



UCF

COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

# FACULTY RESEARCH TALKS

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Zoom talk | Friday, Nov. 1, 2024 | Noon to 1 p.m.



PRESENTER 1:

**JING HU**

Assistant Professor  
Civil, Environmental  
and Construction  
Engineering

## **Biogeochemistry in Managed Soil and Water Systems for Mitigating Greenhouse Gas Emissions and Improving Water Quality**

Biogeochemistry is an interdisciplinary study exploring the physical, chemical and biological processes that are mediated by both biotic and abiotic components, which result in the cycling of elements such as carbon, nitrogen and phosphorus. Human activities have substantially altered the biogeochemical cycling of several key elements in the soil and water systems, leading to adverse environmental consequences. In this talk, Dr. Hu will discuss her research, which draws upon the knowledge of biogeochemistry: using nature-based solutions and ecological engineering to mitigate greenhouse gas emissions and enhance water quality.

Prior to joining UCF, Dr. Hu was an assistant research professor in the Geosystems Research Institute at Mississippi State University. She received her doctorate from the University of Florida in soil and water sciences, and master's and bachelor's degrees from China Agricultural University, specializing in agricultural, bio-environmental and energy engineering. Her research interests are in biogeochemistry in managed soil and water systems, with an emphasis on greenhouse gas emission mitigation, and nature and ecological engineering based solutions for water quality improvement.

## **Physics-Aware Safe AI for Net-Zero Energy Systems**

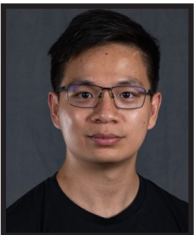
Achieving net-zero energy systems will require concerted action across society, including the development of innovative technologies. Although artificial intelligence (AI) and machine learning methods have significant potential to play an important role, they often struggle to contend with the physics, hard constraints, scalability and privacy issues that are inherent through the adoption of distributed renewable energy sources and demand response programs. To address these limitations, Dr. Wu will present a framework of physics-aware safe AI by advancing graph signal processing and demonstrate how it can enable the design of AI models that explicitly capture relevant constraints and decision-making processes.

Dr. Wu received his doctoral degree in information engineering from Chinese University of Hong Kong in 2021. From September 2021 to August 2024, he was a postdoctoral associate at Cornell University. His research interests include safe reinforcement learning, graph signal processing and graph neural networks in power systems.

## **Integrating Machine Learning and Physics for Intelligent Cyber-Physical Systems**

Cyber-physical systems (CPS) are becoming increasingly prevalent, and integrating machine learning is essential to enhance their performance and autonomy. Dr. Nghiem's research focuses on developing intelligent CPS by integrating machine learning with physics, control, optimization and computing. This presentation will provide an overview of his work on data-driven modeling, physics-informed machine learning, active learning, learning-based control and adaptive sampling to improve CPS efficiency, with applications in HVAC systems and robotics.

Dr. Nghiem received his doctorate in electrical and systems engineering from the University of Pennsylvania. Before joining UCF, he was an assistant professor then an associate professor at Northern Arizona University. His research focuses on developing integrated frameworks leveraging control, optimization, machine learning and advanced computing to tackle challenges in cyber-physical systems. He is a recipient of the NSF CAREER Award and the NSF ERI Award. He is a Senior Member of the Institute of Electrical and Electronics Engineers.



PRESENTER 2:

**TONG WU**

Assistant Professor  
Electrical and  
Computer Engineering



PRESENTER 3:

**TRUONG NGHIEM**

Associate Professor  
Electrical and Computer  
Engineering; Modeling,  
Simulation and Training;  
Knights Digital Twin  
Initiative

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