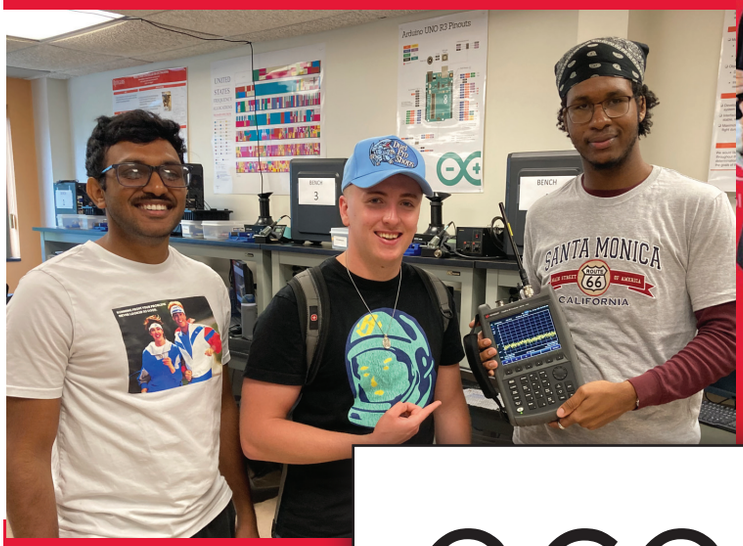

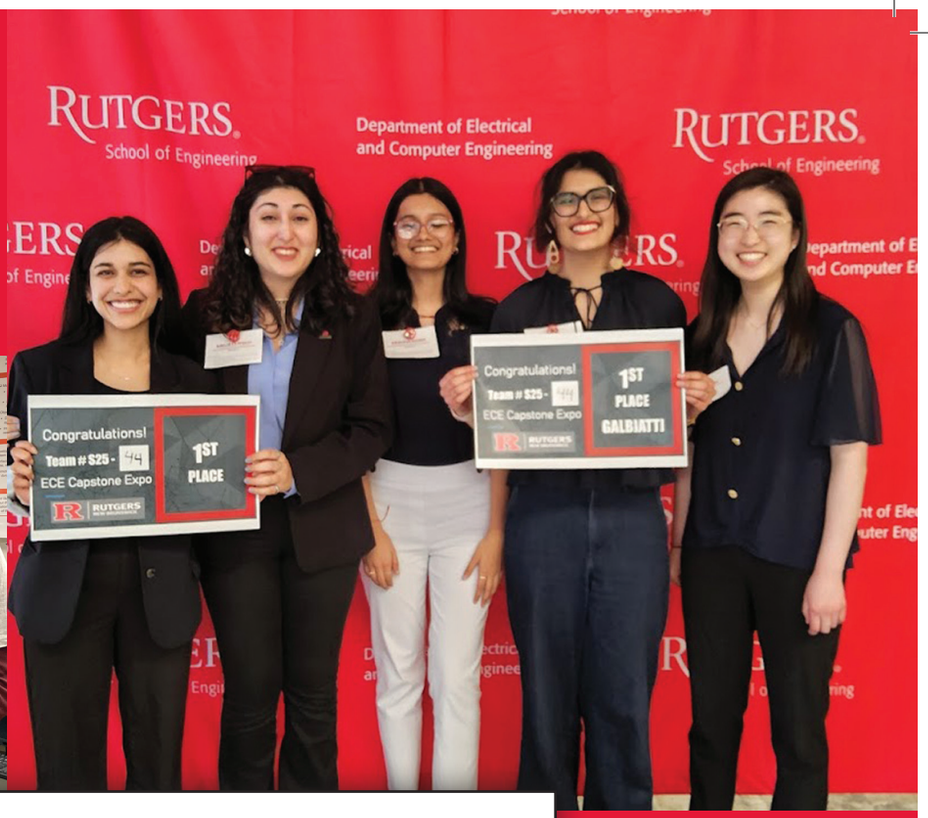

ecenews

Department of Electrical and Computer Engineering

2025

RUTGERS–NEW BRUNSWICK
School of Engineering

ECE Newsletter

Contents

ECE News is an annual publication of Rutgers ECE.

Editor: Yingying Chen

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ECE News is also available at **www.ece.rutgers.edu** or can be received by mail by sending a request to **ece-help@soe.rutgers.edu**

Visit us at **www.ece.rutgers.edu**

Message from t

Celebrating a Year of Excellence and Innovation

Welcome to the Department of Electrical and Computer Engineering at Rutgers University. As we reflect on the past academic year, I am honored to share the remarkable accomplishments and milestones that have defined our community of scholars, innovators, and leaders. This has been a year of growth, recognition, and resilience—one that underscores our unwavering commitment to excellence in education, research, and societal impact.

Our commitment to the highest standards was affirmed this year as our undergraduate programs earned full accreditation from the Accreditation Board for Engineering and Technology (ABET) through 2031. This accreditation was granted with no deficiencies, weaknesses, or concerns, a commendable outcome that speaks volumes about the dedication and professionalism of our faculty, staff, and curriculum committees. It is a powerful endorsement of the standards we uphold and the transformative education we provide to our students. Furthermore, our national reputation continues to ascend. The latest U.S. News & World Report rankings placed Rutgers #42 in the nation and #16 in top public schools, which reflects the strength of our academic offerings, the impact of our research, and the success of our graduates. This recognition is a reflection of the collective effort and vision that drives our department forward.

ECE By The Numbers

36 Faculty

11 Lecturers

173 MS Students

967 Undergraduate Students

289 Graduate Students

109 PhD Students

$8.2 MIL New Research Grants

1903-2023 Celebrating ***120*** years

the Chair

The excellence of our faculty has been a cornerstone of our success. Our faculty's innovative research continues to break new ground, exemplified by the receipt of the 2025 Edison Patent Award by Dr. Kristin Dana for a novel forensic watermarking technique. This technology, which embeds invisible, AI-detectable information into digital images, has profound implications for digital security and authenticity. Additional honors include the Presidential Outstanding Faculty Scholar Award by Dr. Anand Sarwate and the Rutgers Innovation Award by Dr. Kristin Dana, both of which recognize sustained excellence in scholarship and innovation. Our faculty are also increasingly sought after for expert commentary in national media outlets such as The Wall Street Journal, further amplifying the visibility and relevance of their work. Promotions within the department, ranging from the rank of Associate Professor to the rank of Distinguished Professor, reflect the depth of expertise and leadership among our faculty.

Despite a challenging funding environment marked by significant budget constraints, our department has demonstrated remarkable resilience and success in securing competitive research grants. This year, we celebrated the awarding of an NSF CAREER Award to Dr. Daniel Burbano Lombana for groundbreaking research on visuomotor control dynamics—a project that bridges neuroscience, robotics, and AI. Our leadership in multi-institutional initiatives has also expanded, with the department playing a central role in the newly established NSF Center on Responsible AI and Governance (CRAIG), which aims to shape the ethical and societal dimensions of AI technologies (PI Dr. Jorge Ortiz, co-PI Dr. Yuqian Zhang, Dr. Dario Pompili, Dr. Jie Gao (CS), and Dr. Vijayalakshmi Atluri (Business School)). We also secured a $3.8 million NSF grant to lead the COSMOS3 platform, a next-generation testbed for 6G-era wireless networks, positioning Rutgers at the forefront of wireless innovation (PI WINLAB Chief Technologist Ivan Seskar and co-PI Dr. Dipankar Raychaudhuri). Complementing this, a nearly $3 million NSF award was granted to develop hpcGPT, an AI-powered assistant designed to support users of high-performance computing systems (PI Dr. Zhao Zhang, co-PI Hang Liu and Bo Yuan). In addition, the WINLAB team receives the STAIRWAI, a NSF AI-Ready testbed initiative led by Dr. Anand Sarwate. Team from WINLAB led by Ivan Seskar is among the collaborating university and industry partners—including project lead NYU Tandon School of Engineering, Princeton, NYU's Pi-Radio, Nokia, and Analog Device—receiving funding support from a $10 million award from the National Telecommunications and Information Administration (NTIA).

Our students continue to inspire us with their creativity, determination, and excellence. An undergraduate team earned first place in the national Horizons 2040 Challenge, a NASA-sponsored competition focused on addressing the nation's most pressing technological challenges for the year 2040. Another team distinguished itself as the only all-undergraduate group in the Air Force Research Laboratory's software-defined radio challenge, showcasing the depth of talent and ambition within our student body. The success of our Capstone Design program continues to grow, with student projects leading to peer-reviewed publications and presentations at prestigious venues. This year, one team presented their work at the ICCE-Berlin conference, while another was invited to speak at DEF CON 33, one of the world's premier cybersecurity conferences. The top Capstone project, Maestro, earned both the First Place Award and the Galbiati Entrepreneurial Award, exemplifying the fusion of technical excellence and entrepreneurial spirit that we cultivate in our students. Our graduate student achievements have also been exceptional. One of our PhD students received the highly competitive NSF Graduate Research Fellowship, while another won the 2025 Intern AI Hackathon hosted by Marvell. We also celebrate a Best Paper Award at the ACM/IEEE ISLPED conference and multiple research and travel awards that support our students' continued growth and visibility in the global research community.

The success of our alumni continues to make us proud through their leadership and contributions across academia, industry, and government. This year, we were thrilled to see two of our distinguished alumni and Industrial Advisory Board (IAB) members, Dorin Comaniciu and Peter Pupalaikis, elected to the National Academy of Engineering—one of the highest professional honors in the field. We also celebrate the achievements of recent graduates, including Tahsina Saman (PhD '20), recipient of the UNESCO OWSD Early Career Fellowship Award, and Michael Haberman (ENG '90), recipient of the School of Engineering Medal of Excellence.

Our engagement with industry has never been stronger. We welcomed new IAB members from Verizon, Advanced Technical Marketing, and the U.S. Army Research community, strengthening our ties to sectors that are shaping the future of technology. This synergy is exemplified by Professor Dario Pompili's "RescueNet" project, which was a finalist in the Deutsche Telekom T Challenge and has led to an ongoing collaboration focused on developing AI-driven disaster response technologies.

Throughout the year, we have nurtured a vibrant intellectual and social community. Our Colloquium Series and Rutgers Efficient AI (REFAI) seminars brought leading voices from academia and industry to campus, fostering dialogue and collaboration. A particularly meaningful event was the workshop held in memory of our beloved colleague, Professor Sophocles Orfanidis, which brought together experts to honor his legacy and contributions to the field. Events such as the annual ECE Research Day and the Graduate Student Association-hosted "Academia vs. Industry" debate provided platforms for students to showcase their work, engage with faculty, and explore diverse career paths. We also recognize the dedicated service of our faculty in departmental leadership roles and extend a warm welcome to our new Undergraduate and Graduate Program Directors, whose vision and energy will guide our academic programs into the future.

As Rutgers University embarks on its new strategic plan, the ECE Department is well-positioned to contribute meaningfully to national priorities in infrastructure, defense, and security. Our faculty, students, and alumni are driving innovation, shaping policy, and transforming lives through their work. I am deeply proud of the accomplishments highlighted in this newsletter and excited for the opportunities that lie ahead. Together, we are building a future defined by excellence, impact, and leadership.

Warm regards,

Yingying (Jennifer) Chen
Distinguished Professor, Department Chair
Electrical and Computer Engineering
Associate Director of WINLAB

ECE Faculty

Waheed U. Bajwa
Professor
NSF Career Award, ARO YIP Award
Research Interests: statistical signal processing, high-dimensional statistics, machine learning, and networked systems.

Aggelos Bletsas
Professor
IEEE Fellow, Distinguished Lecturer of IEEE, IEEE Communications Society G. Marconi Prize Paper Award
Research interests: scalable wireless communications and sensor networking, RFID and backscatter radio networks, wireless narrowband localization, inference and internet of things that think, software radio, battery-less wireless sensor networks

Daniel Burbano Lombana
Assistant Professor
Research Interests: Dynamical systems and control theory with an emphasis on distributed network systems, collective animal behavior, swarm intelligence, and robot autonomy.

Yingying (Jennifer) Chen
Distinguished Professor and Department Chair
Associate Director of WINLAB
ACM Fellow, IEEE Fellow, Fellow of National Academy of Inventors (NAI), ACM Distinguished Scientist, Peter D. Cherasia Faculty Scholar, NSF Career Award, Google Faculty Research Award, NJ Inventors Hall of Fame Innovator Award
Research Interests: Smart healthcare, internet of things (IoT), smart safety systems, cyber security and privacy, applied machine learning, hardware-software co-design.

Kristin Dana
Professor
NSF Career Award
Research Interests: Computer vision, robotics, pattern recognition, machine learning, convex optimization, novel cameras, camera networks, computer graphics, computational photography, illumination modeling.

Narayan Mandayam
Distinguished Professor and Director of WINLAB
Peter D. Cherasia Faculty Scholar, IEEE Fellow, Distinguished Lecturer of IEEE
Research Interests: Cognitive radio networks and spectrum policy radio resource management for smart city, privacy in IoT.

Ivan Marsic
Professor
Research Interests: Mobile computing, software engineering, computer networks.

Laleh Najafizadeh
Professor
Research Interests: Functional brain imaging, brain connectivity, diffuse optical brain imaging, electroencephalography, cognitive rehabilitation, circuit design and microelectronics, ultra-low-power circuits for biomedical applications, data converters, system on chip, wireless IC design.

Jorge Ortiz
Associate Professor
Research Interests: Machine Learning for cyber-physical systems, Intelligent infrastructure systems, smart health applications.

Athina Petropulu
Distinguished Professor
IEEE Fellow, AAAS Fellow, Distinguished Lecturer of IEEE, IEEE Communications Society G. Marconi Prize Paper Award
Research Interests: Statistical signal processing, blind source separation, cooperative protocols for wireless networks, physical layer security, MIMO radar, compressive sensing.

Salim El Rouayheb
Associate Professor
NSF Career Award, Google Faculty Research Award
Research Interests: Information theory, distributed storage systems and networks, distributed coded data, data secrecy and wireless networks.

Zoran Gajic
Professor
Research Interests: Power control of wireless networks

Sasan Haghani
Teaching Professor and Capstone Coordinator
Research Interests: Applied signal processing with applications in biomedical and environmental domains, network science, smart cities, renewable energy and smart grid, microgrids, home automation systems for smart grid, wireless sensor networks, and broadband communications.

Umer Hassan
Associate Professor
Research Interests: Biosensing, point of contact medicine, microfluidics, global health.

Shirin Jalali
Associate Professor
NSF Career Award
Research Interests: High-dimensional inference and inverse problems, computational imaging, machine learning, information theory, statistical signal processing

Mehdi Javanmard
Professor and Paul S. and Mary W. Monroe Endowed Faculty Scholar
NSF Career Award
Research Interests: Nanobiotechnology, BioMEMS, point of care diagnostics, biomarker detection, microfluidics, electrokinetics, applications of nanotechnology to medicine and biology.

Dario Pompili
Professor
IEEE Fellow, ACM Distinguished Scientist, Rutgers-NB Chancellor's Scholar, NSF Career Award, ONR Young Investigator Award, DARPA Young Faculty Award
Research Interests: Wireless networking, underwater communications, mobile edge computing, Internet of things, distributed robotics/autonomy.

Shriram Ramanathan
Professor and Rodkin Weintraub Chair in Engineering
NSF Career Award, DoD Young Investigator Award
Research Interests: Oxide quantum materials and devices; electromagnetic materials; brain-inspired electronics

Dipankar Raychaudhuri
Distinguished Professor
IEEE Fellow
Research Interests: Future network architectures and protocols, wireless systems and technology, dynamic spectrum access and cognitive radio, experimental prototyping and network research testbeds.

Anand D. Sarwate
Professor
NSF Career Award, A Walter Tyson Award, Rutgers Board of Trustees Research Fellowship for Scholarly Excellence
Research interests: Machine learning, distributed systems and optimization with a focus on privacy and statistical methods.

Deborah Silver
Professor and Executive Director PSM Program
Research Interests: Scientific visualization, computer graphics.

Shantenu Jha
Professor
NSF Career Award
Research Interests: High-performance and distributed computing, computational and data-intensive science and engineering, large-scale cyberinfrastructure for science and engineering.

Bokyung Kim
Assistant Professor
HLF Young Researchers, NSF iREDEFINE, and EECS Rising Stars Fellow
Research interests: processing-in-memory, neuromorphic computing, emerging memories, machine learning acceleration, efficient hardware design, VLSI, computer architecture and system design, device modeling and analysis

Dov Kruger
Associate Teaching Professor

Demetrios Lambropoulos
Instructor

Hang Liu
Assistant Professor and Undergraduate Director
NSF Career Award, IEEE CS TCHPC Early Career Researchers Award for Excellence in High-Performance Computing
Research Interests: High-Performance Computing, Graph Analytics, Machine Learning, Numerical Methods

Yao Liu
Assistant Professor
NSF Career Award
Research Interests: Immersive streaming, mobile/cloud and edge computing, and distributed systems.

