USC Viterbi School of Engineering

Alfred E. Mann Department of Biomedical Engineering

Thursday, February 23, 2023 - 2 pm to 3 pm

Denney Research Center (DRB 145)

ZOOM Link Available Upon Request

Biomedical Engineering Seminar Series
Spring 2023

Dr. Rui Cao, Ph.D.

Postdoctoral Fellow,
Department of Medical Engineering,
California Institute of Technology

"Multiscale functional photoacoustic imaging for brain diseases and cancer diagnosis"

Abstract:

Cancer and cerebrovascular diseases are leading causes of death, accounting for ~20% of all deaths in the United States according to the CDC. A better understanding and accurate diagnosis of them are urgently needed for early disease detection, drug development, and improved patient outcomes. Photoacoustic tomography, a hybrid optical and ultrasound imaging modality, has the potential to revolutionize these efforts by leveraging its rich optical contrasts and tissue-scattering resistant ultrasound detections. Multiscale photoacoustic tomography allows imaging from organelles to whole organs, while the functional information can be quantified through multi-wavelength illumination and wavelength-dependent photoacoustic signal analysis.

In this seminar, I will first discuss functional photoacoustic microscopy of the brain, which enables in vivo imaging of hemodynamic and oxygen-metabolic parameters in the brain, providing valuable insights into brain diseases and dysfunctions. Then, I will introduce the clinical application of photoacoustic histology, which allows intraoperative evaluation of thick bone specimens without the need for tissue sectioning or staining. With deep learning and optical wavefront engineering techniques, it can generate virtually stained images with an extended depth of field for cancer diagnosis. Additionally, I will present our recent research highlighting the potential of photoacoustic computed tomography for deep tissue imaging, especially for human breast cancer and human brain functions.

Biography:

Rui Cao is currently an NIH T32 postdoctoral fellow With Dr. Lihong V. Wang in the Department of Medical Engineering at the California Institute of Technology. He received his master's degree in Optical Engineering and bachelor's degree in Optoelectronics from Nankai University. He obtained his Ph.D. in Biomedical Engineering from the University of Virginia in 2018, working on multi-parametric photoacoustic microscopy of cerebral hemodynamics and oxygen metabolism. His current postdoc research focuses on translating photoacoustic imaging techniques into clinics, including rapid intraoperative histology and human breast and brain imaging. His work received Seno Medical Best Paper Award at SPIE Photonics West in 2022.

Host: Stacey Finley sfinley@usc.edu