SEGMENTATION OF CANCER CELLS IN 3D LUNGS CT SCANS

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Thomas Loux

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ÉCOLE POLYTECHNIQUE

IP PARIS

INF573 : Computer Vision Defense

Computed Tomography (CT) Scans

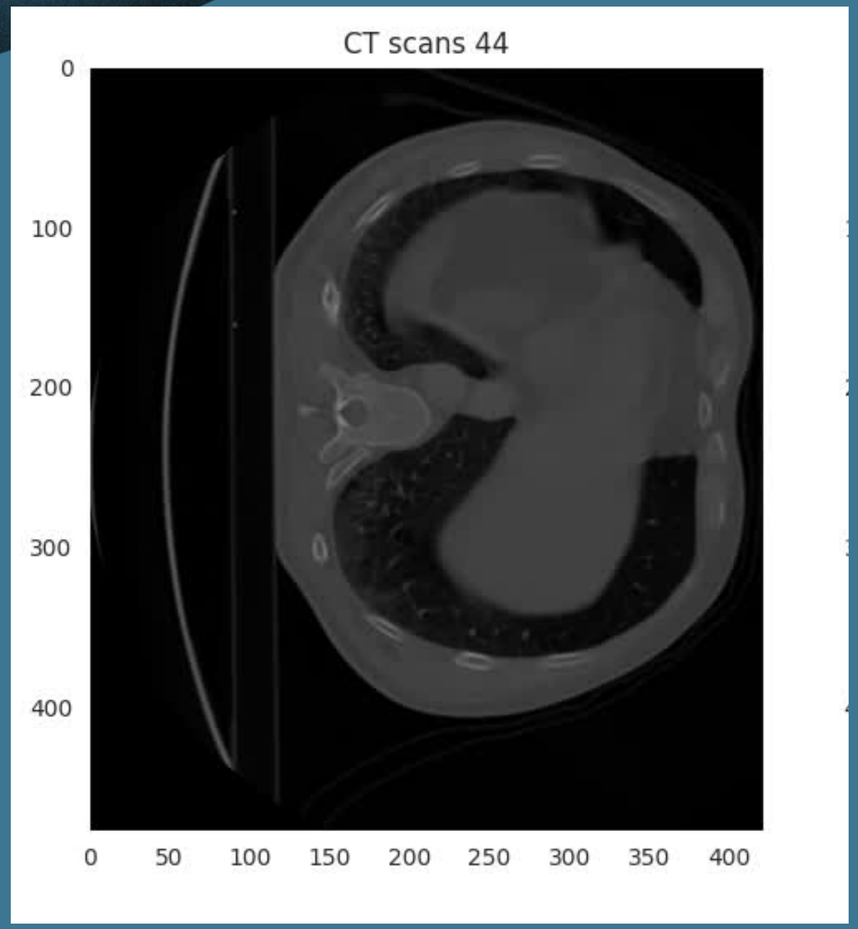

Figure 1 : Example of a CT Scan

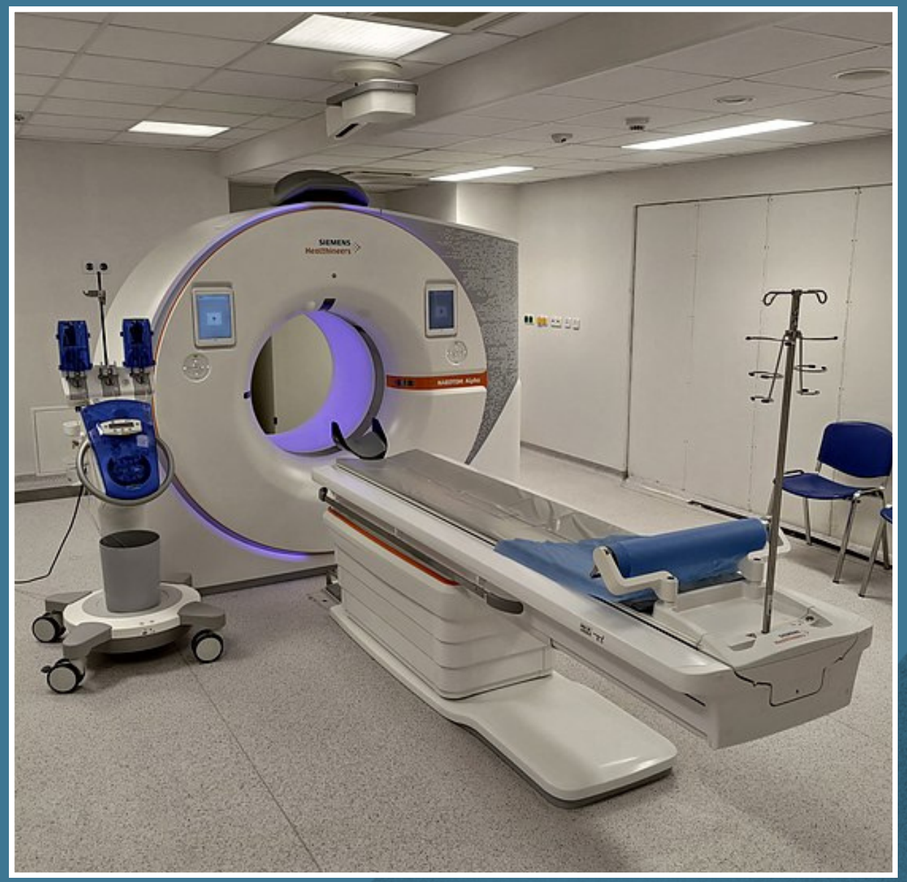

Figure 2 : Scanner

Computed Tomography (CT) Scans

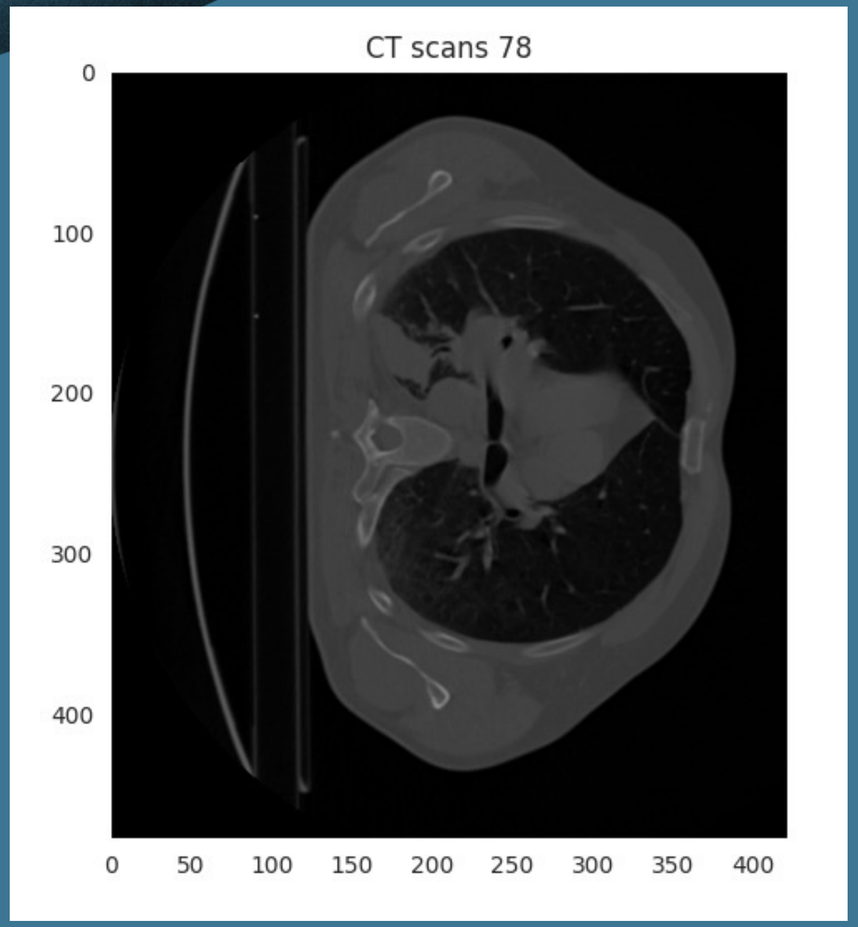

Figure 1 : Example of a CT Scan

- Shape : 512x512xN where N is around 110