Emina Soljanin
Distinguished Professor
IEEE Fellow and Distinguished Lecturer
Research Interests: Efficient, reliable, and secure storage and transmission networks, coding, information, and queuing theory

Predrag Spasojevic
Professor
Research Interests: Communication and information theory, signal processing and representation, cellular and wireless systems, Ad Hoc and sensor networks.

Maria Striki
Associate Teaching Professor
Research Interests: analysis/design/optimization of data algorithms, statistical analysis, mathematical modeling, big data, data analytics, social networks, information systems, cybernetics, wireless-mobile-ad-hoc-cellular networks, (secure) routing, mobile computing, network-computer security.

Wade Trappe
Associate Dean for Academic Programs and Research, Professor and Associate Director of WINLAB
IEEE Fellow
Research Interests: Multimedia security, wireless security, wireless networking and cryptography.

Matteo Turilli
Associate Research Professor
Research Interests: Parallel and distributed computing, software design for distributed infrastructures, computer science computer ethics.

Sheng Wei
Associate Professor and Graduate Director
NSF Career Award
Research Interests: Hardware and system security, multimedia systems.

Chung-Tse (Michael) Wu
Associate Professor
NSF Career Award, DARPA Young Faculty Award
Research Interests: Microwave and millimeter wave components and circuits, passive and active antennas and arrays, electromagnetic metamaterials, wireless sensors and RF systems.

Guosong Yang
Assistant Professor
Research Interests: Systems and control theory, hybrid systems, information-constrained control, learning in optimization and game theory, cyber-physical systems, resilience and security.

Bo Yuan
Associate Professor
NSF Career Award
Research Interests: Algorithm and hardware co-design, machine learning, signal processing systems, embedded and IoT systems.

Yuqian Zhang
Assistant Professor
Research Interests: Computer vision, machine learning, signal processing.

Zhao Zhang
Assistant Professor
Research Interests: High Performance Computing, Deep Learning, Distributed Systems, Cyberinfrastructure, Scientific Applications.

Minning Zhu
Assistant Teaching Professor
Research interests: Microwave and millimeter-wave antenna and array design, metamaterial-based antenna systems and circuits, RF-based in-sensor and near-sensor analog computing systems, and integrated neuromorphic computing system design.

Lecturers:

Michael Caggiano
Narendra Garg
Luis Garrido
Yinglung Liang
Milton Diaz-Munoz
Mehdi Nosrati
Russell Pepe
Krishnamurthy Raghunandan
Kamran Sirohi
Rensheng Wang Zhang
Xin Zhou

Faculty Emeritus

Sophocles Orfanidis
Associate Professor Emeritus
Retired 2023
Research Interests: Statistical and adaptive signal processing, Audio signal processing, Electromagnetic waves and antennas.

Hana Godrich
Associate Teaching Professor
Retired 2022
Research Interests: Distributed power systems, energy resources management and storage, energy efficiency, statistical and array signal processing, resource allocation optimization, distributed detection and estimation with application to smart grid, microgrids, and active sensor networks.

Yicheng Lu
Distinguished Professor Emeritus
Retired 2022
NSF Initiation Award, Rutgers Monroe Faculty Scholar, Faculty of the Year Award (2019)
Research Interests: Micro- and nano-electronics multifunctional oxides - based devices.

Roy Yates
Distinguished Professor Emeritus,
Retired 2022
IEEE Fellow
Research Interests: Resource management in wireless systems, dynamic spectrum access and spectrum regulation, information theory for wireless networks and future internet architectures.

Richard Mammone
Professor Emeritus
Retired 2021
National Academy of Inventors
Research Interests: Communications pattern recognition, neural networks, signal processing, technology commercialization, processes involved with the innovation of new technology.

Jian Zhao
Professor Emeritus
Retired 2021
IEEE Fellow, NSF Initiation Award
Research Interests: Silicon Carbide (SiC) semiconductor devices, SiC JFETs, BJTs, MOSFETS, GTOs, high efficiency smart power integrated circuits, SiC sensors, UV and EUV detectors, SiC inverters/converters.

Grigore Burdea
Professor Emeritus
Retired 2020
NSF Initiation Award
IEEE Virtual Reality Career Award
Research Interests: Virtual rehabilitation, telerehabilitation, haptics virtual reality.

Sigrid McAfee
Associate Professor Emeritus
Retired 2019
Research Interests: Defects in semiconductors, nanotechnology, financial engineering.

Peter Meer
Distinguished Professor Emeritus
Retired 2018
IEEE Fellow, AMiner Most Influential Scholar
Research Interests: Statistical approaches to computer vision.

Peddapullaiah Sannuti
Professor Emeritus
Retired 2017
IEEE Fellow
Research Interests: Simultaneous internal and external stabilization of linear time-invariant systems in the presence of constraints.

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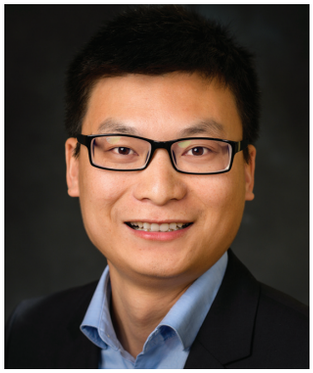
FACULTY News

Three Electrical and Computer Engineering Professors Receive Tenure and Promotions

Dr. Shirin Jalali



Dr. Hang Liu

Dr. Jorge Ortiz

We are delighted to announce and congratulate **Dr. Shirin Jalali**, **Dr. Hang Liu**, and **Dr. Jorge Ortiz** on their well-deserved tenure and promotion to the rank of associate professor. This important milestone is a reflection of their outstanding achievements in research, teaching, and service.

We are proud to celebrate their success and grateful for their dedication to excellence, which strengthens not only the ECE department but also the School of Engineering and Rutgers University as a whole.

We look forward to their continued contributions and leadership in shaping the future of our department and inspiring our students and colleagues alike. Please join us in congratulating Shirin, Hang, and Jorge on this significant accomplishment!

Faculty Promotions for Sarwate and Chen in 2025

Anand Sarwate

Yingying Chen

Anand Sarwate promoted to Full Professor, **Yingying Chen** promoted to Distinguished Professor. These are the major milestones in their academic career recognized by the Rutgers University. We look forward to their continued contributions and leaderships in ECE, SoE and the University.

Faculty Emeritus

(*continued*)

Lawrence Rabiner
Distinguished Professor Emeritus
Retired 2016
IEEE Fellow, National Academy of Engineering, National Academy of Sciences, IEEE Kilby Medal, IEEE Piore Award, IEEE Millennium Medal
Research Interests: Digital signal processing, digital signal processing, speech recognition, speech analysis, speaker recognition, and multimedia.

David Daut
Deceased Professor, 2015
Research Interests: Comminications and information processing, stochastic processes in communication, detection and estimation theory, multidimensional digital signal processing, optical communication systems

Michael Bushnell
Professor Emeritus
Retired 2013
IEEE Fellow
Research Interests: computer aided design (CAD) of very large scale integrated (VLSI) circuits

Paul Panayotatos
Deceased Professor, 2013
Research Interests: solar cells and optical interconnects

Michael Caggiano
Professor Emeritus
Retired 2010
Expertise: Electrical packaging, microwave packaging, analog circuit design, digital circuit design, digital circuit and logic design.

ECE department thanks retired faculty for their long service and commitment to teaching and research.

ECE Lunchtime Talk Series: Celebrating One Year of Mentorship and Collaboration

The ECE Department proudly celebrates the one-year anniversary of its Lunchtime Talk Series, a key initiative launched to support mentoring and professional development for junior and mid-career faculty. Over the past year, the series has covered diverse and impactful topics, including strategies for tenure and promotion, writing competitive federal grant proposals, engaging in professional societies, organizing conferences and workshops, and building connections with industry.

From December 2024 to October 2025, the talks featured contributions from Hang Liu, Mehdi Javanmard, Dario Pompili, Emina Soljanin, Athina Petropulu, Salim El Rouayheb, and Xian-He Sun from IIT. Each session was met with strong attendance and lively participation, reflecting the department's collaborative and collegial spirit. The accompanying photos capture the enthusiasm and engagement that have made this series such a success. Looking ahead, the department encourages more faculty to take part in this meaningful initiative as we continue to grow together as a community.

FACULTY Awards

ECE Impact Awards: Celebrating Excellence in Electrical & Computer Engineering

The ECE Department has recently established ECE Impact Awards, a celebration of extraordinary achievements within our department. These awards honor the faculty, alumni, and staff who have made significant contributions to advancing the mission of the Department of Electrical and Computer Engineering (ECE) at Rutgers.

We are delighted to share that the department awards committee has completed a thoughtful review of the submitted nominations, and we are proud to announce the recipients of the ECE Impact awards 2025. These individuals exemplify the spirit of innovation, leadership, and commitment that defines our department. Their achievements not only push the boundaries of research and education in ECE but also inspire all of us to strive for excellence.

Laleh Najafizadeh
ECE Impact Award for contributions and leadership in critical departmental activities, including the 2025 ABET evaluation.

John Scafidi
ECE Lifetime Achievement Award for more than three decades of tireless support for departmental research and educational endeavors.

Hang Liu
ECE Impact Award for outstanding scholarship and leadership in key initiatives related to the ECE undergraduate program.

Anand Sarwate
ECE Impact Award for outstanding scholarship, inspiring teaching, and dedicated mentoring.

Hana Godrich
ECE Lifetime Achievement Award for groundbreaking and enduring contributions to the ECE undergraduate program, including the capstone experience and industry outreach.

Roy Yates
ECE Lifetime Achievement Award for pioneering contributions to the theory and practice of Age of Information.

Professor Yingying Chen and Her Students Received the Distinguished Paper Award From ACM CCS Conference

Professor Yingyling Chen

Professor **Yingying Chen** and her students have received the Distinguished Paper Award from the ACM Conference on Computer and Communications Security (CCS) 2025 for her work on "Harnessing Vital Sign Vibration Harmonics for Effortless and Inbuilt XR User Authentication." ACM CCS is widely considered as one of the top-tier security conferences, among the big-four security conferences. This work represents a joint research effort among New Jersey Institute of Technology, Temple University, and Texas A&M University:

"Harnessing Vital Sign Vibration Harmonics for Effortless and Inbuilt XR User Authentication"

Authors: Tianfang Zhang, Qiufan Ji, Md Mojibur Rahman Redoy Akanda, Zhengkun Ye, Ahmed Tanvir Mahdad, Cong Shi, Yan Wang, Nitesh Saxena, and Yingying Chen.

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Anand Sarwate Receives the Presidential Outstanding Faculty Scholar Award

Each year Rutgers President Jonathan Holloway and Executive Vice President Prabhas Moghe announce the recipients of the University wide Faculty Year-End Excellence Awards.

Each year these awards honor members of the Rutgers community selected by their colleagues for outstanding contributions to teaching, research, and public service.

This year Anand Sarwate has been awarded the Presidential Outstanding Faculty Scholar Award.

The Outstanding Faculty Awards are Rutgers highest honor for faculty, this award recognizes superior accomplishments in teaching, research, public service, and scholarship.

Distinguished Paper Award *(continued)*

This award-winning paper introduces the first effortless and inbuilt user authentication system for Extended Reality (XR). It harnesses the harmonics of vibrations naturally generated by users' vital signs (e.g., breathing and heartbeat) to derive unique and reliable biometric signatures. Different from traditional password- or gesture-based methods that interrupt immersive experiences or require extra hardware, the proposed approach leverages existing XR motion sensors to unobtrusively capture the subtle vibrations transmitted through a user's skull and facial tissues. By analyzing harmonic frequency ratios that encode each user's distinctive anatomical features, combined with adaptive signal filtering and transformer-based deep learning, the system enables seamless authentication without any explicit user action. Long-term experiments with 52 participants using Meta Quest and HTC Vive Pro Eye headsets demonstrated over 95% true positive and 98% true negative rates across diverse XR contexts, validating its robustness, security, and practicality for real-world deployment. This breakthrough showcases a major step forward toward secure, user-transparent authentication in next-generation XR environments.

The paper was presented at ACM CCS held from October 13 - October 17, 2025.

Professor Laleh Najafizadeh Received SoE Student's Professor of the Year Award

Professor Laleh Najafizadeh

Professor Laleh Najafizadeh received the Students' Professor of the Year Award from the Engineering Governing Council (EGC).

In the 2024-2025 academic year, Rutgers School of Engineering (SoE) students select only one professor from each department who best exemplifies the SOE mission of "Education, Research, and Service" as the EGC Students' Professor of the Year. The award is decided based on student nominations.

Professor Kristin Dana and Alumnus Dr. Wengrowski Received Edison Patent Award

Professor Kristin Dana

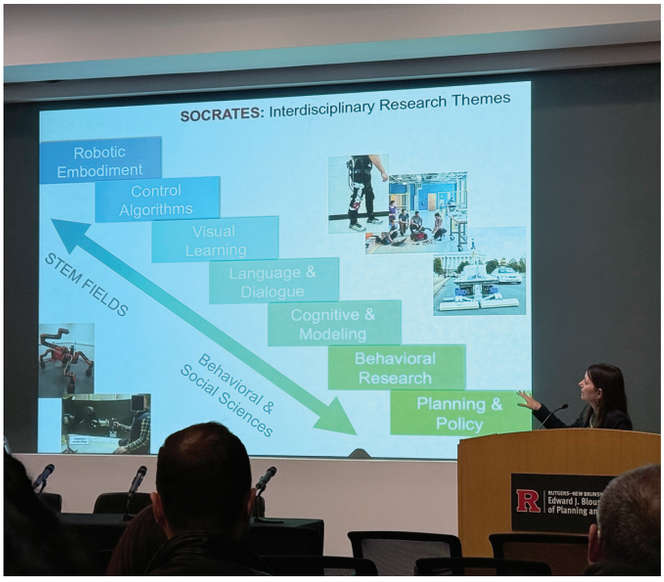
Rutgers Professor **Kristin Dana** and Rutgers alumnus **Dr. Eric Wengrowski** were honored as co-recipients of the Edison Patent Award 2025, presented by the New Jersey Research Council for their innovative contributions to technology and applied science. The award ceremony will take place Nov 20th at Bell Works in Holmdel, on Crawford Corner Road, the historic former home of AT&T Bell Labs. As part of this award, Prof. Dana was interviewed in Thomas Edison's office, located in the Main Laboratory building at his West Orange, New Jersey complex, which is now preserved as the Thomas Edison National Historical Park. There, she reflected on the research that led to the award-winning patent and the inspiration of Thomas Edison. The recognition of Prof. Dana and Dr. Wengrowski highlights Rutgers' enduring leadership in interdisciplinary research and its commitment to carrying forward New Jersey's legacy of invention and discovery.

5th Annual Rutgers Robotics Workshop 2025 Showcases Innovation, Alumni Leadership, and Cutting-Edge Research

By Kristin Dana

The 5th Annual Rutgers Robotics Workshop, held on October 10, 2025, brought together an energetic mix of faculty, students, alumni, and industry leaders at the Civic Square Building in New Brunswick. Organized as part of the NSF National Research Traineeship (NRT) SOCRATES program, *Socially Cognizant Robotics for a Technology Enhanced Society*, the workshop celebrated Rutgers' growing impact in robotics, artificial intelligence, and human-centered technology. The event was co-sponsored by the RAD colab, Rutgers AI and Data Science Collaboratory.

The event opened with a keynote address from Dr. Dhruv Shah, Senior Research Scientist at Google DeepMind and incoming Assistant Professor at Princeton University, who presented *"Evaluating and Improving Steerability of Generalist Robot Policies."* Dr. Shah discussed new approaches to improving the language grounding and generalization of large-scale robot policies, offering an inspiring vision for next-generation autonomous systems. Following the morning plenary, students presented their work during the poster spotlight and poster session, where attendees explored research on socially aware robotics, learning-based perception, and human-robot collaboration. The SOCRATES Faculty Lightning Talks featured Rutgers professors Clinton Andrews, Kristin Dana, Kostas Bekris, Pernille Hemmer, Matthew Stone, and Jacob Feldman, each highlighting their lab's contributions to socially cognizant robotics in action.



Alumni in AI: Rutgers Roots in Robotics

A major highlight of this year's workshop was the "Alumni in AI" speaker session, bringing together Rutgers graduates from the past five to twenty years, many of whom had studied in Professor Kristin Dana's lab or classes. Their talks covered a diverse array of AI applications, from robotics and digital iden-

tity to generative media and smart manufacturing. Speakers included Umama Ahmed (Norm AI), Sahir Ali (Modi Ventures), Wayne Chang (Spruce ID), Seth Karten (Princeton Computer Science), Elias Guseman (Jersey City Dept. of Infrastructure), Matthew Purri (Octozi), Eun-Sol Kim (Nanotronics), Rahul Sheth (Texel AI), and Niral Shah (Humane) The session showcased how Rutgers alumni are shaping the future of AI across research, entrepreneurship, and industry.

