THE INTEGRATOR

2020

Booga Gilbertson

A visionary alum and leader at Puget Sound Energy is looking ahead to give back to UW ECE students

W ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY *of* WASHINGTON

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ELECTRICAL & COMPUTER ENGINEERING

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MESSAGE FROM THE CHAIR

DEAR MEMBERS OF THE UW ECE COMMUNITY,

It is my pleasure to introduce this year's issue of The Integrator, our department's flagship, alumni-focused publication. I hope that you are doing well and prospering despite these challenging times. This has been an extraordinary year for UW ECE by any measure, both in terms of challenges faced by the department and by the notable accomplishments of our faculty and students. Along with the rest of the University and the world-at-large, our department has been dealing with COVID-19 and the impact it has had on our students, faculty and staff.

First of all, we have been teaching remotely since the end of the winter quarter. Last spring and this fall, all of our courses shifted to be solely online, except for a few independent research projects. This has been a huge undertaking by our faculty, staff and students. We have pivoted to teach lab courses with kits that we mail out to students all over the world; we have learned to administer exams remotely; and most importantly, we have found ways to maintain a sense of community even when we are all scattered across the world through multiple time zones. It has been challenging, but it is also quite an accomplishment. Enrollment and teaching ratings are superb, and both faculty and students have found innovative ways to move traditionally hands-on projects to a virtual learning environment.

Our ENGineering INnovation and Entrepreneurship (ENGINE) capstone program, which is also taught remotely now, has nearly 140 students participating this year, illustrating the success and value of this program. In the past few years, ENGINE students have created incredible projects with serious real-world impact. For example, a team of undergraduate students from our last ENGINE cohort, with guidance from our industry partner Alaska Airlines, developed a reliable and easy-to-use web portal, which acts as a manual to help technicians load computer software onto airplanes more efficiently. The portal proved to be so accurate, dependable and efficient that the airline is implementing the tool across their entire fleet this year.

Research is going extremely well. All of our experimental labs are currently able to work on campus. We have safety plans, social distancing and testing in place. Last year, we brought in more than $21M in research funding, and despite all the challenges this year, we will likely top that amount thanks to some particularly large, multidisciplinary grants in data science, quantum computing, and sustainable energy. An exciting aspect of our research this year involves how our faculty and students are addressing the COVID-19 pandemic. We have teams working on protein therapeutics, testing, ventilators, disease tracking, contact tracing and disease monitoring. I think what this really says about our department is how adaptable we are. And it illustrates how adaptable and fundamental UW ECE technology is to our new, everyday reality.

On the topic of quantum computing, I am excited we are at the forefront of a huge push in this direction right now at the UW. We have two funded, open faculty positions in quantum computing, a new training grant for students, and our faculty are co-leading a university-wide strategy that brings together UW ECE, the UW Department of Physics, UW Materials Science & Engineering, Microsoft, the Pacific Northwest National Laboratory (PNNL) and other partners. This year, we also welcomed Scott Aaronson, professor of computer science and director of the Quantum Information Center at the University of Texas at Austin to be the keynote speaker at our premier annual event, the Dean W. Lytle Endowed Lecture Series. Aaronson gave a fascinating presentation on quantum computational supremacy and its applications. His lecture was accompanied by a panel discussion earlier in the day that featured UW ECE associate professor Kai-Mei Fu, David Bacon from IonQ, Krysta Svore from Microsoft, and Brent VanDevender from PNNL discussing the "full stack" of Quantum Computing.

I am excited to share the establishment of the new "You Rock" Endowed Scholarship in Electrical & Computer Engineering by our alumna, Booga Gilbertson, who is on the cover of this issue of The Integrator, and who gave an inspiring address at our graduation ceremony last spring. The purpose of this endowed fund is to provide financial assistance to UW ECE undergraduate students, particularly those from rural communities who are the first in their family to attend college and those who are underserved or underrepresented in STEM and computer science.

It's clear that UW ECE has incredible research, fantastic students and a vibrant, supportive community all poised to make great advances together. Simultaneously, UW ECE, the University and indeed the world are all facing great uncertainty with current events. Our plan going forward is to continue to keep people safe and healthy, ensure stability for our department in the short term, while simultaneously planning for future growth and excellence.