- Size : around 1mm x 1mm x 3 mm

- Training
  - 291 Files
  - Scans, Segmentation
- Test
  - 100 Files

- Task : 3D Segmentation of Cancer Cells

Computed Tomography (CT) Scans

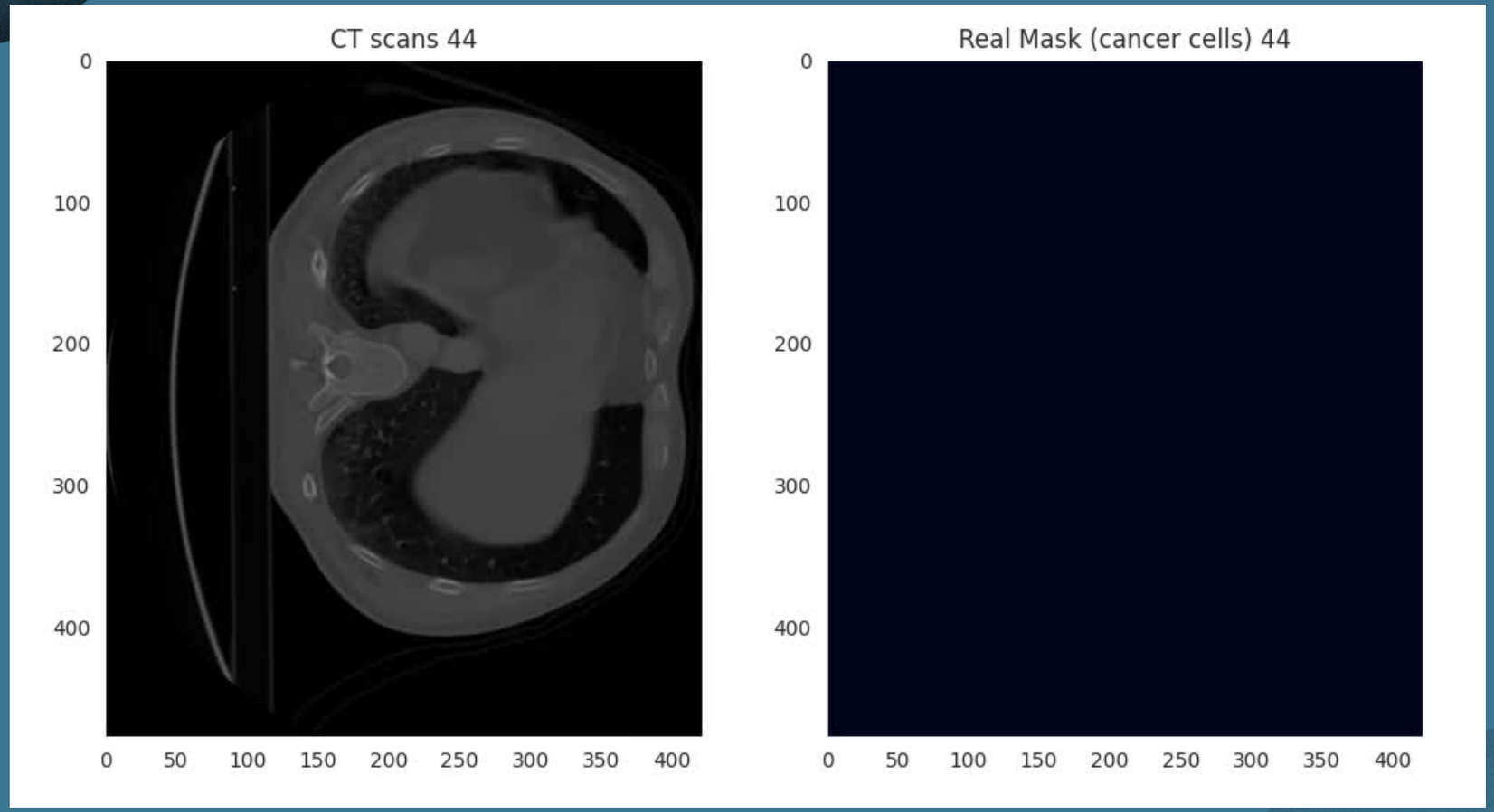

Figure 3 : CT Scan (left), Binary Mask for main tumor (right)