Graduate student talks and industry lightning sessions continued the afternoon's momentum, emphasizing the role of collaboration in bridging academic research and real-world applications. The keynote address by Dr. Gabriela Oana Cula, Senior Director at Janssen Pharmaceuticals gave her talk on *"Immunology Endpoints Using AI & Computer Vision."* Dr. Cula, who completed her doctorate at Rutgers 20 years ago and was the first PhD student of Prof. Dana, reflected on how her experience in computer vision research at Rutgers shaped her successful career applying AI and imaging in healthcare innovation.

The workshop concluded with an engaging robot demonstration at the PRACSYS Lab in the Computer Science Department, featuring robots from Professor Kostas Bekris' Lab and from Professor Kristin Dana's Lab. These live demos highlighted the integration of perception, manipulation, and socially aware robotic behaviors. The event closed with an Industry Consortium discussion, reinforcing the commitment to fostering partnerships that advance robotics and AI innovation.

From the inspiring alumni talks to the hands-on demonstrations, the **Rutgers Robotics Workshop 2025** celebrated the SOCRATES program and highlighted Rutgers' active interdisciplinary robotics community and its growing influence in AI innovation.

Automating the Future of AI Hardware Design

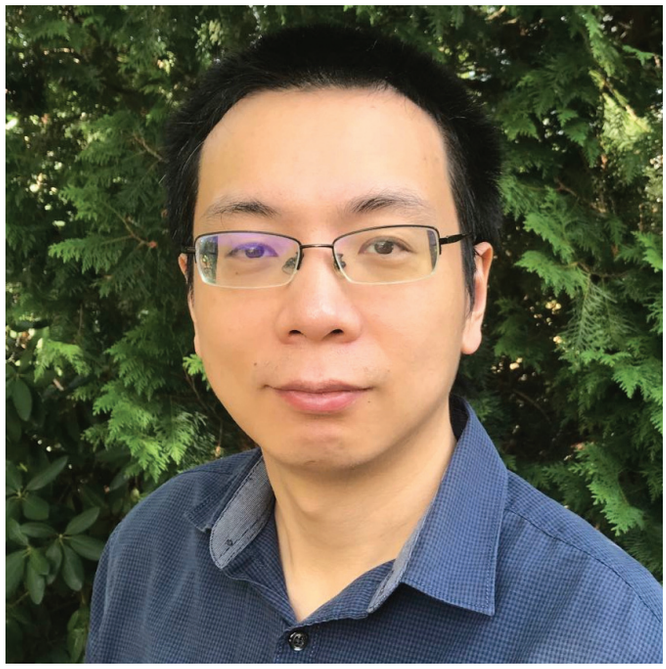
By Bo Yuan

Artificial intelligence (AI) is rapidly reshaping how we live, work, and innovate. From personalized healthcare to advanced manufacturing and scientific discovery, AI technologies are driving a new wave of transformation across industries. But while AI algorithms and software evolve at lightning speed, the hardware that powers them—specialized AI accelerators—still takes months or even years to design and optimize.

This imbalance between fast-moving AI models and slow-to-develop hardware has become a bottleneck for progress. Each new generation of AI accelerator must strike a delicate balance between speed, power efficiency, flexibility, and cost. Designing these chips remains largely a manual process, requiring expert engineers to explore countless possibilities before arriving at a viable solution.

To address this challenge, **Professor Bo Yuan** and his collaborators at Texas A&M University (TAMU) are developing HexAI, a comprehensive automation framework for next-generation AI hardware design. The central idea behind HexAI is to make building AI chips as intelligent and adaptive as the AI algorithms they are meant to support.

HexAI brings together three core innovations within a single integrated platform. First, it introduces a structured design-space representation that allows computers to explore architectural options systematically instead of by trial and error. Second, it employs data- and workload-aware adaptation, enabling hardware to tailor its configuration to the specific needs of AI applications such as large-language-model training or multi-tenant inference.



Professor Bo Yuan

Finally, it integrates backend-aware optimization methods that predict how architectural choices affect chip-level power, area, and timing—long before physical implementation begins.

The result is a system that can design efficient AI accelerators in a fraction of the time traditionally required, achieving significant improvements in performance and energy efficiency. "Our goal is to make AI hardware design as automated and adaptive as AI itself," explains Professor Yuan. "By reducing the design cycle from months to days, we can unleash innovation across academia and industry alike."

Beyond accelerating chip development, HexAI contributes to a larger vision of sustainable and accessible AI computing. Energy-efficient hardware is essential for reducing the carbon footprint of large-scale AI systems and for enabling broader participation in the AI economy. Through collaboration between Rutgers and TAMU, the project is combining expertise in computer architecture, electronic design automation, and machine learning to advance this vision.

Looking ahead, Professor Yuan's team aims to extend HexAI's capabilities to support emerging domains such as edge computing and scientific AI, where efficient and adaptive hardware will play a crucial role. By bridging the gap between hardware and intelligence, their work exemplifies Rutgers ECE's commitment to developing technologies that are not only powerful but also responsible and sustainable.

INNOVATIVE Research

Prof. Dario Pompili and his team are a Top 12 Finalist in the International T Challenge 2025

In early June, **Dario Pompili**, a professor in the School of Engineering Department of Electrical and Computer Engineering and the director of the Cyber-Physical Systems Laboratory, and two of his team members, doctoral candidates Zhile Li and Songjun Huang, went to Bonn, Germany to compete as one of 12 finalist teams in the 2025 T Challenge.

Sponsored by Deutsche Telekom and T-Mobile US, T Challenge2025, its theme "AI at the Heart of Telecom – Transforming Networks, Elevating Customer Experiences," provides a global stage for innovative, pioneering solutions that deploy AI to reshape the future of telecommunications. [

Pompili's "RescueNet: AI-Driven Radio Access Network for Rapid Disaster Response," was the only university project among the 450 entrants selected to participate in a live exhibition and stage presentation at Deutsche Telekom's Bonn headquarters.

Revolutionizing Disaster Response

Working with a team composed of, in addition to Li and Huang, post-doctoral student Ayman Younis, and doctoral candidates Adhwaa Alchaab and Tingcong Jiang, Pompili developed RescueNet, a portable, AI-driven 5G network for rapid deployment in disaster zones and remote areas.

According to Pompili, RescueNet uses Open RAN, or ORAN, architecture and satellite backhaul to ensure reliable, high-speed connectivity for disaster first responders such as police, fire fighters, and medical teams, as well as communities affected by natural disasters, such as hurricanes, wildfires, and earthquakes that often cripple network infrastructures at times they are most needed.

"Its AI engine," he says, "optimizes spectrum, manages traffic, and enables real-time edge computing, thus providing fast, efficient, and resilient communication in critical situations."

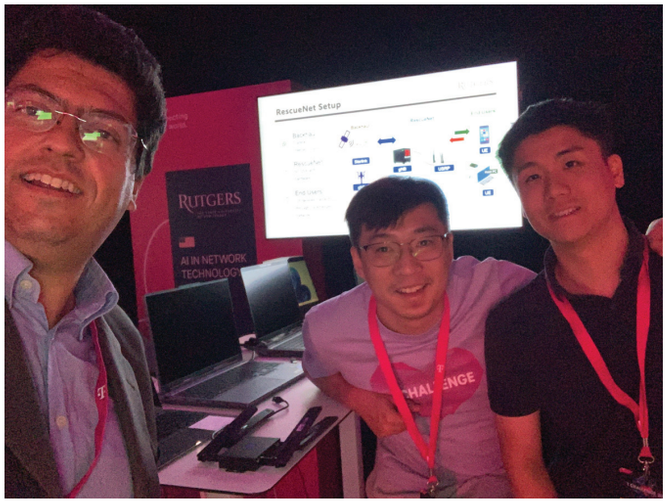
What excites Pompili most about RescueNet is its use by first responders in unpredictable emergency situations that are increasingly impacting people and communities the world over.

"Our technology can increase coordination among first responders via added communication capabilities in disaster scenarios, besides being able to add connectivity to remote areas," he says.

A Promising Project

When Pompili co-authored his first paper on RescueNet in 2016, machine learning was not yet capable of solving communications problems in real time. "My lab then resumed that work more recently, when machine learning technology was more mature and able to support RescueNet's core functionalities."

After submitting his 2025 T Challenge application last fall and being selected as a finalist, the team was advised by US T-Mobile and D-Telekom mentors as they prepared a comprehensive demo to present in Bonn.



Prof. Dario Pompili at left attends Deutsche Telecom and T-Mobile US T Challenge 2025 with doctoral students Zhile Li and Songjun Huang. Left to right: Dario Pompili, Songjun Huang, Zhile Li

While RescueNet did not place in the final four, competing and presenting in Bonn was productive. Pompili reports that they received positive feedback and suggestions from potential investors, event attendees, and D-Telekom and US T-Mobile managers on additional functionalities to incorporate in RescueNet.

Currently continuing its collaboration with D-Telekom and US T-Mobile, the team is developing a more integrated demo that includes satellite communications and more stable AI-driven functionalities to support the quality of service for a variety of users.

Pompili aims to have a minimum viable product (MVP) available to consumers by summer's end. "This prototype version of our product should have just enough features to be used by early consumers who will be able to provide feedback for future development," he explains. "The core idea behind any MVP is to quickly test a product idea with real users to gather feedback and validate whether or not the product is worth pursuing further and avoid building a full-fledged product before understanding market needs."

While RescueNet technology has already passed the NSF Innovation Corps, or I-CORPS, regional for customer discovery, the plan is to present it to the National I-CORPS in the fall to scale it nationally with more customer interviews.

Looking further ahead, Pompili is equally encouraged by RescueNet's provisional patent received via Rutgers.

Decision-Making and Learning With Communication Constraints

Proessor Anand Sarwate

I joined the ECE Department in January 2014 as an Assistant Professor and my research focused on communications, signal processing, machine learning (ML), and privacy. Modern machine learning (the backbone of AI systems) was just getting started. I've always been interested in research problems that lie somewhere at the intersection of communication, computation, and statistics. How much information is needed to make the right decision? How hard it is to make that decision? What if we don't want someone to know that information? What is information anyway? These are vague questions but come out of real engineering applications. I have always been interested in problems where different entities (people, hospitals, companies, governments) have data and want to collaborate reliably and safely.

Scenarios where communication constraints appear in data processing. Left: one party wants to communicate to another but the communication medium is subject to eavesdropping or interference. Middle: many data holders with different constraints wish to communicate with a central entity. Right: agents or devices can communicate with each other only if they are close and must collaborate to achieve some objective.

From an engineering perspective, modern ML (and now AI) systems still lack several key features that demand from reliable and safe technologies: trustworthiness, interpretability, and robustness. My group (and collaborators) have been working on questions related to these issues for a while now. In this article I'll highlight three projects we've been recently working on.

Safe collaboration for human health research. I've been working for the last decade on an NIH-funded project with research team (now based in Atlanta at the TReNDS center) that works with neuroimaging data such as magnetic resonance imaging (MRI). A big challenge in mental health research is that the study sizes are small: MRIs are expensive, and many conditions are relatively rare. Sharing data between research groups is challenging and sometimes impossible: there are a lot of legal agreements to work out to protect the privacy of individuals who are in the study. We've been building a system that can allow research groups studying the same mental health condition to do joint studies without having to share the patient data using distributed learning (now popularized as federated learning). A key question is what kind of privacy guarantees we can make, which is the focus of ECE PhD student Ye Tao's research. We've had some promising test runs on large international collaborations, including one on the impacts of smoking and alcohol on adolescents which involved 55 researchers with 43 different affiliations from 8 countries. Our vision looking forward is to have researchers contribute their own analysis tools to make our platform an easier way to do large cohort studies with much more robust findings.

Living on the edge. Current (and probably future) ML/AI models require a lot of computation, so running an AI model on your phone would rapidly drain the battery. Currently, a lot of devices that "running AI models" send the data from your phone to a data center in cloud which does the computation. The downside of this is delay, or latency, which can be a killer for many applications. For example, using a dashcam to help prevent car collisions can require decisions every few milliseconds. Cars have much more battery power than a phone or a drone: what can we do in the future? An emerging paradigm is the Mobile Edge Cloud (MEC), which might take the form of smaller data centers that are more densely deployed, and mobile devices can partially or fully "offload" their AI computation to the MEC to improve latency. T ECE PhD students Nitya Sathyavageeswaran and Yu Wu and I have been studying problems that arise when offloading is costly: many "AI as a Service" models charge per use or may not be completely trusted to not sell your data. We have been looking at several problems around balancing latency, privacy, and reliability of AI models through an NSF-funded project at Rutgers WINLAB.

Understanding AI models and reliability. A lot of the data processing in ML/AI models is basically long-studied methods from "classical" signal processing but assembled in somewhat new ways. The key game changer is that with enough computation you can optimize over the whole assembly (this idea was succinctly captured by Berkeley professor Ben Recht). Can we use "classical" tools to understand and improve AI models? We've been looking at several different problems in this space, partially supported by the Pacific Northwest National Lab (PNNL). With ECE PhD student Xin Li and I been revisiting the process of tokenization—which is a core element of ML/AI systems—using in a way that both improves accuracy and is potentially easier for computation. This work rests on results from my long collaboration with ECE faculty Waheed Bajwa on multidimensional signal processing. With ECE PhD student Sinjini Banerjee we are studying how (and if) the differences between AI models can be leveraged to improve reliability. This work rests on understanding how to measure the differences between AI models, which is not a well-defined problem. Another explores these differences experimentally by using a third AI model as a kind of "microscope" to measure the differences between AI models, revealing that models may have different "signatures."

Looking ahead. When I started here, wireless technologies were everywhere and integrated into so many aspects of our lives: it took decades to get here! Now there's an idea that we should have "AI technologies everywhere" in a much shorter time horizon. I think more research is needed, particularly when we specialize AI models to high-stakes applications like manufacturing, agriculture, and medicine. Many of these areas will rely on wireless communication systems, which have worked for years on addressing the big challenges of reliability, resilience, and energy efficiency. These challenges also face AI systems, and I think we've just scratched the surface of what is needed. I am leading a recently-funded pilot project at WINLAB (with Chief Technologist Ivan Seskar and ECE faculty Jorge Ortiz, Yinging Chen, Bo Yuan, Narayan Mandayam, Waheed Bajwa, Hang Liu, and Bo Yuan) to create a vision for an AI-enabled version of our COSMOS testbed that can catalyze research in both AI for Wireless (using AI to help wireless systems) and Wireless for AI (making "wireless-native" AI systems). As I enter my second decade at Rutgers, I'm looking forward to many more research collaborations both inside and outside of Rutgers.

INNOVATIVE Research

Electrical and Computer Engineering Professor Receives Prestigious NSF CAREER Award

Daniel Burbano Lombana, assistant professor in the Department of Electrical and Computer Engineering (ECE) at the Rutgers School of Engineering, has received a National Science Foundation Faculty Early Career Development (CAREER) award for his project Understanding and Analyzing the Feedback Principles Underlying Visuomotor Control Dynamics in Fish Schools. The five-year award totals $644,498 and supports an integrated agenda spanning research, education, and public outreach. The NSF CAREER program is among the foundation's most competitive awards, recognizing early-career faculty who show strong promise as research leaders and educational role models.

PI Daniel Burbano

What Visuomotor Control Dynamics Are

At the heart of this project is visuomotor control dynamics, how animals turn what they see into movement, moment by moment. In a fish school, every individual is constantly reading a stream of visual information: where its neighbors are, how they're moving, what obstacles lie ahead, and how the surrounding visual scene is shifting. Those cues are instantly translated into swimming decisions, when to turn, how fast to go, and how close to stay. Because the entire school is in motion, this is a continuously updating feedback process: fish integrate visual input in real time and make rapid adjustments in heading, speed, and spacing to keep the group cohesive and responsive as conditions change.

