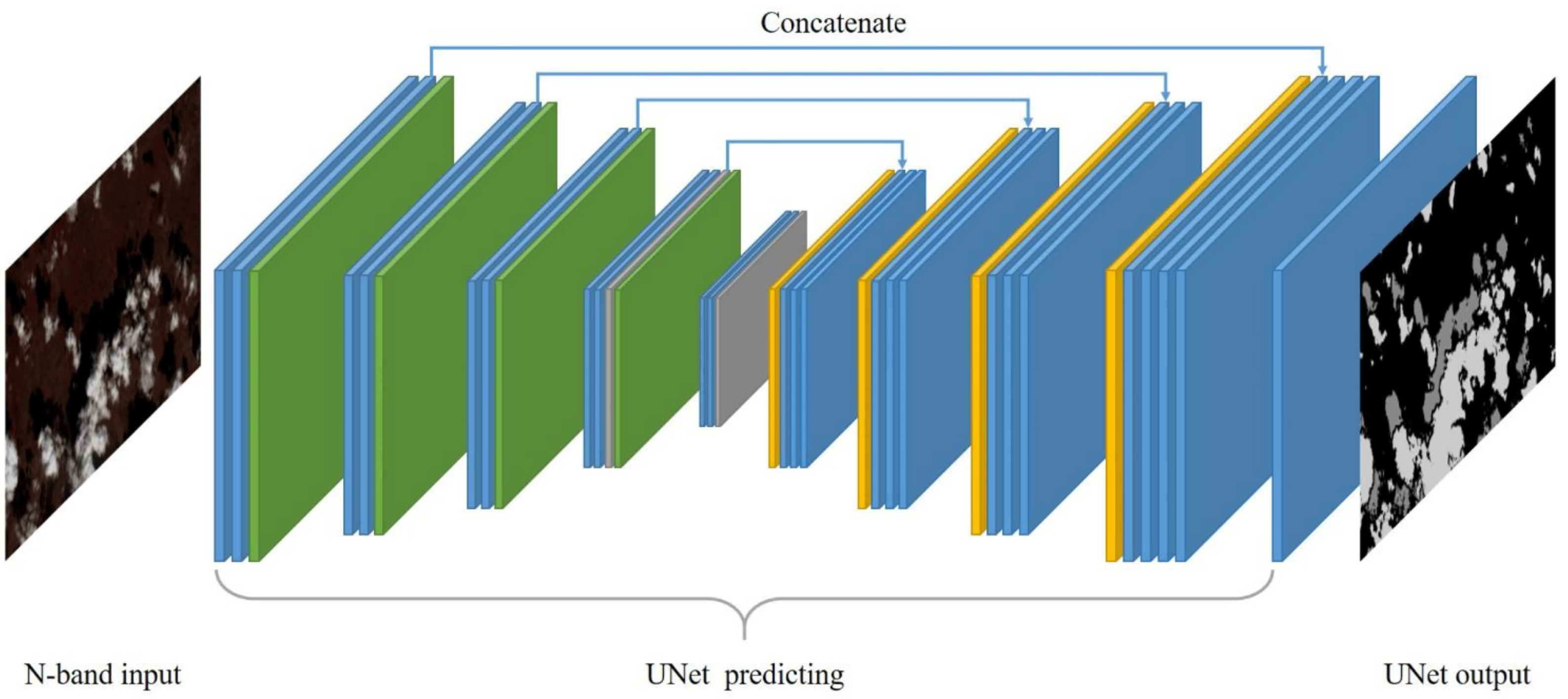
- Reducing analysis time for radiologists
- Improving diagnostic accuracy and reproducibility



