Master's internship – 2026

Bronchoscopic Real-time Ablation Planning for Thermal Therapy

Supervision:

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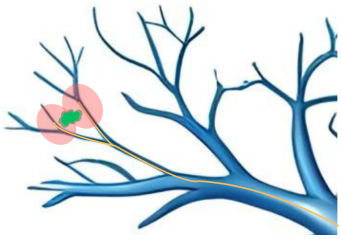
Context:

Lung cancer remains the leading cause of cancer-related mortality worldwide. Surgical robotics has transformed bronchoscopic navigation and biopsy by enabling precise access to small, peripherally located lung nodules. These systems use a highly maneuverable, ultra-thin catheter with real-time shape sensing, allowing operators to reach distal airway generations and maintain catheter stability throughout navigation. Beyond diagnostics, this robotic platform opens new possibilities for minimally invasive thermal ablation of peripheral tumors, using multi-deloyment / impact procedures from several distal bronchi surrounding the tumor, in order to destroy it without touching it with the catheter.



Work description:

The objective of this project is to facilitate the preoperative planning of a novel endoluminal thermal ablation strategy for peripheral lung tumors. The project builds on previous work by the team, where a fast simulation method for percutaneous thermal ablation of liver tumors based on chained neural cellular automata (C-NCA), a novel AI technique, was designed to support interactive planning.

In this project, the intern will extend this algorithm to develop an interactive planning tool that allows clinicians to manipulate catheter endpoints in distal bronchi and instantly visualize the resulting ablation zone, including tumor coverage and safety margins. In a second phase, the intern will study an automatic planning approach based on C-NCA to compute the optimal number and placement of catheter endpoints required for full tumor coverage. Key quantitative metrics, such as tumor coverage percentage, total ablation volume, and volume of healthy tissue affected, will be used in a validation study to assess the performance of the approach on various segmented datasets of lung volumes. This internship may be pursued in a subsequent PhD thesis.

References:

1. J. Mehtali, J. Verde , C. Essert. *C-NCA : Chained Neural Cellular Automata for Fast and Accurate Thermal Ablation Estimation*, In proceedings of MICCAI 2025, Daejeon, Republic of Korea, page 67–77, Springer, LNCS, Volume 15963, septembre 2025, *doi:10.1007/978-3-032-04965-0_7*
https://papers.miccai.org/miccai-2025/0156-Paper4370.html

Team and environment:

The internship will be part of a collaboration between multiple disciplines (image processing, geometric modelling, computational geometry, medicine) and co-supervised by experienced researchers and clinicians.

The intern will be hosted in an office at the ICube Institute, Illkirch Campus of Strasbourg, and have access to all the necessary hardware and IT resources. The intern will occasionally go to the IHU Strasbourg.

The development will be done in C++ and python.

Internship duration: 5-6 months, starting January, February or March 2026.

Profile: MSc with a major in computer science, computer graphics, image processing, or related fields. Proficiency in C++ is required, python recommended. Proficiency in English (oral and written) is required.

For further information and application, please contact the supervisors.