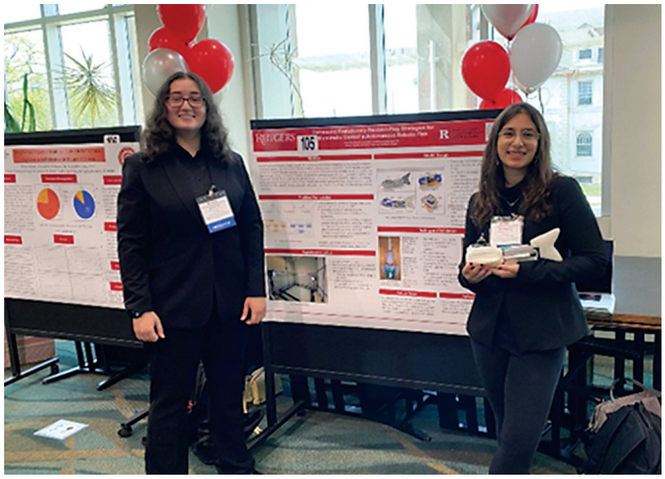
Uncovering Feedback Principles in Fish Schools

Feedback is a familiar idea in control engineering: behavior is corrected based on sensory input relative to a goal. A thermostat compares room temperature to a set point; a robot compares its current path to a desired trajectory and adjusts its motors to stay on course. Fish schools rely on the same principle, but without a central controller. Each fish makes small, real-time corrections using only local sensory cues from the environment and its closest neighbors. As a result, collective behavior emerges in the group as cohesive, avoids collisions, and adapts quickly to disturbances.

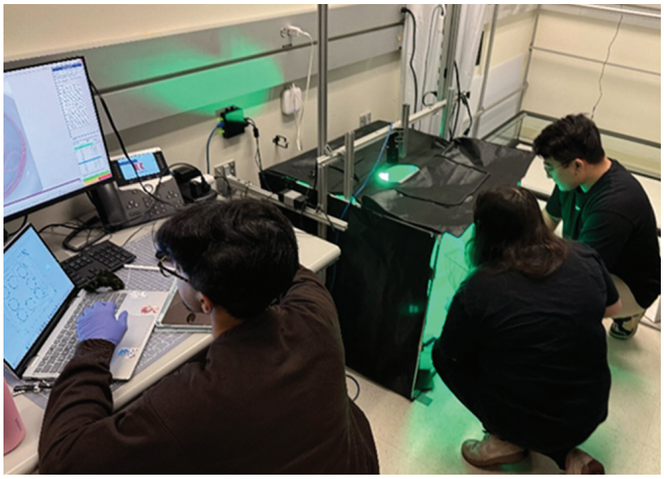
To identify the rules underlying this decentralized feedback, the CAREER award will study zebrafish, a well-established model organism known for rich social behavior and experimental accessibility. In observation arenas designed for precise visual manipulation, researchers will present structured cues such as moving patterns, illumination gradients, and optical flow fields that mimic realistic environmental shifts. High-resolution tracking will capture individual and group trajectories, orientations, and spacing. These datasets will be paired with mathematical modeling to reverse engineer the feedback laws fish use and to explain how local decisions scale into stable collective motion.

From Fish to Autonomous Swarms

The engineering impact of this work is direct. Fish coordinate effectively using local sensing, minimal communication, and fast decisions, the same constraints faced by many engineered swarms operating in complex, GPS-

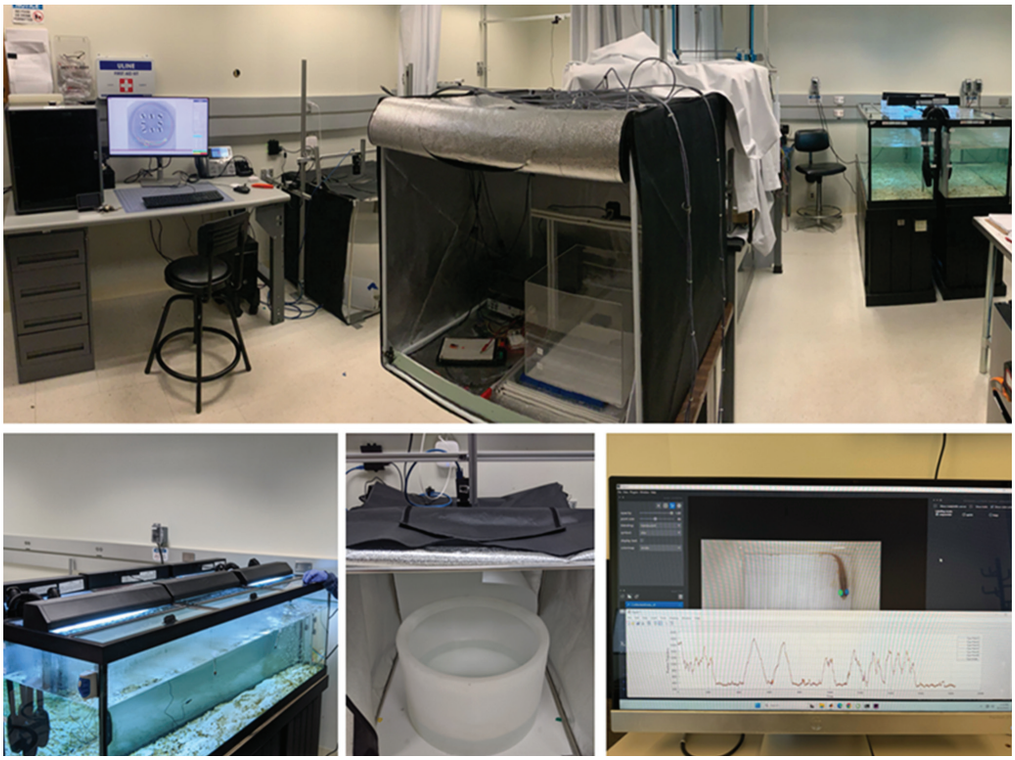


Undergraduate students Lavanya Rao (Left) and Maya Zarcone (Right), who worked in the Swarm Intelligence Lab, developed an autonomous robotic fish.



Undergraduate Students Ali Khan (Left) and Julia Alvarado (Center) and PhD student Deze Liu (Right) working in the Swarm Intelligence Lab to understand visual feedback in fish schools.

denied environments. By translating biological feedback principles into mathematical models, the project aims to deliver control strategies for autonomous multi-agent systems that must coordinate without centralized oversight. Potential applications include swarms of drones navigating forests or collapsed buildings during search-and-rescue missions, fleets of autonomous underwater vehicles coordinating in coral reefs for environmental monitoring, and ground robots collaborating to map or contain wildfires. In each scenario, agents must act independently yet cooperatively, often with limited bandwidth and incomplete global information. Fish schools provide a powerful natural blueprint for robust, scalable autonomy under exactly those conditions.



The Swarm Intelligence Laboratory, equipped with behavioral arenas for controlled experiments, camera systems integrated with tracking software, and dedicated husbandry tanks.

Big-Picture Scientific Value

Beyond technology, the CAREER project addresses a foundational scientific question: how do animals with minimal cognitive and energetic resources achieve sophisticated group intelligence? Zebrafish have small brains and tight energy budgets, yet their schools display rapid adaptation and problem-solving. Identifying the simplest sensory-motor feedback strategies that yield complex coordination advances understanding of the origins of intelligent behavior, while revealing deep links between biological collectives and artificial ones.

A Lab Built for Interdisciplinary Discovery

The research will take place in the Swarm Intelligence Lab at Rutgers, which supports both live-animal studies and bio-inspired robotics. The lab includes three vivariums for housing zebrafish, observation tanks for behavioral experiments, dedicated workbenches for circuit and robotic system design, and custom 3D-printed components that enable rapid prototyping. This infrastructure allows insights to move quickly from biological observation to theoretical analysis and engineered implementation.

Education and Outreach as Core Outcomes

A defining feature of the CAREER program is the integration of research with education. Burbano's education plan is structured into four tiers. Tier 1 focuses on community engagement and K–12 outreach through after-school programs and events such as Rutgers Day, where families explore fish behavior, robotics, and biomimetic design through hands-on demonstrations. Tier 2 provides research experiences for Rutgers undergraduates, involving them directly in experimental design, data analysis, mathematical modeling, robotics development, and control research. Tier 3 advances curriculum development in systems and controls. Burbano is modernizing several courses to incorporate inquiry-based learning and real-world applications, and he has introduced a new graduate course, Data-Driven Systems and Control (16:332:514). The course challenges traditional model-first approaches by showing how control strategies can be designed directly from data, mirroring how animals operate in nature: they do not rely on explicit mathematical models of their environments but instead use sensory input to make rapid, adaptive decisions. Tier 4 introduces a peer-led Training-to-Train initiative, featuring student-run panels and mentoring sessions that demystify STEM research pathways and careers through open dialogue.

Students at the Heart of the Project

Undergraduate and graduate students will be active contributors throughout the CAREER award. They will help design and run fish experiments, build and test robotic systems, develop new mathematical models of collective behavior, and implement autonomy algorithms inspired by the findings. The project is intentionally collaborative, providing sustained training at the interface of biology, mathematics, and engineering.

Meaning and Momentum

For Burbano Lombana, the CAREER award is both personally meaningful and professionally energizing. It affirms the long-term interdisciplinary vision of his work and provides stable support to pursue bold research ideas while investing in educational innovation. In today's uncertain and highly competitive funding environment, the continuity and visibility of a CAREER award are invaluable. With this platform, his team is poised to reveal how visual feedback drives coordinated motion in fish schools and to translate those principles into smarter, more adaptive autonomous systems, while inspiring curiosity and wonder in students and the broader public.

INNOVATIVE Research

Seeing Beyond a Snapshot: Advances in Snapshot Compressive Imaging

By Shirin Jalali

Every time we snap a photo or record a video, we capture only a slice of reality. The world is inherently high-dimensional (HD), rich with depth, motion, wavelength, polarization, and more, yet most sensors are two-dimensional (2D). Capturing richer information (e.g., hyperspectral scenes, volumetric videos, tomographic datasets) often demands slow, expensive scanning systems. The result is a persistent gap between the information we would like to capture (for science, medicine, and engineering) and what conventional cameras can efficiently measure.

Snapshot Compressive Imaging (SCI) offers a different path. SCI pairs *optical encoding (hardware) with computational reconstruction (software)*. Rather than recording an HD dataset one slice at a time, SCI uses a coded optical mask to compress the scene into a single 2D snapshot; algorithms then reconstruct the full HD data cube. Intuitively, the mask mixes multiple frames or spectral bands into one measurement, and the reconstruction algorithm uses structure in the data, such as sparsity, low-rank dynamics, or spatial regularity, to separate them. In short, SCI lets us see beyond a single picture, effectively trading simple hardware for principled computation.

SCI has shown impact across hyperspectral imaging, high-speed video, holography, tomography, polarization imaging, and microscopy. By eliminating sequential scanning, SCI enables faster acquisition and lower data bandwidth. From a systems viewpoint, SCI also delivers a multiplexing gain, more efficient use of photons under fixed exposure, when the reconstruction algorithm is well matched to the mask and noise conditions.

Yet a central question remained: *under what conditions is it possible to recover an HD data cube from a single 2D snapshot?* Practitioners knew SCI could work, but rigorous performance guarantees, mask-design principles, and learning strategies that *generalize across instruments* were limited. Without these, it is difficult to choose exposure times, mask patterns, or algorithmic hyperparameters with confidence.

Our research program addresses this gap through four advances. We established the first rigorous mathematical foundations for SCI reconstruction, clarifying when recovery is possible and how performance scales with noise, coding, and data structure. We developed theory-guided algorithms via deep unfolding, blending the reliability of iterative methods with the flexibility of neural networks. We introduced an analytical framework for mask design and optimization, connecting optical patterns and physical constraints to reconstruction quality and identifiability. Finally, we designed training-data-free neural methods that adapt to new imaging conditions without supervised datasets, crucial for emerging modalities and rare regimes.

Together, these advances help transform SCI from a promising concept into a predictable, deployable tool for efficient, high-dimensional imaging. This work at Rutgers ECE has been supported in part by an NSF CAREER award, enabling foundational advances with translational impact.

Foundations for SCI

A long-standing question in SCI is whether a single 2D snapshot can contain enough information to reconstruct a high-dimensional dataset. Beyond demonstrations, users need to know *when* the approach will work, how well it can work, and what algorithmic structure is necessary. We addressed this by developing a compression-based framework tailored to SCI's forward model. The analysis links recoverability to how "simple" (compressible) the underlying data cube is under realistic priors, while explicitly accounting for the mask and noise. This yields **fundamental performance bounds**, scaling laws that specify when accurate recovery is possible, and insight into how many effective degrees of freedom can be stably captured in a single shot [1].

We complemented theory with algorithms. The paper introduced two recovery methods with **provable convergence guarantees**. These methods preserve the physics of the measurement operator while enforcing compatible data priors. Empirically, they substantially improved reconstructions of high-speed video and other dynamic scenes, elevating SCI from an experimental technique to one with a solid theoretical backbone. For practitioners, this means clearer criteria for setting exposure, mask density, and reconstruction parameters, and a principled understanding of trade-offs among noise level, compression ratio, and fidelity.

Building on this foundation, we introduced **GAP-net**, a deep-unfolding architecture that fuses principled optimization steps with CNN-based denoisers [2]. Each iteration performs a physics-consistent update followed by a learned denoising step. This design offers (i) interpretability, each layer corresponds to an operation in an iterative solver; (ii) data efficiency and generalization, fewer learned parameters and better cross-instrument robustness; and (iii) stability, we proved global convergence for a variant of the method, rare in deep inverse problems. In practice, GAP-net attains state-of-the-art quality for both video and spectral SCI while remaining fast and adaptable. The broader impact is that theory informs architecture, and architecture feeds back into predictable performance, tightening the loop from analysis to deployment.

Optimizing Optical Masks

Every SCI system is defined by its **optical mask**, which encodes an HD scene into a compressed snapshot. The mask governs three properties: (i) how distinguishable frames/bands remain after multiplexing, (ii) how photons are allocated across time or wavelength, and (iii) how robust the encoding is to hardware constraints. Early analyses assumed idealized random masks (e.g., i.i.d. Gaussian) for mathematical convenience, whereas real systems must use **binary, physically constrained** masks. This raised two practical questions: How much does mask choice matter, and how should we design better masks?

Prior mask-optimization efforts were largely empirical and computationally heavy. In recent work by Ph.D. student **Mengyu Zhao** [3], we provided the first analytical characterization of SCI with realistic binary and structured masks. The framework connects mask statistics to reconstruction error via explicit conditioning measures, clarifying, for example, how duty cycle, temporal/spectral correlations, and **spatial structure** influence identifiability and stability.

Two outcomes are especially useful to practitioners: (i) design rules, guidance for selecting mask density and structure to balance photon efficiency and invertibility, and (ii) co-design, tuning masks and algorithms together, leading to measurable gains in reconstruction quality. By moving beyond idealized assumptions, this work enables predictable performance under physical constraints, directly informing how we build instruments that are both accurate and manufacturable.

Unsupervised SCI

Deep learning has driven rapid gains in SCI reconstruction, but many methods require large labeled datasets that are difficult to obtain. Collecting matched pairs of coded measurements and ground-truth data cubes is often infeasible or ethically constrained. This motivates a key question: Can we harness neural networks for SCI without supervised training?

In work by Ph.D. students Mengyu Zhao and Xi Chen [4], we investigated untrained neural networks (UNNs) for SCI, leveraging network structure as an implicit prior. Because the prior is encoded by architecture rather than external data, UNNs adapt per scene and avoid domain shift. This is particularly attractive for biomedical or field deployments where training data is scarce, privacy-sensitive, or expensive.

Our contributions were twofold. First, we introduced a theoretical framework linking network capacity, mask design, and the number of frames that can be reliably recovered. Second, we proposed SCI Bagged Deep Video Prior (SCI-BDVP), which aggregates multiple UNN reconstructions and stabilizes training with regularization schedules and early stopping. The result is fewer artifacts and improved robustness across noise levels. Remarkably, SCI-BDVP achieves state-of-the-art results among unsupervised methods and, under noisy conditions, can surpass supervised baselines.

Future Directions

Many SCI applications operate under photon-limited regimes (microscopy, remote sensing, night video). Shot noise dominates and interacts with multiplexing, making naive reconstructions suboptimal. We are developing models that explicitly account for Poisson-Gaussian noise, enabling robust fidelity at low exposure.

Real sensors also saturate and quantize, breaking linearity and biasing reconstructions. We are incorporating clipping-aware models and exposure-adaptive strategies to achieve reliable performance in wide dynamic range scenes.

Finally, many systems deviate from ideal linear superposition (e.g., fluorescence lifetime, scattering, non-linear transduction). We are extending SCI to non-linear forward models using differentiable optics, self-calibrating inference, and plug-and-play priors. These efforts broaden SCI's reach and improve robustness in real-world instruments.

Together, low-light robustness, saturation awareness, and non-linear modeling close the gap between benchtop demos and field-ready systems. They address the most common failure modes: too few photons, too many bright pixels, and physics that depart from linearity. Tackling these with principled algorithms gives practitioners predictable performance envelopes and reduces the need for extensive per-instrument retuning.

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[2] Meng, Ziyi, Xin Yuan, and Shirin Jalali. "Deep unfolding for snapshot compressive imaging." *Int. J. Comput. Vis.*, 131.11 (2023): 2933–2958.

