2021-2022

ANNUAL REPORT

GT Georgia Tech College of Engineering
**School of Electrical
and Computer Engineering**

[**RANKINGS**]

U.S. News & World Report
**Graduate and
Undergraduate Rankings**

#2
E.E.
undergraduate
program

#4
Cmp.E.
undergraduate
program

#4
E.E.
graduate
program

#6
Cmp.E.
graduate
program

It's my sincere pleasure to share with you the 2021-2022 Georgia Tech School of Electrical and Computer Engineer (ECE) Annual Report. What a transformative year it has been! I'd like to thank the entire ECE community — students, faculty, staff, alumni, corporate and government partners, and friends — for the support you've provided me as I transitioned into the role of Steve W. Chaddick School Chair. A change in leadership always entails a significant amount of work and effort, but for it to be successful, trust and encouragement are required. I'm incredibly fortunate and thankful to have been supplied with both in excess.

As you know, we're living in extraordinary times. With new challenges, we've created a new reality — one that hasn't been perfect — but that still pushes us to excel and thrive. This new normal allows us to learn together again side-by-side, but incorporates the lessons we've learned and grace we've found through the pandemic.

As you'll discover while reading this report, ECE's commitment to excellence has never faltered. This year, we've reimagined student support and well-being, continued to publish transformative leading research, and, of course, graduated more electrical and computer engineers than any other institution in the world — and they're in high demand! We've continued to expand and evolve our curriculum threads, which have given ECE students the flexibility to explore and create unique degree experiences. We've also bolstered in-demand programs like cybersecurity, machine learning, and robotics.

Excitingly, our hard work has not gone unnoticed. Both of ECE's undergraduate academic programs rose to their highest-ever positions in the latest U.S. News & World Report Best Colleges rankings. Electrical engineering moved up two places to No. 2, a record high. Computer engineering moved up one spot to No. 4, matching the program's high set in 2020. Among public universities, Tech's electrical engineering is the top program in the country for the first time ever.

It's no wonder that ECE is looked on to contribute to the technological, economic, and social enrichment of the State of Georgia, the nation, and the world. Specifically, ECE is uniquely positioned to train the future microelectronics workforce and develop impactful microelectronics advances with the backing of the recently passed CHIPS Act, as well as other government and corporate microelectronics funding commitments.

Before you settle in with this year's Annual Report, there's one thing I would ask of you: spread the word. Share your pride and let others know about the impact of our community. ECE is shaping the future of the world right now. Let's celebrate it!

Sincerely,

Arijit Raychowdhury

Arijit Raychowdhury
Steve W. Chaddick School Chair

ECE OVERVIEW

[ENROLLMENT]

2,539
overall total

1,253
total undergraduate
enrollment, FY 21

594 B.S.E.E.
659 B.S.Cmp.E.

19% females
18% underrepresented
minorities

1,286
total graduate
enrollment, FY 21

549 M.S.E.C.E.
5 M.S. Bioengineering
2 M.S. Cybersecurity
89 M.S. Cybersecurity—online
561 Ph.D.
16 Ph.D. Bioengineering
22 Ph.D. Machine Learning
27 Ph.D. Robotics
2 Non-degree seeking

19% females
9% underrepresented
minorities

[DEGREES]

697
overall total

315
total undergraduate
degrees awarded, FY 21

158 B.S.E.E.
157 B.S.Cmp.E.

25% females
15% underrepresented
minorities

382
total graduate
degrees awarded, FY 21

267 M.S.E.C.E.
7 M.S. Cybersecurity
3 M.S. Bioengineering
98 Ph.D. E.C.E.
1 Ph.D. Bioengineering
6 Ph.D. Robotics

22% females
8% underrepresented
minorities

LEADERSHIP TRANSITIONS

Raychowdhury Named New Chair of Electrical and Computer Engineering

Arijit Raychowdhury started as the Steve W. Chaddick School Chair for ECE, on December 1, 2021. Raychowdhury has been a member of the Georgia Tech faculty since January 2013. He is the director of Georgia Tech's Institute for Electronics and Nanotechnology Center for Circuits and Systems, while also serving as the co-director of the Georgia Tech Quantum Alliance.

Raychowdhury is a pioneer in energy-efficient digital and mixed-signal circuit and system research. He has contributed to foundational technologies that have been widely adopted by the leading semiconductor industries. In addition to his roles at Georgia Tech, he is currently a distinguished lecturer of the IEEE Solid State Circuits Society and a mentor for IEEE Young Professionals and IEEE Women in Circuits. He has leadership roles in multiple National Science Foundation and Semiconductor Research Corporation centers.

A diverse group of faculty, staff, and students participated in a nationwide search for the new chair. The committee was led by Susan Margulies, professor and former chair of the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University. Professor Douglas Blough served as ECE's interim chair until Raychowdhury was selected.

