

UConn | SCHOOL OF ENGINEERING

# ECE

ELECTRICAL & COMPUTER ENGINEERING



**FALL 2021**  
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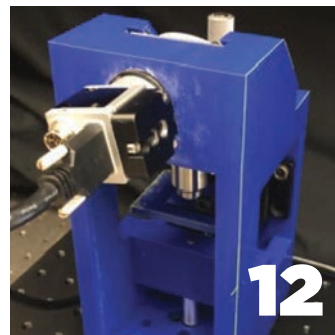


FALL 2021

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SCHOOL OF ENGINEERING

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This newsletter is published for the alumni, faculty, students, corporate sponsors, and friends of the Department of Electrical & Computer Engineering at the University of Connecticut. Comments are always welcome.

Please send correspondence and address corrections to the address below or email [john.chandy@uconn.edu](mailto:john.chandy@uconn.edu).

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The creative efforts of the School of Engineering staff members Eli Freund, Chris LaRosa and Mary McCarthy are gratefully acknowledged.

# MESSAGE FROM THE DEPARTMENT HEAD



I am pleased to share with you the Fall 2021 edition of our newsletter. The last year and a half have been challenging for all of us, but we are all so happy and excited to be back on campus and getting back to a semblance of normal.

The data below summarizes some of the ECE Department activities during the past year. However, numbers never tell the full picture of a department, and the following pages should highlight some recent student, alumni, and faculty success stories.

If you would like more information about any item in the newsletter or about our research and educational programs, please send me a note at [john.chandy@uconn.edu](mailto:john.chandy@uconn.edu). Also, check our website ([www.ee.uconn.edu](http://www.ee.uconn.edu)) for the latest news about the department.

**John Chandy**, *Professor and Head*



## 2020-2021 SUMMARY

**215**

PEER-REVIEWED PUBLICATIONS

**25**

TENURED/TENURE TRACK FACULTY

**376**

UNDERGRADUATE STUDENTS

**\$5.5M**

IN RESEARCH EXPENDITURES

**3**

RESEARCH PROFESSORS

**135**

GRADUATE STUDENTS

**15K**

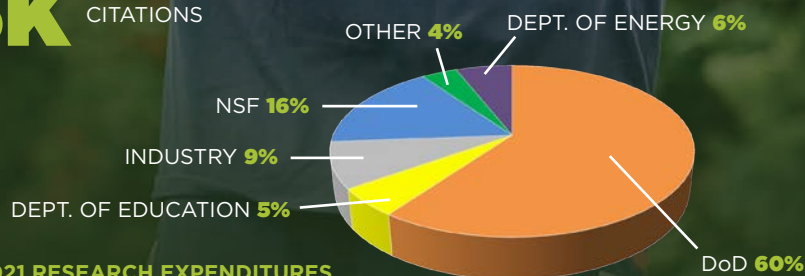
CITATIONS

**12**

Ph.D. DEGREES GRANTED

**72**

BSE DEGREES GRANTED



2020-2021 RESEARCH EXPENDITURES



# SENIOR DESIGN DEMONSTRATION DAY 2021

## 1<sup>st</sup> Place TEAM 2108

Wearable Fall Prevention Device (Presco)

Sponsored by Presco Engineering, this project focused on designing a new and modernized prototype of the Wearable Balance Belt, a balance assistance and training system for fitness and rehabilitation environments. The belt detects when a person is leaning too far in any direction and will trigger a vibration on that side, signaling the person to straighten up and stay within their limits of stability. Through designing a custom printed circuit board, a new 3D-printed mechanical design, and developing software for tilt detection, the team built a prototype that is less than half the weight of the original belt and has significantly improved signal strength for vibration.



Left to Right: Bryan Ziobron, Jamie Moschella, Marjol Mukallari, and Angelina Fagundes.

## 2<sup>nd</sup> Place TEAM 2127

Passive Acoustic Array  
Design for Environmental  
Monitoring (NUWC)



Left to Right: Aaron Spaulding, Paul Roach, and Elizabeth Chamiec-Case.

## 3<sup>rd</sup> Place TEAM 2113

Smart Box for Transportation  
of Critical Articles  
(Aquiline Drones)



Left to Right: Nicholas Law, Sadman Sakib, and Andrew White.

## GRADUATE STUDENT AWARDS

### ECE POSTER COMPETITION

**First Place: HIEP NGUYEN** - Investigation of 2D Nano-structured Winding Insulation for High Torque Density Medium-Voltage Motor (Advisor: Dr. Yang Cao)

**Second Place: YISHU BAI** - Performance Metrics-based Smart Modeling of Production Systems: Theory and Testbed (Advisor: Dr. Liang Zhang)

**Third Place: ZIJIAO TIAN** - Launch Point Estimation with a Single Fixed Passive Sensor Without Trajectory State Estimation (Advisor: Dr. Yaakov Bar-Shalom)

**JARED NYE** was awarded a GAANN (Graduate Assistantships in Areas of National Need) fellowship with funding from the U.S. Department of Education

**QIAN YANG** was awarded the Vijaya G. Raghavan Fellowship for 2021-2022

**ZACHARIAH SUTTON** was awarded the Professor Peter Willett Fellowship for 2021-2022

# UNDERGRAD STUDENT NEWS

## LAUREN BOULAY

*Lauren Boulay (B.S.E. '21) received the 2021 Outstanding Senior Women Academic Achievement Award from the UConn Women's Center.*



Lauren has been an advocate for women, racial equality, mental health, and the LGBTQ+ community. She had many roles on campus as an Officer for the Society of Women Engineers, member of the Engineering Ambassadors, and a Werth Institute Innovator. In these positions, she promoted entrepreneurship to the local community and acted as a student activist for her peers, as she specifically aided in the advancement of women pursuing careers in STEM. Lauren has been an ambitious creator when working with the Office of Naval Research at the Naval Air Warfare Center Aircraft Division and their optical engineering lab. There, she has constructed and tested unmanned underwater vehicles optimized with laser imaging, allowing the U.S. Navy to better scan subsurface objects in brackish water. She will study the field of robotics in graduate school and continue working in Engineering Research with the Naval Air Warfare Center Aircraft Division in Patuxent River, Maryland.

