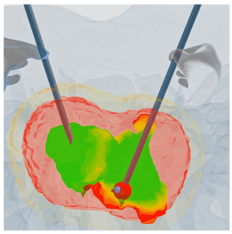
Master's internship – 2027

AR & Tracking for thermal ablation planning

Supervision:

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Context:



Thermal ablation is a minimally invasive technique used to destroy tumors from the inside using a needle with a heating tip. For the treatment to be effective and safe, clinicians need to plan precisely where to insert the needle and how much tissue will be destroyed. To support this planning step, our team has developed a fast simulation method based on AI that can instantly predict the ablation zone, based on the patient's anatomy and the ablation parameters. We have also developed VR visualization tools to facilitate the exploration of these simulations. The next challenge is to integrate the visualization tool and simulation in an augmented reality system that can be used to guide the procedure.

Work description:

This internship will address the research challenge of integrating 2D and 3D visual information for trajectory planning of percutaneous thermal ablation into an augmented reality system that can be used to guide the procedure in the operating room. The intern will be tasked with developing the AR system based on an off-the-shelf head-mounted display (HMD) and integrate existing planning visualization tools previously developed. The main research challenge will be to make sure the system is able to accurately track AR HMD relative to the patient's internal anatomy representation in order to provide an accurate overlay. To do so, the intern will implement and evaluate two different tracking strategies: 1) A marker-based approach where the camera feed of the HMD will be used to track radio-opaque reflective markers positioned on the patient's skin and 2) A markerless approach that will consist of aligning the surface of the patient's skin captured by the HMD's depth sensors with a skin model extracted from the planning scans.

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 and co-supervised by experienced researchers and clinicians in Strasbourg and Montreal.

The intern will be hosted in an office at the ICube Institute, Illkirch Campus of Strasbourg, France, and have access to all the necessary hardware and IT resources. The intern will also have access to the clinical experimental facility for translational research and the network of the IHU to collect expert feedback and validation. The intern will have to spend a minimum of 12 weeks in Montreal, Canada as part of the internship. Funding is already available to cover travel costs.

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, 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.