Zhang Appointed ECE Senior Associate Chair

Ying Zhang was appointed senior associate chair for ECE, effective August 1, 2021. She succeeded Mary Ann Weitnauer, who served in the position since 2016.

Zhang joined the ECE faculty in 2006 after graduating with her Ph.D. in systems engineering from the University of California, Berkeley. She began her career at the Georgia Tech Savannah campus and then moved to the Atlanta campus in 2012, where she is currently a professor and the director of the Sensors and Intelligent Systems Laboratory.

Zhang

She is highly involved in enhancing education for both undergraduate and graduate students. As a Provost Teaching and Learning Fellow, she worked with colleagues to develop strategies that help faculty incorporate best practices for blended, face-to-face, and online teaching during and after the pandemic.

ECE CARES: COMPREHENSIVE STUDENT SUPPORT

While the pandemic has added innumerable challenges, it has also provided an opportunity for higher-learning institutions to re-think and prioritize initiatives aimed at student support.

"The Institute offers many meaningful resources for students. Due to our proximity with our community, ECE has an important vantage point to understand student needs and deliver on them," said Raychowdhury. "We want all students to know that we're here for them and have their back."

One of Raychowdhury's top priorities since becoming chair in December 2021 has been to create sustainable, recurring student support initiatives that can be embedded within the School and live beyond a particular chair's tenure. As the world and Georgia Tech return to more in-person activities and a new "normal," the School has launched the new initiative, ECE Cares.

While still in development, ECE Cares is an umbrella program to capture initiatives aimed at strengthening student support and community building. ECE Cares will be incorporated throughout the many levels of the School by reinforcing existing initiatives and creating new ones.

One such program took place before spring semester finals on April 16, when nearly 600 ECE undergraduate and

> "The Institute offers many meaningful resources for students. Due to our proximity with our community, ECE has an important vantage point to understand student needs and deliver on them. We want all students to know we're here for them and have their back."
>
> — Arijit Raychowdhury

graduate students attended the first-ever Pre-Finals Student Wellness Drop-In located in TI Plaza (outside Van Leer). Students built their own care packages — with study supplies, snacks, and ECE swag — to prep for finals. The event was organized by the Student/Faculty Committee and the ECE Student Advisory Council.

Another fundamental goal of ECE Cares is to alleviate the financial burden associated with attending college. There are many additional costs students are required to fund outside of tuition, books, and room and board, including course supplies and equipment. This spring, ECE was able to purchase 550 myDAQs from National Instruments which students can now check out from the Georgia Tech Library. The program also uniquely aids non-ECE majors, as many students within the College of Engineering are required (or elect) to take some myDAQ-required courses. Additionally, ECE launched a Computer Loaner Program to provide laptops to ECE students if their computing equipment is being repaired.

With the success of these loaner programs, ECE Cares now plans to set up a similar offering for 450 Mbed devices. Combined, the programs will effectively eliminate more than $500 per ECE student on course equipment fees, and will lower financial barriers for up to 4,000 students each semester across campus.

Furthermore, ECE has hired a new academic professional position with a focus on student engagement and well-being initiatives. Along with peer counselors, this important position will work directly with students and faculty members to build on and improve the ECE student experience.

Anna Holcomb, ECE lecturer and assistant director the Undergraduate Professional Communications Program, and Samay Chandna, president of the ECE Student Advisory Council at the Pre-Finals Student Wellness Drop-In.
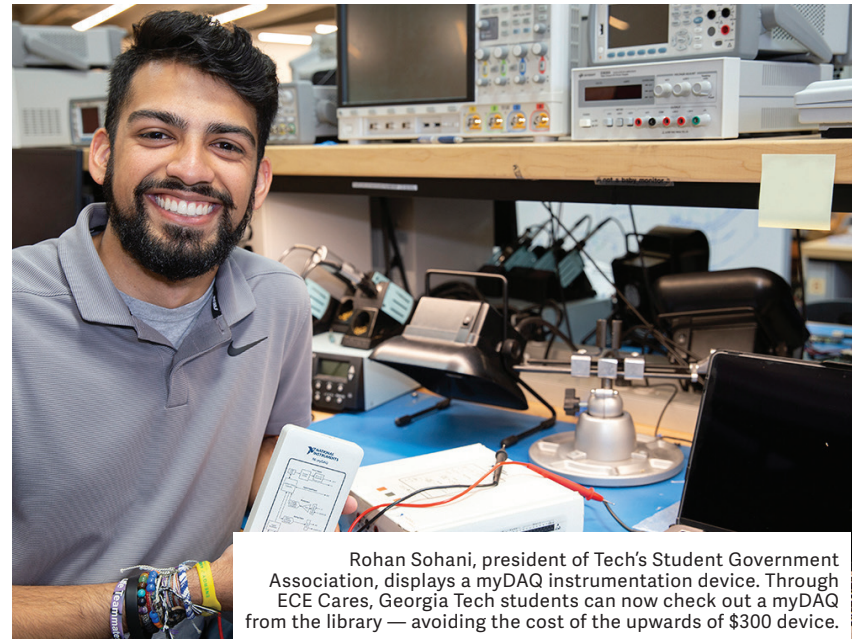
Rohan Sohani, president of Tech's Student Government Association, displays a myDAQ instrumentation device. Through ECE Cares, Georgia Tech students can now check out a myDAQ from the library — avoiding the cost of the upwards of $300 device.