Measuring performance : Dice Metric

$$\text{Dice Loss} = 1 - \frac{2|A \cap B|}{|A| + |B|}$$

$$\text{Dice Metric} = \frac{2|A \cap B|}{|A| + |B|}$$

Figure 4 : Dice Metric

Note : it corresponds to Dice Metric corresponds to F1

Architecture : 3D Unet

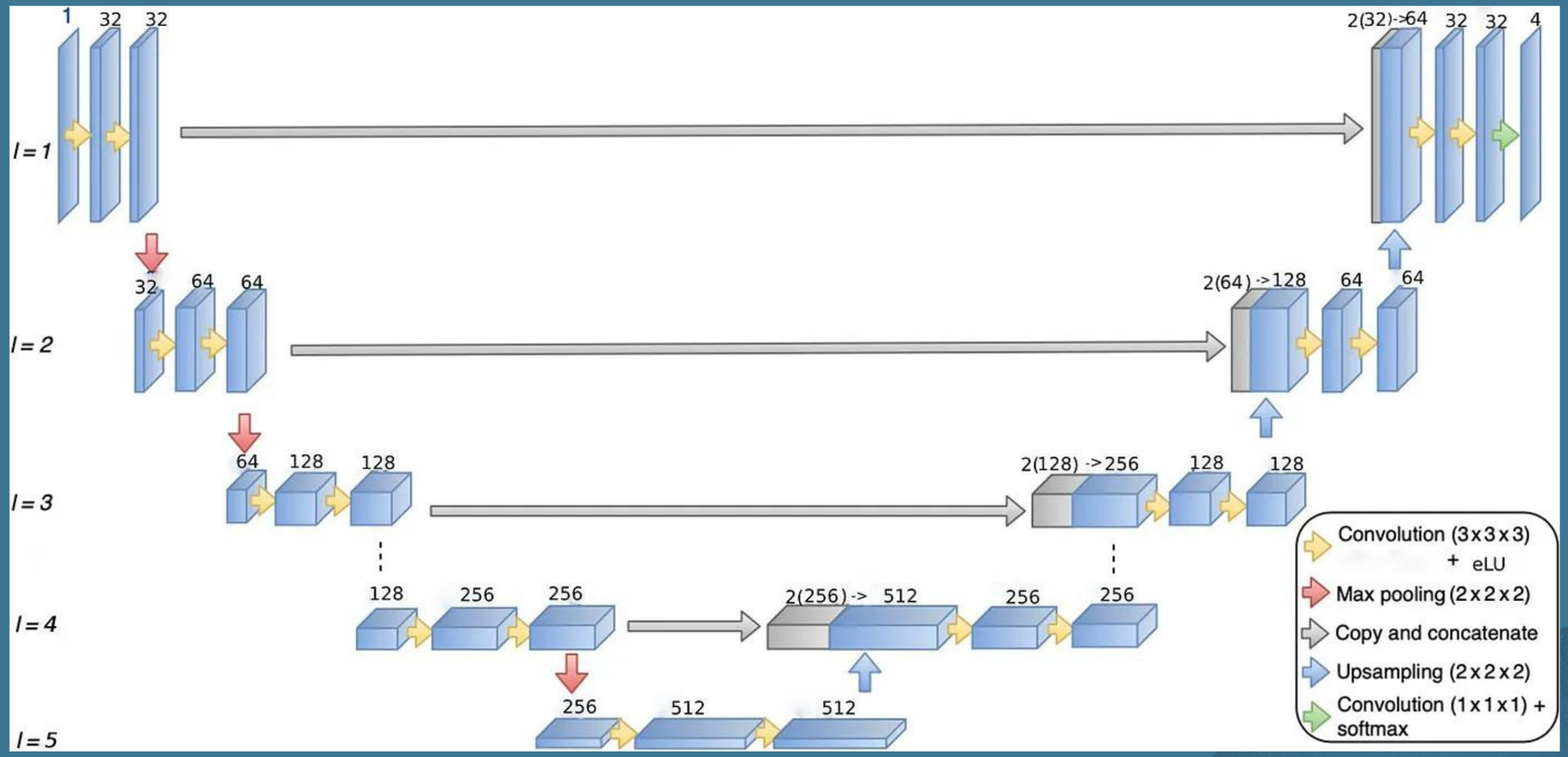

Figure 5 : Architecture of a 3D Unet

Data - Pipeline

Preprocessing

- Crop Image (remove border)
- Ensure orientation
- Scale Intensity to [0, 1] (from -1024, 3071)
- Random extract patch (center selected using its label)

