AI-Based Tumor and Ablation Zone Segmentation for Liver Thermal Ablation

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FACTS & FIGURES

Start date:	01/05/2023
End date:	31/12/2028
IHI funding:	24.307 k€
Industry contribution:	21,458 k€
Total Cost:	45,765 k€
Project website:	https://imagio-project.eu
Social media:	linkedin/imagio-project

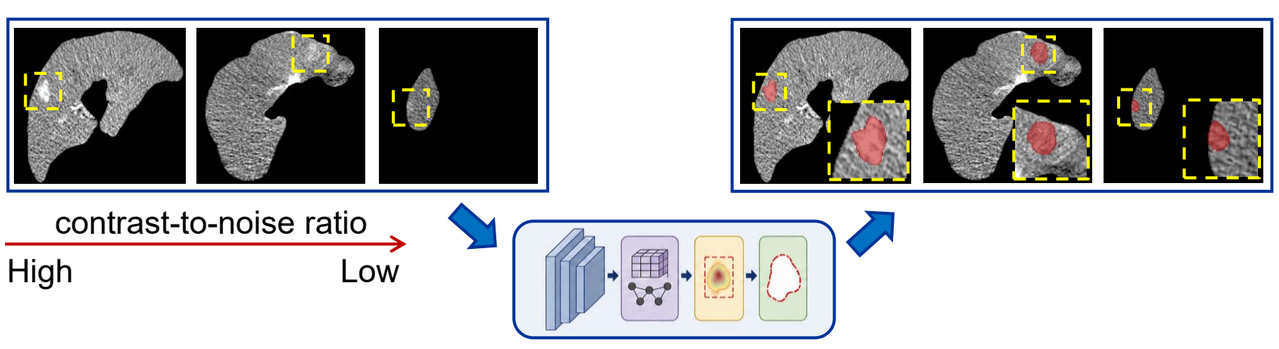
CHALLENGE

- Thermal ablation is a first-line treatment for early-stage HCC. Accurate tumor and ablation-zone segmentation is essential for treatment planning, prognostic modeling, and ablation-margin assessment. **IMAGIO aims to automate the time-consuming manual segmentation tasks using artificial intelligence (AI).**
- HCC tumors and ablation zones can have low visibility and poorly defined boundaries on CT. Moreover, tumors eligible for thermal ablation are typically small (≤3 cm). **Therefore, robust models are needed to handle low visibility and small tumors.**

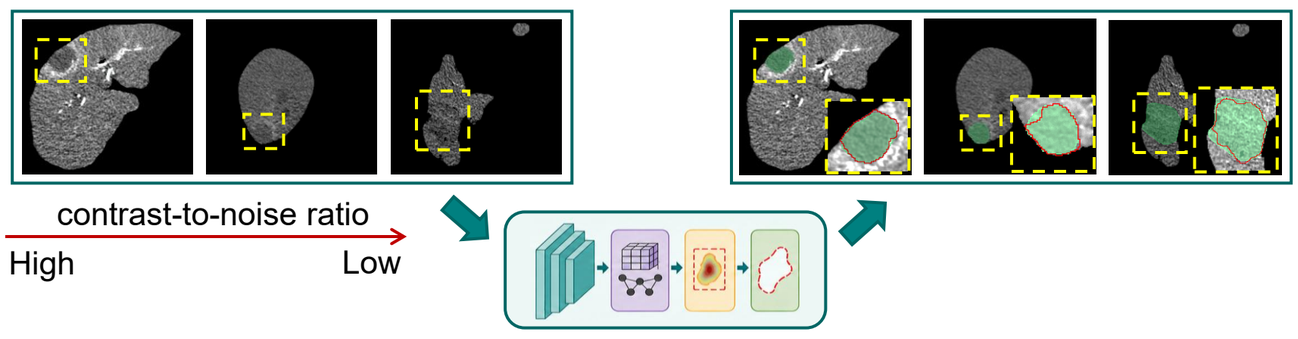
APPROACH & METHODOLOGY

- We used the contrast-to-noise ratio parameter to quantify tumor and ablation-zone visibility on CT images.
- We developed a camouflage-inspired model for automated tumor segmentation and a Fourier contour prediction model for automated ablation zone segmentation.
- We used a multicenter dataset for developing and testing of the models.