**See more Undergraduate Student News on page 8**

# ALUMNI NEWS

**STEPHEN GREINER** (B.S.'82, M.S.'87) received the Meritorious Senior Professional Rank Award after



recently retiring from the Naval Undersea Warfare Center (NUWC) Division Newport.

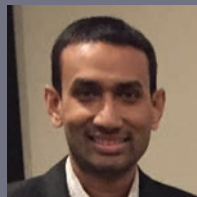
**HARISH RAVICHANDAR** (Ph.D.'18) has joined the Georgia Institute of Technology as a new Assistant Professor in the School of Interactive Computing. While at UConn his



research was supported by UTC-IASE grants, UTC-IASE graduate fellowship and summer predoctoral fellowships from the ECE department. While at

UConn his work was focused on human-robot interaction, specifically, on designing human action intent algorithms and imitation learning methods for robot control. After leaving UConn, he joined Georgia Tech where he expanded his research focus to coordination of heterogenous multi-agent systems in addition to human-robot interaction and robot learning.

**MD SHAHED ENAMUL QUADIR** (Ph.D.'20) has joined Monmouth College as a new Assistant Professor in the Department of Physics and Engineering.



After graduating from UConn, he joined the University of Florida as a postdoctoral associate continuing his research in hardware security.



**RIDVAN UMAZ** (Ph.D.'18) has been promoted to associate professor in Electrical & Electronics Engineering at Bitlis Eren University, Turkey. Ridvan

also has been named a coordinator of the Technology Transfer Office at Bitlis Eren University.

**DAVID TONN** (Ph.D.'07), an engineer in the Naval Undersea Warfare Center (NUWC) and Adjunct Faculty, was awarded the 2021 Dr. Delores M. Etter Top Scientists and Engineers Award. His idea for revolutionizing the Submarine Mast Antenna Controller led to the invention, which reduces the complexity of the antenna controller unit (ACU), saves approximately \$230,000 per installation and was used on 64 U.S. Navy submarines and saved the fleet more than \$15 million. David also received the 2018 Vice Adm. Harold G. Bowen Award for Patented Inventions for this invention.



**ANDREW SLATER** (B.S.'85), has received a UConn/Connecticut Innovations Third Bridge grant to support his research in haptic feedback technologies for firefighters.



Andy is now a UConn Biomedical Engineering Ph.D. student and also received funding and support from the UConn Fire Department, CTNext, the UConn BME Department, and Dell Technologies, where he also works full-time.

**Scan the QR code for more info!**

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UConn Engineering

masterofengineering.uconn.edu

## Electrical & Computer Engineering

### Master of Engineering Degree

UConn School of Engineering's Master of Engineering (MENG) in Electrical and Computer Engineering enables you to provide technical contributions in design, development, and manufacturing in their practice of electrical and systems engineering. In addition to professional development, which greatly enhances your career potential.

Electrical Engineering focuses on various industries from electric power and communications to create technologies connecting the world and helping to improve our lives. Computer Engineering emphasizes the analysis, design, implementation, optimization, and application of computing systems.

**MENG Core Courses (12 credits)**

ENGR 5201 Professional Communication and Information Management  
ENGR 5302 Engineering Project Planning and Management  
ENGR 5204 Advanced Engineering Mathematics  
ENGR 5305 MENG Capstone Project - Students are encouraged to work on a company-sponsored project

**Concentration and Elective Courses**

<https://masterofengineering.uconn.edu/electrical-and-computer-engineering-2/>  
electrical and computer engineering journal club

**UConn**  
SCHOOL OF ENGINEERING  
PROFESSIONAL EDUCATION



## ALUMNI

# Rags to Riches: Alumnus Uses Education to Lift Himself from Poverty

By Eli Freund, Editorial Communications Manager, UConn School of Engineering

Growing up in Hyderabad, India, in a family of modest means, **VIJAY RAGHAVAN** '96 knew he wanted to change his life for the better. So, he made a plan.

"I was an only child in a family of very modest means living paycheck to paycheck with absolutely no safety net whatsoever. It was obvious to me that education was



my only way out of the paralyzing poverty." So, Raghavan set out on a career path in engineering, knowing that was the path to a more stable life.

"These were the decades before the IT (Information Technology) boom when there were only two career paths that guaranteed employment: engineering or medicine. I was bad at biology and good at math which made it easy for me to choose the engineering path."

Raghavan, a member of the UConn Engineering Academy of Distinguished Engineers and Director of Engineering at MathWorks, a mathematical computing software company located in Massachusetts, initially started off getting his undergraduate degree in India, graduating from Osmania University in 1990.

From there, Raghavan turned his eye towards the United States, to continue his education in graduate school. But Raghavan encountered a problem—schools weren't willing to invest in his education financially, and he couldn't afford to pay for his graduate education on his own.

"UConn was the only school that offered me financial assistance. This was thanks to Prof. Krishna Pattipati and Prof. David Kleinman who offered a tuition waiver and graduate assistantship in their Cyber Lab. This was a really a big break for me as I could not have afforded to come to the U.S. without it. I stayed on until 1996 to finish my Ph.D. under Krishna, who supported me throughout my stint at UConn."