It is my honor to serve as chair of this great department. I wish you and your loved ones all the best.
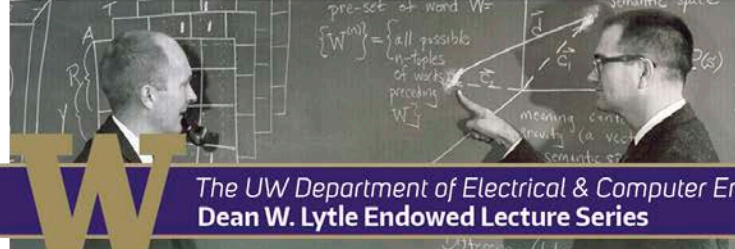
ERIC KLAVINS
PROFESSOR AND CHAIR,
UW DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

UW ECE professor and Chair Eric Klavins
Photo: Dennis Wise / University of Washington

/// UW ECE WELCOMES NEW DEPARTMENT CHAIR, ERIC KLAVINS

On April 1, 2020, professor Eric Klavins became chair of the University of Washington Department of Electrical & Computer Engineering (UW ECE). Klavins has been with UW ECE since 2003 and holds adjunct appointments in the Paul G. Allen School of Computer Science & Engineering and the Department of Bioengineering. As the director of the Center for Synthetic Biology and also the Biofabrication Center, Klavins fosters meaningful partnerships across campus and with industry.

He is a dedicated educator, receiving the Faculty Innovator Award in Teaching and Learning from the UW College of Engineering for his work in course development and undergraduate research. As a scientific adviser to two UW-based startups, he has helped build a culture of entrepreneurship in research and education. Klavins is dedicated to the mission and excellence of UW ECE, and he has a vision for the future of electrical and computer engineering firmly rooted in societal impact.

In research, Klavins develops synthetic biological systems. When he first joined the UW, he focused on stochastic processes, robotics and self-assembly, before pivoting to biology and genetic engineering. Today, his work focuses on genetic circuits, protein engineering, mathematical modeling and laboratory automation. He received his Ph.D. from the University of Michigan, and he is the recipient of many professional honors, including an NSF CAREER Award, an Allen Distinguished Investigator Award, an Innovation Award from the UW, an Amazon Catalyst Fellowship and a CoMotion Innovation Fund Award.

Klavins succeeds professor Radha Poovendran, who was department chair from 2014 to 2019, and professor Bruce Darling, who was interim chair from January through March 2020.

> "UW ECE has incredible research, fantastic students, and a vibrant community all poised to make great advances."
>
> –Eric Klavins

The UW Department of Electrical & Computer Engineering
Dean W. Lytle Endowed Lecture Series

The Dean W. Lytle Endowed Lecture Series is the UW Department of Electrical & Computer Engineering's premier annual event, featuring internationally-renowned researchers in the fields of communications, networks, and signal processing. The series was established in 2006, the Centennial Year of UW EE, through fundraising efforts led by Louis Scharf, in collaboration with Marilyn Lytle and the Lytle family, Dean's graduate students, his colleagues at Honeywell's Marine Systems Center and the UW ECE community.

THE 13TH ANNUAL LYTLE LECTURE

Thursday, November 19, 2020

The 2020 Lytle Endowed Lecture featured guest speaker Scott Aaronson, the David J. Bruton Centennial Professor of Computer Science at the University of Texas at Austin (UT Austin). His lecture focused on "Quantum Computational Supremacy and Its Applications."

Aaronson, who is also the director of the Quantum Information Center at UT Austin, conducts research in theoretical computer science that has primarily focused on the capabilities and limits of quantum computers. His first book, *Quantum Computing Since Democritus*, was published in 2013. Aaronson received the National Science Foundation's Alan T. Waterman Award, the United States PECASE Award and the Tomassoni-Chisesi Prize in Physics. Previous to UT Austin, Aaronson spent nine years as a professor in electrical engineering and computer science at MIT.