STUDENTS AND STUDENT GROUPS

ECE student groups provide outlets for community building, K-12 outreach and service, and professional development. Our students also participate in interdisciplinary clubs and many social, professional, and cultural organizations at Georgia Tech.

Student Groups

ECE Ambassadors • ECE Graduate Student Organization • Eta Kappa Nu • Georgia Tech IEEE
The Hive • Women in Electrical and Computer Engineering • The Amateur Radio Club

Award Winners

Our students receive awards through the Roger P. Webb Awards Program in ECE and awards events held by other organizations and offices on campus.

Katherine Roberts
Outstanding Electrical Engineering Senior Award

Zachary Olkin
Outstanding Computer Engineering Senior Award

Landon Ballard, Chenghao Duan
ECE Graduate Teaching Assistant Excellence Award

Sajjad Abodollahramezni, Santhosh Karnik, Mohit Prabhushankar, Mohammad S. E. Sendi
ECE Graduate Research Assistant Excellence Awards

Pradyot Yadav
ECE Undergraduate Research Award

Panni Wang
Sigma Xi Best Ph.D. Thesis

GT IEEE POWER AND ENERGY SOCIETY TAKES TOP SPOT IN STUDENT BRANCH CHAPTER PROGRAM

The Georgia Tech student branch chapter of the IEEE Power and Energy Society (PES) was awarded the first place prize for IEEE Region 1-7 (U.S. and Canada) in the highly competitive 2021 PES High Performing Student Branch Chapter Program.

Chartered by both IEEE and IEEE PES, the IEEE PES @ Georgia Tech student branch encourages the development and dissemination of knowledge in the power and energy fields throughout the Tech community. Currently, there are more than 250 members of Tech's IEEE PES chapter, including undergraduate students, graduate students and alumni. Nearly 100 members have joined the Tech IEEE PES student branch chapter since the Fall 2020 semester, many of whom are also members and volunteers of the IEEE PES international society.

FABIA ATHENA NAMED A 2022 IBM PH.D. FELLOWSHIP AWARD RECIPIENT

Fabia F. Athena, a third-year Ph.D. student, has received a 2022 IBM Ph.D. Fellowship Award recipient. Athena's research involves the development of a fundamental understanding of the mechanism of a specific class of analog memristors for use in biologically realistic neuromorphic architectures. Her work links the necessary underlying materials physics (control of the thermal and chemical properties of the adaptive oxide) to the performance of the device, circuit, and application.

Since 1951, the prestigious IBM Ph.D. Fellowship Program has collaborated with faculty, students and universities by recognizing and supporting exceptional Ph.D. students that address focused areas of interest in technology.

SMITH RECEIVES NATIONAL DEFENSE SCIENCE AND ENGINEERING GRADUATE FELLOWSHIP

Liam Smith, a second year Ph.D. student, was chosen as a recipient of the 2022 National Defense Science and Engineering Graduate (NDSEG) Fellowship. The fellowship is the highest honor awarded to graduate students by the U.S. Department of Defense agencies. It will support Smith's Ph.D. studies for the next three years.

Smith's research centers on modeling space weather through machine learning (ML) — the science of getting computers to act without being explicitly programmed. Specifically, his work focuses on the near-Earth space environment's response to space weather, including solar flares and coronal mass ejections — events that have potential to disrupt satellite communications, trigger outages for ground communication systems, degrade and destroy satellites, and, in extreme cases, knock out power across large regions.

FACULTY AND STAFF

FY2022 STATS

87	8	56	84	34	36	3
academic faculty	academic professionals	research faculty	administrative staff	faculty members holding chairs or professorships	IEEE Fellows	NAE members

New Faculty

Suman Datta
Professor; Joseph M. Pettit Chair in Advanced Computing; Georgia Research Alliance Eminent Scholar; Joint appointment with the School of Materials Science and Engineering (MSE)

Larry Heck
Professor; Rhesa Screven Farmer, Jr. Advanced Computing Concepts Chair; Georgia Research Alliance Eminent Scholar

Cong (Callie) Hao
Sutterfield Family Early Career Professor Computer Systems and Software, VLSI Systems and Digital Design

Fabian Monrose
Professor; Julian T. Hightower Chair in Cybersecurity

William Robinson
Professor; Georgia Tech Research Institute Deputy Director for Research for the Information and Cyber Sciences Directorate