Postprocessing

- Softmax
- Keep Largest Connected Component
- Fill in

Prediction - Sliding Window

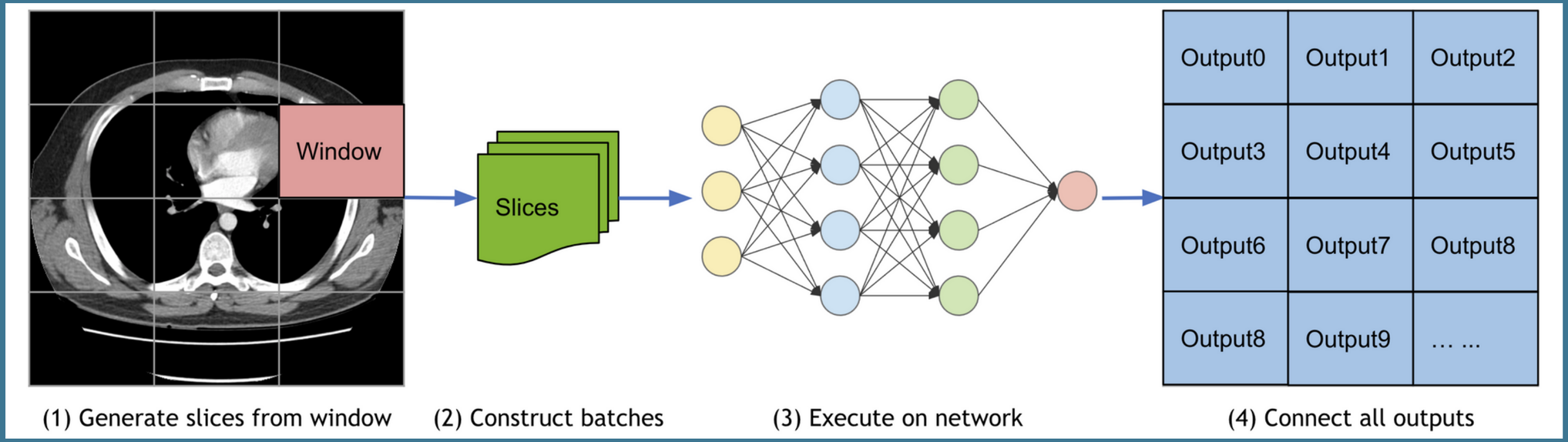

Figure 6 : Explanation Sliding Window Inference

