ANNUAL REPORT 2023-24

Northeastern University
Electrical and Computer Engineering

NORTHEASTERN

Northeastern University
College of Engineering

With over 240 tenured/tenure-track faculty and 20 multidisciplinary research centers and institutes with funding by eight federal agencies, the College of Engineering is a leader in experiential education and interdisciplinary research focused on discovering solutions to global challenges to benefit society. Northeastern's global university system–with engineering programs on campuses across the U.S. and in multiple countries–provides flexible academic offerings, innovative partnerships, and the ability to scale ideas, talent, and solutions.

About Northeastern

Founded in 1898, Northeastern is a global research university and the recognized leader in experiential lifelong learning. Our approach of integrating real-world experience with education, research, and innovation empowers our students, faculty, alumni, and partners to create worldwide impact.

Northeastern's personalized, experiential undergraduate and graduate programs lead to degrees through the doctorate in 10 colleges and schools across our 13 campuses worldwide. Learning emphasizes the intersection of data, technology, and human literacies, uniquely preparing graduates for careers of the future and lives of fulfillment and accomplishment.

Our research enterprise, with an R1 Carnegie classification, is solutions oriented and spans the world. Our faculty scholars and students work in teams that cross not just disciplines, but also sectors–aligned around solving today's highly interconnected global challenges and focused on transformative impact for humankind.

We are a leader in experiential education and interdisciplinary research, focused on innovating for global impact.

DEAR COLLEAGUES, FRIENDS, AND STUDENTS,

It is my pleasure to address all of you as the interim chair of the Department of Electrical and Computer Engineering (ECE) at Northeastern University. On January 1, 2025, Edmund Yeh, professor of electrical and computer engineering, will take the helm as our permanent department chair.

Our ECE department continues to move to new heights and set new standards within Northeastern. In FY2024, our faculty received more than $52 million in external research awards, primarily from the National Science Foundation, the Department of Defense, and the Department of Commerce, among many others. Our accomplished faculty received prestigious honors, including being elected to the American Academy of Arts and Sciences, and several being named fellows and distinguished members of professional societies. On the junior faculty side, four of our assistant professors received early-career awards from the NSF and DARPA.

The number and caliber of our students continue to rise. During the 2023-2024 academic year, the department had 830 undergraduate students, and at the graduate level enrollment reached 618 master's and 322 doctoral students—a record for the department. While most of our graduate students are based in Boston, we see a growing presence at our Seattle campus. Additionally, we recently created new programs, including a concentration, minor, and MS in semiconductor engineering, with the master's program planned to be launched at both our Boston and Oakland campuses. Our semiconductor programs address the national demand for a highly skilled workforce aligned with the goals of the CHIPS Act.

Our students have had many achievements. In the last year, two of our PhD students received the U.S. National Defense Science and Engineering Graduate Research Fellowship, another was selected as a NASA Space Technology Graduate Research Fellow, and one received the ACM/IEEE CS George Michael Memorial HPC Fellowship, while many others received Best Paper Awards and won competitions at professional society conferences.

To support the growth of our academic programs, the department continues to hire outstanding faculty across the network. Six tenure-track faculty joined our department for the 2024-2025 academic year, including two based at our Oakland campus, and four joint with other colleges at Northeastern. With these colleagues on board, the department today has 90 tenured and tenure-track faculty, 14 teaching faculty, and 12 research faculty. This makes ECE one of the most comprehensive ECE departments in the country. This is in part reflected by the latest graduate rankings by the U.S. News and World Report: 35 and 29 for electrical and computer engineering, respectively.

Last but not least, the department has 12 dedicated staff members who ensure day-to-day operations and help faculty and students realize their vision and goals.

Sincerely,

Josep Miquel Jornet, PhD and IEEE Fellow
Professor and Interim Chair of Electrical and Computer Engineering
j.jornet@northeastern.edu

For more details, visit our website at ECE.NORTHEASTERN.EDU.

Photo by Matthew Modoono

Quick Facts ELECTRICAL AND COMPUTER ENGINEERING

90 **TENURED/ TENURE-TRACK** Faculty

62 **Young Investigator Awards** (YIA), including ▶ **30** **National Science Foundation** CAREER Awards

322 **Doctoral Students**

619 **Master's Students**

830 **Bachelor's Students**

Graduate Student Enrollment (Fall 2023) Up **65**% vs. 2018

50 **Professional** Society Fellowships, including ▶ **18** **IEEE** Fellows *and **3** Faculty served as President of IEEE*

$137M **External Research Awards** (2022-2024)

$52M in FY2024

18%	DHHS	2%	Foreign
22%	DOD	3%	Foundation/NP
2%	DOE	3%	Industry/Corp.
10%	Federal/Other	40%	NSF

The department offers **8** research concentrations and is either the lead or partner of **12** federally-funded research centers and institutes.

AY2024 Young Investigator Awards

Siddhartha Ghosh
Assistant Professor
NSF CAREER and DARPA Young Faculty Award

Alireza Ramezani
Assistant Professor
NSF CAREER Award

Aatmesh Shrivastava
Associate Professor
DARPA Young Faculty Award

Lili Su
Assistant Professor
NSF CAREER Award

Kristina Johnson
Assistant Professor
NIH Career Development Award

NEWEST RESEARCH CENTERS AND INSTITUTES

Externally established centers, with external partners:

- DHS Software target Engineering to Neutralize the Threat Reality
- NSF AI Institute for Future Edge Networks and Distributed Intelligence
- NSF Center for Pandemic Insights
- NSF IUCRC Center for Hardware and Embedded Systems Security and Trust

Internally established institutes:

- Institute for Experiential AI
- Institute for Experiential Robotics
- Institute for NanoSystems Innovation
- Institute for the Wireless Internet of Things

Quick Facts COLLEGE OF ENGINEERING

With **246** tenured/tenure-track faculty and **20** multidisciplinary research centers and institutes with funding by eight federal agencies, the college is a leader in experiential education and interdisciplinary research focused on discovering solutions to global challenges to benefit society.

