Committee on Medical Physics Seminar

"Analyzer Based Phase-Contrast X-ray Mammography"

Presented by

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Abstract: Analyzer-based phase contrast X-ray imaging (ABI) permits visualization of soft-tissue structures (such as in mammography) that are not detectable by use of conventional X-ray methods, at reduced radiation dose to the patient. Therefore, it holds great potential for a wide range of human, small-animal, and microscopic bioimaging applications. ABI utilizes a semiconductor crystal, called an analyzer, to selectively measure certain the angular content of an X-ray beam (on the order of microradians) after it passes through the object. These tiny beam deflections reveal extremely fine detail, allowing extraordinary image quality for mammography and other soft-tissue applications. The journal Academic Radiology has called this technique the “third wave” in imaging breakthroughs, following shadowgraph imaging and computed tomography (CT). ABI has been well documented to produce extraordinary images at synchrotron facilities, but compact ABI prototypes have required imaging times that are far longer than what is practical for clinical use. In this talk we will discuss a breakthrough approach, including a number of innovative design concepts that, when combined, are expected to deliver whole-breast imaging at 100 µm resolution in 10 seconds.
Bio: Dr. Jovan G. Brankov is Associate Professor of Electrical and Computer Engineering, Associate Professor of Biomedical Engineering and Director of Advance X-ray Imaging Laboratory (AXIL) at IIT. He has diverse research interests related to medical imaging, image processing and machine learning. His research focuses on applications of machine learning for medical image quality assessment based on a human-observer model and image processing in the fields of medical imaging. More recently he has been leading hardware and software development of several novel imaging systems, including phase-sensitive x-ray (DEI/MIR) imaging and agent-derived early photon tomography (ADEPT).

Dr. Brankov has been awarded over $4.0 million in NIH grants as Principal Investigator (P.I.) or subcontract P.I., and have been a key investigator on many grants totalling over $14 million in past 10 years. He is author/co-author of 150 publications, 2 technical reports, 2 patents and a book chapter on ABI imaging. His is currently serving as: associate editor for Transaction on Medical Imaging (IEEE), Medical Physics (AAPM) and Journal of Medical Imaging (SPIE), program committee member for IEEE International Symposium on Biomedical Imaging and SPIE Image Perception conferences and member of BioImaging and Signal Processing (BISP) Technical Committee of the IEEE Signal Processing Society. He also served as ad hoc reviewer for the NIH BMIT-A and B study sections. He is a member of SPIE, Sigma Xi and senior member of IEEE technical communities.