Training

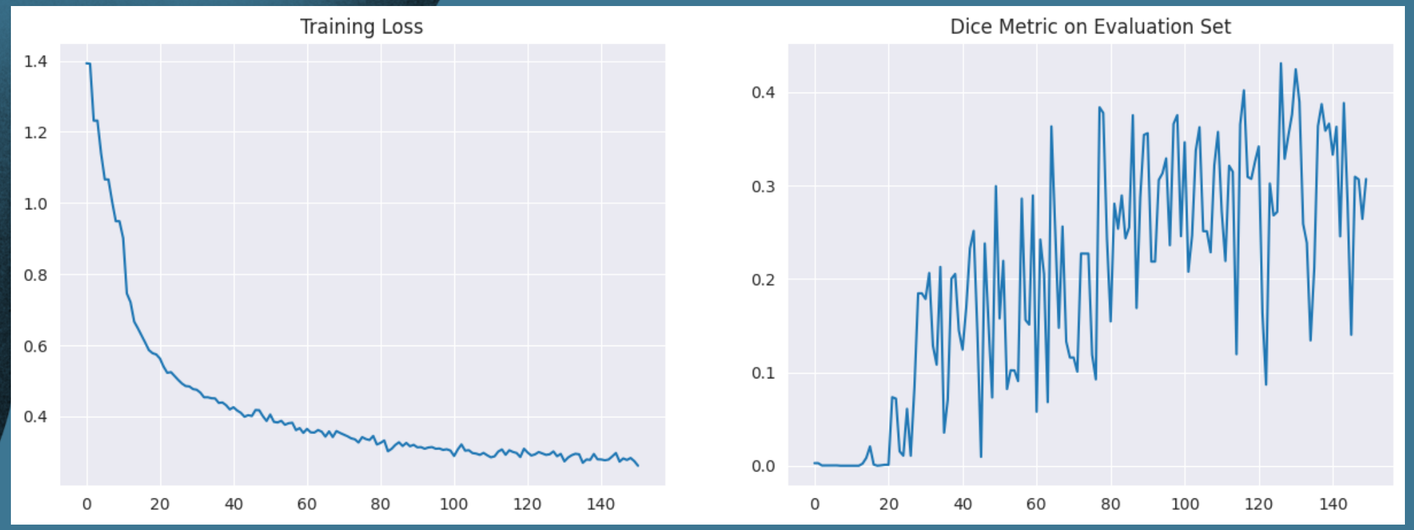

Figure 7 : Unet 150 epochs

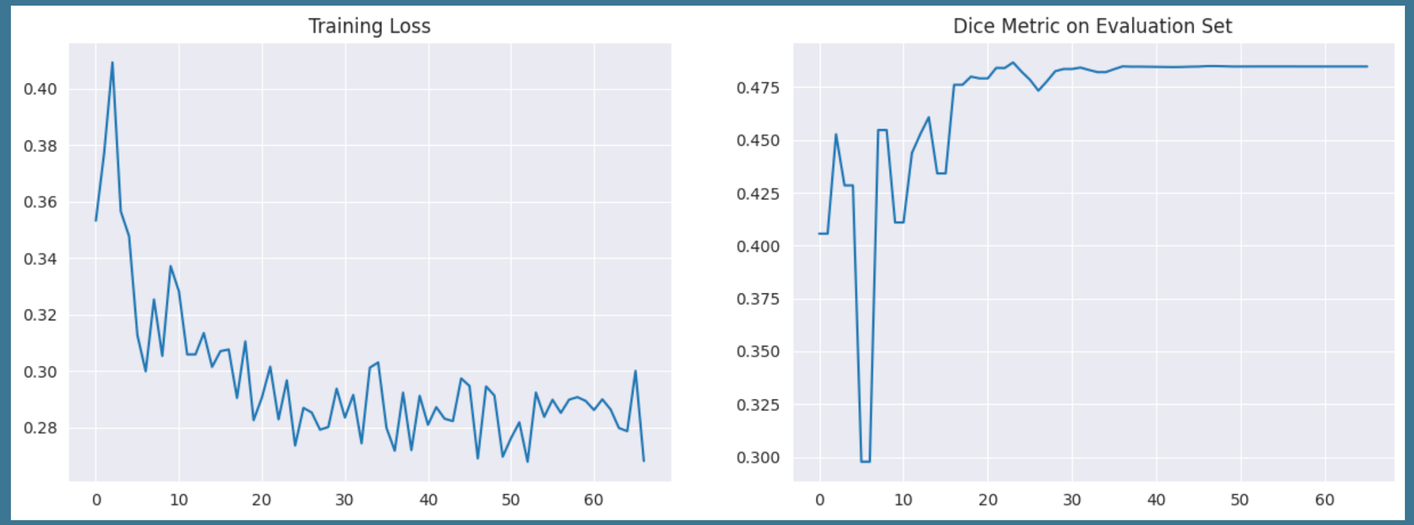

Figure 8 : Further training of previous model

Note :