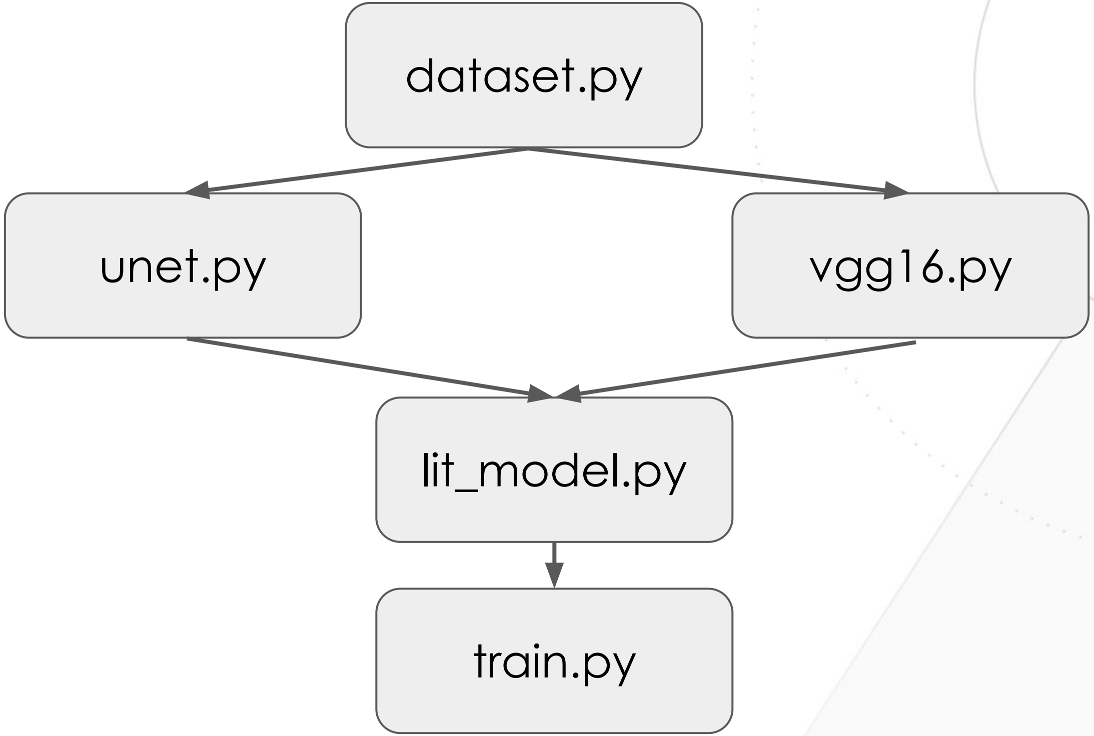
Architecture VGG16



Architecture U-Net

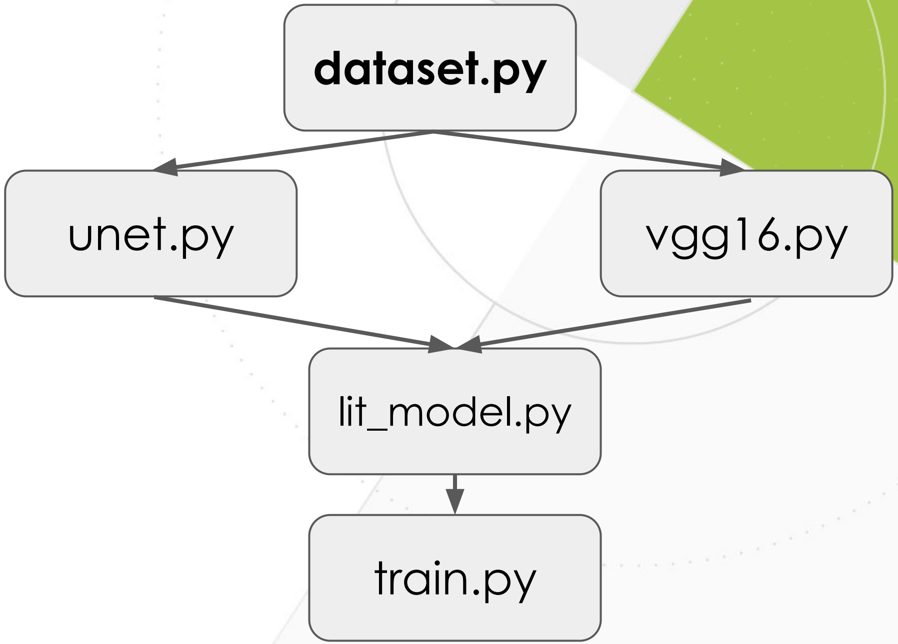


Work and implementation



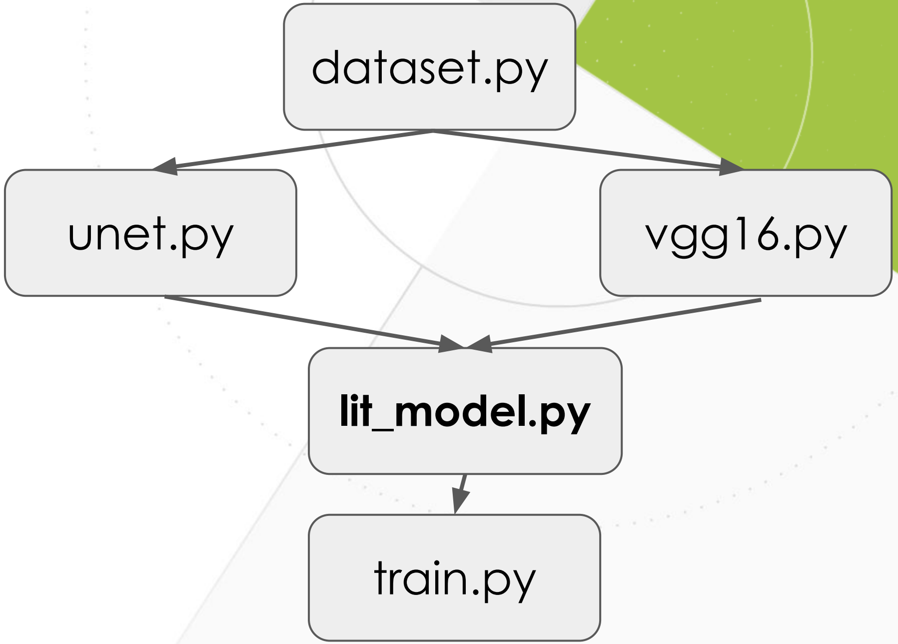
datasete.py

- Load data
- Data preprocessing
- Awakening the data
