COLLEGE OF ENGINEERING

BENJAMIN FRANKLIN NEXTGEN AWARD LAUREATE LECTURE

Equitable Medical Imaging

Medical imaging allows us to peer into the body to provide diagnostic or surgical guidance information. Ultrasound imaging transmits sound that is reflected and detected by a sensor array placed in contact with the skin, while photoacoustic imaging transmits light that is absorbed, causing thermal expansion, which generates sound that can be detected with the same senor array. In both cases, the sensed signals are processed using beamformers to display images. Conventional beamformers, however, exclusively rely on signal amplitudes, ignore the impact of light transmission through darker skin tones, or assume uniform properties (e.g., sound speed) which overlook naturally occurring intra- and inter-patient variations. In this talk, I will provide real-world examples of the medical imaging inequities that result from conventional beamformer design choices. I will then describe techniques to address these inequities using signal processing innovations that consider spatial correlations rather than signal amplitudes. Specific clinical applications that have the greatest potential to benefit from a coherence-based imaging approach include cardiovascular health assessments, breast cancer diagnosis and treatment, biopsies, neurosurgery, teleoperated robotic surgery, and wearable health applications with flexible arrays.

Speaker Bio:

Muyinatu Bell is the John C. Malone Associate Professor of Electrical and Computer Engineering, Biomedical Engineering, and Computer Science at Johns Hopkins University, where she founded and directs the Photoacoustic and Ultrasonic Systems Engineering (PULSE) Lab (https://pulselab.jhu.edu). Prof. Bell holds a doctorate in biomedical engineering from Duke University and a bachelor's in mechanical engineering from the Massachusetts Institute of Technology. She is the Editor-in-Chief of the *Journal of Biomedical Optics,* having previously served as Associate Editor-in-Chief of IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (T-UFFC), Associate Editor of IEEE Transactions on Medical Imaging, and as an

Editorial Advisory Board member of GEN Biotechnology. She is also a member of the Chan Zuckerberg Initiative (CZI) Imaging Program Scientific Advisory Board. Her research is funded by leading government agencies and private foundations, including the NIH, NSF, ARPA-H, and CZI, with with patents issued and/or pending for short-lag spatial coherence beamforming, photoacoustic-guided surgery, and deep learning for beamforming. Among her numerous awards and honors, Prof. Bell has been recognized with MIT Technology Review's Innovator Under 35 Award (2016), the NSF CAREER Award (2018), the NIH Trailblazer Award (2018), the Alfred P. Sloan Research Fellowship (2019), Maryland's Outstanding Young Engineer Award (2019), the SPIE Early Career Achievement Award (2021), the IEEE Ultrasonics Early Career Investigator Award (2022), and the NSF Alan T. Waterman Award (2024). Prof. Bell is a Fellow of AIMBE, SPIE, and Optica.

Open to the public (registration required)

Registration: https://forms.office.com/r/Yu2WUM1qaK (in-person)
https://forms.office.com/r/5wWn9ee9pq (virtual)

For more information, contact Fauzia Ahmad at fauzia.ahmad@temple.edu.