Indian Institute of Science

Centre for BioSystems Science and Engineering

BSSE Seminar

At 4:00 PM on 3rd December 2018

MRDG seminar hall, 1st Floor Biological Sciences Building

Quantitative ultrasound imaging techniques for tissue characterization

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Abstract

Ultrasound is a point-of-care imaging modality that can improve access to cutting edge healthcare. However, conventional ultrasound lacks information about tissue stiffness and structure, which are valuable for enabling objective diagnosis. Quantitative ultrasound-based technologies can extract structural and mechanical properties nondestructively and aid tissue characterization and diagnosis of pathologies. For example, integrated backscatter imaging compensates for ultrasound beam diffraction, system-dependent parameters, and acoustic attenuation, to obtain features based on the intrinsic backscatter from tissue. Shear wave elasticity imaging exploits the shear wave generated by an ultrasound beam and extracts tissue stiffness parameters based on the measured shear wave velocity. I will discuss research efforts to assess the structure and stiffness of 3-D tissue-engineered constructs, which can help guide their fabrication. I will demonstrate the feasibility of estimating cell concentration and detecting spatial variations in the structure of collagen scaffolds using integrated backscatter imaging, and report on shear wave elasticity imaging for estimating the elastic modulus of constructs. Next, I will discuss the in vitro evaluation of shear wave elasticity imaging for predicting thrombolytic susceptibility, which is relevant in multiple diseases including stroke and deep vein thrombosis. Finally, I will propose future research plans focused on developing quantitative ultrasound techniques for objective diagnosis of cancer and ophthalmic pathologies.

About the Speaker

Dr. Karla P. Mercado-Shekhar received a bachelor's degree in Biomedical Engineering from Boston University in 2009. During her undergraduate studies, she availed the opportunity to conduct research in ultrasound imaging at Brigham and Women's Hospital, Harvard Medical School. She received a Master of Science (2010) and Doctoral degree (2015) from the University of Rochester, where she was the recipient of the Provost's fellowship. Her doctoral research focused on ultrasound imaging and quantitative characterization of tissue-engineered constructs. Her doctoral work was recognized with two Best Student Paper awards from the Acoustical Society of America and a Best Poster award from IEEE. She is presently a Postdoctoral Fellow at the University of Cincinnati College of Medicine. She is a recipient of a postdoctoral research grant from the National Institutes of Health, which is focused on developing ultrasound shear wave elasticity imaging to predict susceptibility to thrombolytic therapy. Dr. Mercado-Shekhar's future research interests lie in cancer and ophthalmic imaging and tissue characterization.