5 **Engineering Departments**

142 **YOUNG INVESTIGATOR** Awards
Including **73** NSF CAREER Awards, and **24** DOD Young Investigator Awards

110 **Professional Society Fellowships**

3,274 **Total Co-op Hires** (AY2024)

2,420 **Co-op Employer Partners** (AY2022-2024)

TOTAL ENROLLMENT (Fall 2023)
10,481 65% Graduate
35% Undergraduate

Graduate Enrollment Growth up **63**% vs. 2018

New Tenure-Track Faculty

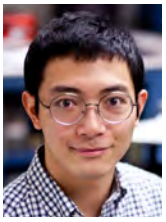
PRIMARY APPOINTMENT: ELECTRICAL AND COMPUTER ENGINEERING

Aravind Nagulu *Assistant Professor*

PhD: Columbia University, 2021
Previously: Assistant Professor, Washington University
Scholarship focus: Analog/RF/millimeter-wave integrated circuits and systems, analog computing, biomedical scanners, and hardware for large-scale quantum computing systems
Campus: Oakland, California

Weiyan Shi *Assistant Professor*

Jointly appointed: Khoury College of Computer Sciences
PhD: Columbia University, 2023
Previously: Postdoc, Stanford University
Scholarship focus: Persuasive dialogues, dialogue systems, natural language processing, AI safety, machine learning, artificial intelligence
Campus: Boston



Yuan Yuan *Assistant Professor*

PhD: University of Virginia, 2019
Previously: Sr. Research Scientist, Hewlett Packard Labs
Scholarship focus: Optoelectronic devices, single-photon detection, silicon photonics, large-scale photonic integrated circuits for interconnects and computing
Campus: Oakland, California

PRIMARY APPOINTMENT: OTHER NORTHEASTERN COLLEGE

Ivana Dimitrova *Assistant Professor*

Jointly appointed: Physics
PhD: Massachusetts Institute of Technology, 2020
Previously: Postdoctoral Fellow, Harvard University
Scholarship focus: Quantum networking and quantum computing with atoms in optical tweezer arrays, cavity QED, many-body states
Campus: Boston

Seth Hutchinson *Professor*

Jointly appointed: Khoury College of Computer Sciences
PhD: Purdue University, 1988
Previously: Professor and KUKA Chair for Robotics in the School of Interactive Computing, and Executive Director of the Institute for Robotics and Intelligent Machines, Georgia Institute of Technology
Scholarship focus: Robotics: planning, sensing, control, human-robot interaction, bio-inspired robotics, multi-robot systems
Campus: Boston

David Sherman *Assistant Professor*

Jointly appointed: Physical Therapy, Movement, and Rehabilitation
PhD: University of Toledo, 2022
DPT: Boston University, 2014
Previously: Postdoctoral Fellow, Harvard John A. Paulson School of Engineering
Scholarship focus: Movement neuroscience, sensorimotor physiology, clinical research, orthopedics, rehabilitation
Campus: Boston

Newest Academic Programs and Campuses

New MS in Semiconductor Engineering

The Master of Science in Semiconductor Engineering is an interdisciplinary, cutting-edge program offered by the Institute for NanoSystems Innovation, College of Engineering, and D'Amore-McKim School of Business. The program prepares students through interdisciplinary knowledge and experimental tools to meet the new needs of semiconductor companies to fill the talent gap for careers in this rapidly evolving in-demand industry.

Expanding Across the Global University Network

The PhD in electrical engineering is now offered at the Oakland, California, campus. Additionally, the MS in electrical and computer engineering is offered at the Seattle, Washington, campus.

Faculty by Research Area

Communications, Control and Signal Processing

Pau Closas
Ken Duffy
Jennifer Dy
Najme Ebrahimi
Deniz Erdogmus
Mahdi Imani
Vinay Ingle
Stratis Ioannidis
Kristina Johnson
Josep Jornet
Laurent Lessard
Hanoch Lev-Ari
Hessam Mahdavifar
Jose Martinez Lorenzo
Tommaso Melodia
Sarah Ostadabbas
Purnima Ratilal-Makris
Francesco Restuccia
David Rosen
Masoud Salehi
Bahram Shafai
Milad Siami
Hanumant Singh
Milica Stojanovic
Edmund Yeh
Sze Zheng Yong

Computer Networks and Security

Stefano Basagni
Mallesham Dasari
Ken Duffy
Yunsi Fei
Josep Jornet
Engin Kirda
Dimitrios Koutsonikolas
Tommaso Melodia
Francesco Restuccia
Wil Robertson
Xiaolin Xu
Edmund Yeh

Computer Systems and Software

Yunsi Fei
David Kaeli
Mieczyslaw Kokar
Dimitrios Koutsonikolas
Miriam Leeser
Xue "Shelley" Lin
Fabrizio Lombardi
Ningfang Mi
Gunar Schirner
Devesh Tiwari
Yanzhi Wang
Xiaolin Xu
Edmund Yeh
Xuan "Silvia" Zhang

Computer Vision, Machine Learning, and Algorithms

Derya Aksaray
Octavia Camps
Jennifer Dy
Deniz Erdogmus
Yun Raymond Fu
Mahdi Imani
Stratis Ioannidis
Kristina Johnson
Hessam Mahdavifar
Jose Martinez Lorenzo
Sarah Ostadabbas
David Rosen
Weiyan Shi
Milad Siami
Lili Su
Yanzhi Wang
Xiaolin Xu
Edmund Yeh

Electromagnetics and Optics

Charles DiMarzio
Najme Ebrahimi
Siddharth Ghosh
Vincent G. Harris
Yongmin Liu
Edwin Marengo
Jose Martinez Lorenzo
Sunil Mittal
Hossein Mosallaei
Carey Rappaport
Purnima Ratilal-Makris
Michael B. Silevitch
Milica Stojanovic
Nian X. Sun
Srinivas Tadigadapa

Microsystems, Materials, and Devices

Ahmed Busnaina
Cristian Cassella
Marco Colangelo
Ravinder Dahiya
Benjamin Davaji
Najme Ebrahimi
Canek Fuentes Hernandez
Siddharth Ghosh
David Horsley
Yong-Bin Kim
Nicol McGruer
Sunil Mittal
Marvin Onabajo
Matteo Rinaldi
Aatmesh Shrivastava
Soner Sonmezoglu
Nian X. Sun
Srinivas Tadigadapa
Mingzhong Wu
Xuan "Silva" Zhang

Power Electronics, Systems and Controls

Ali Abur
Mahshid Amirabadi
Bradley Lehman
Laurent Lessard
Bahram Shafai
Milad Siami
Eduardo Sontag
Mario Sznaier

Robotics

Derya Aksaray
Ravinder Dahiya
Kris Dorsey
Michael Everett
Mahdi Imani
Jose Martinez Lorenzo
Taskin Padir
Alireza Ramezani
David Rosen
Bahram Shafai
Milad Siami
Hanumant Singh
Sze Zheng Yong