After graduating with his master's and Ph.D. from UConn Engineering, Raghavan started working for MathWorks in 1996, which produces some of the most recognizable engineering software in the world, like MATLAB and Simulink.

Raghavan has stayed his entire career at MathWorks because of the culture and the unique engineering challenges he gets to tackle on a daily basis.

"I was very fortunate to work on some very exciting projects and technologies that allowed me to grow technically as well as career-wise. At MathWorks we believe in growing engineering leadership from within. This culture gave me ample opportunities to grow from an individual technical contributor to where I am today as a Director of

Engineering at MathWorks. I now manage a number of different product areas in the fields of simulation, code generation, verification and validation."

Looking back on his career, Raghavan realizes that his younger self was right—education was his key to a prosperous and enriching future, and he's grateful he took that leap. As an alumnus, he has given back to the School of Engineering multiple times,

**“If you are a successful alumnus reading this, I urge you to look back to your UConn years and try to put a value on those years and see if you can repay a fraction of it. If you are a current student, make sure you remember these years and come back to support UConn when you are able.”**

and he urges other alumni to give back.

"Those six years [at UConn] turned out to be the most memorable and formative years of my life. The graduate school courses were amazing.

If you are a successful alumnus reading this, I urge you to look back to your UConn years and try to put a value on those years and see if you can repay a fraction of it. If you are a current student, make sure you remember these years and come back to support UConn when you are able."

# GRADUATE STUDENT NEWS AND AWARDS

**BRANDON D'AGOSTINO '20** (CompE/EE) has been awarded the National Science Foundation (NSF) Graduate Research Fellowship for 2021. This fellowship provides three years of financial support for graduate study leading to

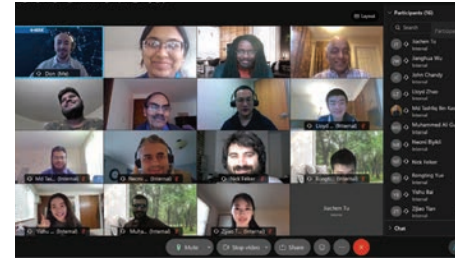


research-based graduate degrees in STEM. He is currently completing his M.S. degree and will be attending Stanford University in Spring 2022 for doctoral studies.

Brandon's foray into academic research began in summer 2019 via an NSF Research Experiences for Undergraduates (REU) fellowship in Dr. Omer Khan's Computer Architecture Group. Since his initial stint that summer, Brandon has remained engaged in research with Dr. Khan as a research assistant. Brandon contributed to IRONHIDE, a secure multicore architecture that efficiently mitigates microarchitecture state-based side-channel attacks in microprocessors, that was presented at the 2020 IEEE International

Symposium on High-Performance Computer Architecture, and co-authored OPTIMUS, a security-centric dynamic hardware partitioning scheduler for secure processors, that was published in 2020 at the IEEE Transactions on Computers. Brandon is also a tutor in UConn's chapter of IEEE Eta Kappa Nu (IEEE-HKN), the electrical engineering honor society.

The IEEE ECE Graduate Student Chapter was formed in January 2021 led by two graduate students **ARSHIAH MIRZA** and **ROMAN MAYS** with assistance from the IEEE-CT Young Professionals Chair, **DONALD McMENEMY** (B.S.'14, M.S.'20) and Dr. **JOHN CHANDY** as the advisor. The new organization has a goal to foster academic and peer relationships and will serve as a valuable social and professional development outlet for our grad students. As part of their activities, they have been arranging weekly seminars. They also organized a virtual poster presentation competition on March 28<sup>th</sup>, 2021, in collaboration with the young professionals group of IEEE-CT. Twelve



graduate students from various labs from our department came to present and discuss their research. From this, many students and inquiring minds were able to have conversations and discourse on various topics on the forefront of science and technology. This experience allowed for the sharing of ideas within the department and for preparation for the School of Engineering Poster Competition that was held on April 1<sup>st</sup>. Dr. Faquir Jain, Dr. Necmi Biyikli, and Mr. Nicholas Felker graciously judged and provided the feedback for this event.

## FACULTY NEWS

Dr. **YAAKOV BAR-SHALOM** virtually presented "*Target Tracking and Data*

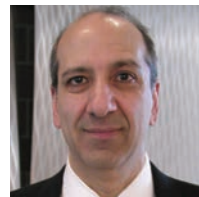


*Fusion*" to the recently reactivated Telecom Paris IEEE Student Branch, which was voted the number one lecture for the fields of study. There were 175

registered for the webinar and the outreach pushed the total to over 200 views.

Bar-Shalom was also an external advisor to the Singapore Defense Science Organization (DSO) team which won the prestigious 2021 DSO Big Idea (dBI) award with the team's Big Idea titled "EYE BELI3VE --- EO-Y-EO Baseline Extended - Localization Incorporating 3D Velocity Estimation." With Bar-Shalom's close collaboration, Dr. **YANG RONG**, **JACK HUANG** and **JESSICA GOH** developed a comprehensive tracking algorithm with full Maximum Likelihood Information Transfer (fMLIT) that enabled the team to win the highest innovation award.

Dr. **BAHRAM JAVIDI** was selected by the Board of Directors of the Optical Society (OSA) as the 2021 recipient of the Emmett N. Leith Medal. He was recognized for exceptional innovation and transformative technological impact on



the field of information optics, including pioneering contributions to digital holography for life sciences, information security, optical sensing, and processing of photon starved scenes.

In August, Javidi was also named by the International Society of Optics and Photonics (SPIE) as an SPIE Luminary.

Finally, Javidi was named a finalist for the Berthold Leibinger Innovation Award for his rapid disease identification technology using compact, low-cost optical holographic instruments, including COVID-19 detection.