[3] Zhao, Mengyu, and Shirin Jalali. "Theoretical Characterization of Effect of Masks in Snapshot Compressive Imaging." *SIAM J. Imaging Sci.*, 18.3 (2025): 1707–1741.

[4] Zhao, Mengyu, Xi Chen, and Shirin Jalali. "Untrained neural nets for snapshot compressive imaging: theory and algorithms." *NeurIPS 37* (2024): 89752–89781.

Step Inside the ECE Department: A Virtual Showcase of Our Labs

By Yao Liu

Our research group is developing a virtual showcase of the ECE Department, allowing you to step inside and explore our labs in photorealistic detail. Soon, alumni, prospective students, and partners will be able to experience our key instructional and research spaces from anywhere, using nothing more than a standard web browser.

This effort builds on the innovative work of PhD candidate **Mufeng Zhu**, who designed a new system for streaming complex 3D scenes efficiently into everyday devices. MS student **Jing Du** strengthened the system over the summer with performance improvements, while MS student **Handong Xue** and PhD student **Zihao Ding** led on-site image capture and data preparation for training the models.

At the heart of this project is 3D **Gaussian Splatting (3DGS)**, a state-of-the-art technique for photorealistic 3D reconstruction. Instead of discrete points (as in traditional 3D point clouds), 3DGS represents a scene with many small, colored 3D ellipsoids. A machine learning training pipeline learns the color, size, and orientation of these ellipsoids from ordinary photos, and a specialized renderer combines them to produce photorealistic views from any viewpoints directly in the browser.

The challenge is scale: 3DGS scenes can be many gigabytes in size. Sending all that data to the browser at once would cause long loading times and waste bandwidth, especially on mobile devices.

Our solution is **SGSS (Streaming Gaussian Splat Scenes)**. Instead of downloading the full 3DGS scene data up front, SGSS fetches only those discrete parts of the scene that are visible in the user's current view. As the user explores, the browser-based SGSS client fetches new scene data on demand. SGSS also prioritizes the most visually important elements, so a rendering appears quickly and refines over time. The result: smooth, bandwidth-efficient navigation through these virtual spaces.

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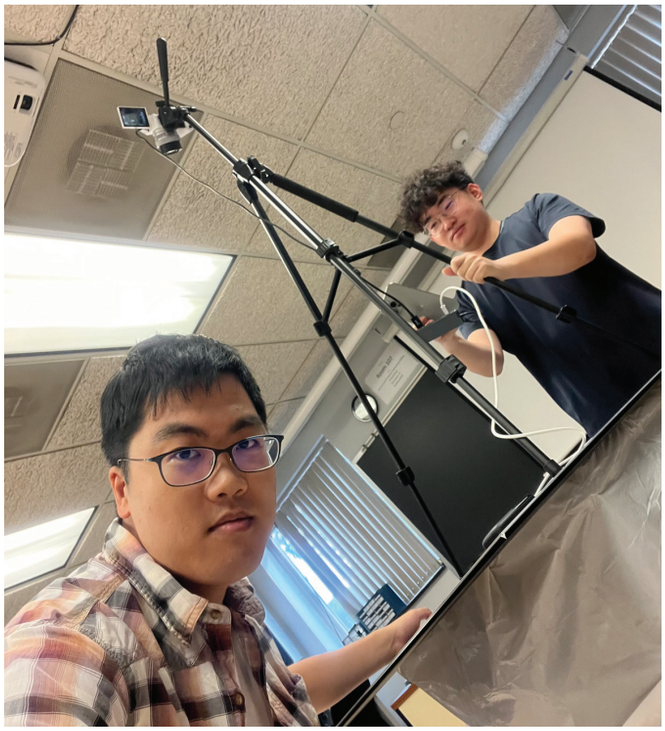
Step Inside the ECE Department: A Virtual Showcase of Our Labs (*continued*)



MS student Handong Xue and PhD student Zihao Ding lead the process of image capture, the foundational step for creating each virtual space.

To showcase SGSS, we choose our own campus. Our ambitious goal is to build a digital portfolio of the ECE department's most significant spaces. To do so, tens of thousands of photos of each location will first have to be captured and then processed through training pipelines. The team has completed the first phase: one EE lab has been fully captured and is now viewable as a high-fidelity virtual exhibit on a standard web browser. This first phase has proven the feasibility of taking images from the field, processing them through SGSS, and allowing realistic 3D spaces to be streamed and explored interactively.

The research was published at the 16th ACM Multimedia Systems Conference (ACM MMSys 2025) [1]. Building on this foundation, our team has also prepared a code release so that similar streaming experiences can be deployed for outreach and instruction.

Next, the group will expand the virtual showcase by digitizing other key areas, such as our senior design lab and research labs. We will also continue to refine the streaming protocols for a wider range of devices and networks and prepare a public demonstration of the SGSS technology to showcase the innovation here at Rutgers ECE.

Reference

[1] Zhu, Mufeng, Mingju Liu, Cunxi Yu, Cheng-Hsin Hsu, and Yao Liu. "SGSS: Streaming 6-DoF Navigation of Gaussian Splat Scenes." *Proceedings of the 16th ACM Multimedia Systems Conference*, 2025.

PhD candidate Mufeng Zhu and MS student Jing Du demonstrate the final result: a smooth, interactive virtual experience running directly in a web browser.

GRANTS

Grants received by ECE faculty from 10/2024 to 9/2025

Jorge Ortiz with **Yuqian Zhang**, **Dario Pompili**, **Jie Gao** (Computer Science), and **Vijayalakshmi Atluri** (Business School) worked together with researchers from Ohio State (lead), Northeastern, and Baylor along with industry and government partners to establish the **Center on Responsible AI and Governance (CRAIG)** to advance artificial intelligence that is safe, transparent, fair, and accountable.

Ivan Seskar and **Dipankar Raychaudhuri** have received a new NSF grant titled "COSMOS3: Enhancing and Sustaining the COSMOS Platform" to enable research on 6G era wireless networks. This 3-year effort is led by Rutgers University is a collaboration with Columbia and Duke universities.

Jorge Ortiz is co-PI on the teLLMe project to develop a conversational system that lets residents query street-level data and receive explanations supported by video evidence and causal analysis. The project titled "ReDDDoT Phase2: Leveraging Urban AI as a Communal Tool for Connection and Exchange in Harlem". Rutgers, under Jorge Ortiz, will take on the technical foundation of the system.

Athina Petropulu and **Aggelos Bletsas** received an NSF grant entitled "MIMO ISAC for High-Rate Communication and Accurate Situational Awareness in High-Mobility Scenarios." This project addresses the growing demand for high-performance, compact, and energy-efficient wireless systems by advancing Dual Function Radar Communication technology. This is a 3 year grant from NSF's Communications, Circuits, and Sensing-Systems (CCSS) Program.

Athina Petropulu, **Yingying Chen** and **Chung-Tse (Michael) Wu**, received a new NSF Award entitled "VSMART: Vital Sign Monitoring viA Remote Tracking". Radar technology for monitoring vital signs, including heart rate and respiration rate, shows significant potential in transforming health monitoring via remote, continuous observation of multiple individuals. This is a 3 year grant from the NSF's Communications, Circuits, and Sensing-Systems (CCSS) Program.

Anand Sarwate (PI), with Co-PIs **Ivan Seskar**, **Yingying Chen**, **Bo Yuan**, and **Jorge Ortiz**, and senior personnel **Narayan Mandayam**, **Waheed Bajwa**, **Hang Liu**, and **Zhao Zhang** collaborated on planning project titled "STAIRWAI to COSMOS: Sensor-enabled Test Bed for Advancing Innovative Research in Wireless+AI". The STAIRWAI project was selected as one of the four highlighted projects by the National Science Foundation in its recent announcement on AI-Ready testbeds. The STAIRWAI pilot project will support the integration of wireless technology with AI to improve the performance and reliability of next-generation networks.

Bo Yuan received an NSF grant, titled "HexAI: Holistic Exploration for Design Automation of Efficient AI Accelerators". This award develops HexAI, a comprehensive design automation framework for next-generation AI accelerators. Hex AI integrates architectural optimization, workload and data-awareness, and backend circuit syntheses into a unified framework.

Dario Pompili (PI) and **Roger Wang** (Rutgers CEE) and the Woods Hole Oceanographic Institution were awarded a three-year NSF CPS research project, titled "ML-Assisted Marine Plume Identification using Networked Intelligent Underwater Vehicle Swarms". The project is a collaborative effort between Rutgers University and the Woods Hole Oceanographics Institution (WHOI).

Daniel Burbano Lombana has been awarded a five-year NSF CAREER Award for the project "Understanding and Analyzing the Feedback Principles Underlying Visuomotor Control Dynamics in Fish Schools".

Umer Hassan received a HealthAdvance Grant Award on the project, "A Biomedical Test to Transform Clinical Care of Septic Patients in Emergency Settings of Hospital." Dr. Hassan is the sole PI on the 2-year award.

Zhao Zhang, **Hang Liu**, and **Bo Yuan** were the recipients of a collaborative Cyberinfrastructure for Sustained Scientific Innovation (CSSI) Framework award from the National Science Foundation (NSF). The team, led by **Zhou Zhang** (PI), is taking the lead on the three-year project titled "hpcGPT: Enhancing Computing Center User Support with HPC-enriched Generative AI."

Ivan Seskar and a WINLAB team are among the collaborating university and industry partners—including project lead NYU Tandon School of Engineering, Princeton, NYU's Pi-Radio, Nokia, and Analog Devices — receiving funding support from the National Telecommunications and Information Administration (NTIA).

Mehdi Javanmard and BME Professor **Francois Berthiaume** together received a New Jersey Commission for Spinal Cord Injury grant for the project "Dynamic Sensing of Pressure Wounds in Spinal Cord Injury". This is a three-year research project from December 2024 to November 2027.

Zoran Gajic received a one-time unrestricted gift for "Development of Reinforcement Learning Projects for Enhancement of Academic Curricula: RL for Engineers" from MathWorks Inc.

Salim El Rouayheb was the recipient of a new ARL award for the project titled "DAST: Dynamic, Adaptive, and Swift AI at the Resource-Constrained Tactical Networks." Dr. El Rouayheb is a co-PI on this three-year collaborative effort between Rutgers and the University of Illinois at Chicago (UIC).

Sasan Haghani together with **Carolyn Sarter** (Institute for Health, Health Care Policy, and Aging Research), **Peggy Swarbrick** (Rutgers Scarlet Well) and **Amy Spagnolo** (Rutgers, Scarlet Well), received a Behavioral Health and Equity Pilot Seed funding grant from Rutgers University - New Brunswick Office of the Vice Provost for Research titled "Facilitating Access to Digital Health Information for Individuals with Miltifaceted Health and Social Needs: Smartphone App Co-design in Community Wellness Centers."

STUDENT News

Meet an ECE Student

Rishita Dasgupta

Hello! My name is **Rishita Dasgupta**, and I am a junior in Electrical and Computer Engineering with a minor in Computer Science. I am also a member of the Honors College, where I've balanced a near-perfect GPA with active involvement in research, teaching, and service. My first exposure to ECE research came during an information session hosted by Dr. Anand Sarwate in my freshman year. What stood out to me was his advice on how to reach out to professors and frame my interest in research. Following that session, I began exploring the research interests of ECE faculty on my own. In doing so, I realized how broad the field is and how those areas connect to real-world applications. That process ultimately guided me toward my first major experience: the Aresty Summer Science Research Program in 2024. Through Aresty, I joined Dr. Shirin Jalali's group, where I worked on deep learning for coherent imaging methods. Our goal was to improve image reconstruction in areas like optical coherence tomography, synthetic aperture radar, and digital holography. My role focused on implementing convolutional neural networks in PyTorch and NumPy, building reproducible training pipelines, and comparing the results to traditional reconstruction techniques. The most valuable part of this project was learning how to adapt machine learning models to physics-based problems, where the assumptions are very different from natural images. This experience gave me my first real sense of how research requires both technical skill and creativity. Since that summer, I have continued in Dr. Jalali's group. Being in that position has pushed me to grow quickly, such as during our group meetings where we engage in discussions about our research and fundamental underlying concepts. I also took Dr. Jalali's course, "Topics in ECE: Applications of Machine Learning and Statistics," during my sophomore year, which helped me deepen the theoretical grounding for the techniques I use in research. Together, these experiences have solidified my interest in pursuing machine learning and artificial intelligence as the core areas of my academic focus. Beyond research, I've sought out industry experience. During my internship at Verizon in Summer 2025, I developed a Python automation pipeline for SIP log validation, reducing runtime from over 30 minutes to under a minute per case. I also automated device configuration workflows for 5G field testing, which reduced manual setup time by about 95%. The scale of impact was eye-opening. I discovered how small technical optimizations led to significant improvements in testing throughput and efficiency. Leadership and service have also played a central role in my undergraduate years. I currently serve as Secretary of IEEE-HKN, the honor society recognizing the top third of juniors in ECE, and I was recently offered a spot in Tau Beta Pi, which represents the top eighth of juniors across the entire School of Engineering. As a School of Engineering Ambassador, I represent the ECE department at outreach events, and as an Honors College Ambassador & Mentor, I work closely with first-year students, offering guidance and support during their transition to college. Teaching is a major part of my identity at Rutgers. As a Learning Assistant for large first-year engineering courses with over 700 students, I lead review sessions, support problem-solving, and help make foundational material more approachable for hundreds of students each semester. I also work as a grader and proctor for the Computer Science department, which has strengthened my ability to evaluate technical work consistently and fairly. I've also been active in both engineering and computer science student organizations. On the CS side, I joined the Mobile App Development Club's selective frontend program, where I built components in JavaScript, Node.js, and HTML/CSS. Later, I became involved in the flagship CS outreach club, where I organized company partnership events, helping to connect students with recruiters. These experiences highlight one of my favorite aspects of the ECE degree: the flexibility to branch into computer science while maintaining a strong foundation in systems and hardware. My involvement also extends to the broader Rutgers community. As a freshman, I served as a representative for the Society of Women Engineers (SWE) and attended both SWE conferences and the Grace Hopper Celebration under nearly or completely full scholarships. These experiences gave me early exposure to professional development and networking opportunities that continue to shape my career goals. Additionally, I've been involved in the Engineering Governing Council (EGC) and the Rutgers University Student Assembly (RUSA), which has allowed me to engage with student governance and understand how policy affects the student experience. Outside of academics and leadership, I enjoy traveling and hiking. Exploring new places helps me reset and keeps me grounded and reminds me that engineering problems exist in the real world. Ultimately, the goal of my work is to serve people and communities. Looking ahead, I hope to keep building expertise in machine learning, data science, RF engineering, and embedded systems, whether through graduate study or industry. My long-term goal is to apply these tools to areas like imaging and communications, where careful system design can have direct impact. Being part of Rutgers ECE has given me opportunities to grow as a researcher, engineer, and mentor. Each experience, everything from that first info session with Dr. Sarwate, to my ongoing research with Dr. Jalali, to my leadership and teaching roles, has shaped my path. I'm excited to continue building on this foundation in the years ahead!

Meet an ECE Student *(continued)*

Amrik Krishnakumar

Hi! My name is **Amrik Krishnakumar**, and I'm a junior in Electrical and Computer Engineering department at Rutgers University. Rutgers Engineering & ECE have helped me discover my passion for engineering through its coursework, student organizations, and opportunities for hands-on experience.

When I first started, I was set on the Electrical Engineering track, drawn to the idea of building and testing hardware systems. However, after joining the Rutgers Institute of Electrical and Electronics Engineers (IEEE), I quickly realized my interests extended beyond circuits. I was intrigued by how hardware and software interact to bring various systems to life. Through IEEE, I worked on electronics projects, explored robotic systems, and gained my first exposure to software engineering. Those experiences inspired me to dive deeper into embedded systems, machine learning, and systems integration, ultimately leading me to switch to the Computer Engineering track.

Outside the classroom, Rutgers Engineering organizations have helped me grow as both a leader and an engineer. I currently serve as the President of Rutgers IEEE, the very club that sparked my curiosity in the field, as well as the Systems Engineering Lead for the Rutgers CubeSat Initiative (STAR), where we work on satellite hardware and flight software integration.

I was also the Events Chair for the Engineering Governing Council, where I organized events with deans and administration such as Cardboard Canoe, Rutgers Day, and First Year Kickoff, for the broader engineering community.

These experiences also guided me toward exciting industry roles. This past summer, I interned at Lockheed Martin as a Software Engineer Intern, where I developed automation tools for control systems and worked on Linux-based software integration and testing. Before that, I was a Machine Learning Engineer Intern at Avlino, where I built machine learning models & pipelines in a large-scale cloud environment.