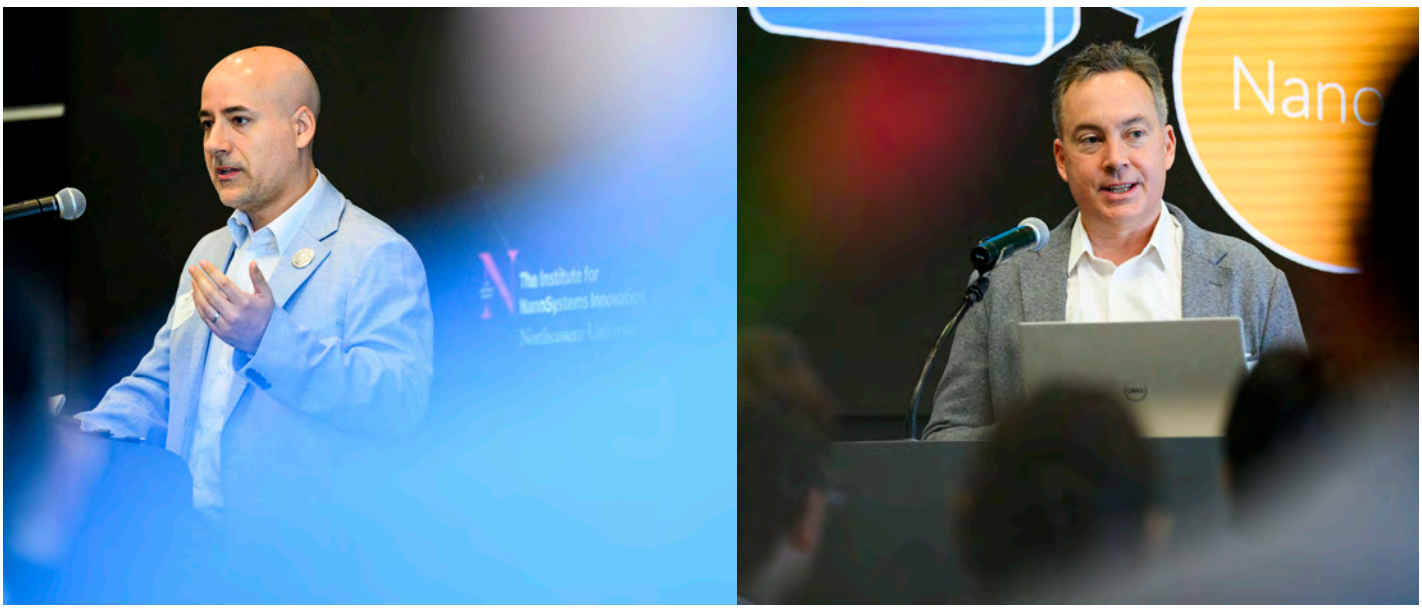
New Research Centers and Institutes

NSF Center for Pandemic Insights

Nian Sun, Distinguished Professor of electrical and computer engineering, is co-principal investigator of the new Center for Pandemic Insights focused on preventing the next pandemic before diseases emerge. Funded over seven years through the National Science Foundation's Predictive Intelligence for Pandemic Prevention (PIPP), the $18 million center is led by the University of California, Davis, and is in collaboration with 10 partnering institutions, including Northeastern. Sun is leading innovative sensing technology to enable pre-emergence detection efforts for pathogen sensors, including sensor development, tests, optimization, validation, and deployment. **Jennifer Love**, associate teaching professor for engineering, is part of an education, outreach, training, and workforce development project team.

Institute for NanoSystems Innovation at Northeastern

The Institute for NanoSystems Innovation at Northeastern is a global institute focused on research, education, and entrepreneurship in semiconductors and related technologies. **Matteo Rinaldi**, professor of electrical and computer engineering (ECE), is the institute's director and **David Horsley**, ECE professor, is deputy director. With locations on Northeastern's Boston, Massachusetts, and Oakland, California, campuses, NanoSI's bicoastal, open innovation environment fosters partnership between university, industry, and government. NanoSI's interdisciplinary team consists of 22 core faculty and over 150 researchers (graduate students and research staff). The institute receives over $20 million annually in federal and industry funding and is home to leading national programs supported by DARPA, ARPA-E, DoD, DHS, and NSF in RF and mmWave devices and systems, ultra-low power sensors, advanced functional materials, nano-photonics, quantum devices and systems, and microelectronics for medical devices. NanoSI researchers and partners have access to unique experimental capabilities.



Matteo Rinaldi (left) and David Horsley (right), both co-directors of the Institute for NanoSystems Innovation, open the NanoSI launch event held in the EXP building on Northeastern's Boston campus.

Academy Members and Fellows of Professional Societies

Named a Member of the American Academy of Arts and Sciences

Eduardo Sontag, University Distinguished Professor of electrical and computer engineering, and bioengineering, was elected to the American Academy of Arts and Sciences for his career that has made breakthroughs in the mathematics of nonlinear and complex systems, with repercussions for biomedicine, systems biology, and neural networks. The American Academy of Arts and Sciences is one of the most prestigious organizations a scholar can be invited into. An interdisciplinary organization, it "convenes leaders from every field of human endeavor" to address the issues facing the world and to tackle new ideas.

Sontag's work has focused on determining how to "model systems mathematically and how one can steer them in order to achieve desired purposes," a field more broadly called control theory. These systems—and the purposes they might be steered toward—are numerous. The unifying concept in his work is the idea that states of systems change over time, such as the variables describing the dynamics of an airplane or a car in the context of a self-driving vehicle, or a cell in the human body. His research is on theoretical foundations and underlying mathematics, developing conceptual principles and algorithms which enable applications by scientists and practitioners in different fields.

Sontag is a Fellow of the International Federation of Automatic Control (IFAC), American Mathematical Society, Society for Industrial and Applied Mathematics (SIAM), and Institute of Electrical and Electronics Engineers (IEEE). Other prestigious honors include the IFAC Technical Committee Award on Non-Linear Control Systems, which is the "highest distinction on nonlinear control systems research," the Richard E. Bellman Control Heritage Award—the highest recognition in control theory and engineering in the U.S., the W. T. and Idalia Reid Prize presented by SIAM, the IEEE Control Systems Field Award, and the IEEE CSS Hendrik W. Bode Lecture Prize.

