

Project Title: Image-guided tumor ablation with AI confirmation

- Summary phrase or short description
This is a comprehensive projects that involves 1. Computer-integrated interventions, 2. AI in medicine and 3. Medical image analysis. The students will gain hands-on experience in the above three areas in a clinical environment at NIH.
- **What Students Will Do:**
 1. Conduct phantom experiments using a clinical EM navigation system
 2. Observe clinical procedures and process clinical data
 3. Develop an algorithm for needle localization in CT images
 4. Train a deep learning model for ablation zone segmentation in contrast enhanced CT based on preliminary work at NIH
- **Deliverables:**
Report and/or presentation for phantom and clinical studies
- **Size group:** no more than 2
- **Skills:** It is desirable for the project to have graduate students with image processing experience.
- **Mentors:** Sheng Xu (xus2@cc.nih.gov), Michael Kassin (michael.kassin@nih.gov), Bradford J. Wood (bwood@cc.nih.gov)

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Computer Integrated Interventions



- Image guided biopsy and/or ablation using EM tracking
- Various research and commercial navigation systems
- Goal: Evaluate Imactics navigation in phantom and clinical studies
 - Patient mount field generator
 - Fully automatic registration
 - No modification of clinical devices



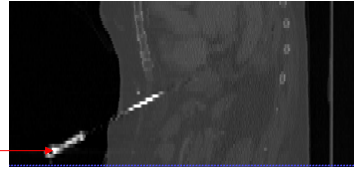
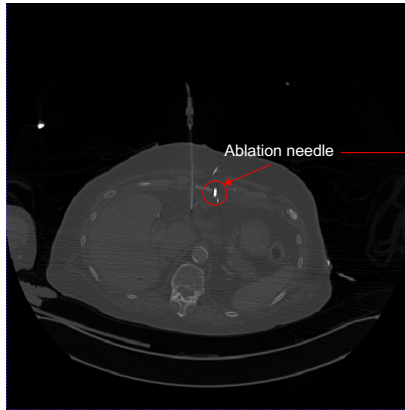
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Needle Localization in CT



- Develop an algorithm to segment the ablation needle in interventional CT
- Determine the orientation and the tip of the needle

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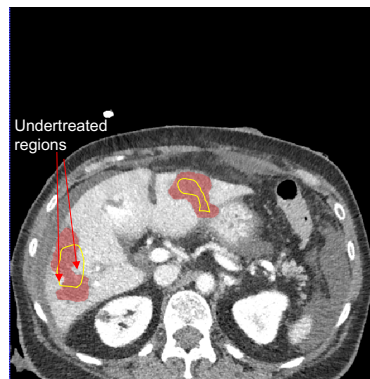
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AI Segmentation of Ablation Zones

- Train a deep learning model for ablation zone segmentation in post-ablation CT
 - The students can either develop their own algorithm or use existing NIH software to train the model.
 - Programming is optional (The preferred programming language is Python.)
- Assess ablation coverage of tumors to identify undertreated regions
 - Registration between pre- and post-ablation CT images can be done manually using existing software tools.



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