Whether through classes, research, or internships, I'm always striving to learn something new. If I could leave one piece of advice, it would be to stay motivated, keep learning, and push your limits. In an age of rapid AI and systems innovation, staying curious and adaptable is essential.

Looking ahead, I hope to pursue a master's degree and continue growing with the same mindset that Rutgers ECE has inspired in me.

Rushika Thandra

Hi, I'm **Rushika Thandra**, a graduate student specializing in Electrical and Computer Engineering at Rutgers University, with a focus on Embedded Systems and Machine Learning. My academic journey began at Purdue University, where I earned my bachelor's degree in Electrical Engineering. My undergraduate years were defined by hands-on engineering experiences, from building real-time embedded systems to exploring hardware-software integration, which fueled my passion for creating impactful technology solutions.

I chose Rutgers for my graduate degree because of the strong ECE curriculum and research opportunities. The program's blend of rigorous coursework, research, and collaboration with distinguished faculty provides a great environment to deepen my expertise in embedded systems and AI applications. Rutgers' emphasis on interdisciplinary learning and industry engagement, along with the welcoming and collaborative community within the ECE department, made it an easy decision.

During my time at Rutgers, I have actively engaged in both academic and community roles. I served as the Outreach Officer for the Electrical and Computer Engineering Graduate Student Association (ECEGSA), where I lead sponsorship efforts and organize events to connect students with industry leaders. I am also an active member of the Society of Women Engineers (SWE) and Women in Computer Science (WICS). Through WICS, I received a scholarship to attend the Grace Hopper Conference, the world's largest gathering of women in technology, which was an inspiring and empowering experience. Additionally, I have served as a grader for Professor Maria Striki's Computer Architecture and Cloud Computing courses, which has strengthened my technical foundation and given me insight into academic instruction.

My professional journey has included diverse internships that bridge embedded systems and AI. Most recently, as an Embedded Software Intern at AMD, I designed firmware for Smart Data Accelerators using RISC-V and Zephyr RTOS, optimized concurrency in multicore systems, and merged different test coverage builds.

Research and projects have been a defining part of my graduate experience. I have engineered secure embedded environments using ARM TrustZone, OP-TEE, and Intel SGX, and developed smart home monitoring systems with integrated authentication, environmental sensing, and real-time alerts. Another highlight has been my Machine Learning Scoring proj-

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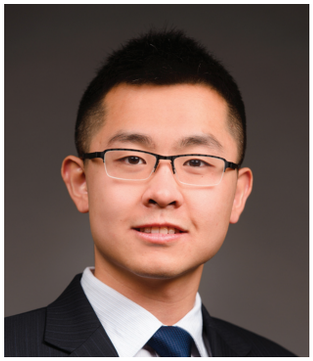
STUDENT News

Meet an ECE Student *(continued)*

ect, which I originally completed as a final assignment for my Data Structures course, and I am now working on publishing it with Professor Dov Kruger.

My favorite part of ECE at Rutgers is the culture of collaboration, whether it's brainstorming design ideas with classmates, working alongside professors on cutting-edge projects, or participating in department events that bring together students from diverse backgrounds and disciplines. The department's support for student initiatives and openness to innovation have made my time here both challenging and rewarding.

After graduating in January 2026, I plan to return to industry, leveraging my skills in embedded systems and AI to build secure, high-performance solutions. I am also preparing to publish my machine learning research, contributing to the academic and engineering community. Through my work on Topmate.io, I was recently featured on a Times Square billboard, a surreal and unforgettable moment. These experiences have reinforced my commitment to applying my skills to create innovative, impactful technologies that bridge the gap between research and real-world solutions.



Kailong Wang

My name is **Kailong Wang**, and I am a fifth-year PhD candidate in the Electrical and Computer Engineering (ECE) department at Rutgers University, under the supervision of Prof. Athina Petropulu. My doctoral studies have been a journey of exploration and exploitation, curiosity and bravery. It has been a process of deep growth, where I have immersed myself in the fields of signal processing, stochastic processes, and optimization. My research focuses on tackling the complex challenges at the forefront of the next generation of wireless systems, 6G. The vision for this new era is ambitious: to operate in high-frequency bands and support high-mobility scenarios (like vehicle-to-everything communication), all while confronting the critical issue of electromagnetic spectrum congestion. My work addresses this challenge by advancing Integrated Sensing and Communication (ISAC), a revolutionary concept identified by the ITU as crucial for 6G. ISAC aims to merge sensing (like radar) and communication (like Wi-Fi) functionalities into a single, efficient system. This integration creates powerful opportunities in signal processing, resource allocation, and overall system design. My path into this cutting-edge research was not straightforward. With a background in mathematics and statistics, I had to learn signal processing from scratch and, more importantly, overcome my fear of failure. I began the PhD program full of curiosity but lacked the bravery for the trial-and-error nature of research. This journey has taught me to see failure not as an end but as a steppingstone, shifting my entire perspective from pure exploration (acquiring knowledge) to exploitation (applying knowledge to solve real-world problems). This iterative process has been crucial for refining my ideas. I could not have navigated this path without the incredible support of my advisor, Prof. Petropulu, and the Rutgers ECE department. The department's courses, research seminars, and numerous public talks expanded my vision and inspired me to think outside the box. As a result of this work, I have published in several top-tier conferences, e.g., ICASSP, JC&S, Eusipco, with journal articles currently under review. Beyond research, my experience as a Teaching Assistant (TA) for the Cryptography course has been immensely rewarding and I was awarded as the TA of Fall 2024. While cryptography is not my primary research topic, it is an indispensable component of any secure wireless system. This role helped me appreciate the broader context of my work and see the bigger picture. The pleasant experience of guiding students to a comprehensive understanding of how to design secure communication systems has been a powerful source of motivation on my research journey. Through this role, I have also significantly developed my mentoring abilities and skills in providing constructive feedback. As I enter my fifth year, I am focused on synthesizing my research, reflecting on the lessons learned, and setting new goals for the future. It is time to draw a conclusion to this chapter of my research journey. I am profoundly grateful for the support and guidance I have received from my advisor, the ECE department, and my peers. I am excited to see where this final year leads and am confident that the skills in research, problem-solving, and perseverance I've gained at Rutgers will serve me well in my future endeavors.

Successful Inauguration of the IEEE Antennas and Propagation Society (AP-S) Student Branch Chapter at Rutgers University

We're proud to celebrate the successful Inauguration of the IEEE Antennas and Propagation Society (AP-S) Student Branch Chapter at Rutgers University!

On the evening of Saturday, October 11th, in Richard Weeks Hall, the inaugural event welcomed 100+ participants, including industry leaders, IEEE Senior Fellows, IEEE Women in Engineering (WIE), IEEE Honors Society (HKN) and representatives from Rutgers University, Kean University, Mercer County Community College, NJIT, Hunter College, and Columbia University.

Our Student Poster Competition featured 10+ posters from students in Electrical & Computer Engineering and Materials Science at Rutgers University, Kean University, and Toms River High School—showcasing innovative research and inspiring conversations across disciplines.

This milestone was made possible through the leadership of Faculty Advisor Prof. Demetrios Lambropoulos, Chapter Chair Shuping Li, Vice Chair Donglin Gao, Secretary Yeyang Chen, Treasurer Shubin Xie, and a dedicated volunteer team led by Prof. Xuemeng Li (Hunter College).

IEEE AP-S
Antennas and Propagation Society

CAPSTONE Expo

ECE Senior Capstone Design Expo 2025

We had a very successful ECE Capstone EXPO yesterday with 53 teams presenting their capstone projects. A panel of 45 judges from industry and academia joined us to select the top projects. In addition, three awards in the categories of best in research, best in impact and best in commercialization were given and the three teams with the highest combined score in these categories were awarded the 1st, 2nd and 3rd place Galbiati Entrepreneurial Awards.

Speaking with the judges, I would like to report that they were very impressed with the quality and the breadth of the capstone projects this year. The judges talked very highly about the complexity and innovation of the capstone projects and the enthusiasm students showed in presenting their work. Those that have been judging for the past few years expressed that every year they have observed our students selecting more complex and intriguing projects. The team scores were very close, and as a result, the judges voted that we give the top 15 teams awards instead of the usual top 10. I would like to take this opportunity to thank our judges for their effort and time taken from their busy schedules to support our capstone program and celebrating our students' achievements!

Special thanks to the ECE Staff: Pam, Kevin, John, Arletta, Katie and Chris for helping to make this year's EXPO another successful event! This would not have been possible without their hard work, months of advanced planning, and dedication. I would also like to acknowledge the contributions of our Capstone TA, Maahin, who did an excellent job this year and has been a great help to the ECE Capstone! Thank you also to all our student volunteers who helped on Capstone EXPO Day!

I would like to congratulate this year's senior students who participated in the ECE capstone program and their advisors from inside and outside Rutgers ECE who helped guide their projects. Your help and support of our students are essential to the success of the Capstone Program!

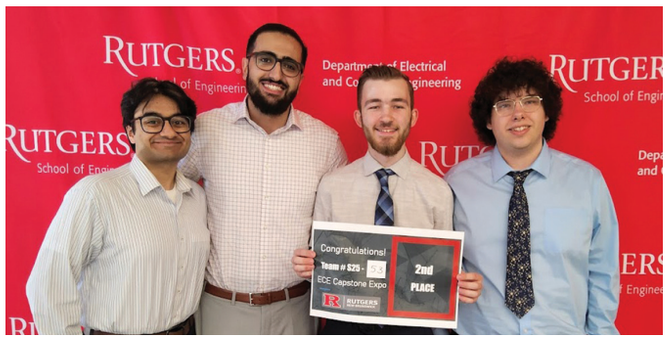
I would like to acknowledge the support of the following industry sponsors: 7x24 Exchange Metro New York Chapter, Novo Nordisk, Lockheed Martin, L3Harris, DEVCOM, Verizon, and Blythe Children's Hospital!

Congratulations to all the students and their advisors!

Here is the list of award recipients and their advisors:

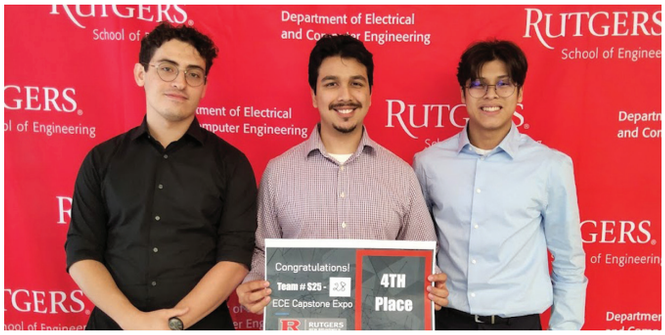
Top 15 projects and Awardees of Best in Research, Commercialization, Impact and top 3 Galbiati Awards:

1st Place and 1st Place in Galbiati Entrepreneurial Award
Project S25-44: **Maestro**
Team members: **Gunjan Adya, Deshna Doshi, Melis Durgut, Haejin Song, Shreya Pandey**
Advisor: **Jorge Ortiz**



2nd Place
Project S25-53: **Unmanned Wireless Penetration Testing Device**
Team members: **Ayaan Qayyum, Omar Hamoudeh, Harris Ransom, Gaetano Smith, Patrick Zong**
Advisor: **Predrag Spasojevic**

3rd Place and Best in Impact Award
Project S25-38: **Wildfire Risk Assessment Device**
Team members: **Rumaysa Adnan, Muskan Aga, Avani Bhavsar, Nabil Lekmine**
Advisor: **Maria Striki**

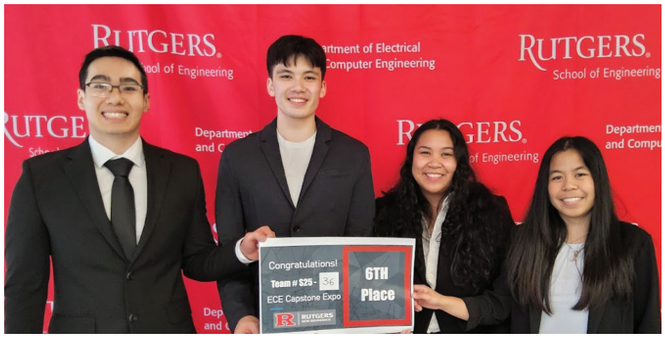


4th Place
Project S24-24: **Gaitway**
Team members: **Aaron Clarion, Michael Gibbons, Chris Hoskin, William Mejia, Yusuf Yaglidere**
Advisor: **Demetrios Lambropoulos**

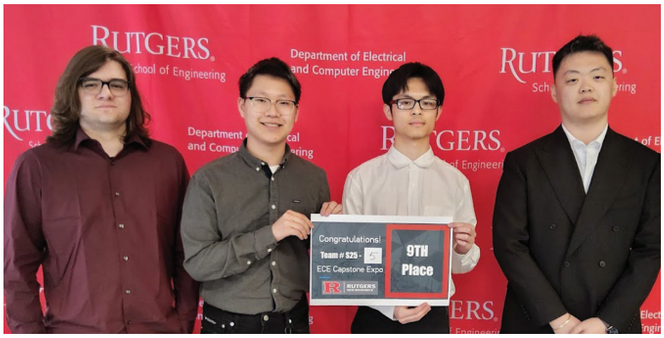
7th Place
Project S25-9: **Rhythmic Shoulder Stabilization Simulator**
Team members: **Sharbel Sassine, Sahaj Singh**
Advisor: **Sasan Haghani**

5th Place, Best in Research, and 3rd Place in Galbiati Entrepreneurial Award
Project S25-21: **Accurate Soil Nutrient (NPK) Sensor with Photochemical Reactions**
Team members: **Jonathan Covell, Ryan Covell, Alexander Booth, Sathya Gopinath Thangamani**
Advisors: **Aggelos Bletsas and Richard Howard**

8th Place
Project S25-10: **Early Wildfire Detection Drone**
Team members: **Zakria Abdelaziz, Amar Abualhassan, Ahmed Alnadi, Haseeb Elkhouga**
Advisors: **Daniel Burbano and Sasan Haghani**



6th Place
Project S25-36: **PetPal: Intelligent Robotic Caretaker for Pets**
Team members: **Katrina Celario, Jason Nguyen, Andy Pham, Jamie Solomon**
Advisor: **Kristin Dana**

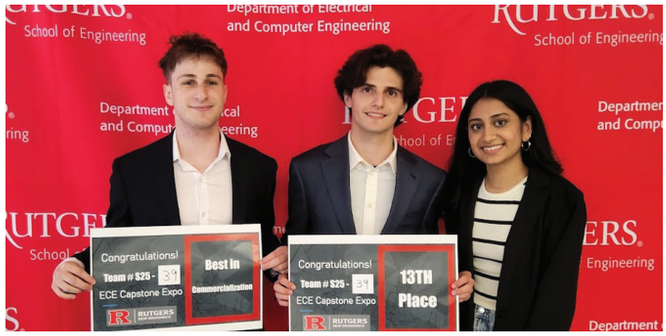


9th Place
Project S25-5: **Touchless Interface Device**
Team members: **Joseph Dinh, Justin Pang, Henry Sprigle, Haojia Zhu**
Advisor: **Sasan Haghani**

CAPSTONE Expo

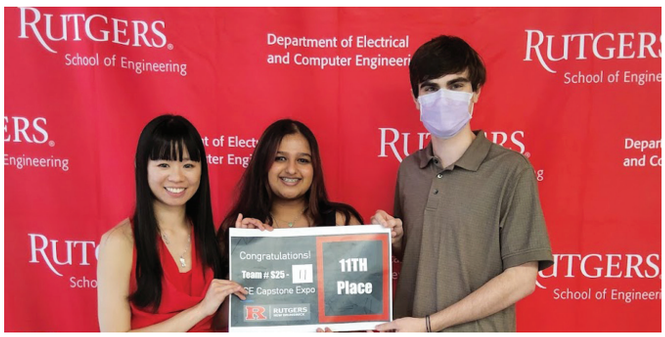
10th Place and 2nd Place in Galbiati Entrepreneurial Award

Project S25-13: **Custom Hardware Architectures for Accelerated ML Model Inference**
Team members: **Abdulwahab Malik, Damiano DiMaggio, Josh Green, Romany Ebrhem, Ruben Alias**
Advisors: **Dov Kruger and Hang Liu**



13th Place and Best in Commercialization

Project S25-39: **Breeze Beam**
Team members: **Anmol Patel, Christian Verderosa, Rudrani Ghosh, Tomer Butbul**
Advisor: **Yingying Chen**

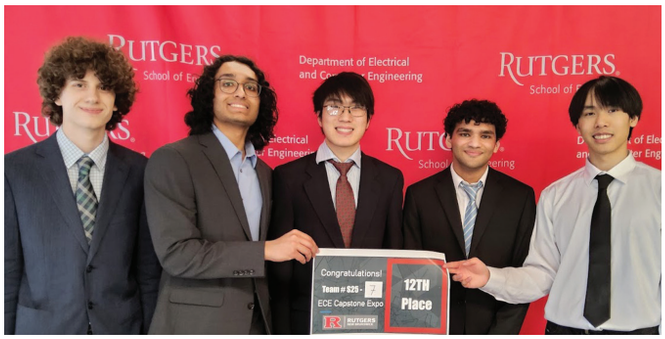


11th Place

Project S25-11: **PDoc**
Team members: **Michael Hanley, Maya Kalapatapu, Aarti Rao, Elisabeth Tam**
Advisor: **Dov Kruger**

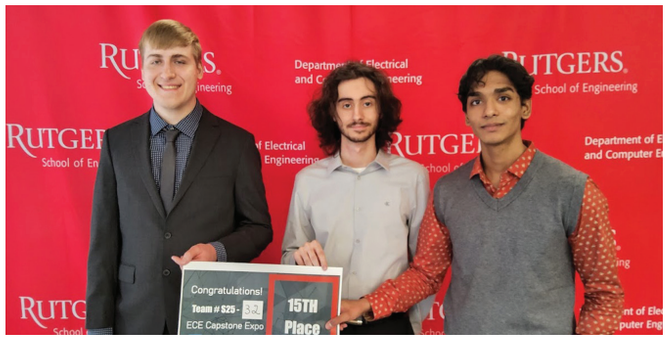
14th Place

Project S25-22: **Ultrasonic Phased Array**
Team members: **Gavin Cabida, Tenzin Kyizom, John Allen Manego**
Advisor: **Anand Sarwate**



12th Place

Project S25-7: **Self-driving in Scale Multi-Car Environments**
Team members: **Brandon Cheng, Tommy Chu, Adam D'Souza, Arya Shetty, Dylan Turner**
Advisor: **Ivan Seskar and Kristin Dana**



15th Place

Project S25-32: **GrAIdient**
Team members: **Sachin Ganpule, Taner Fetoski, Alexander Ruskulis**
Advisor: **Dov Kruger**

Building Community and Leadership: Inside the ECE-GSA

In Spring 2024, a group of graduate students came together with a shared vision: to build a more connected, supportive, and inclusive experience for all students in Rutgers' Department of Electrical and Computer Engineering (ECE). From that effort, the **ECE Graduate Student Association (ECE-GSA)** was created—a student-led organization dedicated to fostering community, amplifying graduate student voices, and supporting personal and professional growth.

