Software-defined Radios for Cognitive Connected Robots and Autonomous Systems

A weeklong summer camp for high-school students

Florida Atlantic University College of Engineering and Computer Science

June 28, 2021 - July 2, 2021

The use of the electromagnetic spectrum (EMS) is becoming increasingly more important as sensing, communications, and networking are tightly integrated in autonomous systems and create unique challenges as a core part of future beyond 5G and wireless Internet-of-Things (IoT) technology. Software-defined radios (SDRs) provide a flexible hardware platform to capture, visualize and process real-world EMS signals. Furthermore, existing and emerging software tools provide unprecedented capabilities to manage and control the electromagnetic spectrum and, in particular, radio frequency signals.

Participants will:
- Receive a hands-on, practical introduction to fundamental aspects of the current state-of-the-art in digital signal processing and machine learning for wireless communications, cognitive wireless connected robots, and autonomous systems
- Learn how to write code to implement and deploy software-defined radio applications that perform local radio spectrum monitoring and build methods for managing local interference inherent in radio control of autonomous unmanned systems that can move in the two-dimensional space
- Learn the basics of radio propagation, digital signal processing and machine learning for radio-frequency wireless communications, spectrum sensing and interference management as well as associated programming frameworks and libraries
- See examples of SDR applications for interference-avoiding wireless communications in Wi-Fi radio and acoustic frequencies for unmanned underwater and airborne vehicles
- Develop a better awareness of wireless technologies that support a new class of autonomous networked (and tele-operated) robots and (ii) adaptive swarming intelligence (for connected schools of robots) in resource-constrained and challenging propagation environments.

Program Requirements:
- Open to all rising 10th, 11th, 12th graders with a 3.25 HS GPA
- Must have experience with basic computer programming (Python, C) and Discrete Signal Processing (e.g. filtering and sampling)
**Program Costs:**
$600-includes one week of course instruction, FAU Engineering Swag Bag, and Certificate of Completion

**Program Contact:**
Jessica Hibberd, M.Ed., Associate Director, Student Success & Community Outreach
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**About the Professor**

**George Sklivanitis, Ph.D.** is a Research Assistant Professor and a faculty fellow with the Institute for Sensing and Embedded Network Systems Engineering (I-SENSE) in the College of Engineering and Computer Science at Florida Atlantic University (FAU).

His research focuses on modeling, optimization and experimental evaluation of autonomous networked systems in challenging, congested (and sometimes contested) communication environments such as underwater, in the sky and in space. He has made leading contributions in the design and implementation of software-defined radio testbeds for cognitive wireless radio-frequency communications and adaptive high-speed underwater acoustic networks. Currently, he investigates the development of robust signal processing and machine learning algorithms that will enable the deployment of truly smart wireless radios that can self-localize, self-optimize spectrum access and dynamically route traffic to build resilient, self-healing wireless networks.

Dr. Sklivanitis is a member of the ACM, IEEE Communications, IEEE Signal Processing and IEEE Oceanic Engineering Societies. Since 2017, he serves as the co-organizer and technical program committee co-chair of the IEEE INFOCOM Workshop on Wireless Communications and Networking in Extreme Environments (WCNEE).

He has won several teaching, research & entrepreneurship awards, including:

- 2021 winner of the World Ocean Initiative’s Ocean Changemaker Challenge
- Best Paper Award Finalist in the 15th IEEE International Workshop on Antenna Technology (iWAT-2019)
- 2018 FAU Tech Runway Launch Competition Finalist
- 2017 SUNY Chancellor’s Award
- Best Demo Award in the 10th ACM International Conference on Underwater Networks and Systems (WUWNet-2015)
- 2015 SUNY Buffalo Graduate Student Award for Excellence in Teaching
- First finalist and winner of the U.S. Academic National Contest on Software Defined Radios that was organized by Nutaq Inc (2014)