European Academy of Sciences and Arts Member, Fellow of NAI, and Fellow of AIMBE

Photo by Matthew Modoono

Yun Raymond Fu, Distinguished Professor of electrical and computer engineering, jointly appointed in Khoury College of Computer Sciences, was elected a member of the European Academy of Sciences and Arts, in the technical and environmental sciences class. He was also named a Fellow of the National Academy of Inventors, the highest professional distinction awarded solely to inventors. He was elected a Fellow of the American Institute for Medical and Biological Engineering "for outstanding contributions to innovative artificial intelligence technologies for biomedical image analysis and pioneering leadership in technology translation and commercialization." Additionally, Fu received the 2024 Edward J. McCluskey Technical Achievement Award from the IEEE Computer Society for innovative and impactful contributions to representation learning, computer vision, face and gesture recognition.

Photo by Mary Knox Merrill

AAAI Fellow

Jennifer Dy, Distinguished Professor of electrical and computer engineering, jointly appointed in Khoury College of Computer Sciences, was elected a Fellow of the Association for the Advancement of Artificial Intelligence for significant contributions to unsupervised and interpretable machine learning, advancing AI to address healthcare challenges, and service to the AI community.

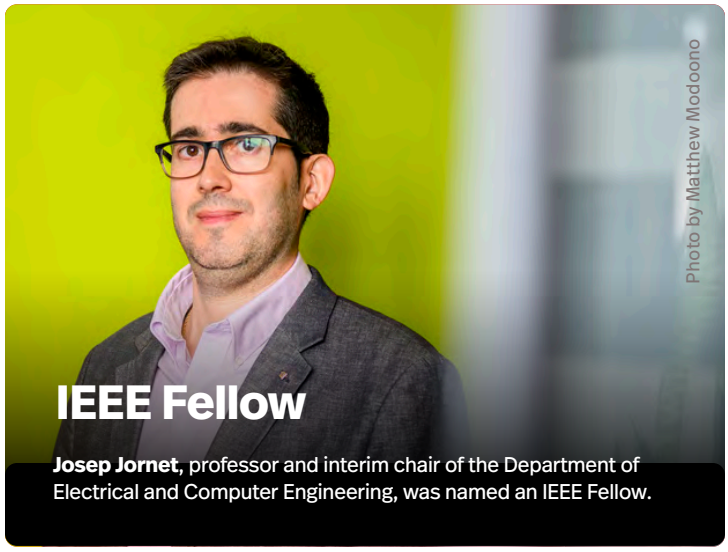


Photo by Matthew Modoono

IEEE Fellow

Josep Jornet, professor and interim chair of the Department of Electrical and Computer Engineering, was named an IEEE Fellow.

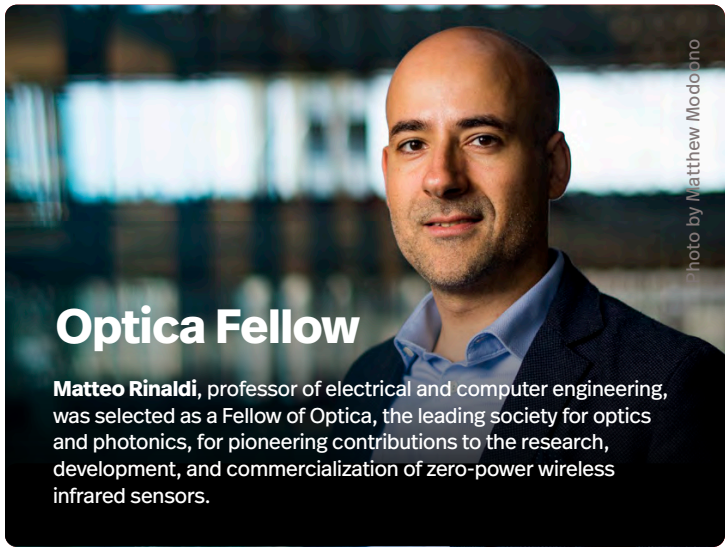


Photo by Matthew Modoono

Optica Fellow

Matteo Rinaldi, professor of electrical and computer engineering, was selected as a Fellow of Optica, the leading society for optics and photonics, for pioneering contributions to the research, development, and commercialization of zero-power wireless infrared sensors.

Early-Career Award Grants

DARPA Young Faculty Award To Develop Ultra-Low Power Machine Learning Hardware

Aatmesh Shrivastava, associate professor of electrical and computer engineering, was awarded a Young Faculty Award for up to $1 million from the Defense Advanced Research Projects Agency (DARPA) for "Nano-Watt Power Machine-Learning Hardware using Precision Analog Computing." The research aims to create ultra-low power (nano-watt level), analog computing, machine-learning (ML) hardware for applications at the edge that are otherwise not possible due to power consumption.

NSF CAREER Award To Strengthen Federated Learning

Lili Su, assistant professor of electrical and computer engineering, was awarded a $611,000 National Science Foundation CAREER Award to consolidate the theoretical foundations and enrich the algorithmic toolbox of distributed machine learning. Her research seeks to quantify the effectiveness of existing algorithms and design new and more efficient ones, all with a focus on enhancing resilience against three main challenges: data heterogeneity, inherent system faults, and external attacks.

NSF CAREER Award for Novel Microsystems To Advance Integrated Signal Processing

Siddhartha Ghosh, assistant professor of electrical and computer engineering, was awarded a $540,082 CAREER Award from the National Science Foundation to develop novel microsystems that enable seamless interaction between acoustic, optical, and electrical fields to generate transformative effects in communications and information processing.

DARPA Young Faculty Award To Improve All-Acoustic RF Signal Processing

Siddhartha Ghosh, assistant professor of electrical and computer engineering, was awarded a $500,000 Young Faculty Award from the Defense Advanced Research Projects Agency to create single-platform microsystems that can process acoustic waves in the radio frequency domain while also incorporating active functionality with passive acoustic wave (AW) devices.

NSF CAREER Award To Design Autonomous Robots That Navigate Crawlspaces

Alireza Ramezani, associate professor of electrical and computer engineering, was awarded a $681,000 National Science Foundation CAREER Award for "Dynamic Locomotion With Plasticity for Remote Sensing in Crawlspaces." The research will focus on developing an autonomous robotic device that mimics bird and bat movement to effectively move through tight crawlspaces while gathering data through sensors.