Now entering its second year, the ECE-GSA has grown into a vibrant hub for academic, professional, and social engagement. During the 2024–2025 academic year, we hosted eight events with nearly 300 attendees—from career workshops and faculty panels to laid-back socials and wellness activities. One standout was our **Faculty Debate on Careers in Academia vs. Industry**, where students connected directly with faculty in a candid, insightful conversation. Another favourite were our wellness events, which offered a calm and welcoming space for students to unwind and connect during finals season.

At its core, the ECE-GSA is about creating a space where every graduate student—no matter their background, research area, or year—feels seen, supported, and empowered. Our executive board, made up of both Ph.D. and M.S. students, works closely with department faculty and staff to plan events, support new initiatives, and spotlight student achievements on social media. We're especially passionate about helping first-year students feel at home in the department and confident navigating graduate life.

The ECE-GSA is open to everyone -- we welcome all ECE graduate students to attend general meetings, propose ideas, or help out with events. Many of our current board members got their start by volunteering for a single event—and stayed because they found a community that values collaboration, leadership, and fun.

We keep recruitment casual and community-centered. At the start of each semester, we conduct outreach at orientation and hold interest meetings open to all. Throughout the year, we share opportunities to participate through our mailing list, social media, and department announcements. Whether you're excited to lead a workshop, recommend a speaker, or simply want to meet other students—we want you to know there's a place for you here.

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Honoring Dedicated Service: Rutgers ECE Staff Milestones

The Department of Electrical and Computer Engineering proudly recognizes the outstanding dedication and service of four valued members of our staff whose commitment has shaped the department's success and community over the years.

John Scafidi has devoted an incredible **36 years (1989–2025)** to Rutgers ECE. His long-standing service and deep institutional knowledge have been instrumental in supporting the department's operations and academic mission. John's reliability, expertise, and genuine care for colleagues and students alike have left a lasting mark on ECE.

Chris Reid, with **32 years of service to Rutgers (1993–2025)**, has been a cornerstone of the university's success across multiple departments. Before joining ECE in **2017**, Chris worked in **Rutgers Treasury and Student Accounting**, where he developed a strong foundation in financial management and university operations. Since arriving at ECE, his dedication, adaptability, and tireless support have ensured the smooth functioning of the department through years of technological and organizational change.

Arletta Hoscilowicz celebrates **10 years of service (2015–2025)**. Known for her professionalism and commitment to excellence, Arletta has contributed greatly to the department's efficiency and positive environment. Her attention to detail and teamwork continue to make a meaningful impact every day.

Kevin Wine is recognized for his **17 total years of service**, including **11 years at WINLAB (1995–2006)** and **6 years with ECE (2019–2025)**. His experience and dedication across both areas have strengthened the connection between research and administration, making him a valued member of the Rutgers engineering community.

Together, these four individuals represent nearly a century of combined service—a testament to their loyalty, professionalism, and the strong community spirit that defines Rutgers ECE. The department extends its heartfelt gratitude and congratulations to John, Chris, Arletta, and Kevin for their many years of commitment and excellence.

Building Community and Leadership (*continued*)

Looking ahead, we're excited to grow our partnerships with alumni, industry mentors, and other student groups across Rutgers Engineering. We believe that building a strong graduate community means more than just academic success—it means creating a culture of support, leadership, and belonging that carries forward into every stage of our careers.

To learn more or get involved, follow us on Instagram @rutgersecegsa or email us at ***rutgersecegsa@gmail.com***. Whether you're a student, alum, faculty member, or prospective applicant—we'd love to hear from you and welcome you into our community.

ECE Department Mini Retreat

Following the first ECE faculty meeting of Fall 2025 on September 24, the department held a mini retreat at Stagehouse Tavern in Somerset. The retreat focused on strategic discussions aimed at shaping the future direction of the department. Faculty and staff members were grouped by thematic areas to facilitate focused and productive dialogue.

The retreat featured five main discussion topics:

1. **Department Hiring Strategy** – identifying strategic hiring areas to strengthen the department's expertise in both teaching and research.
2. **Increasing MS Enrollment and Graduate Program Recruitment** – exploring approaches to attract and retain more high-quality graduate students.
3. **Strengthening Career Planning for Undergraduates** – developing initiatives and events to enhance students' career readiness and connections with industry advisors.
4. **Addressing Shrinking Federal Grant Opportunities** – sharing experiences and building strategies for expanding industry collaborations and alternative funding sources.
5. **Enhancing Mentoring for Junior and Mid-Career Faculty** – improving support structures through mentoring programs, lunchtime talks, and dual-mentor models.

The discussions generated valuable ideas and action items that will inform departmental planning and future initiatives. The department appreciates the contributions from everyone. The attached photos capture the enthusiastic, collaborative, and friendly spirit among our faculty and staff members.

ECE and Keysight FoxHunt Event

This fall, students in Principles of Electrical Engineering kicked off the semester with an exciting and unconventional new workshop: an RF Fox Hunt! Spearheaded by Professor Demetrios Lambropoulos and Lab Technician Kevin Wine, the event was a fantastic collaboration with Jim Barsaloux of Keysight Technologies and Ben Rosolie of Newark Electronics. The goal was to introduce students to the world of Radio Frequency (RF) engineering in a fun and engaging way, right from the start of their academic journey.

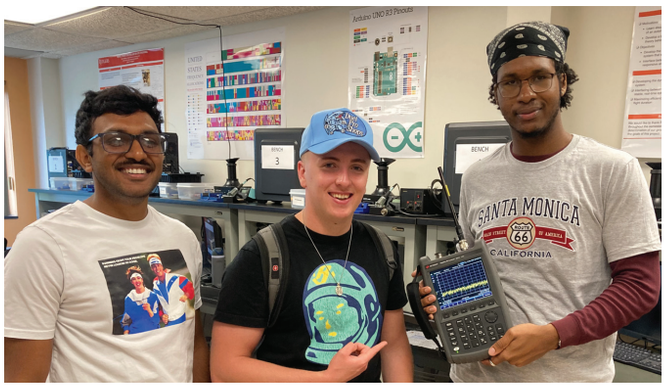
A "Fox Hunt" is a competition where participants use receivers to find hidden transmitters, known as "foxes". For this workshop, students were equipped with recently acquired Keysight FieldFox portable spectrum analyzers. After a brief training session, they formed groups of four and used these devices, along with specialized antennas, to visualize and locate several transmitters hidden across the Busch campus. The teams competed against the clock, earning points for each "fox" they successfully found and photographed within the 60-minute time limit.

A key component of the workshop was getting students hands-on with fundamental RF test equipment. A spectrum analyzer is a device that displays signal strength (amplitude) as it varies over a range of frequencies, allowing students to "see" the invisible radio signals and pinpoint their location. This activity provided a practical application of the theoretical concepts they'll be learning, giving them a unique advantage and a glimpse into the exciting field of wireless technology. A big thank you to Professor Lambropoulos, Kevin Wine, and the team from Keysight and Newark Electronics for making this innovative learning experience a huge success!

Keysight FieldFox Donation

Thanks to a generous donation by Keysight Technologies, the ECE Department has acquired several portable FieldFox Model N9913C RF Analyzers. These units will be utilized mostly in undergraduate RF courses to add real-world RF content to the laboratory experience. We have already put them to use in the Fall FoxHunt event for our incoming EE students.

The donation included multiple feature upgrades to enable the Spectrum Analyzer and Vector Network Analyzer capabilities of the FieldFoxes, and represents a strategic step forward in the department's RF teaching footprint.



Ben Rosolie of Keysite with Rutgers students

Rutgers Team is a Top-Ranked Robotics Team at the 2025 VEXU World Championship

VEX, according to the Guinness Book of World Records, is the world's largest robotics competition, bringing student teams of all ages together to showcase their innovative custom-built robots in challenging competitions.

In May, the Rutgers VEXU team–SCAR–joined more than 2,400 robotics teams from across the United States and more than 60 countries in Dallas to compete.

SCAR earned an impressive 22nd place international ranking competing in the VEXU, or university division – a ranking that also cemented their position as the top-ranked robotics team in New Jersey.

Meeting the Challenge with a Unique Design

The VEX University Robotics Competition, or VEXU, pits qualifying teams of university students against one another in a unique game that changes every year. The teams, which have designed, built, and programmed their robots, compete on a 12-by-12 foot foam tile floor, with robots scoring points by manipulating objects and interacting with their environment.

Mechanical engineering majors Jouan Yu, who graduated in May, and rising senior Mahdhav Rawal, were co-presidents of the 15-member Rutgers VEXU Robotics Team, which fosters teamwork and innovation in robotics, over the past year.

"Our robot used a unique roller design to collect rings off the ground, whereas the vast majority of teams used hooked conveyors," recalled Yu. Rawal noted how the team focused on the core win conditions of the game, scoring rings, defending corners, and goal possession. "Our simple and effective design allowed us to be reliable in match play and competitive," he says.

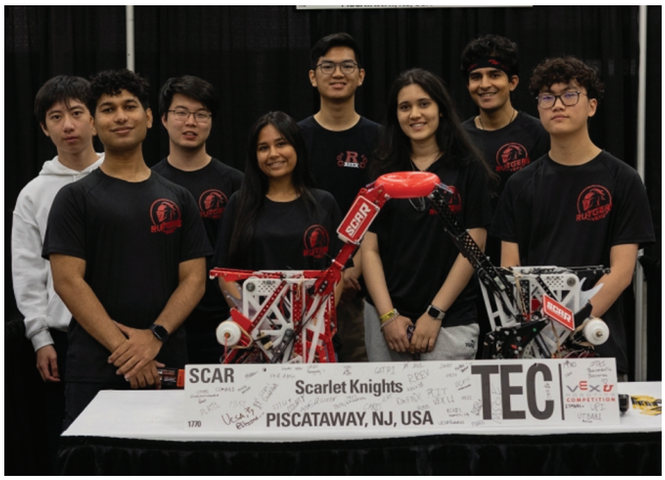
Yu, who will be pursuing his master's degree in mechanical engineering through the School of Engineering's BS/MS program, takes pride in his team's performance. "Our team consistently qualifies for the yearly world championship, and keeping the 5+ year streak alive is very important to me as lead and co-president," he says. "Moreover, doing well at the world championships proves that our team can compete toe-to-toe against the best teams from around the world. It always feels great to represent Rutgers internationally and win."

Looking back, Yu has loved the club's energy. "It's a lean team of passionate and dedicated people, all working together to build robots to compete internationally," he says. "I'm a big believer in the future of robotics and automation and am astounded by the advances made recently in the field, such as integration with AI, robotic surgery, and soft robotics. However, to be frank, what excites me the most is the competition aspect of robotics. I love making robots and seeing the innovative and creative solutions others come up with."

Looking Ahead

Rawal, who plans to continue his club involvement as a consultant for team business, project management, and engineering needs, will be designing robots for the upcoming 2025-2026 season as part of his senior design project.

For him, robotics is a dynamic field that can be implemented in industries like healthcare, manufacturing, and aerospace. "More importantly, I believe robotics is a great catalyst for inspiring the next generation of scientists and engineers," he explains.



Engineering Students Win First Place

A team of Rutgers School of Engineering students earned first place at the national Horizons 2040 Challenge, a prestigious innovation competition hosted by XFoundry and NEXPLORE in partnership with NASA.

The challenge brought together 260 students from 21 universities to develop solutions addressing NASA's most pressing technological shortfalls for the year 2040, as outlined by the Space Technology Mission Directorate (STMD). These shortfalls represent urgent areas where current technology is insufficient to support future space exploration and science missions.

Representing Rutgers as Team InnerSolace, the group proposed a proactive health system designed to predict, prevent, and manage circadian misalignment in extreme environments, protecting human performance where traditional healthcare cannot reach. Their innovative concept aims not only to benefit astronauts, but also to support shift workers, first responders, and others facing chronic circadian disruption.

The interdisciplinary team was composed of:

- **Azra Bano** (Computer Engineering, Class of 2028)
- **Joseph Henriquez** (Electrical Engineering, Class of 2028)
- **Aayushi Mallik** (Aerospace Engineering, Class of 2027)
- **Saarthak Shah** (Aerospace Engineering, Class of 2028)

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2024 Capstone Team Publishes Paper Based on Senior Capstone Project

A paper was recently published based on the 2024 Capstone project titled "Radar-Based Vital Sign Monitoring with Automated Beam Steering". After birth, newborn infants are commonly monitored at the hospital using biometric sensors through their incubators. This is expensive and problematic, and potentially uncomfortable for the newborn.

Capstone team S24-48 consisting of **Daniel Gore**, **Daniel Petronchak**, **Felipe Valencia**, **Gavin Young**, **Nithish Warren**, led by their advisor Prof. Athina Petropulu, developed a remote sensing technique using radar for vital sign monitoring of newborn infants. The team utilized Double Phase Shifter technology and Fast Fourier Transforms (FFTs) to insure stable and precise monitoring of the infants vital signs.

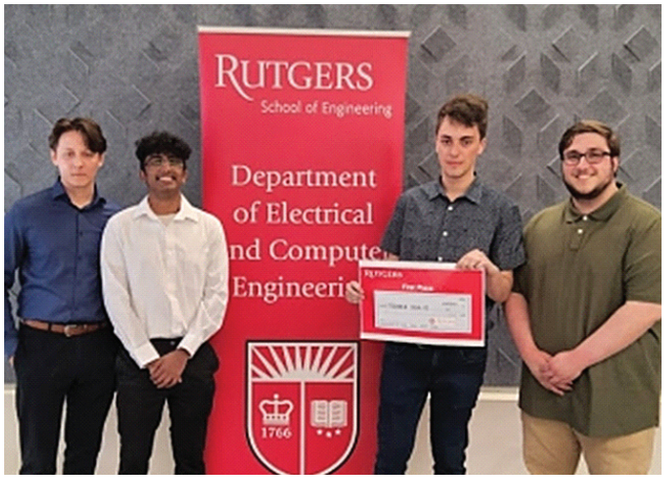
The capstone design team for this project consisted of four electrical engineering students and one computer engineering student, all of whom were graduating seniors. Upon forming a capstone team, the students choose their advisor, Athina Petropulu, because of their unanimous desire to gain experience in signal processing and wireless communication systems.

The paper can be viewed online at:

https://jet.scholasticahq.com/article/136960-radar-based-vital-sign-monitoring-with-automated-beam-steering

The paper's authors were the five members of the the capstone team - Daniel Gore, Daniel Petronchak, Felipe Valencia, Gavin Young, Nithish Warren, and their advisor Professor Athina Petropulu.

