

**HECKTOR 2025**  
**HEad and neCK TumOR Lesion Segmentation,  
Diagnosis and Prognosis Using Multimodal Data**  
**Fourth Edition**

 *Awards will be given to the  
top 3 teams per task*

 *+ 1 x NVIDIA DGX Spark  
prize from our sponsor*

 **جامعة محمد بن زايد  
للذكاء الاصطناعي**  
**MOHAMED BIN ZAYED UNIVERSITY  
OF ARTIFICIAL INTELLIGENCE**

 **BC  
CANCER** RESEARCH  
Provincial Health Services Authority

 **UNIVERSITÉ  
DE  
SHERBROOKE**

 **LATIM**  
Laboratoire de Traitement  
de l'Information Médicale  
of Imaging and Medical  
Information Processing

 **Inserm BECQUEREL**  
La science pour la santé  
From science to health  
UNICancer NORMANDIE-ROUEN

 **CENTRE HOSPITALIER  
UNIVERSITAIRE DE NANTES**

 **Institut de  
Cancérologie  
de l'Ouest**  
 **CHU  
NANTES**

 **CHU  
BREST**  
CENTRE HOSPITALIER  
UNIVERSITAIRE

 **CHUS**

 **Centre hospitalier  
universitaire  
de Sherbrooke**

 **MD Anderson  
Cancer Center**

 **Hes-SO  
VALAIS  
WALLIS**

 **USZ** **Universitäts  
Spital Zürich**

 **CHU  
de Poitiers**  
 **CHUV**

# HECKTOR 2025

*Less is More: Efficient PET/CT Segmentation and Multimodal Prediction of  
Recurrence-Free Survival and HPV Status in Head and Neck Cancer*

Lishan Cai, XingLong Liang, Tianyu Zhang, Jiaju Huang, Tao Tan, and Yunchao Yin  
Team MEDAI 23/09/2025

# Background

Head and Neck Cancers (HNC):

**5th** leading cancer by incidence

Radiotherapy (RT) – Standard Treatment

locoregional failures – **40%** patients after RT

**PET/CT** – diagnosis, prognosis, treatment planning and ...

Current trend – AI + PET/CT : **limited dataset**



## HECKTOR 2025 Challenge

- 
1. Primary gross tumor (GTVp) and involved lymph nodes (GTVn) segmentation
  2. Recurrence-Free Survival (RFS) Prediction
  3. HPV Status Classification

# Background

## Head and Neck Cancers (HNC):

**5th** leading cancer by incidence

Radiotherapy (RT) – Standard Treatment

locoregional failures – **40%** patients after RT

**PET/CT** – diagnosis, prognosis, treatment planning and ...

Current trend – AI + PET/CT : **limited dataset**

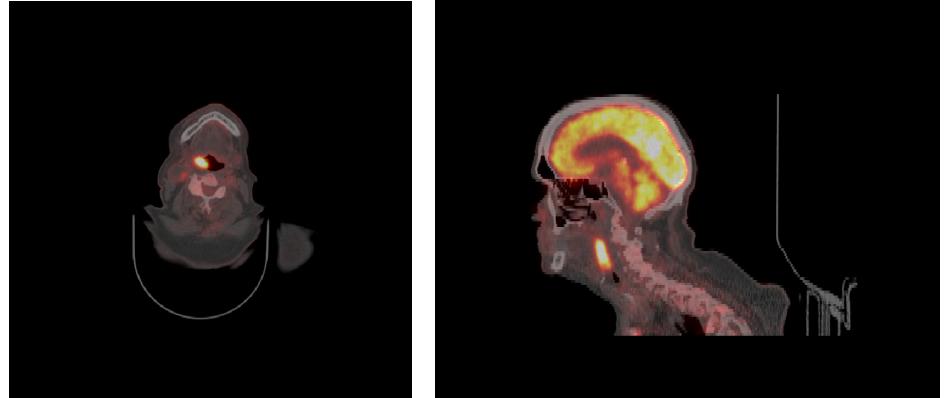


### HECKTOR 2025 Challenge

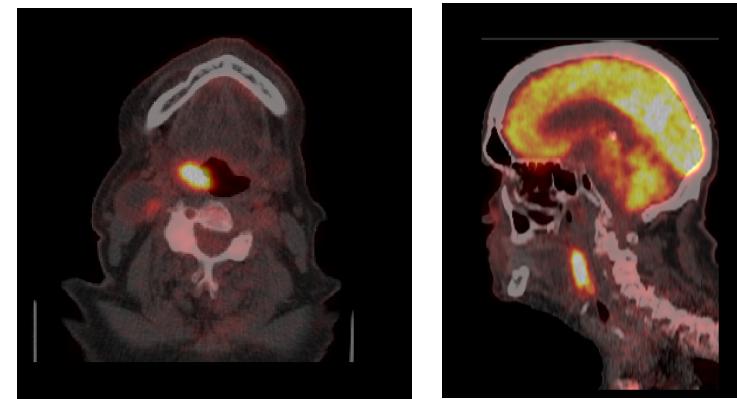
- 
1. Primary gross tumor (GTVp) and involved lymph nodes (GTVn) **segmentation**
  2. Recurrence-Free Survival (RFS) **Prediction**
  3. **HPV Status Classification**

