

High-Intensity Focused Ultrasound (HIFU) for Mechanical Ablation of Tumor

Project Description: High-intensity focused ultrasound (HIFU) can be used to ablate bulk tissue through inertial cavitation. When applying this minimally invasive technique, bubbles are excited and maintained to liquefy the target tissue. The main goal of this project is to develop a fast computational tool with reasonable accuracy that eventually could be seamlessly integrated into a HIFU surgical machine, and thereby guide the optimization of treatment plan, namely, effectively treating a target volume and efficiently covering the target region with an optimal scan format and ultrasonic administration specifics at each treatment location.

Job Description: We are seeking a skilled and motivated candidate interested in taking on an approach of combining experiment and numerical simulation for biomedical engineering research. Therefore, attention to details and ability to follow experimental protocols are expected of the candidate. The ideal candidate will have a background in thermal-fluids and experience in multiphase flow and/or heat/mass transfer, and a passion for coding. For instance, the candidate will use high-speed imaging equipment and obtain shadowgraphs for bubble clouds in parallel with prediction of cloud progression through coding. S/he also should have a can-do attitude and the willingness to explore new things, *e.g.*, image processing for determination of bubble cloud envelope. As another example, the 2nd year of this project would involve acceleration of the numerical simulation by using numerical results to train a deep learning network and incorporating physics-informed neural network into flow prediction.

Basic Qualifications of the Candidate:

- Master's or Bachelor's degree in Mechanical or Biomedical Engineering, Math, Statistics, or a related field with a focus on machine learning.
- Familiarity with programming languages MATLAB, C or Python.
- Experience in literature review, report drafting, and preparation of journal manuscripts.

This position is funded through Focused Research Extended Experience (FREE) scholarship at our Institute. We believe that this experience and the resulting publication(s) will help the candidate hone research skills and enhance his/her chance in obtaining offers from reputable graduate programs or industry. This position is available immediately. The term of employment spans two years, and the contract is structured for annual renewal.