The project also won the 1st Place Award at the 2024 Capstone Design in April 2024.



Daniel Petronchak, Nithish Warren, Daniel Gore, Felipe Valencia

Capstone Team Accepted to DEFCON 33!

The ECE Capstone team "Unmanned Wireless Penetration Testing Device" was recently accepted to present at DEFCON 33, one of the world's largest cybersecurity conferences! **Ayaan Qayyum**, **Omar Hamoudeh**, **Gaetano Smith**, and **Harris Ransom** hope to represent the university. They will be presenting a demonstration of their project to top industry experts and peers. Their work was a compact rover that, while receiving commands from over a mile away, could crack the passwords of Wi-Fi networks. Their project advisors were Professor **Predrag Spasojevic** and **Morriel Kasher** (ECE PhD 2025). Their innovative work was only possible through the continued support of the ECE Department.

Students Win First Place (*continued*)

After being selected as one of four national finalists, the students traveled to Amazon Headquarters in Virginia to present their proposal before NASA experts, industry leaders, and fellow innovators. Azra Bano and Aayushi Mallik delivered the team's final presentation on stage to an audience of hundreds, while Joseph Henriquez and Saarthak Shah played pivotal roles in refining the pitch through research, iteration, and technical development.

Throughout the competition, students engaged in rapid-fire presentations, workshops with Intel, and keynote sessions from NASA professionals. They also had the opportunity to connect with mentors and meet NASA Astronaut Jeanette Epps, who emphasized the importance of tackling circadian health challenges for the future of space exploration.

Reflecting on the experience, the team highlighted the importance of rapid iteration, storytelling in science, and human-centered thinking in engineering innovation. Their victory underscores Rutgers Engineering's commitment to preparing students to address the world's most critical challenges through creativity, collaboration, and impact.

2025 WINLAB Summer Internship Program

The WINLAB Summer Internship Program returned in 2025 with participation of over 65 students, including undergraduates from across the country, , graduate students and select high school students from New Jersey, as well as international participants from Angers, France. Over a 10-week period from late May to early August, these interns joined team-based research groups under faculty mentorship to tackle cutting-edge projects in wireless technologies and smart systems. Each team met weekly to report progress and exchange ideas, fostering a collaborative atmosphere across experience levels. The program culminated in a public Open House on August 7, 2025, where students presented their findings and demonstrations to peers, friends, professors, and industry visitors.

One hallmark of the WINLAB internship is its multi-year and multidisciplinary nature. Projects are designed to be completed in one summer yet often extend beyond it, allowing motivated interns to continue their research into the academic year and even subsequent internships. Many projects build on prior work and are part of larger ongoing initiatives, giving students a chance to contribute to real-world research that doesn't stop when summer ends. Each intern not only developed technical skills but also gained insight into the full research process, from problem formulation to final presentation

Smart Aerial Sensing Systems (SASS) - a project in the 2025 WINLAB Summer Internship, focused on deploying camera based urban environmental sensing. Interns worked outdoors capturing imagery and sensor data aimed at improving street-level environmental awareness, such as detecting pedestrian flow, vehicular density, and air quality indicators. The broader goal is to develop an integrated system that enhances real time situational awareness for smart streetscapes. As another project that is part of the **CS3 ERC initiative**, SASS aligns with national smart city priorities by combining aerial sensing with privacy preserving wireless infrastructure and edge-enabled analytics. Through this project, students gained field experience in data collection and helped validate methods that could scale to larger urban deployments, supporting the NSF-funded mission to create resilient, livable streets.

During the 2025 WINLAB Summer Internship program, a team of

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Summer Internship Program (*continued*)

student researchers developed an augmented and virtual reality (AR/VR) data visualization project exploring how immersive technology can enhance data exploration and analysis. The project focused on development of an AR-based 3D modeling tool that reimagines traditional computer-aided design software in a more accessible, immersive virtual environment. The broader goal of this effort is to leverage AR/VR for intuitive visualization of complex information, supporting effective analysis and decision-making across diverse domains and was also partially supported by the CS3.

Two other standout projects: the **Self-Driving Vehicular Project** and the **AR Mural Platform**—exemplify WINLAB's long-term, iterative approach to complex research challenges. Both were launched in previous summer internships and have continued to evolve through sustained engagement by students and faculty. The Self-Driving Vehicular Project, now in its third year, has students training miniature autonomous cars to navigate smart intersection environments using low-latency cameras and radios. Each summer, teams build on the progress of previous cohorts, advancing both algorithms and hardware platforms.

Similarly, the AR Mural Platform, begun two years ago, allows distributed users to collaborate in creating digital art installations viewable through augmented reality, with each new group of interns enhancing its capabilities and creative potential. Beyond these flagship and smart city-focused initiatives, this year's interns contributed to a wide range of research - from cloud-native 5G networking and battery-free IoT sensors to quantum wireless and digital twins for network energy optimization. Interns reported progress at weekly meetings, gaining not just hands-on technical skills but also experience in teamwork, communication, and iterative design.

Beyond these featured projects, the 2025 internship offered a panorama of research topics reflecting the diversity of modern wireless and networked systems. Interns worked on projects ranging from next-generation network infrastructure to Internet of Things (IoT) sensing, AI-enabled communications, and privacy in smart cities. For example, one group focused on open radio access networks (O-RAN), creating a educational curriculum and developing cloud-native 5G network functions to improve resilience and spectrum management in future wireless networks. Another team pursued battery-free IoT sensing for agriculture in the Plant Doctor project, rebuilding ultra-low-cost backscatter sensors to continuously monitor plant health without batteries. In the Magic Room project, students experimented with passive RFID tags and machine learning to detect the presence and movements of people in an indoor space without using cameras, exploring

Summer Internship Program (*continued*)

new forms of smart building technology. Meanwhile, the COSMOS testbed – a city-scale wireless research platform – inspired projects on the coexistence of 5G and satellite communications, where interns used software-defined radios to emulate terrestrial and satellite links sharing the same spectrum and applied machine learning to manage interference. Students in another project developed a digital twin for network energy consumption, modeling how different 5G network deployments consume power under varying loads to help optimize energy efficiency. On the data science front, a team worked on real-time, robust, and reliable machine learning (R^3 ML) over wireless, investigating how edge computing and federated algorithms can make AI services more responsive, and secure in mobile networks. There were also forward-looking research endeavors in the realm of quantum inspired computing: one project explored quantum-inspired algorithms for improving wireless network throughput in massive MIMO systems, aiming to overcome computational bottlenecks in servicing large numbers of IoT devices. Other interns delved into cybersecurity/privacy topics like studying data leakage from VR headsets and building a privacy-preserving smart city operating system (the CityOS project). Collectively, these projects illustrate the wide range of skills and interests among the interns – from hardware and circuits to software, AI, and human-centered design. Yet, despite their different focus areas, all teams shared their progress in group meetings and often learned from each other, reflecting the interdisciplinary ethos of the WINLAB program.

As the internship drew to a close, the accomplishments of the students were evident not only in their final presentations but also in the new knowledge they gained and the ongoing collaborations they seeded. Many interns have expressed interest in continuing research with their mentors, either through independent study or returning to WINLAB in the future. The experience has been described as intensive but highly rewarding – a crash course in advanced research that also builds teamwork and communication skills.

The 2025 program would not have been possible without the generous support of several organizations and initiatives. Student stipends and project resources were funded by **The Center for Smart Streetscapes (CS3, NSF ERC)**, the **NSF REU program**, a generous donation from **nVerses Capital**, and **Rutgers University internal sources**. This multifaceted funding approach enabled a robust internship experience and allowed students to contribute to meaningful research. Supported by these key partners, the WINLAB summer internship continues to serve as a training ground for the next generation of engineers and researchers.

Janice Campanella and Noreen DeCarlo Retire

Janice Campanella

We would like to recognize Janice Campanella for her over 19 years of dedicated service at WINLAB, where she served as an Accounting Specialist with exceptional professionalism and commitment. Janice played a vital role in supporting the lab's financial operations including supporting several large externally funded projects. She managed budgets, processed invoices, tracked expenditures, and ensured compliance with financial policies. Her attention to detail and accuracy were essential in keeping our financial processes running smoothly and efficiently. Beyond her technical expertise, Janice was known for her reliability, patience, and collaborative spirit. She was a trusted colleague and a steady presence on our team. Her long-standing contributions have left a lasting impact on the organization, and her presence will be truly missed. We are deeply grateful for her many years of service and wish her all the best in this next chapter.

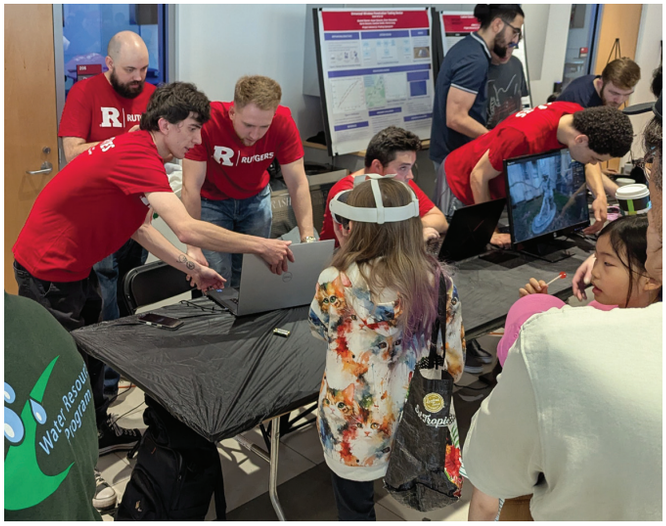
Narayan, The WINLAB Team and ECE

Noreen DeCarlo

We are proud to recognize Noreen DeCarlo for 32 years of dedicated service as an Administrative Assistant at WINLAB. Her professionalism, reliability, and attention to detail made her an essential part of our team. Throughout her career, Noreen provided outstanding support, helping to keep our operations running seamlessly with both skill and grace. Her deep knowledge and calm presence made her someone everyone could count on across the organization. From managing communications and coordinating schedules to handling day-to-day tasks and complex projects, Noreen approached everything with care and precision. As she begins her well-earned retirement, we thank Noreen for her outstanding contributions. She will be greatly missed, but her impact will be felt for years to come. We wish her all the best in this well-deserved next chapter.

ECE Open House

RUTGERS Day



ALUMNI News

Alumnus Dorin Comaniciu and Elected to the NAE Class of 2025

Dorin Comaniciu

Dorin Comaniciu, Siemens Healthineers senior vice president for artificial intelligence and digital innovation, joined Siemens Corporate Research in 1999 after earning his doctoral degree in electrical and computer engineering from the School of Engineering. He held key scientific and leadership roles at Siemens before assuming his current position in 2018.

He has recently been elected as a member of the National Academy of Engineering (NAE) Class of 2025 – a prestigious professional honor bestowed on a select group of engineers who have made outstanding contributions to the fields of engineering practice, research, or education. Along with other members of the NAE Class of 2025, he joins a group of world-class engineering leaders from academia, business, and government.

Comaniciu will be formally inducted during the NAE's annual meeting in October for his pioneering contributions to "diagnostic imaging and image-guided therapy, leading to better diagnosis and treatment for numerous patients."

The honor is especially meaningful to Comaniciu, who says, "As an engineer, you dream to change the world and bring to life and translate innovations that make it a better place. To be elected to the National Academy of Engineering is like a dream come true, where your peers recognize your contributions to the world."

A Celebrated Innovator

His advocacy for developing technologies to save and enhance lives while addressing critical issues in global health is evident in his work in computational imaging, machine intelligence, and precision medicine, resulting in the development of countless clinical products that have revolutionized the quality of patient care the world over by providing accurate, effective solutions for detecting, quantifying, and treating disease.

A case in point: his team's radiation therapy planning solutions, which Comaniciu is particularly proud of. "The AI-based contouring for radiation therapy is being used daily in more than 800 cancer centers, helping the precise and efficient delineations of organs at risk and clinical target volumes for more than half a million cancer patients per year worldwide," he reports.

It is just one of his many significant innovations and research results that include more than 550 granted patents and 350 peer-reviewed papers reflecting his scientific interest in machine learning, robust computer vision, medical imaging and biomedical informatics.

A recipient of the 2016 School of Engineering Medal of Excellence as a Distinguished Alumnus in Research, Comaniciu is currently sharing his expertise with SoE as a member of the Department of Electrical and Computer Engineering Industry Advisory Board.

"We are so proud of ECE distinguished alumnus Dorin Comaniciu on this well-earned and truly deserved honor from the National Academy of Engineering," says professor and Department of Electrical and Computer Engineering chair Yingying Chen. Her sentiments are echoed by WINLAB director and ECE distinguished professor Narayan Mandayam, who states, "We are all so proud of your outstanding accomplishments, Dorin."

Distinguished Achievement in Research Nubis Communications, Inc. Founding Member Peter J. Pupalaikis BS'88

Peter J. Pupalaikis

Peter J. Pupalaikis is a founding member of Nubis Communications, Inc., a startup company that develops low-power, high-density, and high-speed silicon photonics electro-optical transceivers for data centers and ML/AI applications. He is responsible for system simulations and simulator development, signal and power integrity, and test and analysis infrastructure development.

Prior to Nubis, Mr. Pupalaikis worked for 25 years at Teledyne LeCroy, where he was vice president of technology development. His numerous inventions in the areas of signal processing, RF and microwave systems, applied mathematics, and measurement enabled the company to develop highly accurate and very high bandwidth measurement instruments, holding records for real-time oscilloscope bandwidth for over a decade. These instruments are critical for the development of technology in numerous areas. Some of his research and development led to new classes of instruments, such as network analyzers based on time-domain reflectometry.

He was elevated to IEEE fellow in 2013, published the textbook, "S-parameters for Signal Integrity" in 2020 through Cambridge University Press, and was inducted into the U.S. National Academy of Engineering in 2024.

After serving in the United States Army, he earned a Bachelor of Science degree in electrical engineering with high honors from Rutgers. He is a member of Tau Beta Pi and Eta Kappa Nu honors societies.

Industry Advisory Board

The Advisory Board provides input on academics, research, administration, outreach, advocacy, and development. The Board reviews the graduate and undergraduate curriculum and degree programs, program educational objectives, and program outcomes, and offers suggestions for change to keep them current. The Board evaluates the quality and scope of our research, its relationship to our programs, its relevancy and helps guide future directions. The Board recommends ways to build new relationships with industry and to strengthen those we have.

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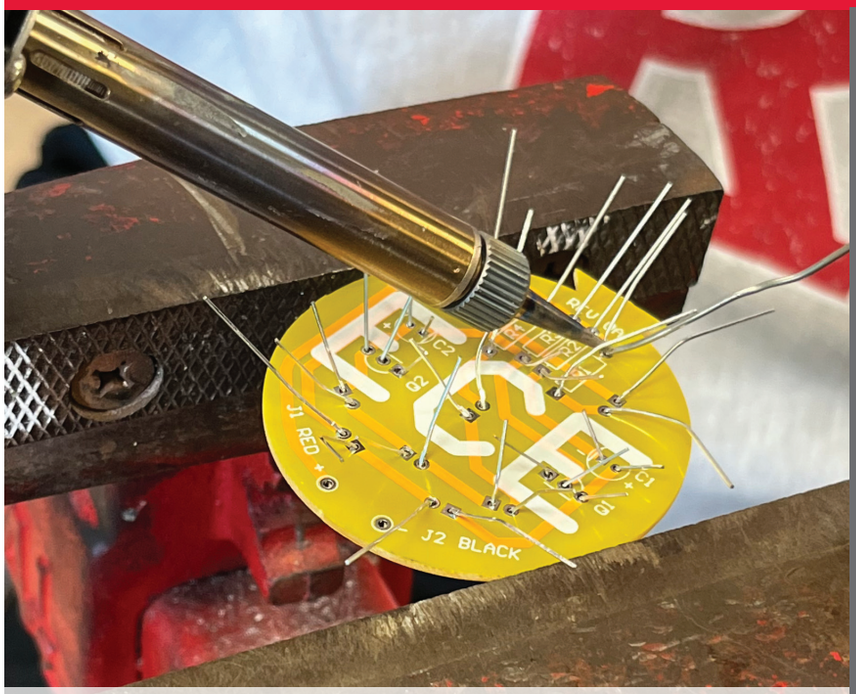

RUTGERS–NEW BRUNSWICK
School of Engineering

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For decades, the Department of Electrical and Computer Engineering (ECE) has been home to groundbreaking research and educational practices. Your gift to ECE supports such a tradition; more specifically, it provides the students, faculty, and researchers with the resources they need to continue developing the minds and technology that make our world a better place.

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- Attract excellent students, by providing fellowships
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