Karthikeyan (Karthik) Sundaresan
Professor
Telecommunications

Faculty & Staff Awards

External Awards & Honors

Ghassan AlRegib | IEEE Grade of Fellow

Vince Calhoun | 2022 IEEE Region 3 Outstanding Engineer Award; Fellow of the Organization for Human Brain Mapping (FOHBM); Schizophrenia International Research Society Honorific Award for Outstanding Translational Research

Russell Dupuis | 2022 Benjamin Franklin Medal in Electrical Engineering

Bonnie Ferri | IEEE Grade of Fellow; 2022 John R. Ragazzini Education Award (American Automatic Control Council)

Omer Inan | American Institute for Medical and Biological Engineering (AIMBE) College of Fellows; Presidents' Award of Distinction for Team Science from the Georgia Clinical and Translational Science Alliance

Tushar Krishna | 2021 Qualcomm Faculty Award; IEEE International Symposium on High-Performance Computer Architecture Hall of Fame

Xiaoli Ma | IEEE Signal Processing Society (SPS) Board of Governors

Daniel Molzahn | National Science Foundation (NSF) CAREER Award

Azad Naeemi | IEEE Solid-State Circuits Society James D. Meindl Innovators Award

Andrew F. Peterson | 2021 Technical Achievement Award (Applied Computational Electromagnetics Society)

Arijit Raychowdhury | 2021 Qualcomm Faculty Award; 2021 Technical Excellence Award (Semiconductor Research Corporation); IEEE Grade of Fellow

Gabriel Rincón-Mora | IEEE Circuits and Systems Society Distinguished Lecturer

From left: Daniel Dapkus, Russell Dupuis, Azad Naeemi, Chaouki T. Abdallah, Oliver Brand.

Maryam Saeedifard | 2021 U.S. Clean Energy Education and Empowerment Technology Research & Innovation Award; IEEE Grade of Fellow; Nagamori Foundation Award

Raghupathy Sivakumar | National Academy of Inventors Fellow

Gordon Stüber | IEEE Vehicular Technology Society (VTS) Board of Governors

Shimeng Yu | IEEE Electron Devices Society Distinguished Lecturer

Internal Awards & Honors

Nivedita Bhattacharya | Student Recognition of Excellence in Teaching: 2021 CIOS Award

Oliver Brand | Georgia Tech Outstanding Achievement in Research Program Development Award

Chance Brown | Staff Innovation and Process Improvement Award; ECE Hats Off Performance Award

Nisaa Buchanan | ECE Hats Off Performance Award

Samuel Coogan | Sigma Xi Young Faculty Award

John D. Cressler | Regents Professor

Fanchette Danmola | ECE Hats Off Performance Award

Mark A. Davenport | ECE Eta Kappa Nu 2022 Outstanding Junior Faculty Teacher Award

Joy Harris | 2021 Faces of Inclusive Excellence

Anna Holcomb | ECE Research Spotlight Award

Shu Lin | Soaring Jacket Award

Samer Mabrouk | ECE Research Spotlight Award

Elliot Moore II | ECE Eta Kappa Nu 2022 Outstanding Senior Faculty Teacher Award

Chris Rozell | 2021 Faces of Inclusive Excellence

Brendan Saltaformaggio | Student Recognition of Excellence in Teaching: 2021 CIOS Award (Center for Teaching and Learning); Georgia Tech Class of 1940 W. Roane Beard Outstanding Teaching Award

Julie Sonneberg-Klein | Staff Innovation and Process Improvement Award

Emmanouil Tentzeris | Georgia Tech Outstanding Doctoral Thesis Advisor Award

Linda Wills | Student Recognition of Excellence in Teaching: 2021 CIOS Award (Center for Teaching and Learning)

Muneeb Zia | 2021 Faces of Inclusive Excellence (Institute Diversity, Equity, and Inclusion)

NEETRAC CELEBRATES 25 YEARS OF SUCCESS, LOOKS FORWARD TO THE FUTURE

ECE's National Electric Energy Testing Research and Applications Center (NEETRAC), located off-campus in Forest Park, celebrated its 25th Anniversary on October 27, 2021.

The electric energy-focused, industry-supported center conducts project research for industry leaders and manufacturers, as well as with campus faculty and students. Currently, NEETRAC has 37 members consisting of small-, medium-, and large-sized utility companies and utility manufacturers located throughout North America. These companies pay a membership fee to support this lab and continue important research needed in the utility industry.

NEETRAC research and testing services help electric utilities increase system reliability, reduce cost, and improve system safety. As a historically successful organization, NEETRAC is looking forward to the next 25 years as the center works to provide meaningful research and testing services for their members.

MICROELECTRONICS MOMENTUM DRIVES THE NATION'S SEMICONDUCTOR RESURGENCE

Georgia Tech drives trailblazing chip research and nurtures the future microelectronics workforce that are key to America's long-term semiconductor competitiveness.