**ECE FACULTY AND GRAD STUDENTS** were granted 12 patents in the last year.



Dr. **OMER KHAN** was recognized by the ECE department with the 2020-2021 ECE Outstanding Research Achievement Award and Dr.



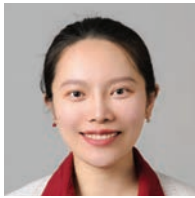
**LIANG ZHANG** was recognized with the 2020-2021 ECE Outstanding Teaching Achievement Award.

A ranking of the top 2 percent of scientists in the world in a study published in *PLOS Biology Journal* included eleven professors and emeriti from the UConn ECE Department. The study identifies the top scholars in their fields by considering their career long citation impact through 2019. The ECE faculty who were listed are Drs. **YAAKOV BAR-SHALOM**, **ALI BAZZI**, **BAHRAM JAVIDI**, **DAVID KLEINMAN**, **PETER LUH**, **KRISHNA PATTIPATI**, **GEOFF TAYLOR**, **MARTEN VAN DIJK**, **PETER WILLETT**, **SHENGLI ZHOU**, and new faculty **JUNBO ZHAO**.



# NEW ELECTRICAL & COMPUTER ENGINEERING FACULTY

**ZONGJIE (LISA) WANG** joined the department this fall. She completed her Ph.D. in 2018 through a joint Ph.D.



program at the Harbin Institute of Technology and Cornell University. She has spent the last three years as a postdoc and research associate in Systems Engineering

at Cornell University. Zongjie's research interests are in power systems, optimization techniques, energy efficiency and renewable energies, and data analytics, and she will be affiliated with the Eversource Energy Center.

**JUNBO ZHAO** will be joining the department January 1, 2022. He completed his Ph.D. in 2018 at Virginia Tech and then served as a research assistant

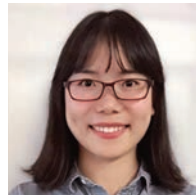


professor for a year at Virginia Tech before joining Mississippi State University as an assistant professor in August 2019. In his short career, Junbo has

developed an impressive record with over 60 IEEE Transactions papers and a number

of best paper awards and individual awards recognizing his research. Junbo's research interests are in cyber-physical power system modeling, estimation, security, dynamics and stability, uncertainty quantification, renewable energy integration and control, robust statistical signal processing and machine learning, and he will be affiliated with the Eversource Energy Center.

**SHAN (SUSAN) ZUO** will also join the department January 1, 2022. She completed her Ph.D. last year at the University of Texas Arlington after previously completing a Ph.D. at the University of Electronic



Science and Technology of China in 2018. She has spent the last year as a professor at Nanjing University of Posts and Telecommunications in China. Susan's research

interests are in Autonomous Systems, Cyber-Physical Systems, Control Theory, Reinforcement Learning, Multi-Agent Systems, and Microgrids. As we start up our new robotics undergraduate program, we are excited that Susan will be an integral part of that effort.

## UNDERGRAD STUDENT NEWS

**EVAN FAULKNER** (B.S.E.'20) is the first author of an IEEE journal paper with a high impact factor. E. Faulkner, Z. Yun, S. Zhou, Z. Shi, S. Han and G. B. Giannakis, "An Advanced GNU Radio Receiver of IEEE 802.15.4 OQPSK Physical Layer," in *IEEE Internet of Things Journal*, 2021. The work started out as undergraduate research with Prof. **SHENGLI ZHOU** and was finished in collaboration with graduate student Zelin Yun.

Undergraduate students, **QUINCY HEINRICH** and **ZACHARY STONE** were awarded a UConn IDEA grant to support their project named "Variable Pole Induction Motor and Controller". They are working to develop a method of magnetic pole variation which would allow them to change the torque-speed characteristic of an induction motor during operation. The behavior exhibited by a motor with an adaptable number of poles would be much like a motor attached to a transmission, allowing for a variety of effective 'gear ratios' internal to the motor. In giving the motor itself this ability, they can eliminate the need for mechanical gears in applications which demand a large range of motor speeds. This would reduce mechanical complexity in such an application while increasing reliability. Their goal is to take the traditional combination of motor and transmission and combine them both into one unit with no more mechanical parts than a standard induction motor.

## NEW GRANTS

The U.S. Department of Energy (DOE) announced on July 26, 2021 that UConn would be one of its new Industrial Assessment Centers, assisting small- and medium- sized manufacturers in reducing their carbon emissions and lowering energy costs, while training the next generation of energy-efficiency workers. The award is a 5-year grant with over \$3.3 million total budget, in which \$1.75 million comes from DOE and \$600k cost-share come from United Illuminating and Eversource.

U.S. Senator **CHRIS MURPHY** (CT) sent his congratulations immediately following the announcement, saying that "This is great news for Connecticut's environment and economy. UConn's work as one of the U.S. Department of Energy's Industrial Assessment Centers will help local manufacturers cut emissions and energy costs while training the future generation of engineers, and I'm glad to see Connecticut as part of this major investment in clean energy."

The UConn Industrial Assessment Center will be headed by ECE Associate Professor, Dr. **LIANG ZHANG**, with ECE Associate Professor in Residence Dr. **AMY THOMPSON** serving as Assistant Director along with team members Drs. **UGUR PASAOGULLARI** (Mechanical Engineering), **BAIKUN LI** (Environmental Engineering) and **HAITHAM GHALWASH** (Computer Science). A satellite center at University of New Haven will collaborate with the main center at UConn in all project activities.

Dr. **MONTY ESCABI** received a five year award from the National Institutes of Health totaling \$1.7 M in collaboration with **IAN STEVENSON** and **HEATHER READ** of Psychological Sciences. The project is titled "The Role of Statistical Structure for Natural Sound Recognition in Noise".