- Prepare for the training
- Sending the data



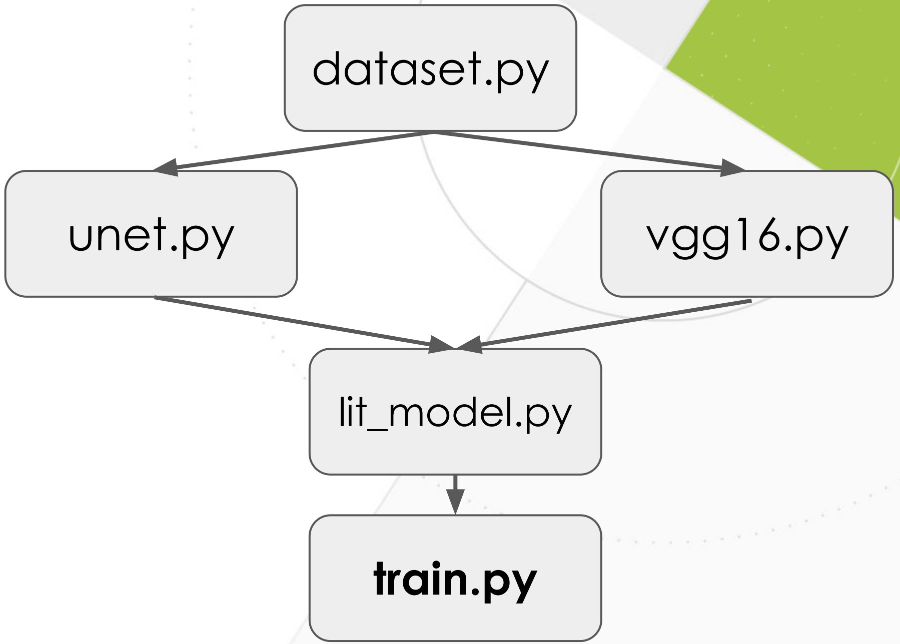
lit_model.py

- Import the models (classification or segmentation)
- Set the Adam optimization
- Dice score for segmentation
- Accuracy for classification



