



NEW FACULTY MEMBER

Picking Up the Signal

Many ECE challenges include finding and following the correct signal in the din of a noisy background, and Mary Lanzerotti's work has brought further clarity to researchers in pursuit of strong signals. She works toward this goal in the lab, in the classroom, and beyond.

After serving as an assistant professor at the United States Military Academy for three years, Lanzerotti joined ECE as a collegiate assistant professor in August 2020. She has 12 years of engineering experience designing integrated circuits (ICs) for high-performance server chips and aerospace applications—where finding and amplifying the correct signal is vital. Now, she's leveraging data science for signal processing.

"Most recently, my students, collaborators, and I have been developing models to estimate weak signal parameters in the presence of a strong, noisy signal," said Lanzerotti.

Lanzerotti is also still interested in

optimizing the design of complex ICs and systems for aerospace applications and has been developing theoretical phase measurement approaches for weak simultaneous signals for next-generation electronic warfare receivers.

In 2016, Lanzerotti developed a new method for displaying electrical properties for IC layout designs that improved visualization of properties, for which she holds one of her six patents.

SIGNAL SAVVY IN THE CLASSROOM

Lanzerotti is currently one of three instructors teaching ECE 2714 - Signals and Systems, where she and her senior colleagues are introducing students to the mathematical analysis tools needed for the study of signals, signal processing, system description, and system response.

She is also teaching ECE 5620—Advanced DSP and Filter Design, where students learn about digital filters and other

INTRODUCING

MARY LANZEROTTI

- › Adjunct associate professor of computer engineering, Air Force Institute of Technology, 2019 - present
- › Assistant professor, United States Military Academy, 2017-2020
- › Assistant professor, Augsburg College, 2014-2017
- › Associate professor of computer engineering, Air Force Institute of Technology, 2011-2014
- › A.B., Physics, Harvard University, 1989
- › M. Phil., Physics, University of Cambridge 1991
- › M.S., Experimental Physics, Cornell University, 1994
- › Ph.D., Physics, Cornell University, 1997



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signal processing algorithms. These concepts are integral to wireless communications, medical instrumentation, digital video, and audio consumer products, among many other applications.

In both classes, Lanzerotti is able to incorporate her research and student interests in course concepts into the class engagement and participation activities.

“I love how different aspects of this research can be linked to core concepts,” said Lanzerotti. “This way, students can discuss the real-life applications of what we’re studying.”

AMPLIFYING UNDER-REPRESENTED STUDENTS

Some of Lanzerotti’s students find deeper connections between research, class work, and their own career trajectories in the IEEE STEM Oral History Project.

In collaboration with the IEEE History Center, Lanzerotti coordinates an oral

history project aimed to inspire the next generation of underrepresented young people in Science, Technology, Engineering, and Mathematics (STEM). This project was initiated with support from the Air Force Institute of Technology, and the first oral history interview was conducted by two undergraduate students in the summer of 2013.

The goal of the oral history project is to interview distinguished leaders in science and engineering identified by Lanzerotti’s undergraduate students.

The students have the opportunity to engage in a unique mentorship with the STEM role models they identify while they simultaneously pursue research in signal processing and integrated circuits.

For example, students in the cohorts have been supported by sponsors to conduct research on topological constraints for integrated circuits or complex radio frequency signal processing. As the students worked and conducted experiments, they

were also identifying leaders in their desired career fields, whom they then interviewed. These oral histories were transcribed by the students and are now archived on the Engineering Technology and History Wiki (ethw.org).

“The oral history interviewees discuss their lives with the students and offer perspectives into their careers in science,” said Lanzerotti.

Research results produced by the students are presented at national conferences and published in conference proceedings. Transcripts of the interviews are available to the general public and are published in perpetuity on the IEEE Engineering Technology and History Wiki.

“I like it all,” said Lanzerotti. “I feel fortunate to teach, pursue research, and collaborate with students and colleagues in different fields—I’m the luckiest person in the world.”