NIH Career Development Award To Generate Quantitative Metrics of Vocal Communication for Minimally-Speaking Individuals

Kristina Johnson, assistant professor of electrical and computer engineering, jointly appointed in Bouvè College of Health Sciences, received a $700,000 Career Development Award from the National Institutes of Health to generate a sensitive, quantitative metric of vocal communication for minimally-speaking individuals using a novel remote and highly personalized data collection methodology.

Faculty Honors

Photo by Adam Glanzman

American Ceramics Society Lifetime Award

Vincent Harris, University Distinguished and William Lincoln Smith Professor of electrical and computer engineering, was selected to receive the American Ceramics Society's W. David Kingery Award, which recognizes distinguished lifelong achievements involving multidisciplinary and global contributions to ceramic technology, science, education, and art.

Photo by Bella Martinez

10-Year UbiComp Impact Award

Gregory D. Abowd, dean of the College of Engineering and professor of electrical and computer engineering, was a recipient of the 2023 UbiComp (ubiquitous computing) 10-Year Impact Award for his paper, "Instant Inkjet Circuits: Lab-based Inkjet Printing To Support Rapid Prototyping of UbiComp Devices," which was originally published in 2013. This is Abowd's fifth impact award.

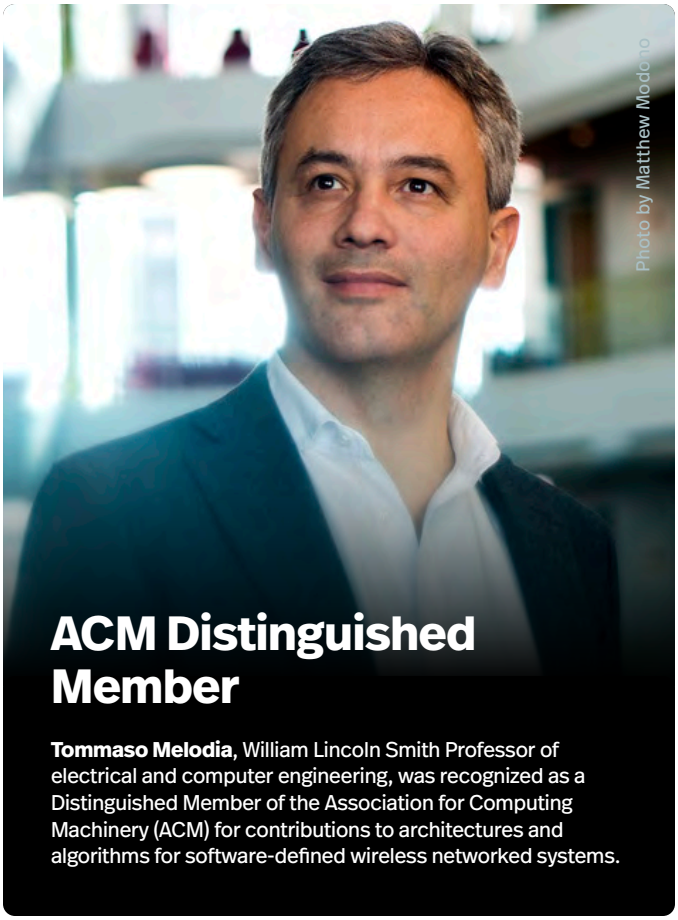


Photo by Matthew Modoono

ACM Distinguished Member

Tommaso Melodia, William Lincoln Smith Professor of electrical and computer engineering, was recognized as a Distinguished Member of the Association for Computing Machinery (ACM) for contributions to architectures and algorithms for software-defined wireless networked systems.

Honored Among Leading Women in Visual Tech and AI

Octavia Camps, professor of electrical and computer engineering (ECE), and **Sarah Ostadabbas**, ECE associate professor, were recognized by LDV Capital, a venture fund, as two of the "120+ Women Spearheading Advances in Visual Tech and AI", which highlights contributions of women in fields such as machine vision, pattern recognition, and generative models.

Faculty Honors

Fulbright Specialist Roster

Cristian Cassella, associate professor of electrical and computer engineering, was recommended by a panel of the U.S. Department of State's Bureau of Educational and Cultural Affairs and World Learning to join the prestigious Fulbright Specialist Roster for three years.

Photo by Matthew Modoono

IEEE Division X Director-Elect

Ravinder Dahiya, professor of electrical and computer engineering, was elected as IEEE Division X Director-Elect for 2024. The division includes the following societies and councils: Computational Intelligence Society; Control Systems Society; Engineering in Medicine and Biology Society; Photonics Society; Robotics and Automation Society; Systems, Man, and Cybernetics Society; Systems Council; and Sensors Council.

Photo by Matthew Modono

Named to ASEE-NE Leadership

Bala Maheswaran, Distinguished Teaching Professor of electrical and computer engineering and first-year engineering program, was named to the leadership of the American Society for Engineering Education board of directors.

Global Network Accelerator Award

Matteo Rinaldi and **David Horsley**, professors of electrical and computer engineering, received the 2024 Northeastern University Global Network Accelerator Award, which recognizes the contributions of faculty who continue to push the advancement of experiential learning and discovery beyond the boundaries of place. Rinaldi and Horsley launched the new Institute for NanoSystems Innovation, the university's first bi-coastal research institute located in Boston and Oakland.

Faculty Grants and Publications

SELECTED HIGHLIGHTS

Photo by Matthew Modoono

$13M ARPA-H Award for Breakthrough 3D Imaging To Detect Lung Cancer Early

Soner Sonmezoglu, assistant professor of electrical and computer engineering, started the FY2025 year receiving a $13 million award from the Advanced Research Projects Agency for Health, titled "PAIL: PhotoAcoustic Imaging technology for diagnostic Lung assessment." The effort will result in a radically new, miniaturized optical photoacoustic imaging system with advanced image reconstruction algorithms. It is expected to transform the photoacoustic imaging field by providing real-time and high-contrast volumetric images that can assist in diagnosing and treating cancer and other major diseases. Collaborators include pathologists, surgeons, and engineers from Massachusetts General Hospital, Johns Hopkins University, and the University of Washington.

$2M NSF Award To Improve Power Delivery for High-Performance Computing

Nian Sun, Distinguished Professor of electrical and computer engineering, and **Aatmesh Shrivastava**, associate professor of electrical and computer engineering, in collaboration with Cornell University, received a $2 million National Science Foundation grant to develop next-generation integrated power delivery systems for high-performance computing.