The Lytle Lecture was preceded by a panel discussion on the state of quantum computing research that included industry experts from IonQ, Microsoft, Pacific Northwest National Laboratories (PNNL) and UW ECE and physics associate professor Kai-Mei Fu, who is also co-chair of UW's interdisciplinary QuantumX Initiative.
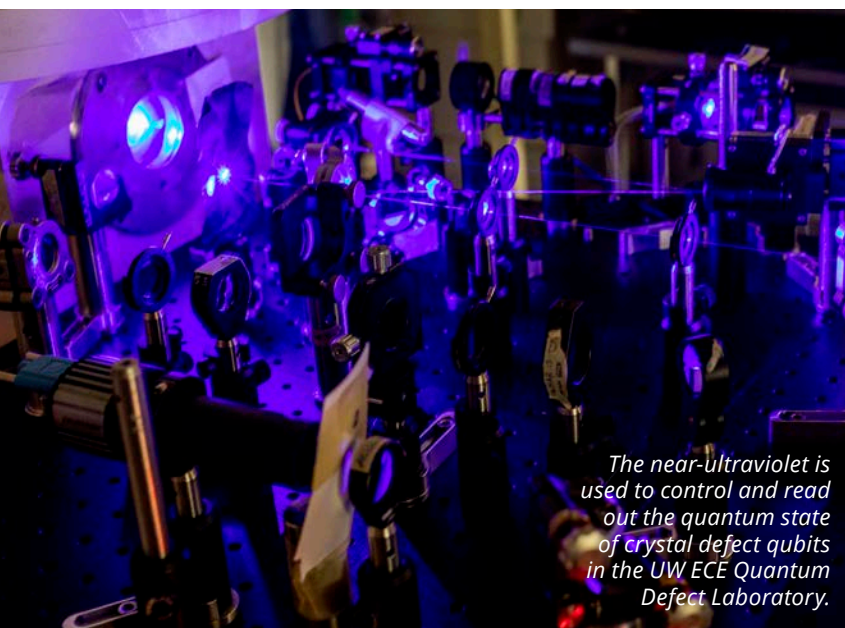

Professor Scott Aaronson, 2020 Lytle Lecture speaker

The near-ultraviolet is used to control and read out the quantum state of crystal defect qubits in the UW ECE Quantum Defect Laboratory.

Photo: Dennis Wise / University of Washington

This year's Lytle Lecture Series theme on quantum computing aligns with UW ECE's ongoing efforts to position the University of Washington and the Pacific Northwest as a leader in the nascent field of quantum-enabled technologies over the next few years.

In addition to its goal of housing a five-qubit quantum computer in the near future, the UW ECE department also plans to hire two additional full-time faculty members in the fall of 2021 with expertise in Quantum Information Science & Technology (QIST).

"Our vision is for UW to have expertise across the full quantum stack," said Fu. "Our future colleagues in UW ECE, ME, and CSE will help UW address the key QIST engineering challenges of performance and scalability. We want to help develop a Quantum Silicon Valley in the Pacific Northwest, and we want UW to be the #1 place in the world for students to come and build their skills in QIST."

For more information, please visit:
www.ece.uw.edu/news-events/lytle-lecture-series/

ALUMNI VIRTUAL TOWN HALL

THIS SEPTEMBER, A NUMBER OF NATIONAL AND INTERNATIONAL UW ECE ALUMNI PARTICIPATED IN OUR DEPARTMENT'S INAUGURAL ALUMNI VIRTUAL TOWN HALL EVENT.
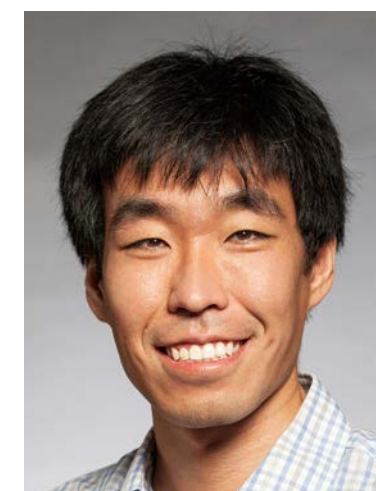

Amy Orsborn

Clare Boothe Luce
Assistant Professor

NEURAL INTERFACES

Kai-Mei Fu

Associate Professor

QUANTUM INFORMATION SCIENCE & TECHNOLOGY

Baosen Zhang

Keith and Nancy Rattie Endowed
Career Development Professor

SUSTAINABLE ENERGY SYSTEMS

On September 17, UW ECE hosted its very first virtual alumni town hall event. Alumni from across the department's five-decade history and from across the globe (including one alum who tuned in all the way from Finland in the middle of the night!) joined us to hear about the department's latest updates and exciting faculty research in the areas of Neural Interfaces, Quantum Information Science and Technology (QIST), and Sustainable Energy Systems.