Train.py

- Set the epochs, batch size
- Inherit the model from lit_model
- Stock the weights in ModelCheckpoint file
- Start the training



lit_model.py

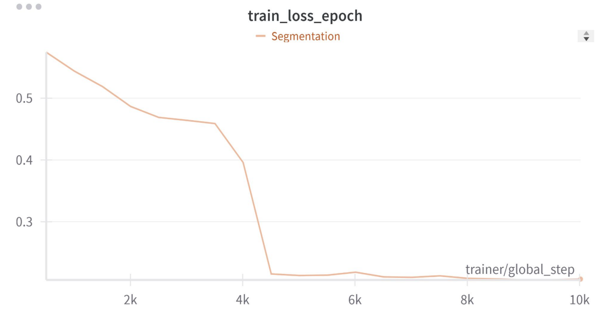
predict_classification.py

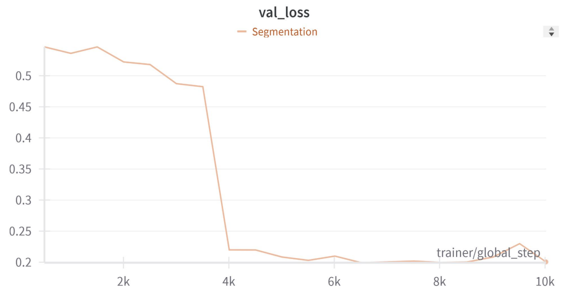
- Load ModelCheckpoint
- Load test dataset
- Preprocessing data
- Classification
- Getting the class predicted.

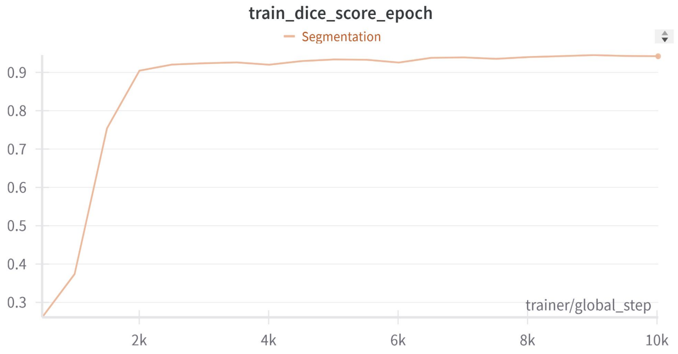
predict_segmentation.py

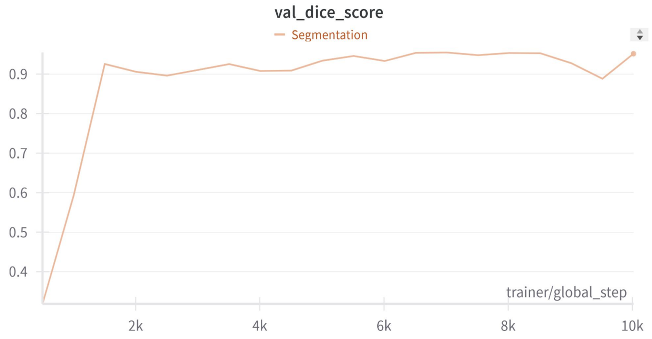
- Load ModelCheckpoint
- Load the test dataset
- Preprocessing data
- Segmentation
- Predicts the mask