$2M NTIA Award To Develop Testing Technology for 5G Open RAN

Pedram Johari, principal research scientist of electrical and computer engineering (ECE), is leading a $2 million project awarded by the National Telecommunications and Information Administration's Wireless Innovation Fund to develop a digital framework for testing 5G Open RAN systems called "DigiRAN: High-Fidelity Digital Twins for Interoperability, Security and Performance Testing of Open RAN Systems."

NSF $4.8M Renewal Award for Growing the Cybersecurity Workforce

Associate Professor **Wil Robertson**, Khoury College of Computer Sciences, jointly appointed in electrical and computer engineering (ECE); **David Kaeli**, ECE Distinguished Professor; and ECE Affiliated Faculty **Guevara Noubir** were awarded a $4.8 million National Science Foundation renewal CyberCorps® Scholarship for Service program for "Securing the Future: Scholarship for Service at Northeastern University."

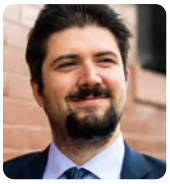
Photo by Adam Glanzman

$3.97M ONR Award To Improve Navy Ship Power Management

Vincent Harris, University Distinguished and William Lincoln Smith Professor of electrical and computer engineering (ECE), is leading a multi-institutional $3.97 million Office of Naval Research award to develop advanced magnetic materials that will operate at higher frequency and power levels, enabling more efficient and cost-effective power usage aboard Navy ships. The research team includes ECE Assistant Research Professor **Parisa Andalib**, who serves as a co-principal investigator for Northeastern's portion of the project; Kostas Research Institute Senior Research Scientist **Yunume Fitcherova**; the University of Pittsburgh; Dartmouth College; and the University of Missouri.

$2M NTIA Award To Develop AI-Powered Testing for Next-Generation Cellular Networks

Michele Polese, assistant research professor of electrical and computer engineering, is leading a $2 million project awarded by the National Telecommunications and Information Administration's Wireless Innovation Fund for "AutoRAN: Automated End-to-End Continuous Testing for Open and Disaggregated Cellular Systems."



$2M NSF Award for Designing New Chips for AI-Enabled Spectrum Perception

Francesco Restuccia, assistant professor of electrical and computer engineering, in collaboration with Florida International University, the University of Delaware, and the University of Arkansas, was awarded a $2 million National Science Foundation grant to provide constant Gigabit-per-second wireless connectivity for future applications like augmented reality and smart vehicles.

$1.6M NSF Grant To Create Inclusive Cities Through Technology

Qi "Ryan" Wang, associate professor of civil and environmental engineering, and **Yanzhi Wang**, associate professor of electrical and computer engineering, in collaboration with the University of Florida and the University of Virginia, received a $1.6 million National Science Foundation award for "Strengthening Elderly Mobility in Urban Landscapes: Towards Age-Inclusive and Equitable Communities." The team will use a novel methodology for transforming infrastructure planning, design, and operation through advanced technologies with an emphasis on social equity and user experience.

$1.5M ONR Award To Improve Interactions Between People and AI Agents

Mahdi Imani, assistant professor of electrical and computer engineering, in collaboration with George Washington University, was awarded a $1.5 million Office of Naval Research award. The project aims to enhance collaboration, communication, and learning among teams of humans and AI agents.

Photo by Brooks Canaday

$1M NSF Award for Enhancing Educational Research With AI and Cloud Infrastructure Training

Ningfang Mi, associate professor of electrical and computer engineering, in collaboration with Temple University, George Mason University, and the University of North Carolina, is leading a $999,969 National Science Foundation grant for "AI4EDU: Cloud Infrastructure-Enabled Training for AI in Educational Research and Assessment." The project addresses fundamental issues of user training on advanced cyber infrastructure, such as cloud computing systems, and the challenges of working with large quantities of education data.

The World's First Sub-THz Satellite Network Platform

Josep Jornet, professor of electrical and computer engineering (ECE), and interim ECE department chair; **Andrew Gouldstone**, professor of mechanical and industrial engineering; **Tommaso Melodia**, ECE William Lincoln Smith Professor; and **Ken Duffy**, ECE professor, jointly appointed in the College of Science; and in collaboration with the Morehead State University Space Science Center, were awarded $750,000 from the National Science Foundation for "Development Towards a Community Research Platform for sub-THz Satellite Communication Networks." The project explores the development of the world's first community research platform for sub-terahertz satellite communication networks.





Enhancing AR/VR Performance in 5G Networks

Edmund Yeh, professor of electrical and computer engineering (ECE), and **Dimitrios Koutsonikolas**, ECE associate professor, in collaboration with Tufts University, received a $600,000 National Science Foundation award for "TARGET: Latency-aware Edge Computing for VR/AR in 5G and Beyond Networks." The project will address shortcomings in current 5G millimeter wave networks and edge infrastructure with an enhanced edge architecture for Beyond 5G networks.

Using Interference Structure To Improve Wireless Communication

Ken Duffy, professor of electrical and computer engineering, jointly appointed in the College of Science, in collaboration with Boston University and MIT, was awarded $780,000 from the National Science Foundation for "Interferers in Our Midst." The team will develop methods to improve communication performance in shared, congested, and contested spectrum bands.

Photo by Matthew Modoono

Creating Age-Inclusive VR

Sarah Ostadabbas, associate professor of electrical and computer engineering, in collaboration with the University of Rhode Island, was awarded a $600,000 National Science Foundation grant for "Graph-Centric Exploration of Nonlinear Neural Dynamics in Visuospatial-Motor Functions During Immersive Human-Computer Interactions." She is investigating how aging impacts the ability to use emerging HCI technologies such as virtual reality.

Revolutionizing Refrigeration With Tiny Wireless Sensors

Cristian Cassella, associate professor of electrical and computer engineering (ECE), and **Nian Sun**, Distinguished Professor of ECE, received a $500,000 National Science Foundation award for "Boosting the Cold Chain Efficiency Through Integrated, Magnetoelectric, Piezoelectric, and Ferroelectric devices in pAssive on-Chip Tags (IMPACT)." The research will demonstrate a new class of passive wireless sensor nodes and generate long-range remote sensing microsystems with mm-scale spatial resolution that can be mass produced through standard semiconductor processes.