## RESEARCH

# Power and Energy Faculty Spark New Innovation in Several Fields

*Written by Ryley McGinnis, Engineering Communications*



The Department of Electrical and Computer Engineering has powerhouse research and teaching faculty. Still, a group of faculty members focused on power and energy research know that their potential can only be multiplied by coming together.

Professors **ALI BAZZI, SUNG YEUL PARK, ZONGJIE WANG, YANG CAO, JUNBO ZHAO,** and **HA NGUYEN** comprise the six core faculty members, with two affiliate members, **KRISHNA PATTIPATI** and **SHAN ZUO**. Each member focuses on different research areas, but together, they represent the expanse of research in the power and energy space.

“In the past 14 years, the department has added faculty that show the breadth and depth of power and energy research,” said Bazzi, the group’s leader.

For Bazzi, the group is an essential step to position the department and UConn as a leader in the field. “Our expertise span the field, from power systems to micro-grids, to power components,” he said. With their combined knowledge, they hope to expand the knowledge they can teach their students and access to more significant and impactful grants.

“The power and energy group focuses on new opportunities and conducts diverse research activities and education from various perspectives, including power systems and power electronics,” said Wang, assistant professor in the department.

Wang hopes the group and collaboration of the faculty members’ research interests will lead to further innovations to improve power grids’ efficiency and stability.

“Security, especially, is an emerging need in power and energy,” said Bazzi. “Successfully securing power grids requires people who understand the power system, power components, grid protection, and more. Collectively, our group has the knowledge to tackle these emerging issues.”

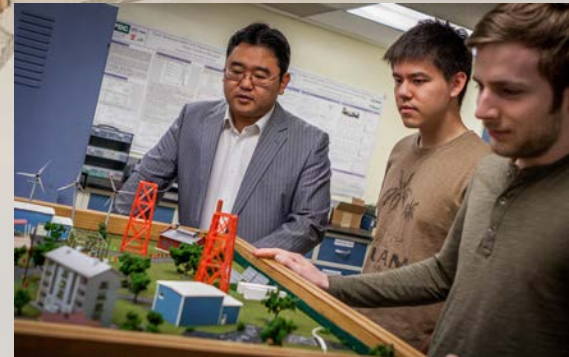
Another main area of interest for the group is renewable energy. Wang, Nguyen, Zhao, and Park focus on renewable energy in their research, but with collaboration among the rest of the team, they see even more possibilities for expanding renewable energy.

Several of the faculty members, including Bazzi, Cao, and Nguyen, are also team members at the Eversource Energy Center, a dynamic research partnership between Eversource and UConn faculty to tackle topics from storm preparedness, electric grid reinforcement, and renewable energy.

The group plans to leverage each of their existing partnerships to create curriculum and research innovations, said Bazzi. “We are positioning ourselves to offer cutting-edge coursework and research for undergraduate and graduate students.”

## Core Faculty Profiles:

Ali Bazzi is an associate professor and the leader of the Power and Energy Group. He received his Ph.D. from the University of Illinois at Urbana-Champaign, and his research interests are design, control, and optimization of power electronic systems. Bazzi is also the leader of the Power Electronics and Drives Advanced Research Laboratory (PEARL) as part of the Center for Clean Energy Engineering at UConn.



Sung-Yeul Park is an associate professor and received his Ph.D. from Virginia Tech. His main research interests are in power electronics, energy conversion, renewable energy, and smart grids.

Zongjie Wang is an assistant professor and received her Ph.D. from Harbin Institute of Technology. Her research interests are in modern power systems, including transmission and distribution systems, renewable energy, optimization, and distributed energy resources.

Yang Cao is a professor and UConn alumnus. He received his Ph.D. in materials science from UConn in 2002. His research focuses on grid protection, flexible electronics, and high-voltage engineering. He is also a team member at the Eversource Energy Center.

Ha Nguyen is an assistant research professor and received her Ph.D. from the Technical University of Denmark. She previously worked with the Center for Energy Research at the University of California. Her research interests are power system modeling, operation and control, simulations, frequency stability and control, and renewable energy integration.

Junbo Zhao is an assistant professor and earned his Ph.D. from Virginia Tech. His research interests include cyber-physical power system modeling, monitoring, uncertainty quantification, dynamics, stability control, and security with renewable energy.

# UNDERGRAD STUDENT PROFILE

## KEVIN LINDSTROM

Kevin Lindstrom is a senior Electrical Engineering and Engineering Physics double major. He is currently the President of HKN and the Photo/Video Editor at The Daily Campus. Kevin's interests include optics, firmware development, and communication networks.

The past two summers, Kevin was an intern at Veeder-Root in Simsbury, CT designing circuits to implement RS-485 and LoRaWAN communication standards into the existing product line of sump sensors. He gained experience using AWS IoT Core and configured transmitters, packet forwarders, and gateways to make a useful network topology.

Previously, Kevin worked for one and a half years as a software development intern in Cigna's Technology Early Career Development Program where he investigated using OCR and NLP to extract information

from contracts and utilized GitLab CI/CD to create a DevOps pipeline.

Kevin is currently taking graduate classes at the University of Connecticut with the objective of pursuing a masters after graduating. He is currently working with Dr. George Gibson and Dr. Carlos Trallero in the physics department to implement equipment into their experimental setups. He will hopefully join professor Trallero's lab as a graduate student next Fall.

In his free time, Kevin loves exploring the outdoors through backpacking, climbing, and mountain biking. He also loves photography because it allows him to apply his technical knowledge creatively to capture unique moments.