U-Net Segmentation Model Performance



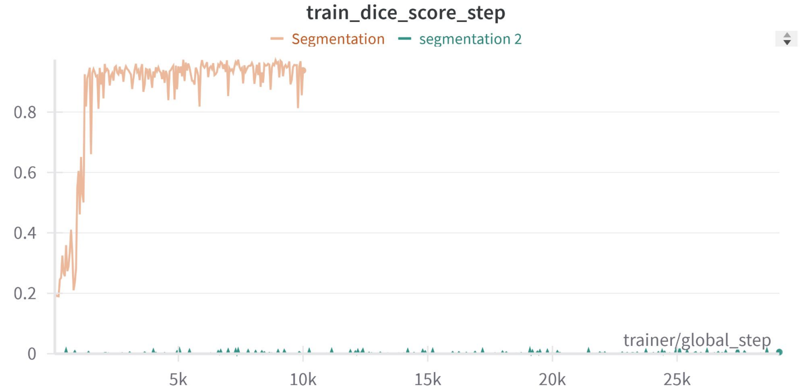


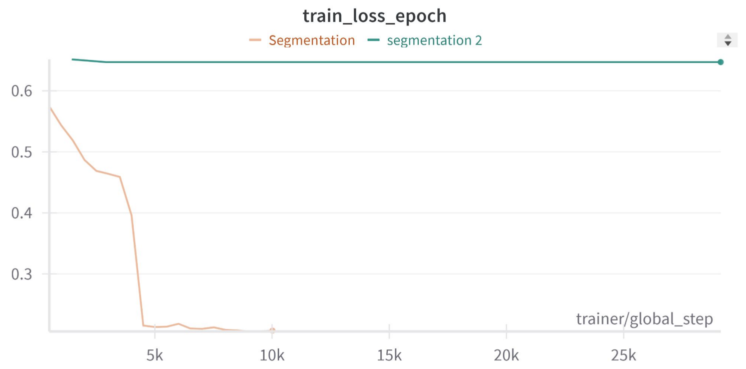




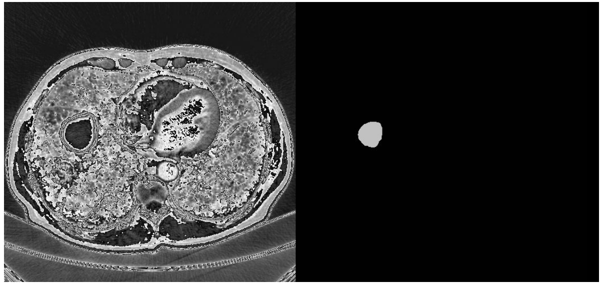
U-Net Segmentation Model Performance

Trouble : Our first attempt was a failure

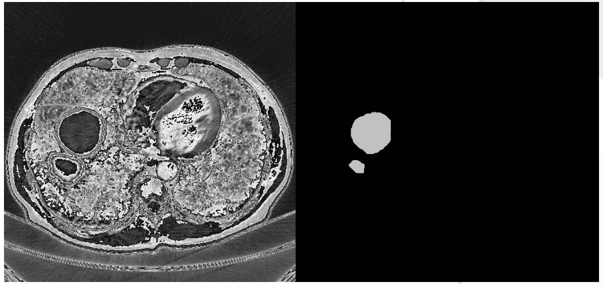




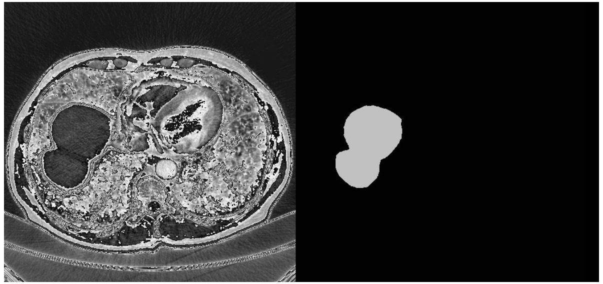
Experimental Results of Our Segmentation Model



