The Department of Mechanical Engineering
College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

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Noninvasive Tissue Characterization and Monitoring with Diffuse Optical Imaging
Friday, October 20th, at 12:00 PM, Room 173 Light Engineering Building

Abstract

For disease characterization and evaluation of intervention efficacy, there is a strong need for imaging modalities that can provide (bio)markers fast, frequently, and noninvasively. Diffuse optical imaging (DOI) is a promising tool for fulfilling this niche. By combining multiple techniques, DOI can simultaneously quantify functional and metabolic contrasts such as tissue blood flow, oxygenation, and oxygen/cellular metabolism, without the need for contrast agent administration, which is particularly attractive for early diagnosis and intraoperative evaluation in real-time. Additionally, fluorescence imaging can play a significant role in disease visualization by providing high molecular contrast and sensitivity with real-time, noncontact, and large field-of-view capabilities that are attractive for intraoperative imaging. In the first part of the talk, results from neuroimaging applications will be presented. I will show recent results from traumatic brain injury monitoring in the neurointensive care unit, demonstrating that noninvasive optical measures have a high correlation with invasive neuromonitoring metrics. Next, I will present an in vivo demonstration of a novel, dual-channel, dual-modal theranostic endoscope that allows imaging, therapeutic light delivery, and light-triggered release of doxorubicin (Dox) from liposomes to optimize Dox bioavailability at tumor sites. The endoscopic platform is very suitable for imaging and therapy monitoring of ovarian, brain, lung, and colon cancers. Overall, portable and fast multimodal instrumentation has allowed us to study tissue in a variety of physiological contexts, including cancer diagnosis and therapy monitoring, as well as the characterization of neurological disorders in both preclinical and clinical settings.

Biography

Dr. Sunar is a SUNY Empire Innovation Associate Professor in the Dept. of Biomedical Engineering at Stony Brook University. He earned his Ph.D. degree in the Department of Physics and Astronomy at the University of Pennsylvania, Philadelphia, in the research area of diffuse optical imaging for early assessment of the therapy response. His current research areas include the development and applications of quantitative optical imaging tools for metabolic and functional imaging for the characterization of cancer and neurological diseases in preclinical and clinical settings. He is a recent NIH Brain Initiative awardee for developing innovative technology for neuromonitoring of patients with acute brain injuries in the NeuroICU, and an NCI R01 awardee for developing an imaging platform to map intraperitoneal ovarian metastases as well as treat them effectively via targeted chemo-photo therapy.