# FACULTY RETIREMENTS

*On January 1, 2021, two faculty members, Rajeev Bansal and Peter Luh, retired from the Department of Electrical and Computer Engineering. Both made outstanding contributions to the department and now serve as emeritus faculty members.*

**RAJEEV BANSAL** has seen many changes in the Department of Electrical and Computer Engineering at UConn in his nearly 40-year tenure, ones that he's proud to have been a part of.

In 1981, Bansal graduated with his Ph.D. in applied physics from Harvard University.



Immediately after that, he joined the department what was then called the Department of Electrical Engineering and Computer Science. Upon his arrival,

he jumped right into research, teaching, and service to the department.

"When I came to UConn, I looked for ways in which I could collaborate with different laboratories and industry partners," said Bansal. So he started working with the Naval Research Laboratory in New London, Connecticut, and the Institute of Materials Science at UConn.

Bansal's research interests lie in the links between physics and electrical engineering, specifically electromagnetics—think microwaves, radio technologies, radar, and more.

In addition to striking new research collaborations, Bansal served in numerous leadership positions in the department. From 1997 to 1999, he served as associate department head, and again from 2006 to 2009. From 2009 to 2018, he served as department head.

"I'm very proud that the department grew in size while I was department head. The greatest part was that we had a very harmonious department," said Bansal.

Additionally, in his time as department head, UConn's Department of Biomedical Engineering was founded. "In 2012, I served as the first interim department head for biomedical engineering while also holding the department head position for ECE," said Bansal.

Bansal is excited to see what new changes come to UConn and the ECE department. "Technology and engineering change rapidly. What's exciting is seeing how the department responds to it," said Bansal.

**PETER LUH** joined the Department of Electrical and Computer Engineering in 1980 after graduating from Harvard with his Ph.D. in applied mathematics.

Since he arrived at UConn, he has seen a lot of changes centering around the initiatives inside and outside of the department he was a part of.

For research, he has focused on optimization systems like power systems, smart grids, and intelligent manufacturing, and he has seen this research area at UConn expand as the faculty and student body have grown. "Colleagues at UConn have been



very collaborative, especially in the systems group. We collaborate across the department, the School of Engineering, and the University," said Luh.

Additionally, Luh has received continuous funding from the National Science Foundation for the past 40 years for various research projects in this area.

Luh also ensured he gave back to the UConn community. In the mid-1980s, Luh and other faculty members created the Asian American Cultural Center at UConn and the Asian and Asian American Studies Institute.

In the department, Luh served as department head from 2006 to 2009. At UConn, he served as center director for the Booth Research Center for Advanced Technology, which has now merged with other centers at UConn.

In addition to his contributions within UConn, Luh has taken on numerous leadership positions in the Institute of Electrical and Electronics Engineers (IEEE). He has served on numerous societies within IEEE, including control systems, robotics and automation, and the power and energy societies. He was also chair of the Technical Activities Board Periodicals Committee, overseeing 190 journals and magazines.

Luh is proud of his work with IEEE and in the ECE department, and he looks forward to continuing to contribute to both as an emeritus faculty member over the next few years.



## EDUCATION

# ECE Department Adds New Robotics Major

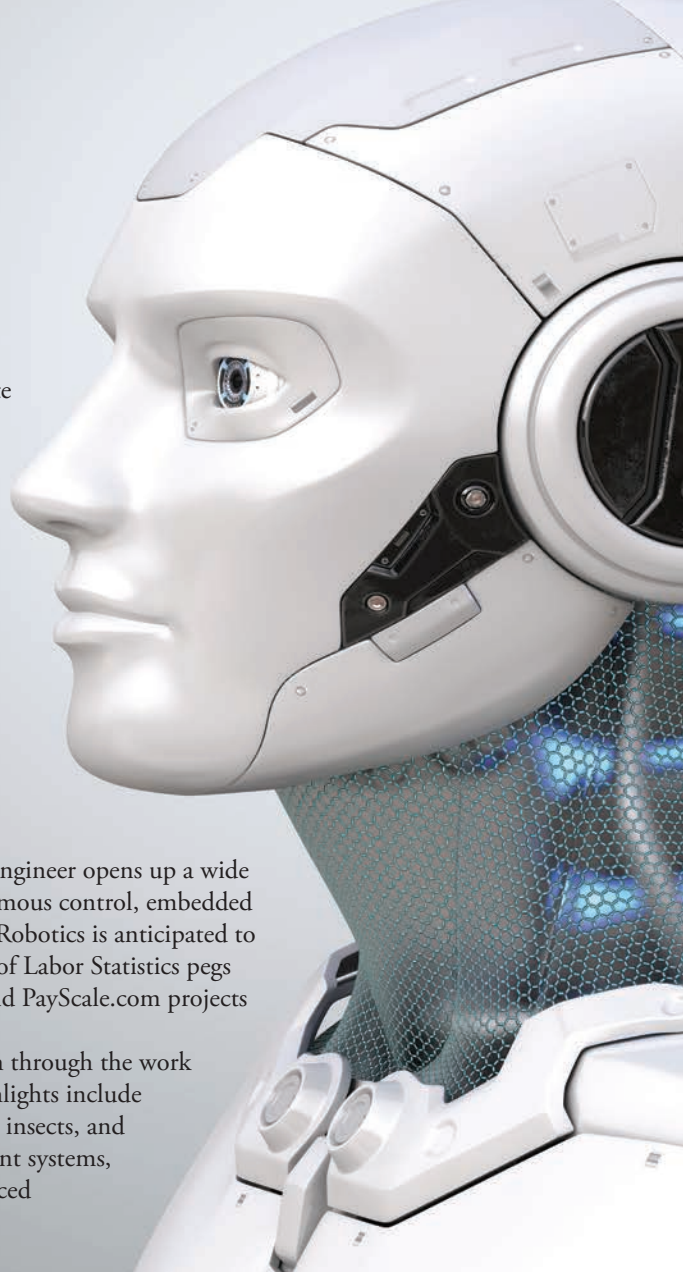
*By Eli Freund, Editorial Communications Manager, UConn School of Engineering*

The University of Connecticut Board of Trustees has approved a new undergraduate major in Robotics Engineering open to prospective and existing students starting in Fall 2022. UConn will be one of only two U.S. research-active universities to offer a major in Robotics Engineering. The major is focused on the design, construction, and operation of robots. The ECE department has taken the lead in developing the curriculum and organization for the new major.