Novel Medical Imaging With Micromirror Technology

Benyamin Davaji, assistant professor of electrical and computer engineering, in collaboration with SUNY at Binghamton, was awarded a $550,000 National Science Foundation grant for "Merging Electrostatic and Ferroelectric MEMS Actuators To Create Tunable High-Speed Scanners." The research focuses on developing a novel scanning micromirror based on scalable MEMS technology.

Learn more about our accomplished faculty

Student Successes

SELECTED HIGHLIGHTS

ACM/IEEE CS George Michael Memorial HPC Fellowship

Photo by Alyssa Stone

Rohan Basu Roy, PhD'24, computer engineering, was awarded the prestigious Association for Computing Machinery/IEEE Computer Society George Michael Memorial High Performance Computing Fellowship for enhancing the productivity of computational scientists and environmental sustainability of high-performance computing with novel methods and tools exploiting cloud computing and on-premise HPC resources. Basu Roy is advised by **Devesh Tiwari**, associate professor of electrical and computer engineering.

National Defense Science and Engineering Graduate Research Fellowships

Andrew Ashdown, PhD'27, electrical engineering, and **Connor McLaughlin**, PhD'27, computer engineering, were recipients of the 2024 Department of Defense National Defense Science and Engineering Graduate Research Fellowship. Highly competitive, it is awarded to promising U.S. scientists and engineers to encourage them to pursue doctoral degrees in designated research disciplines of military importance.

Andrew Ashdown
PhD'27

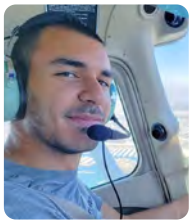
Connor McLaughlin
PhD'27

Patent for Improving RF Resonator Technology

Cristian Casella, associate professor of electrical and computer engineering, and **Xuanyi Zhao**, PhD'23, electrical engineering, were awarded a patent for "Two Dimensional Rod Resonator for RF Filtering."

2024 Amazon Robotics Day One Fellowship

Sophia Jonas, MS'26, robotics, is one of seven new fellows selected for the 2024 Amazon Robotics Day One Fellowship, which supports students from underrepresented backgrounds in STEM fields pursuing robotics degrees. She is pursuing work in human-robot interaction and augmentation, such as exoskeletons, or terrain-based search-and-rescue robots.



NASA Postdoctoral Fellowship

Ali Al Qaraghuli, PhD'24, electrical engineering, received the highly competitive NASA Postdoctoral Fellowship and is now a postdoctoral research fellow at the NASA Jet Propulsion Laboratory.

Mars Rover Team Places First at International Rover Challenge

The Northeastern Mars Rover team competed in the inaugural Winter Canadian International Rover Challenge, where they took home the gold, placing first and securing their first-ever competition win. Northeastern competed against teams from McMaster University, the University of Toronto, and York University.

Best Student Paper Finalist Award at IFAC SYSID 2024

Mohammad Alali, PhD'25, electrical engineering, received the Best Student Paper Finalist Award from the 20th IFAC Symposium on System Identification (SYSID 2024) for his paper "Kernel-Based Particle Filtering for Scalable Inference in Partially Observed Boolean Dynamical Systems."

Series of PhD Research Awards

Duschia Bodet, PhD'25, electrical engineering, and triple Husky, won Best Paper Award out of 3,200 submissions, as well as placed first in the 4-Minute Thesis competition at the IEEE Global Communications Conference (Globecom) 2023. She also received Outstanding PhD Student Award in Research from Northeastern University.

FLEX 2024 Innovators of the Future Student Poster Award

Yilmaz Arin Manav, PhD'28, electrical engineering, won first place at the Innovators of the Future Student Poster Award session at FLEX 2024 (SEMICON West) for his research on "Flexible Hybrid Electronics Metrology Enabled by GHz Ultrasound." He is advised by **Benyamin Davaji**, assistant professor of electrical and computer engineering.

Student Spotlights

Amani Al-shawabka, PhD'24

COMPUTER ENGINEERING

Advised by Tommaso Melodia, William Lincoln Smith Professor of Electrical and Computer Engineering

Originally from Jordan, **Amani Al-shawabka** earned a master's degree in computer engineering from Northeastern in 2019 and transitioned to the PhD program in computer engineering. She also received a master's degree in business administration from German Jordanian University and a bachelor's degree in communication engineering from Yarmouk University in Jordan. Additionally, she has more than a decade of professional experience in the mobile and cellular network industry.

At Northeastern, Al-shawabka made substantial contributions to the computer engineering field, particularly in the application of AI for wireless communication systems, with a focus on radio frequency fingerprinting through deep learning. She excelled in utilizing advanced techniques and algorithms in computer vision and natural language processing to address complex challenges within wireless systems. Al-shawabka developed and customized various neural networks, and she employed Generative Adversarial Networks (GANs) and transformers to solve different problems in the wireless communications domain.

Additionally, Al-shawabka designed and implemented testbeds to examine protocols connecting internet of things (IoT) devices, such as Wi-Fi, Long Range IoT and Narrowband IoT. She used these testbeds to create extensive datasets and made them available to the research community, where researchers could develop their AI models and use these datasets to benchmark their work and advance the domain.

Al-Shawabka worked with InterDigital Inc., a leading wireless communications and video research company, on applying machine learning to the physical layer of communications systems. Her efforts involve creating a testbed for real-world over-the-air RF data collection, curating RF datasets with detailed labeling in formats used by both industry and academia, and developing machine learning models for enhancing physical layer security in low-cost IoT devices.

Her commitment to research was recognized with Northeastern's Electrical and Computer Engineering Excellence in Research Award in 2023. Al-shawabka has authored several publications that were presented at esteemed conferences, including the IEEE INFOCOM and MobiHoc, and received notable recognition within the academic community.

She plans to pursue further research, aiming to make significant contributions to AI for wireless systems.

Haoqing Li, PhD'24

ELECTRICAL ENGINEERING

Advised by Pau Closas, Associate Professor of Electrical and Computer Engineering

Prior to joining the PhD program in 2018, **Haoqing Li** earned a bachelor's degree in electrical engineering from Wuhan University and a master's degree in electrical engineering in 2018 from Northeastern.

Li's research interests broadly include robust signal processing and statistical machine learning, with applications in satellite-based positioning systems and satellite-based image remote sensing. The focus of his dissertation was on developing inference techniques that are robust to different modalities of outliers. He has proposed groundbreaking methodologies to perform automatic outlier rejection, which will impact such processes as mitigating interferences in Global Navigation Satellite System (GNSS) receivers. He applied these methodologies to direct-positioning schemes yielding to high-sensitivity and robust positioning solutions using GNSS signals. Li also explored machine learning data-driven models that contributed to improving the overall performance of physics-based models, particularly to address the long-standing problem of multipath propagation in the GNSS literature. Additionally, he contributed to the field of hyperspectral imaging and satellite-based remote sensing through the development of robust filtering techniques for multi-sensor data fusion.

