

[Gonzalo R. Arce](#), **Charles B. Evans Professor of Electrical and Computer Engineering**

**Research Projects:** (1) Graph and Hypergraph machine learning for long-term predictions of Earth, biomedical, or financial complex systems observations. Develop machine learning methods that exploit time series predictions over graphs. (2) Develop new generative machine learning methods for computational lidar imaging. (3) Machine learning methods for financial services analytics including neural recommender systems with hypergraphs and hyperlink prediction in social networks. Skills required: Good analytical and math skills, signal processing or Fourier analysis, machine learning, and Python programming. For more information see <https://www.eecis.udel.edu/~arce/>

[Nathan Lazarus](#), **Associate Professor of Electrical and Computer Engineering**

**Research projects:** (1) Create wearable/stretchable sensors and actuators for joint protection for the elderly. Develop devices based on non-toxic room-temperature liquid metals and other stretchable electrodes. (2) Design soft robots for underwater or subterranean applications based on stretchable electromagnetic devices. Skills: Although specific background/preparation is not necessary, past experience with one or more of Matlab, COMSOL, Autocad, Solidworks, or 3D printing will be considered favorably. URL: <http://www.lazaruslaboratory.com>

[David Hong](#), **Assistant Professor of Electrical and Computer Engineering, Data Science Institute Resident Faculty**

**Research Projects:** (1) Tensor decompositions for data science. Develop unsupervised ML methods to discover patterns in big data and contribute to an open-source package. (2) Matrix methods for heterogeneous data. Develop rigorous methods and theory to discover subspace structure in heterogeneous data (e.g., from astronomy). Skills: some linear algebra, probability, and programming. More information here: <https://dahong.gitlab.io/>

[Hui Fang](#), **Professor of Electrical and Computer Engineering**

**Research project:** Develop tools that help domain experts to better access and manage the knowledge extracted from the scientific literature. Skills: Good programming skills. For more information see: <https://www.eecis.udel.edu/~hfang/>

[Xiao Feng Qi](#), **Research Professor of Electrical and Computer Engineering**

Distributed holographic MIMO networks for integrated sensing and communication: (1) develop intelligent beamforming algorithms; (2) develop simulation platform for

performance evaluation of the algorithms. Skills: Good math skills with basic exposure to wireless communication. Experience in implementing link-level wireless comm simulation is a big plus.

**Jamie Phillips, Professor and Chair of Electrical and Computer Engineering**

**Research Projects:** (1) Infrared optoelectronic materials and devices, including photodetectors and thermoradiative cells. (2) Microscale photovoltaics and LEDs for self-powered wireless sensors and/or bio-implantable device applications. Contribute to these activities through some combination of materials characterization, device modeling, and electronic and optical characterization. Skills: Background in physics related to semiconductors, materials science, and/or optics and photonics. For more information see <https://sites.google.com/udel.edu/phillipsgroup>

**Chengmo Yang, Professor of Electrical and Computer Engineering**

**Research Projects:** (1) Apply reinforcement learning for secure hardware design, which involves two parties, one injects faults in the hardware to steal sensitive data, and the other develops countermeasures to mitigate such vulnerabilities. (2) Develop robust hardware accelerators for large machine learning models (e.g., vision transformers), to facilitate their usage in autonomous driving. Skills: Excellent programming skills, experienced with machine learning platforms, familiar with hardware description language (VHDL or Verilog).

**Austin Brockmeier, Assistant Professor of Electrical and Computer Engineering**

The [Computational Neural Information Engineering Laboratory](#) advances research at the intersection of machine learning, information theory, and neuroscience. Quantifying the information content of data representations created by learning systems is critical to improve artificial intelligence and to understand the brain. The goal is to develop and validate principled tools to optimize and align representations internal to neural networks—both biological and artificial—for applications ranging from biomedicine to national defense.

**Nektarios Tsoutsos, Associate Director, Center for Cybersecurity, Assurance and Privacy**

**Research Projects:** (1) acceleration of cryptographic primitives; develop optimizations for homomorphic encryption. (2) secure firmware updates for digital manufacturing; integration with software update systems. Skills: Good analytical and computer programming skills (C/C++ and Python required, CUDA knowledge optional), Linux OS, and understanding of computer security principles. [Google Scholar](#)

Roxanne Radpour, **Assistant Professor of Imaging Science and Documentation**

The Imaging Science Laboratory for Cultural Heritage (ISLA-CH offers an opportunity to explore conservation science, spectroscopy, and advanced data analysis. Project 1 focuses on Cypriot wall paintings, employing hyperspectral imaging for super-resolution. This involves analyzing 3D image cubes with high spatial and spectral resolution by combining datasets. Project 2 delves into Infrared (IR) imaging, aiming to build structural models and classifications using video-rate IR cameras on cultural heritage objects. The projects explore enhancing data with better-performing systems, constructing 3D models, and leveraging spectral data for live or post-processed classification. Students gain hands-on experience in cultural heritage analysis and advanced imaging techniques.

Steven Hegedus, **Professor of Electrical and Computer Engineering**

The student will join a team studying how to provide more value to homeowners and utilities by integrating existing power conversion electronics like solar inverters and batteries into the grid. We have a solar array and solar simulators to power different brands of smart inverters and batteries. The research might include using batteries and inverter controls to develop new approaches for voltage and frequency control.

URL: <https://www.ece.udel.edu/people/faculty/ssh/>

Vishal Saxena, **Associate Professor of Electrical and Computer Engineering**

Reconfigurable Analog Optical Processor: Silicon-based Photonic integrated circuits (PICs) are the next frontiers in semiconductors where designers can integrate large-scale optoelectronic systems on a single chip. Our research group (AMPIC Lab) has designed and fabricated optical equivalent of field-programmable gate arrays (FPGA), referred to as Silicon Photonic Reconfigurable Analog Optical Processor (**SiROAP**), where a designer can rapidly prototype an application circuit without designing and fabricating an entire PIC from scratch. SiROAP has versatile applications including radio-frequency (RF) signal processing, neural network or AI accelerators, and optical quantum computing. In this project, the student(s) will develop Matlab/Python-based algorithms to program these processors and mitigate the effect of thermal crosstalk between on-chip components. The work will involve hardware and software components, and developing algorithms and code with existing SiROAP boards that we have fabricated and packaged in our lab.

Mohsen Badiey, **Professor in Electrical and Computer Engineering**

**Research Projects:** (1) Signal processing and applied machine learning for underwater acoustics and environmental systems using real-world data. This project involves

numerical modeling of underwater sound transmission and sea-going opportunities for data collection and experimentation. (2) Design and fabrication of multichannel data acquisition systems. This project involves electronic instrumentation such as microcontroller programming and embedded systems for underwater sensors.

Skills: Good analytical and mathematical skills. Applied physics skills, signal processing, machine learning, and Python/Matlab programming. For more information see our website: <https://www.eecis.udel.edu/~badiay/>

**Yuping Zeng, Assistant Professor of Electrical and Computer Engineering**

**Research interests:** (1) high-speed transistors (heterojunction bipolar transistors and high electron mobility transistors); (2) novel transistors (tunneling field effect transistors and III-V metal-oxide-semiconductor field effect transistors); and (3) light-emitting diodes, laser diodes, photodetectors, etc.