While popular fiction brings to mind talking and walking machines, a broader definition of a robot is a machine that is capable of autonomously carrying out complex actions. Robotics is a growing field that has applications in a number of commercial areas including healthcare, logistics, manufacturing, maintenance, surveillance, amongst others.

The robotics engineering major will have an interdisciplinary curriculum that integrates the disciplines of electrical engineering, computer engineering, mechanical engineering, and computer science. Students will get hands-on experiences in building small-scale robots and learning techniques to control and automate these robots in a variety of settings. The skill set developed as a robotics engineer opens up a wide variety of career opportunities in various fields including electric machines, autonomous control, embedded systems, and artificial intelligence which are all relevant in a number of industries. Robotics is anticipated to see significant growth in employment over the next decade. Data from the Bureau of Labor Statistics pegs robotics engineering as seeing a nine percent growth in jobs from 2016 to 2026, and PayScale.com projects an average salary for robotics engineers of about \$80,000 a year.

The ECE Department has established itself as a leader in robotics research through the work of faculty **ASHWIN DANI**, **ABHISHEK DUTTA**, and **SHALABH GUPTA**. Highlights include research in autonomous drones, path planning, human robot collaboration, cyborg insects, and others. The department has recently hired Dr. **SHAN ZUO**, an expert in multi-agent systems, to complement our robotics faculty. UConn is also an active member of the Advanced Robotics in Manufacturing Institute.



## ACCELERATE UCONN

UConn's NSF-funded "Accelerate UConn" program is a summer short program on technology commercialization. Funded by the NSF I-Corps grant, the purpose of the UConn Accelerate UConn (AU) program is to nurture and support UConn-based entrepreneurial teams in the process of identifying the market opportunity for, and steps necessary to, transition their ideas, devices, processes, or other intellectual activities into the marketplace.

A team from the ECE Department, consisting of Ph.D. students, **YISHU BAI**



(Entrepreneurial Lead) and **TIANYU ZHU** (Technology Lead) and their academic advisor,

Dr. **LIANG ZHANG**, was selected to participate in this program in Summer 2021 based on their technology called smart monitoring and data analytics solution for manufacturing lines. The idea of this technology was hatched in Dr. Zhang's Smart Production Systems Lab from his years of research in smart manufacturing. Its preliminary development has led to two departmental winning posters in the UConn SOE/SAGE Annual Graduate Student Poster Competition in 2020 and 2021.

During this intensive three-week program, the group acted as a start-up and developed their Business Model Canvas based on the guidance from the

program instructors. They also conducted 12 interviews with potential customers from local, national, and international businesses to validate their technology commercialization idea. At the conclusion of the program, the group received a \$1,000 grant to continue the momentum and further their effort in refining their technology and business idea. In addition to additional customer discovery and interviews, Yishu and Tianyu will also utilize the grant to develop a prototype of the technology and explore opportunities to test it in practical environments in the near future.

[accelerate.uconn.edu](https://accelerate.uconn.edu)

## PANDEMIC

# Researchers Develop Cheap, Accurate Device to Diagnose COVID-19

By Kim Krieger and Anna Zarra Aldrich



Lab tests for COVID-19 require pricey equipment, and field tests aren't globally available nor work in real-time, making it hard for health care workers in remote areas of the globe to diagnose the disease. **BAHRAM JAVIDI** and biomedical engineering graduate student **TIMOTHY O'CONNOR** had an idea for a better, easier way to test for COVID. Javidi's team had previously developed testing devices for malaria and sickle cell disease, which are common in under-resourced tropical and subtropical areas. The device picks up on abnormalities in the blood caused by infection.

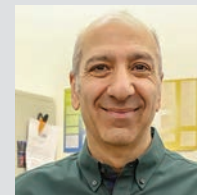
They knew red blood cells are affected during a bout of COVID-19. Red blood cells carry oxygen from your lungs through

how the light changed as it propagated through them: red blood cells with COVID might leave a measurable signature in the light. Laser light had been used to diagnose other diseases involving red blood cells before.

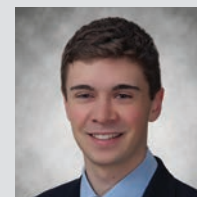
To understand why this would work, remember that lasers are a special form of light. Unlike the sun's light, which shines in all colors, a laser shines in a single, very specific color. And all the light from a laser can be made to travel in the same direction and at the same speed. But when this uniform beam of laser light has to pass through something such as a red blood cell, it changes. The light scatters in different directions, changes speed, or bends a little, producing small changes in the affected light waves. And a sick red blood cell that's a little changed biochemically, or misshapen,

between healthy and COVID-positive red blood cells. UConn Health School of Medicine Dean Bruce Liang and physiologist Jian-Bing Shen collaborated by supplying red blood cells donated by UConn Health COVID patients and helped with the completion of the project.