- Better postprocessing
- Increase exposure to negative sampling
- Too strong reduction of learning rate

Results

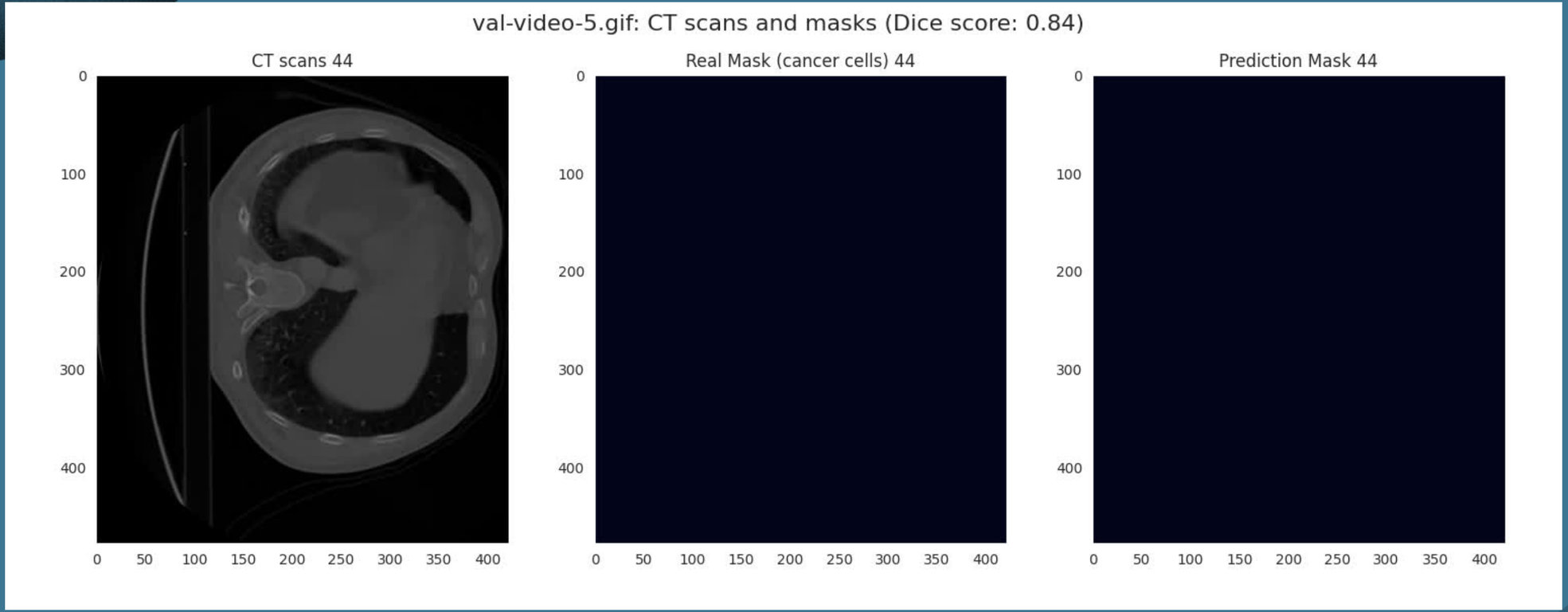

Figure 9 : Prediction on evaluation sample