Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
College *of* Engineering

Fall 2024 Seminar Series

Seminar Title: ***Radio Frequency Systems and Signal Processing Techniques for Indoor Sensing Tasks - Localization, Ranging, and Device-Free Object Detection***

Time: 3:00-3:50 PM, Monday, Sept 23, 2024
Location: Holden Hall 104

Speaker:
Guoyi Xu
Columbia University

Abstract:
The Internet of Things (IoT) envisions technologies featuring radio frequency signals and systems as one of the most important media for both communications and sensing. This talk will focus on the design and implementation of RF systems and signal processing techniques for a variety of indoor sensing tasks. As localization of RF markers is a critical technology with many applications, the talk will start with our work on precision localization of RFID tags. Unlike conventional techniques, we invented a signal processing framework that leveraged spatial diversity of transmitter and receiver antenna locations as measuring points to achieve millimeter-level 3D localization accuracy using a narrow-band signal, and implemented the system on Universal Software Radio Peripheral (USRP) platform at 1 GHz. Then, I will discuss our work on indoor device-free object detection using widely deployed ambient RFID tags and commercial RFID readers, achieving decimeter-level detection accuracy for human occupants in an indoor setting. Finally, I will briefly discuss our ongoing works in communication-assisted sensing, where we exploited the properties of orthogonal frequency division multiplexing (OFDM) waveform for distance measurements, enabling joint communication and sensing (JCAS). The system was implemented on Sivers 60 GHz front-end modules with USRP baseband processor.

Speaker Bio:
Dr. Guoyi Xu received the B. Eng. degree in electrical engineering from the University of Electronic Science and Technology of China in 2018, and the Ph.D. degree in electrical and computer engineering from Cornell University in 2023, advised by Prof. Edwin Kan. He is currently a postdoctoral research scientist with Prof. Harish Krishnaswamy in the Department of Electrical Engineering at Columbia University.