The machine learning process worked, and Javidi and O'Connor were able to reliably train a computer to distinguish



Bahram Javidi



Timothy O'Connor

between healthy and diseased cells. Armed with that information, they could hook up an inexpensive laser and a portable 3D holographic microscope to a laptop to create their COVID diagnostic device. The device can actually be constructed with a 3D printer. The 3D printing blueprints can be sent anywhere and the components for

the device are accessible in every country. The device takes very little training to operate, making it ideal for under-resourced areas in the U.S. and abroad, especially during a health crisis on the scale of the COVID-19 pandemic. Anyone who can take a finger prick's worth of blood and smear it on a glass microscope slide can be trained to use the device to diagnose COVID-19.

**“COVID made the U.S. an under-resourced healthcare system because it just overwhelmed the healthcare system.”**

your bloodstream to all parts of your body, and many of the symptoms of COVID-19, including low oxygen levels and blood clots, involve red blood cells. They hypothesized that a virus like SARS-CoV-2 can be detected by the bio-sensing instrument they developed – and they were right.

The device works by shining laser light on a sample of red blood cells and seeing

could change the light beam's characteristics in a different way than a healthy blood cell would.

Such changes can be subtle and hard to detect with the naked eye. So Javidi and O'Connor used a machine learning technique to have a computer detect how the variations in the laser light differed

*Continued on page 13*



*Researchers Develop continued*

The team admits there is one weakness in their testing: so far, all the red blood cell samples they've used were from COVID-19 patients sick enough to be hospitalized. They would like to test the device on red blood cells from people who have mild or asymptomatic cases, and are looking for health care providers and researchers in Connecticut, Massachusetts, elsewhere in the country, and around the world to work with them.

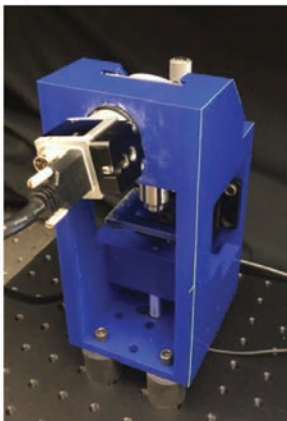
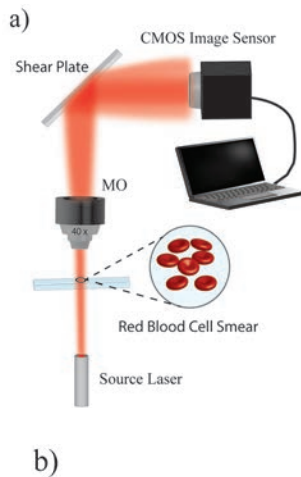
Javidi has been named a finalist for the Berthold Leibinger Innovation Award for this work, particularly for applying knowledge of optics and digital holography, and pattern recognition to biomedical issues with real-life applications for under-resourced healthcare systems.

"It's always an honor to see that your peers value your work and value your contributions," Javidi says.

"COVID made the U.S. an under-resourced healthcare system because it just overwhelmed the healthcare system," Javidi says. "That makes this device very attractive for this kind of pandemic where resources become very scarce." He is now interested in working with colleagues in India and other countries where the pandemic is still raging.

Their work was published in the 5 May issue of *Optics Letters* and more recently highlighted in *IEEE Spectrum*.

This work was supported by the Office of Vice President for Research's COVID-19 Research Seed Funding Program.



# 2021 COMMENCEMENT Congratulations to All of Our Graduates!



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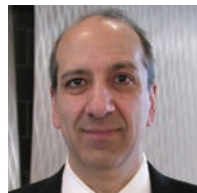
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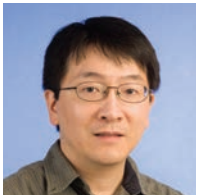
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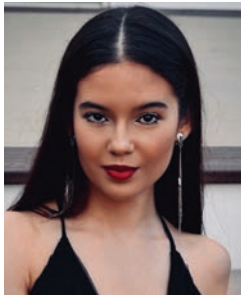
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## UNDERGRAD STUDENT PROFILE

### SOFIA ABDARI

Sofia Abdari is an Electrical Engineering senior, part of the May 2022 graduating class. Does she look familiar? She's usually in the library or ITE, studying until the sun goes down.



Recently she has taken an interest in semiconductor materials and the design/fabrication of (opto)electronics and plans to pursue a master's degree in the field

after completing her bachelor's. The field of semiconductors is rapidly advancing, and Sofia wants to be part of ground-breaking discoveries. Within the domain of semiconductor devices, the design/fabrication of electronics on a nanoscale offers her the chance to apply her materials research to the implementation of physical devices.

As a new member of Dr. Necmi Biyikli's research group, Sofia is exploring her interests first-hand. Industry-grade atomic layer deposition (ALD) technology is located on the 5<sup>th</sup> floor of the Engineering Science Building. These research facilities satiate her increasing appetite for

knowledge. There, she is expanding her grasp on device fabrication, specifically exploring highly-selective atomic layer processes which eliminate the use of lithography by enabling the self-align process.

In addition to her role in Dr. Biyikli's group, Sofia is currently researching ultra-wide bandgap materials for high power applications with Dr. Anwar and fellow group members. Her short term research goals include improving material simulations to identify optimal materials for semiconductor applications.

As you can see, she is quite obsessed with all things related to semiconductors and is an enthusiastic member of the research effort. With still so much to learn, Sofia's interests continue to expand daily.

Sofia was born and raised in New York City, attending a STEM-based high school briefly before moving to New Jersey. She applied to UConn undecided, hoping to branch out and explore non-STEM majors. However, no matter how hard she tried to avoid her fate, she always found her way back to engineering. Is it worth the stress? Sofia seems to think so, as the satisfaction makes it all worth it in the end.

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