The world's dependence on semiconductors came into sharp focus in 2021, when automotive manufacturing ground to a halt because of massive computer chip shortages. As the country rebuilds its semiconductor infrastructure at home, Georgia Tech serves as a vital partner – to train the microelectronics workforce, drive future microelectronics advances, and provide unique fabrication and packaging facilities for industry, academic and government partners to develop and test new solutions.

Georgia Tech is well positioned to support collaborative efforts by industry and government to strengthen the country's semiconductor capacity now that Congress has funded the Creating Helpful Incentives to Produce Semiconductors for America and Foundries Act (or the CHIPS for America Act).

Oliver Brand, ECE professor and executive director of Georgia Tech's Institute for Electronics and Nanotechnology, notes that Georgia Tech's large engineering and science faculty bring a broad set of research expertise to this significant industry challenge. Supporting such a diverse research agenda requires

ECE faculty members Oliver Brand, Madhavan Swaminathan, and Shimeng Yu. Photo by Robert Felt.

robust facilities, which Georgia Tech is uniquely positioned to provide. Georgia Tech looks to become an epicenter of U.S. innovation in semiconductors and packaging as the country begins to reclaim a leadership position as a semiconductor manufacturer.
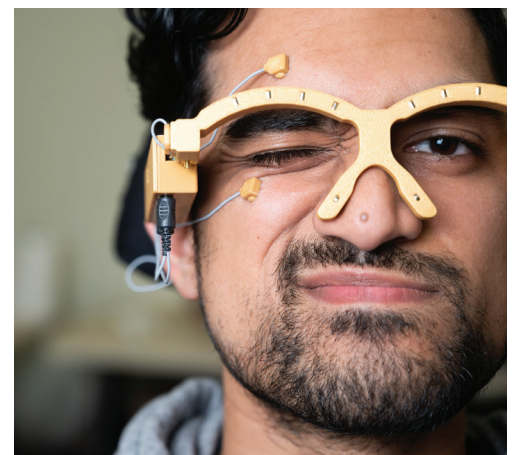
MAGTRACK TECHNOLOGY OPENS DOORS FOR INDEPENDENT OPERATION OF SMARTPHONES, COMPUTERS, AND OTHER DEVICES FOR WHEELCHAIR USERS

ECE partners with Brooks Rehabilitation in human participant phase of groundbreaking technology study.

This year, Brooks Rehabilitation announced that the MagTrack study, a collaborative research endeavor with Georgia Tech ECE, has been successfully completed. Feedback from the Brooks clinical team and its patients has allowed Georgia Tech engineers to transform their early research prototype into a user-ready version that was tested by more than 17 power wheelchair users living with tetraplegia — a form of paralysis caused by spinal cord injury that affects the arms, hands, trunk, legs, and pelvic organs.

The collaboration between the Brooks and Georgia Tech teams has created a path to a first-of-its-kind, innovative application for individuals living with disabilities. The teams — comprised of physicians, clinical therapists, and engineers — brought together multidisciplinary expertise in advanced science, technology, and clinical rehabilitation.

A squint is an example of a facial gesture that MagTrack can detect and issue a discrete command to control a connected device.

"The trajectory of the MagTrack study shows an unprecedented possibility for the advancement of independent function as well as mobility for electric wheelchair users," said Omer T. Inan, Linda J. and Mark C. Smith Chair in Bioscience and Bioengineering and associate professor in ECE. "This technology can significantly improve people's lives. We will continue to work to see these advances in assistive technology come to life."

Asif Khan (left) discusses his research with Georgia Tech President Angel Cabrera (right) during a 2021 visit to Khan's lab.

KHAN LAB WORKING TO IMPROVE EFFICIENCY OF FUTURE ELECTRONICS

Researchers aim to reduce operating voltage as a means of making electronics more efficient.

As the world's demand for electronics keeps growing, so does the impact on climate change. The carbon footprint of those billions of devices we use, including smartphones, already accounts for about 3.7% of all global greenhouse emissions and at the present rate of use, could reach 14% by 2040.

"Therefore, we need to limit the increase of the power that is consumed by future electronics," said Asif Islam Khan, assistant professor in ECE, who is working with an international team of collaborators to do exactly that.

Getting there is the trick, but the 24-person research team think they may have found a way with a class of materials called ferroelectrics and antiferroelectrics. The most immediate impact of this early-stage research would lead to the development of energy efficient electronics, a big deal since electronic devices are becoming ubiquitous. In the long term, in addition to smartphones and laptops with longer battery lives and improved performance, the discoveries here could also help reduce the environmental impact of large data centers and super computers.
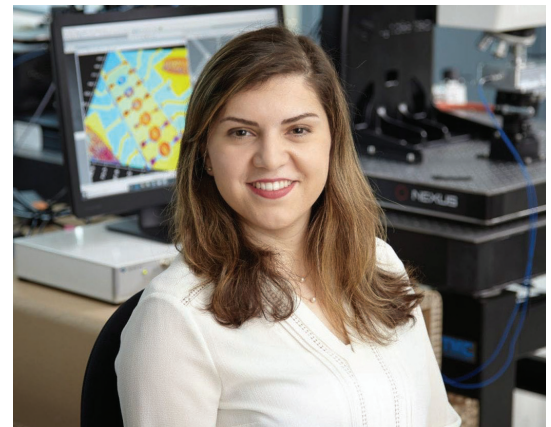
TERAHERTZ IMAGING REVEALS HIDDEN INSCRIPTION ON EARLY MODERN FUNERARY CROSS

Terahertz imaging and signal processing techniques look beneath the surface.