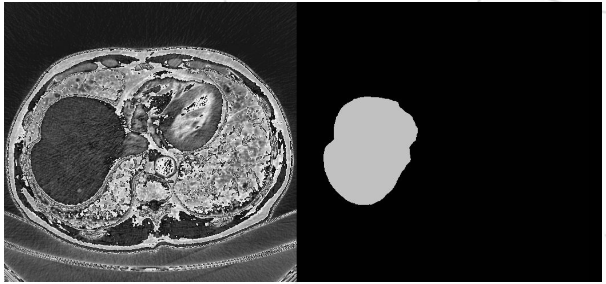
Small tumor



Two tumors

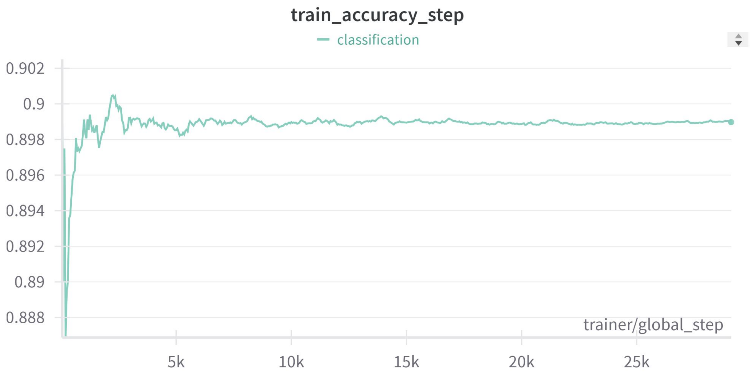


Tumor with a complex shape



Large tumor

VGG16 CLASSIFICATION MODEL PERFORMANCES



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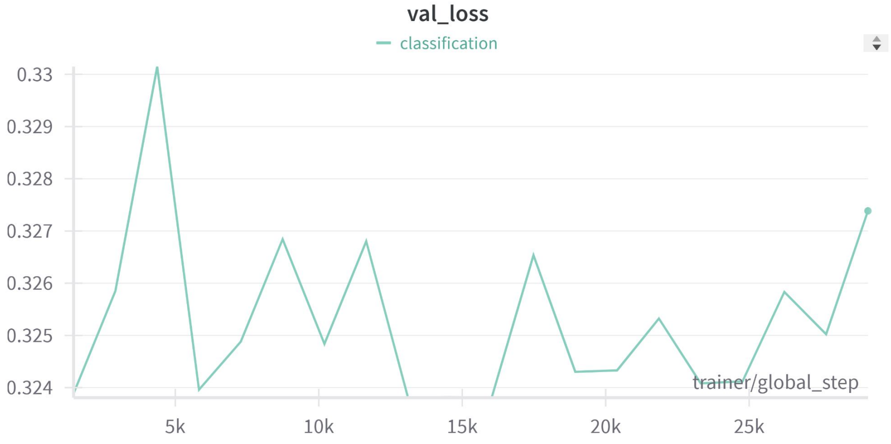
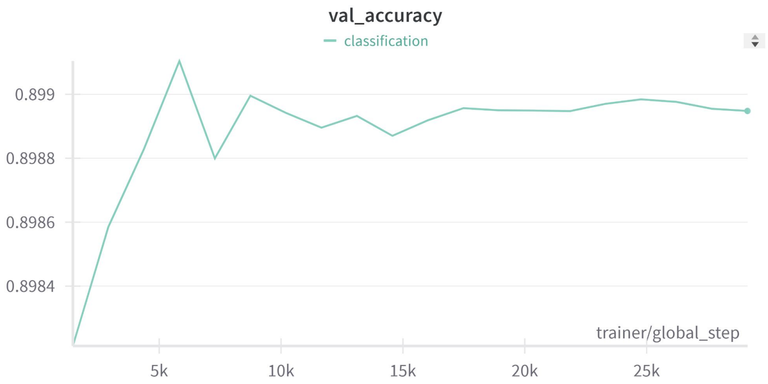
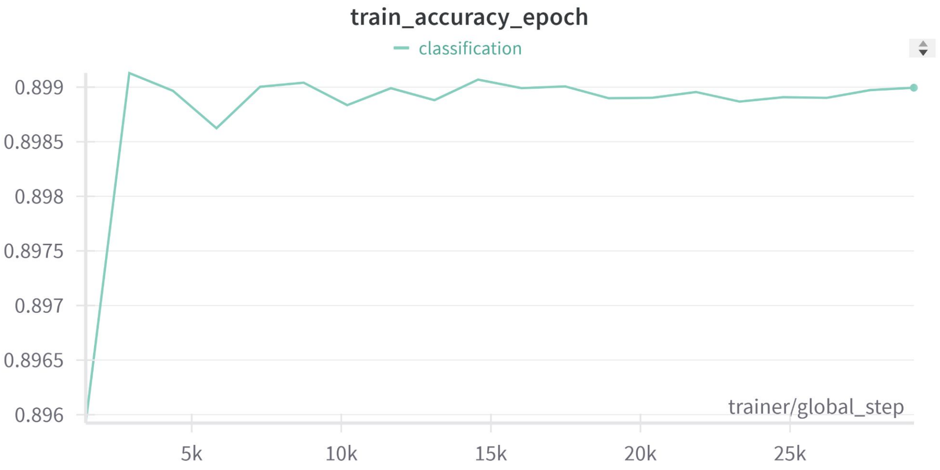
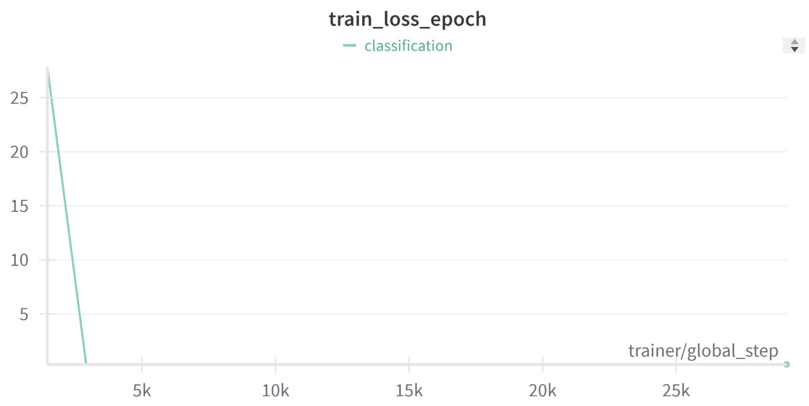
VGG16 CLASSIFICATION MODEL PERFORMANCES





