
Electrical & Computer Engineering

SEMINAR

Louisiana State University

Harnessing and Manipulating Mid-Infrared Light for Biosensing

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Abstract—The mid-infrared (mid-IR) region of the electromagnetic spectrum, also known as the molecular fingerprint region, has long been a focus of scientific and technological research. Mid-IR microscopy is a non-destructive tool that can measure the molecular content of biological samples by probing fundamental vibrational modes, with potential applications in early disease detection and diagnosis. However, limitations such as long acquisition times, limited spatial detail, and a lack of understanding of light-matter interactions have impeded progress in this field. In this talk, I will present advanced mid-IR spectroscopic imaging platforms that address these challenges by using a decision theory framework to improve perceived spatial resolution and enabling label-free classification of surgical tissue sections within minutes. Additionally, I will discuss the development of technology for imaging site-specific chirality of molecules, including the specific challenges and roadblocks to creating a viable and accurate system. The focus of this talk is on using theory and modeling to guide the development of measurement technology and open new opportunities for understanding biomolecules.

Bio—Yamuna Phal is a Ph.D. candidate in Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC). She received her B.Tech. from Indian Institute of Technology Roorkee (IIT-R) and an M.S. from California Institute of Technology (Caltech) in Electrical Engineering. Prior to joining the University of Illinois, Yamuna worked as an analog research engineer for Finisar and the Swedish Institute of Space Physics. Currently, she is working with Professor Rohit Bhargava's research group to develop next-generation IR imaging instruments. Yamuna has been recognized for her research through several scientific awards and publications, including her invention of VCD imaging [patented technology] and the use of decision theory to provide an analytical formulation for the resolution limit for spectral imaging systems. Her work has been featured on the covers of *Analytical Chemistry* and *Journal of Physical Chemistry C*. Additionally, Yamuna has been recognized for her teaching and mentoring skills, receiving awards such as the Harold Olsen Award and E. A. Reid Fellowship for undergraduate teaching and engineering education at UIUC. Four of her mentored teams have also won awards, including the best engineered project award for ECE senior design capstone project.

When: Friday, 10 March 2023, 10:30 - 11:30

Where: Room 3316E Patrick F. Taylor Hall

Info: <https://www.lsu.edu/eng/ece/seminar>