In a multidisciplinary project, researchers at Georgia Tech and Georgia Tech-Lorraine used terahertz imaging and signal processing techniques to look beneath the corroded surface of a 16th-century lead funerary cross. Led by David Citrin, a professor in ECE, the effort brought together imaging scientists, a chemist specializing in archaeological objects, and an art historian to reveal a message that had been obscured by time: an inscription of the Lord's Prayer.

The cross project illustrates that success requires more than just accurate measurement, but also careful data processing and collaboration between researchers from disparate fields. The team's approach opens new perspectives for terahertz imaging analysis and could produce great boosts for the fields of digital acquisitions and documentation, as well as character recognition, extraction, and classification.

ECE professor David Citrin (right) and adjunct professor Alexandre Locquet stand in front of an image of the 16th-century funerary cross used in their study. Photo by Nicolas Jacquet

NEW "MICRO-ROCKER" BOTS ARE POWERED BY A SINGLE ELECTROMAGNETIC COIL

Once the size of ants, these 3D-printed micro-robots can now only be seen under a microscope.

Georgia Tech researchers, led by Sutterfield Family Early Career ECE Professor Azadeh Ansari, have shown that robots about the size of a particle of dust are capable of precise bidirectional control. By harnessing the power of a magnetic field generated by only a single electromagnetic coil, the mobile micro-robots are the smallest of their type.

The bots' updated "rocker" design allows them to move by performing a stick–slip motion with an out-of-plane magnetic field. Being able to demonstrate that a single coil setup is enough for precise bidirectional motion control is a significant hurdle to clear, according to Ansari. With the micro-bots now much easier to operate, the team has been able to demonstrate micromanipulation capabilities.

The researchers are currently working to equip a micro-bot with a tip that could potentially insert nanoparticles into biological tissue for drug delivery or DNA extraction.

Azadeh Ansari,
Sutterfield Family Early Career Assistant Professor.

SHAPING THE FUTURE OF LIGHT THROUGH RECONFIGURABLE METASURFACES

Harnessing the power of "phase-change" materials, researchers have demonstrated how reconfigurable metasurfaces — artificial materials with extraordinary optical properties — are crucial to the future of nanotechnology.

The technological advancement of optical lenses has long been a significant marker of human scientific achievement. One of the most impactful breakthroughs of lens technology in recent history has been the development of photonic metasurfaces — artificially engineered nano-scale materials with remarkable optical properties.

Georgia Tech researchers, led by ECE Professor Ali Adibi, are at the forefront of this technology and have demonstrated the first-ever electrically tunable photonic metasurface platform. The pronounced tuning measures achieved through the new platform represent a critical advancement towards the development of miniaturized reconfigurable metasurfaces.

Driven by device miniaturization and system integration, as well as their ability to selectively reflect different colors of light, metasurfaces are rapidly replacing bulky optical assemblies of the past. Immediate impact on technologies like LiDAR systems for autonomous cars, imaging, spectroscopy, and sensing is expected. With further development, more aggressive applications like computing, augmented reality, photonic chips for artificial intelligence, and biohazard detection can also be envisioned.
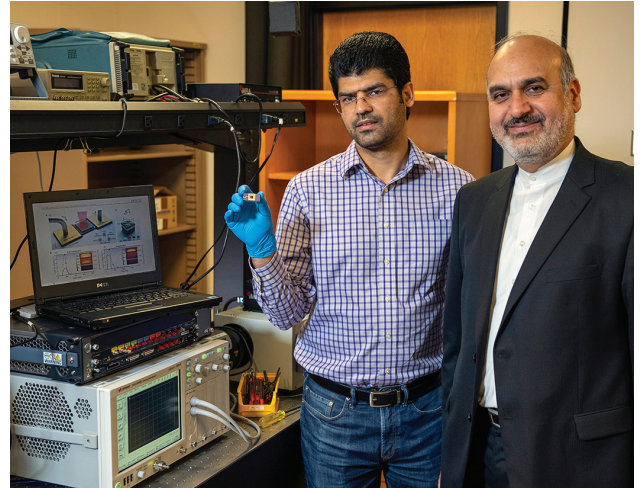
ECE professor Ali Adibi (right) with Ph.D. candidate Sajjad Abdollahramezani in Ali's Photonics Research Group lab where the characterization of the tunable metasurfaces takes place.

