MISSISSIPPI STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

**ECE Research Seminar (Virtual Event*)**
**September 18, Friday, 2 – 3 pm**

# Can the GPS Chip on Your Phone Help Beat the Climate Change?

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**Abstract:** In this talk, I will introduce a "Microwave Farms" concept for precision agriculture driven by Signals of Opportunity (SoOp) and received by smartphones deployed on small drones. In broad terms, "Microwave Farms" opportunistically reutilizes any anthropogenic signals for remote sensing, which are not normally intended for remote sensing. SoOp instruments do not require any spectrum approvals, high-gain directional antennas or onboard transmitters. By using small drones, SoOp can provide measurements that are sensitive to soil moisture up to the root-zone and water content of dense vegetation at high spatial resolutions. First, I will introduce ongoing research examples on the application of the SoOp Coherent Bistatic (SCoBi) Scattering Model and its Simulator to (1) L-band Global Navigation Satellite System (GNSS) signals as they are an excellent example of a widely available system, and (2) military geostationary communication satellite signals at P-bands, as they can interact deeper into the ground. Finally, I will highlight the ongoing experimental efforts to demonstrate how smartphones can be turned into a "bistatic passive radar" through reception of the ambient reflected GPS signals by their internal antennas and GPS chipsets to perform microwave remote sensing of water in soil. These efforts will help build a future where most farmer will have several low-cost drones that provide remote sensing data streams using smartphones as comprehensive computing and microwave remote sensing units that will optimize water utilization.

**Biographical info:**

Dr. Mehmet Kurum received the B.S. degree in electrical and electronics engineering from Bogazici University, Istanbul, Turkey, in 2003, and the M.S. and Ph.D. degrees in electrical engineering from the George Washington University, Washington, DC, USA, in 2005 and 2009, respectively. After completing the PhD, he was awarded a postdoctoral position at Hydrological Sciences Laboratory (HSL) of NASA Goddard Space Flight Center (GSFC), Greenbelt, Maryland where he worked on development of soil moisture retrieval algorithms and EM scattering/emission simulations in support of the NASA Soil Moisture Active Passive (SMAP) satellite mission. During that time, he has also served as the laboratory manager of the Hydrology Wet Lab at NASA GSFC HSL for a year. In 2016, he joined at the department of electrical and computer engineering of Mississippi State University as an assistant professor. He is currently Co-director of InforMation PRocessing and SenSing (IMPRESS) Laboratory. His experience covers basic and applied research, ranging from the design, building, and experimentation of active/passive microwave systems to the theoretical analysis and development of advanced microwave models for a broad spectrum of Earth observation applications such as land surface hydrology, vegetation, and disaster management. His current research involves low technology readiness level (TRL) remote sensing problems via signals of opportunity (SoOp) from small Unmanned Aircraft Systems (UAS) to Small Satellites Platforms, Sensor fusion/ Machine Learning for Inverse problems, Smartphone/Radar Sensing, and High-resolution Earth Imaging.

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