FIU Engineering & Computing
Biomedical Engineering

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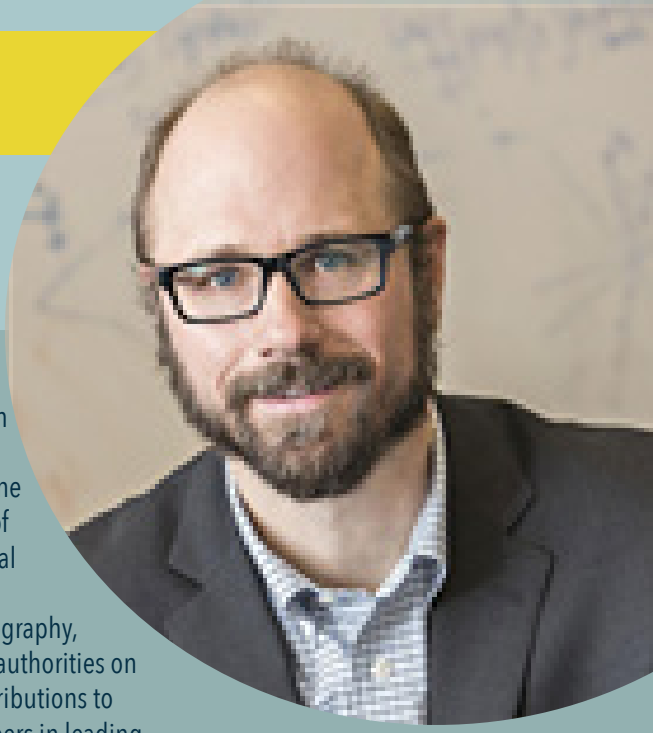
Friday, March 6, 2020

Wallace H. Coulter Foundation
Biomedical Engineering Seminar Series



DR. MARK ANASTASIO is the Donald Biggar Willett Professor in Engineering and the Head of the Department of Bioengineering at the University of Illinois at Urbana-Champaign (UIUC). Before joining UIUC in 2019, he was a Professor of Biomedical Engineering at Washington University in St. Louis, where he established one of the nation's first stand-alone PhD programs in imaging science. Dr. Anastasio's research accomplishments to the fields of biomedical imaging and image science have been numerous and impactful and his general interests broadly address the computational aspects of image formation, modern imaging science, and machine learning. He has conducted research in the fields of diffraction tomography, X-ray phase-contrast imaging, and ultrasound tomography. He one of the world's leading authorities on photoacoustic computed tomography (PACT) and has made numerous and important contributions to development of PACT for over fifteen years. He has published over 140 peer-reviewed papers in leading imaging and optical science journals and was the recipient of a National Science Foundation (NSF) CAREER Award to develop image reconstruction methods. He is a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and the SPIE and currently serves as the Chair of the NIH EITA Study Section.

DR. MARK ANASTASIO

Professor and Head of Bioengineering

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Machine learning-enabled imaging science

ABSTRACT: Machine learning methods are having a profound impact on the field of biomedical imaging. They are being widely employed to perform image-based inferences such as detecting abnormalities in medical images. Moreover, machine learning methods are being actively explored to advance the ways that images are reconstructed in computed imaging modalities and the ways that imaging systems are optimized. It is widely accepted that optimization of medical imaging systems should be guided by task-based measures of image quality (IQ). Task-based measures of IQ quantify the ability of an observer to perform a specified task such as detection or estimation of a signal (e.g., a tumor). In this work, we describe supervised learning-based methods to compute task-based measures of image quality to guide imaging system optimization. Namely, convolutional neural networks (CNNs) are employed to approximate the Ideal Observer test statistic for both a binary signal detection task and a joint signal detection-localization task. We also investigate an augmented generative adversarial network (GAN) architecture named AmbientGAN for learning the statistical distributions of objects from raw imaging measurements, which can further enable the optimization of imaging system designs for specific diagnostic tasks. We will also review our recent advancements in image reconstruction based on GANs and invertible deep generative neural networks with application to MRI.

Through the generous support of the Wallace H. Coulter Foundation the Department of Biomedical Engineering facilitates weekly lectures each year during academic terms. Experts in all areas of Biomedical Engineering are invited to campus to provide a research seminar and to meet with faculty and students and to tour our academic and research facilities.

Friday, March 6, 2020
3:00PM-4:00PM Room EC 2300