Haoqing's technical contributions were published in more than two dozen peer-reviewed publications. His dissertation work was published in top-tier journals such as *IEEE Transactions on Signal Processing, IEEE Transactions on Aerospace and Electronic Systems, IEEE Geoscience and Remote Sensing Letters,* and the *ISPRS Journal of Photogrammetry and Remote Sensing.* In these works, he collaborated with multiple leading researchers from around the globe. He participated in projects that were funded by the National Science Foundation, DARPA, National Geographic Society, and Google.

During his thesis period, Li actively participated in the academic community by mentoring incoming PhD students and serving as teaching assistant for several signal processing courses. He has also been a regular reviewer in prestigious journals and conferences.

Li will be continuing research on GNSS interferences (multipath and spoofing) detection and mitigation techniques as a postdoctoral fellow at the University of Calgary, Canada.

Julian Gutierrez, PhD'24

COMPUTER ENGINEERING

Advised by David Kaeli, College of Engineering Distinguished Professor of Electrical and Computer Engineering, and Pau Closas, Associate Professor of Electrical and Computer Engineering

Prior to joining Northeastern, **Julian Gutierrez** worked for several years at Intel Corp. in Costa Rica on the design and verification of the graphics unit on Intel's leading microprocessor. He received a promotion to local project manager, overseeing a large team of design engineers. In 2017, he earned a master's degree in computer engineering from Northeastern, and then started his PhD. During this time, he was a member of the Computer Architecture Research Laboratory.

Gutierrez's education was supported in part by a NASA fellowship, as well as through scholarships from the University of Costa Rica and the Costa Rican government. As part of his NASA fellowship, Julian worked as a computer engineer in the Safety Critical Avionics Systems Branch at NASA Langley Research Center beginning in 2020. His thesis research focused on the development of a new class of high-performance algorithms used in Global Navigation Satellite Systems (GNSS). These algorithms are used for guiding autonomous aerial vehicles (UAVs) and to address risk mitigation. His research enhances navigation precision and robustness in critical UAV applications.

Gutierrez co-authored 13 peer-reviewed journal and conference papers. His work received best paper nominations at numerous conferences, and he contributed to work that received a Best Presentation Award at GNSS+ 2023. Additionally, he presented research at AIAA Aviation, Hawaii International Conference on System Sciences, International Conference on Performance Engineering, and technical meetings with the Association for Computing Machinery, the Institute of Navigation, and IEEE. In 2019, Gutierrez received a scholarship from Los Alamos National Laboratory, enabling him to participate in its Radiation Effects Summer School.

While pursuing his PhD, Gutierrez mentored many undergraduate students, resulting in research that received undergraduate and graduate awards at Northeastern's RISE Expo. He also offered a free GPU programming class to the Northeastern community from 2017-2019.

Gutierrez currently works as a computer research engineer at the Safety Critical Avionics Systems Branch at NASA Langley Research Center. His focus is high-performance computing development within dependable navigation for autonomous aerial vehicles.

Ankit Mittal, PhD'24

ELECTRICAL ENGINEERING

Advised by Aatmesh Shrivastava, Associate Professor of Electrical and Computer Engineering

Ankit Mittal earned his bachelor's degree in electrical engineering from Dayalbagh Educational Institute in Agra, India. He worked for several years at NXP Semiconductors in India, leading memory-test chip designs for Near Field Communications and high-end electronics, before pursuing a PhD in electrical engineering at Northeastern in 2019.

Mittal, who joined the Energy Efficient Circuits and Systems Laboratory, is passionate about enhancing the energy efficiency of the internet of things (IoT) systems so they are able to self-sustain, envisioning a future where IoT devices and systems can be "deployed and forgotten." His research focus is on developing solutions for robust ultra-low power radio connectivity. Mittal has participated in the development of several research projects led by his advisor, Aatmesh Shrivastava, including those funded by the National Science Foundation's Resilient & Intelligent NextG Systems (RINGS) grants and Northeastern's Center for Research Innovation Spark Fund Award.

He participated in numerous interdisciplinary projects for wireless research, publishing in such esteemed journals as *Nature Communications* and various IEEE journals. Mittal has authored or contributed to 12 journal papers and 10 conference papers. He has led multiple chip tape outs, adopting a holistic design approach influenced by his undergraduate education.

In 2024, Mittal received the 2024 College of Engineering Outstanding Graduate Research Award. Other recognitions include a Best Paper finalist for his work on low-power sensor systems for precision agriculture presented at the 2023 IEEE CAFÉ conference in Italy; and a Best Paper Award at the 2021 National System Conference in India.

Committed to community service, Mittal has mentored students in Northeastern's Young Scholars Program and the Research Experiences for Undergraduates program, both offered through the Michael B. Silevitch and Claire J. Duggan Center for STEM Education. Also, he reviews research papers for top-tier journals and conferences, and volunteers on the IEEE Boston Section's Professional Development and Education committee.

Mittal is currently assessing academic opportunities for interdisciplinary research to develop tailored theories for wireless circuits, systems, and applications.

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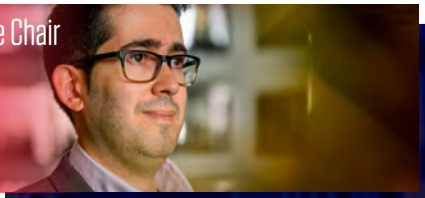

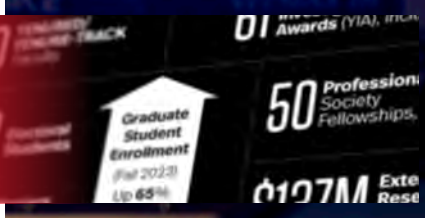

COVER IMAGE

Shown is **Soheil Farazi**, PhD'24, electrical engineering, who is working with Professor Srinivas Tadigadapa. They are using quantum mechanical techniques to develop optical microchips that will revolutionize infrared spectroscopy by reducing the need for bulky and costly palmtop machinery, making the process more accessible. Scan the QR code to read the full story.

Photo by Matthew Modoono/Northeastern University