VGG16 CLASSIFICATION MODEL PERFORMANCES





VGG16 CLASSIFICATION MODEL PREDICTION

VGG 16
ARCHITECTURE

softmax

p0

p1

p2

ARGMAX

background

Tumor

No tumor

VGG16 CLASSIFICATION MODEL PREDICTION

2.2259520e-08 ←background

0.89969039 ← tumor

0.10030963 ←no tumor

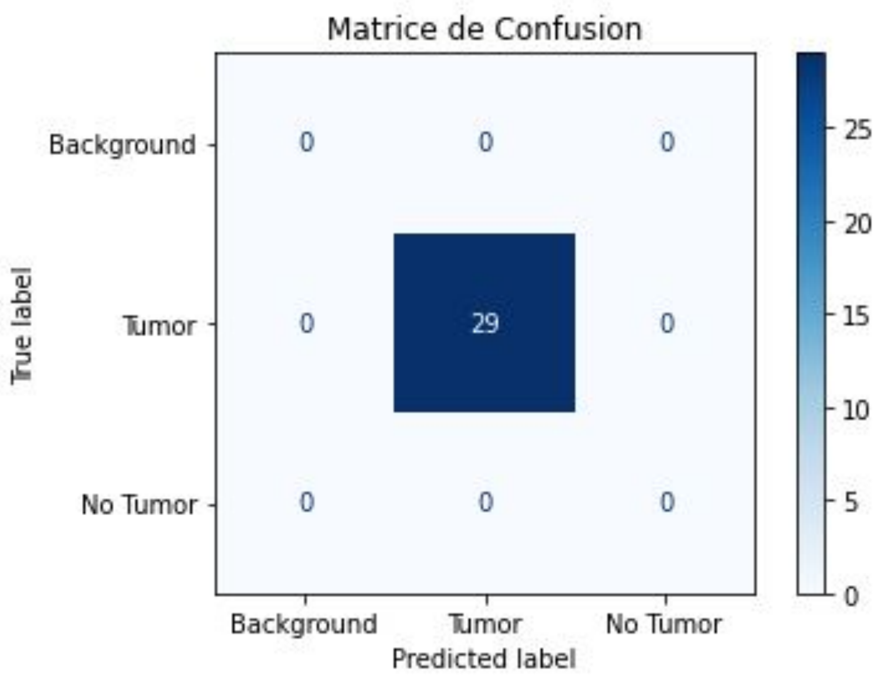



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Image 20: Classe prédite = 1, Probabilités = [2.2259520e-08 8.9969039e-01 1.0030963e-01]
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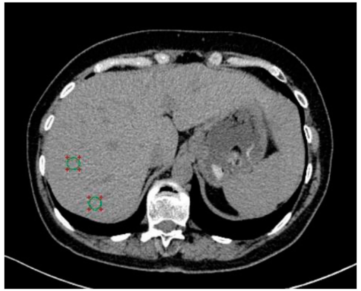
Conclusion

What We Learned:

- The importance of AI in medical imaging and computer vision applications.
- How CNNs like VGG16 and U-Net are applied in real-world medical challenges.
- The complexity of handling medical datasets (preprocessing, annotation, and AI training).

Difficulties Encountered:

- **Managing dataset quality:** CT scans come with varying resolutions and annotations.
- **Tuning deep learning models:** Balancing accuracy, training time, and overfitting.



Thank you for your attention !