# Data Preprocessing

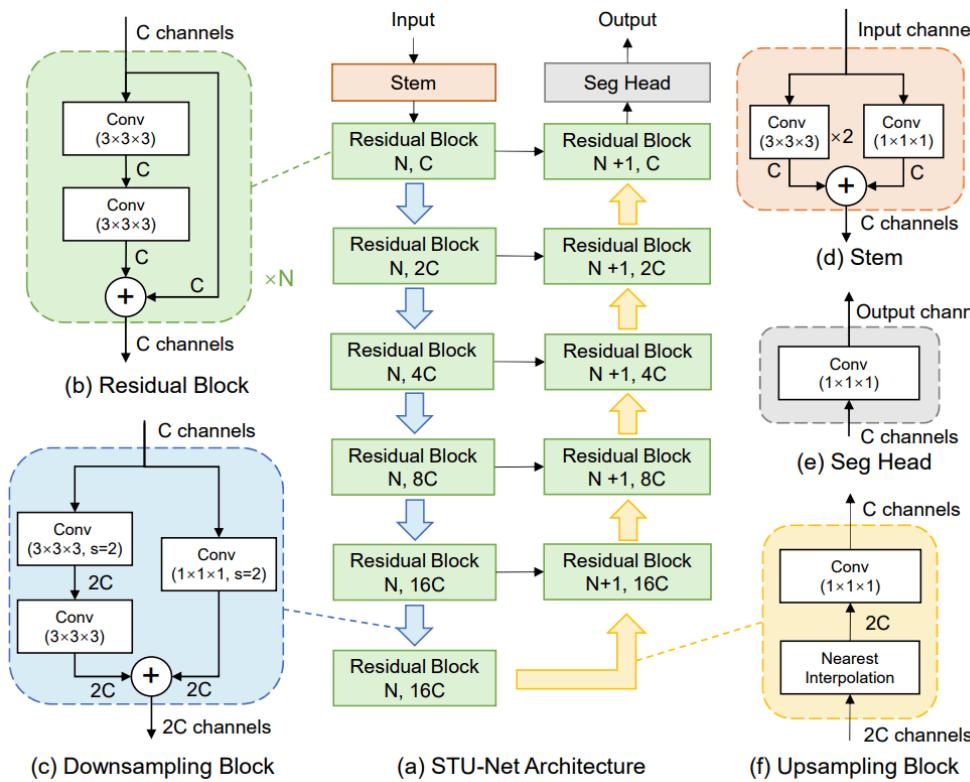
- Resampling to both CT/PET  $1 \times 1 \times 1$  mm
- Detect the top of the head (simple PET thresholding)
- Detect the H&N Centerline
- Crop the bounding box of **200**  $\times$  **200**  $\times$  **310**



↓ **Preprocessing**



# Methods: Task 1 GTVp and GTVn Segmentation



**STU-Net**

## Computational Expenses

	Param (M)	FLOPs (T)	Training Time (s)	Depth	Width
STU-Net-S	14.55	0.66	41	(1,1,1,1,1,1)	(16,32,64,128,256,256)
STU-Net-B	58.16	2.62	78	(1,1,1,1,1,1)	(32,64,128,256,512,512)

The comparison of computational cost of STU-Net-S and STU-Net-B  
Training time is per epoch

**5-Fold cross validation and 10-Fold cross validation using STU-Net-S**

**5-Fold cross validation using STU-Net-B**

nnUNet hyper-parameters configuration was used

NVIDIA RTX A6000

# Results: Task 1 GTVp and GTVn Segmentation

Table 1: Segmentation Performance Using 5-Fold Cross Validation

	Fold 1	Fold 2	Fold 3	Fold 4	Fold 5	Average
Dice (GTVp)	0.7307	0.6761	0.6921	0.6934	0.6790	0.6943
Dice (GTVn)	0.6399	0.6621	0.6862	0.6595	0.6632	0.6622
F1 (GTVn)	0.5942	0.6590	0.6768	0.6581	0.6269	0.6430

Table 2: Segmentation Performance Using 10-Fold Cross Validation

	Fold 1	Fold 2	Fold 3	Fold 4	Fold 5	Fold 6	Fold 7	Fold 8	Fold 9	Fold 10	Average
Dice (GTVp)	0.6891	0.7295	0.6586	0.7384	0.6710	0.6813	0.6551	0.6292	0.7027	0.6777	0.6833
Dice (GTVn)	0.6523	0.6290	0.6713	0.6170	0.5558	0.6528	0.6532	0.6423	0.6617	0.6232	0.6359
F1 (GTVn)	0.6165	0.6085	0.6748	0.5371	0.5573	0.5990	0.6096	0.6466	0.6078	0.5495	0.6007

Segmentation Performance Using 5-Fold Cross Validation (STU-Net-B)

	Fold 1	Fold 2	Fold 3	Fold 4	Fold 5	Average
Dice (GTVp)	0.7254	0.6744	0.6899	0.6974	0.6693	0.6913
Dice (GTVn)	0.6323	0.6885	0.6870	0.6831	0.6464	0.6675
F1 (GTVn)	0.5843	0.6751	0.6789	0.6481	0.6258	0.6424

The experiment setup is the same as 5-fold cross validation using STU-Net-S

# Results: Task 1 GTVp and GTVn Segmentation

Table 3: Leaderboard External Validation (Num≈50) of Segmentation Performance

	Ensemble (5-Fold)	Ensemble (10-Fold)
Dice (GTVp)	0.7626	0.7653
Dice (GTVn)	0.7931	0.7932
F1 (GTVn)	0.6385	0.6641

# Conclusion

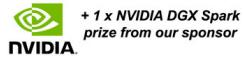
- STU-Net-S is lightweight yet efficient; larger, more complex models do not necessarily yield better segmentation.
- Ensemble is crucial for achieving strong segmentation performance.

# Acknowledgement



## HECKTOR 2025 HEad and neCK TumOR Lesion Segmentation, Diagnosis and Prognosis Using Multimodal Data *Fourth Edition*

Awards will be given to the  
top 3 teams per task



澳門理工大學  
Universidade Politécnica de Macau  
Macao Polytechnic University