SOFT SEMICONDUCTORS THAT STRETCH LIKE HUMAN SKIN CAN DETECT ULTRA-LOW LIGHT LEVELS

Flexible electronics breakthrough could enhance biosensor technology, from wearables to soft-robotic implantable systems

Three engineering labs at Georgia Tech collaborated to demonstrate a new level of stretchability of a photodetector. Pictured above is first author Youngrak Park (right) with the lab leads (L to R) Bernard Kippelen, Samuel Graham, and Olivier Pierron. (Photo credit: Ben Wright, Georgia Tech)

Semiconductors are moving away from rigid substrates, which are cut or formed into thin discs or wafers, to more flexible plastic material and even paper thanks to new material and fabrication discoveries. The trend toward more flexible substrates has led to fabrication of numerous devices, from light-emitting diodes to solar cells and transistors.

Georgia Tech researchers have created a material that acts like a second skin layer and is up to 200% more stretchable than its original dimension without significantly losing its electric current. The researchers say the soft flexible photodetectors could enhance the utility of medical wearable sensors and implantable devices, among other applications.

The researchers — from both mechanical and computing engineering — labs collaborated over three years to demonstrate a new level of stretchability for a photodetector, a device made from a synthetic polymer and an elastomer that absorbs light to produce an electrical current.

Bernard Kippelen, vice provost for International Initiatives and an ECE professor, oversaw the work of Youngrak Park, the study's first author and a Ph.D. candidate in ECE. Following two-and-a-half years of research, Park uncovered the right combination of chemical compounds that produced a super-soft material with the ability to generate and conduct electricity when exposed to light. Park found the perfect ratio for all parts of the semiconductor layer to maintain high performance in the photodetector. But it was painstaking work to prove the materials' stretchability, especially given that a single layer was 1,000 times thinner than a human hair.

The research team foresees rich applications for the soft and stretchable polymer blend beyond wearables for health monitoring, including implantable electronics, smart agriculture, and detecting, identifying, and characterizing ionizing radiation for nuclear fuel cycle monitoring.

COMMERCIALIZATION

GEORGIA TECH NAMES SIVAKUMAR AS VICE PRESIDENT OF COMMERCIALIZATION

ECE's Raghupathy "Siva" Sivakumar was named Georgia Tech's first vice president of commercialization and chief commercialization officer in September, 2021.

A professor who co-founded multiple technology companies, he is the co-founder and former director of CREATE-X, a Georgia Tech initiative to instill entrepreneurial confidence in students and empower them to launch successful startups.

Sivakumar was serving as chief commercialization officer in an interim capacity since November 2020. He now focuses full-time on the goals ahead, which include bringing together commercialization and technology transfer pursuits across campus to move more intellectual property into the marketplace, expanding Georgia Tech's global impact.

STUDENT'S MICROCHIP STARTUP REDUCES ENERGY WASTE, AMPLIFIES POWER SYSTEMS IN 5G SPACE

Ph.D. candidate Edgar Garay's doctoral research has led to the creation of a microchip design startup focused on improving energy efficiency. Its ultra-efficient, silicon-based power amplifiers and front-end modules (FEM will be used in 5G technology, the fifth-generation global wireless standard for machines, objects, and devices).

He worked with VentureLab, a program that works with faculty and graduate students to help them commercialize Georgia Tech research and intellectual property. VentureLab, along with CREATE-X, are part of a broader Georgia Tech strategy to foster entrepreneurial confidence in students and faculty and expand the research-to-commercialized startup pipeline.

The startup has attracted interest and support from Berkeley SkyDeck, a high-tech entrepreneurship startup accelerator at the University of California, Berkeley. The highly competitive SkyDeck program reviews thousands of applications from startup founders around the world but accepts only about 1% of those into its portfolio.
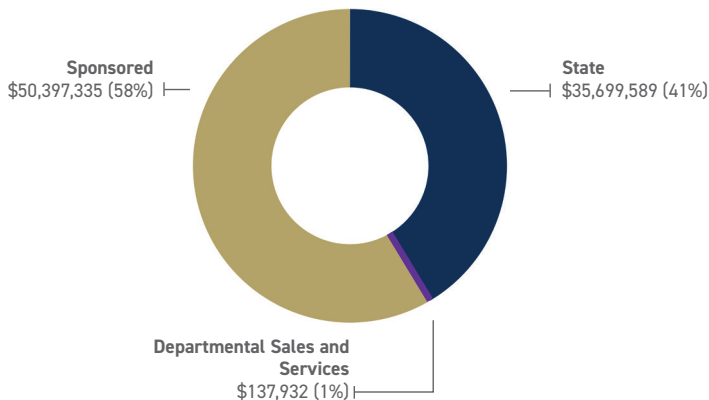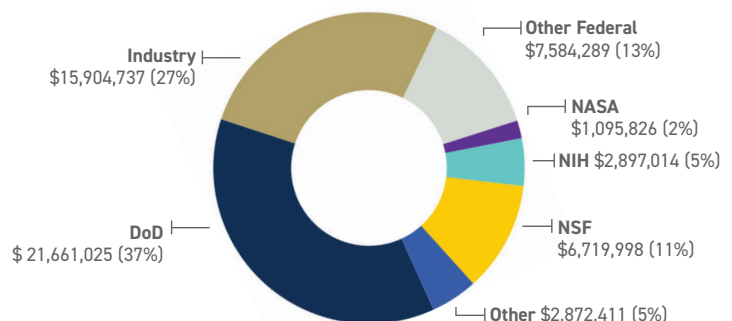
FINANCES

