Gonzalo R. Arce, **Charles B. Evans Professor of Electrical and Computer Engineering**

Research Project:

- 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.
- Develop new generative machine learning methods for computational lidar imaging.
- Machine learning methods for financial services analytics including neural recommender systems with hypergraphs and hyperlink prediction in social networks.

Skills: Good analytical and math skills, signal processing or Fourier analysis, machine learning, and Python programming.

URL: https://www.eecis.udel.edu/~arce/

Hui Fang, **Professor of Electrical and Computer Engineering**

Research Project:

- *Scientific Literature Mining for Plastic Innovation:* The primary goal of the project is to develop a novel natural language processing infrastructure that can accurately and efficiently extract and analyze chemical knowledge from a large number of scientific articles to facilitate plastic upcycling research.

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

Research Description:

- We make optoelectronic devices and electronic devices using GeSn, TiO2, and GaN materials. Students who are interested in semiconductor device design, fabrication, characterization, and device simulations are welcome to join my group.

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

Research Project:

- *Reliable and Secure Machine Learning Hardware:* Deep Learning has become a cornerstone in image segmentation tasks across various domains, including autonomous driving, medical imaging, and remote sensing. Meanwhile, concerns about the robustness and security of these models have emerged. This project will explore fault injection attacks on segmentation DNN models to understand their vulnerabilities and potential impacts.

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

Research Projects:

- *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.

- *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/~badiey/

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

Research Description:

- Understanding the shared information in data representations formed through machine learning is integral for improving data processing and enabling human interpretation. At one scale we are examining how shared text-image representations can be decomposed and modified to enable more accurate information retrieval and efficient data compression. At another scale, we are optimizing artificial neural networks to better align two different data modalities given either shared views or labeled data. In one case, we also look at aligning the brain's response to stimuli in order to advance computational neuroscience with applications to both health and machine learning.

Nektarios Tsoutsos, **Assistant Professor of Electrical and Computer Engineering.**

Associate Director, Center for Cybersecurity, Assurance and Privacy

Research Projects:

- Acceleration of cryptographic primitives; develop optimizations for homomorphic encryption.
- Secure firmware updates for digital manufacturing; integration with software update systems
- Deployment of a web-based IDE based on Theia-Cloud and Kubernetes.

Skills: Good analytical and computer programming skills (C/C++ and Python required), Linux OS, and understanding of computer security principles.

URL: https://scholar.google.com/citations?hl=en&user=f3TVR3kAAAAJ

David Hong, **Assistant Professor of Electrical and Computer Engineering, Data Science Institute Resident Faculty**

Research Projects:

- Tensor decompositions for data science. Develop unsupervised ML methods to discover patterns in big data and contribute to an open-source package.
- Matrix methods for heterogeneous data. Develop rigorous methods and theory to discover subspace structure in heterogeneous data (e.g., from astronomy).

Skills: Linear algebra, probability, and programming. More information here: https://dahong.gitlab.io/

Mario Mencagli, **Assistant Professor of Electrical and Computer Engineering**

Research Projects:

- *Beam-steering Metasurface Antennas for Space Applications:* This project focuses on designing a novel double-layer metasurface (MTS) antenna capable of linearly polarized wave radiation with beam-steering features. The upper layer consists of rectangular apertures, while the lower layer launches a plane wave and enables beam steering by adjusting the inter-layer distance. This lightweight and ultra-thin structure aims to enhance space applications. The project will involve design, fabrication, and testing.
- *Breaking the Bandwidth Limit of Electrically Small Antennas, Resonators, and Absorbers using time modulation:* This project seeks to surpass the Bode-Fano bound, which limits bandwidth in electrically small antennas and similar devices. By using time-modulated matching networks, the goal is to significantly broaden the bandwidth of these components, widely used in medical, communication, and sensor applications. The project will involve designing, fabricating, and testing a time-modulated matching network.
- *Metamaterial Analog Computing:* Targeting wave-based analog computing, this project aims to develop metamaterial (MTM)-based platforms for tasks like matrix-vector multiplication. It addresses challenges in fabrication complexity and reconfigurability by exploring a cavity-based computing platform that is easy to fabricate and needs minimal control signals for reconfiguration. The project involves designing, fabricating, and testing these computing platforms.

Nathan Lazarus, **Associate Professor of Electrical and Computer Engineering**

Research Project:

- *Stretchable electromagnetic valves for soft robots:* This project addresses the need for soft, safe robotics suitable for human interaction, specifically focusing on developing soft, stretchable electromagnetic valves for pneumatic soft robots. Traditional pneumatic systems are limited by bulky, rigid pumps and valves. Building on recent research, the Soft Electronics and Robotics group at the University of Delaware has developed soft electromagnetic devices using liquid metals at room temperature. The project involves exploring similar coil-based designs to create high-performance soft electromagnetic valves for untethered soft robots.