Tumor segmentation:

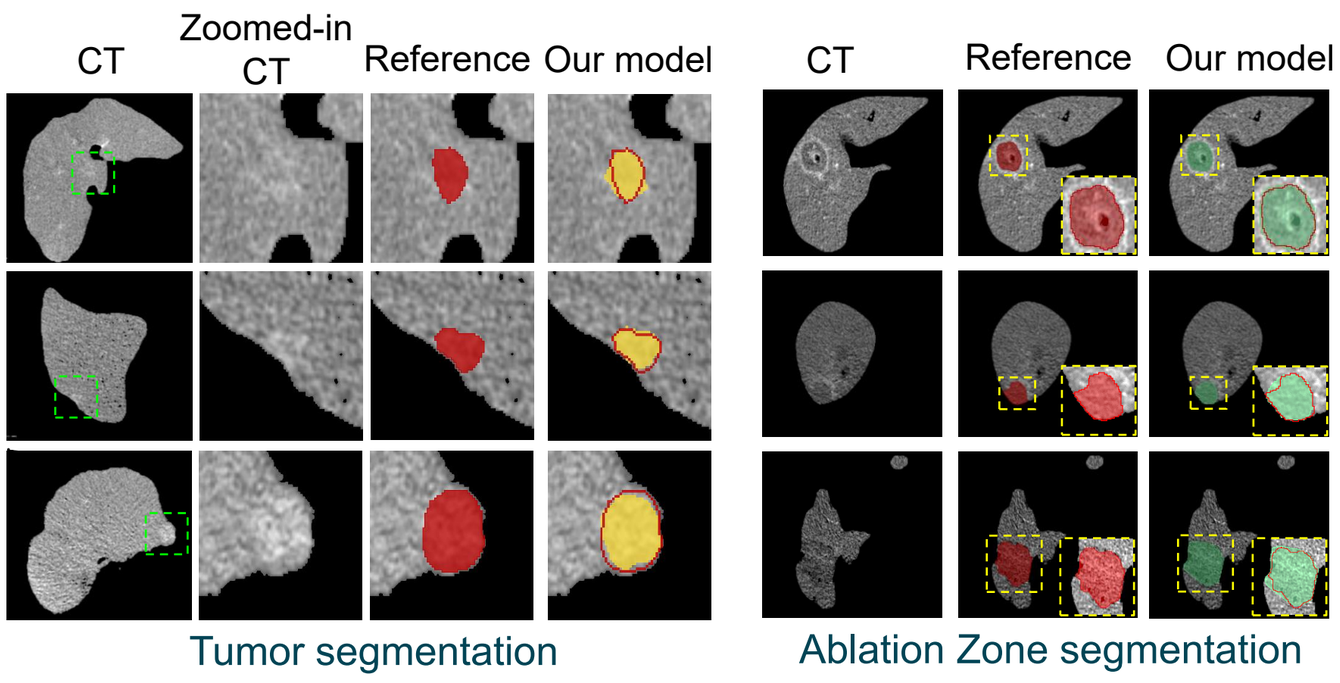


Ablation zone segmentation [1]:



RESULTS

Model	Dice coefficient score (%)	Hausdorff distance	Mean Surface Distance	Precision (%)	Sensitivity (%)
Tumor segmentation	78.5 ± 19.1	5.8 ± 2.6	0.9 ± 0.3	79.0 ± 2.5	79.1 ± 19.6
Ablation zone segmentation	83.8 ± 12.0	13.5 ± 15.2	1.8 ± 1.5	87.0 ± 10.1	84.2 ± 14.0



VALUE OF IHI COLLABORATION

The IHI public–private partnership provides an opportunity to combine clinical expertise, academic research, technical expertise, and industry perspectives. Within WP3 of the IMAGIO project, these collaborations have helped us better understand how to identify relevant clinical challenges through close interaction with clinicians and translate them into well-defined research questions. Collaboration with academic and technical experts enabled us to develop AI-based solutions to address these questions, while collaboration with industry partners provides insight into how these solutions can be translated into clinical practice and ultimately benefit patient care. In addition, IMAGIO provides opportunities to communicate our research to patients and society, strengthening the connection between research, healthcare, and the people it aims to benefit.

CAREER IMPACT

IMAGIO has broadened my experience beyond developing AI methods by exposing me to clinical translation, multicenter research, and interdisciplinary collaboration. Through WP3, I have developed skills in medical image analysis, AI, scientific communication, and collaboration with clinical and technical experts. This experience has strengthened my ability to translate research questions into clinically relevant AI solutions.

1. Gholamiankhah, Faeze, et al. "AblationNet: Deep network for ablation zone segmentation, in hepatic CT, using Fourier contours." *Biomedical Signal Processing and Control* 120 (2026): 110038.

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