New external research funding in FY 22 totaled $58,085,120 from grants and contracts. Of the $58.1 million total, 68% came from federal government sources, 27% came from industry, and 5% came from other sources.

The School spent $86,234,856 from state, sponsored research, and departmental sales and services sources. This money mostly pays for faculty, staff, and researcher salaries, and the rest is used for materials and supplies, travel, and equipment in support of our research and educational missions.

FY 22 EXPENDITURES

Sponsored $50,397,335 (58%)
State $35,699,589 (41%)
Departmental Sales and Services $137,932 (1%)

FY 22 NEW EXTERNAL RESEARCH FUNDING

Industry $15,904,737 (27%)
Other Federal $7,584,289 (13%)
NASA $1,095,826 (2%)
NIH $2,897,014 (5%)
NSF $6,719,998 (11%)
Other $2,872,411 (5%)
DoD $ 21,661,025 (37%)

Transforming Tomorrow — THE CAMPAIGN FOR GEORGIA TECH

Under the stewardship of President Ángel Cabrera, Georgia Tech officially announced "Transforming Tomorrow: The Campaign for Georgia Tech" this fiscal year. Grounded in the Institute's strategic plan, this campaign will bring unprecedented advancements to the Institute that will have the power to shape the future.

Over the next five years, with the support of alumni, parents, faculty, staff, friends, corporations, and foundations, Georgia Tech – and ECE - can secure the resources that will help us achieve the most ambitious goals in our history.

For more information about "Transforming Tomorrow" and ECE's fundraising activities, contact Jeff Colburn, director of ECE Alumni Development at jeff.colburn@ece.gatech.edu or Etta Pittman, director of ECE Corporate Development, at etta.pittman@ece.gatech.edu.

FY 22 DONORS

We would like to thank the following corporations, organizations, and individuals for contributing $10,806,115 to the School and its affiliates during FY 22.

INDIVIDUALS

Chaouki Abdallah and Catherine Cooper
Bill and Dee Allen
Edwin Anderson
Jared Anderson
Anonymous
Brian and Susan Banner
Richard and Patricia Batelaan
Barbara Brown
Rob and Gwyneth Butera
Pierce Cantrell
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FOUR ECE GRADUATES HONORED AT COE ALUMNI AWARDS

The 2022 College of Engineering Alumni Awards were held on Saturday, April 23, 2022 in Atlanta. The inductees were originally scheduled to be honored in the spring of 2020.

Each year, the College's eight schools nominate graduates in three categories: Council of Outstanding Young Engineering Alumni, Academy of Distinguished Engineering Alumni, and the Engineering Hall of Fame.

This year, four ECE graduates were honored: Garrett Langley B.E.E. '09 (bottom right) was honored by the Council of Outstanding Young Engineering Alumni, Carmel Ortiz B.E.E. '89 (bottom left) was honored by the Academy of Distinguished Engineering Alumni, and James G. Pope B.E.E. '65 (top left) and Ronald L. Yancey B.E.E. '65 (top right) were both inducted by in to the Engineering Hall of Fame.

Additionally, Sebastián Negrón, a first-year Dean's Scholarship recipient in electrical engineering, was the student speaker for the Alumni Awards.

ALUMNI ASSOCIATION HONORS FIVE ECE ALUMNI IN 2021 40 UNDER 40 LIST

Georgia Tech's impact reaches every industry, every part of the globe, and every aspect of people's lives through the work of our esteemed alumni. Each year, the Georgia Tech Alumni Association announces 40 distinguished honorees who have innovated industries and positively impacted communities across the globe.

For 2021, five alumni from the ECE were chosen (top right to bottom right): Arindam Basu, MS Math 09, PhD ECE 10; Sam Elia, EE 13, MS ECE 14; Garrett Langley, EE 09; Precious Urenna Onyewuchi, MS ECE 08, PhD ECE 12; and Miheer Walavalkar, MS ECE 07.

Those nominated must have completed at least one semester at Georgia Tech, be under the age of 40 as of June 30, 2021, and have made an impact in their profession or community, spanning all industries and sectors. A committee of 21 faculty, staff, and volunteer leaders, who collectively represented all Georgia Tech colleges, scored each nominee using a 25-point rubric.

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