The event was moderated by UW ECE professor and Chair Eric Klavins, and featured presentations by faculty guests Amy Orsborn, Kai-Mei Fu and Baosen Zhang, followed by a fascinating and informative Q&A session.

Alumni Virtual Town Hall

THURSDAY, SEPTEMBER 17, 2020
5:30 - 6:30 P.M.

ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY OF WASHINGTON

It is the department's honor and priority to remain connected to our alumni. Thanks to everyone who was able to join us at this inaugural event and we hope to see you again at future events as we continue to expand our opportunities for alumni networking and engagement!

If you would like to get in touch with us about this and future alumni-related events, please email: events@ece.uw.edu.

Watch the Alumni Virtual Town Hall video:
https://bit.ly/30PoHWg

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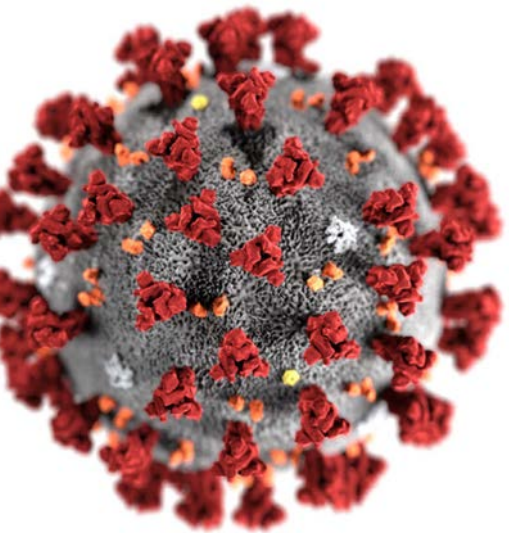
UW ECE faculty and students respond to COVID–19

Faculty and students in UW ECE are leading collaborative research across campus and with other institutions aimed at reducing impacts of the novel coronavirus (COVID-19). Their work ranges from assisting with diagnostics, testing and tracking, to engineering ventilator technology, to developing targeted treatments for the disease. Below are summaries of a few of these projects.

Targeted treatments, diagnostic testing, and data analysis

UW ECE professor and Chair Eric Klavins is leading two large research projects funded by the Defense Advanced Research Projects Agency (DARPA). The first is in collaboration with the director of the Institute for Protein Design, David Baker, who is also a member of the Molecular Engineering & Sciences Institute. Baker's lab is heavily involved in discovery of targeted treatments for COVID-19, and Klavins' lab is collaborating by using Aquarium, software Klavins developed to help build reproducible experimental protocols and workflows. Aquarium helps Baker's scientists and lab technicians conduct research and experiments at a faster rate and standardize data documentation.

Klavins' second project is in collaboration with Boston University and Duke University. It is focused on adapting Aquarium software to repurpose labs for COVID-19 diagnostic testing and data analysis.

"There are a limited number of labs ready to do high-complexity clinical diagnostic testing," said Devin Strickland, a senior research scientist in Klavins' lab. "Many academic labs certainly have people who are perfectly qualified to do experiments, but they don't have the procedural knowledge of how to do COVID-19 testing. What we're hoping to address is how to quickly repurpose labs that are not clinical diagnostic labs."

Ventilator technology

UW ECE professor Blake Hannaford and UW Mechanical Engineering (ME) Ph.D. student Andrew Lewis are working on a dynamic new COVID-19 ventilator technology project as part of a coordinated effort with PATH, UW Medicine, GIX and several other UW units. The project also involves a team of external ventilator experts and several undergraduate UW students. More details are on the project's GoFundMe webpage: **www.gofundme.com/f/pandemic-rapid-response-ventilator**

Contact tracing

UW ECE adjunct associate professor Sham Kakade has created a COVID-19 contact-tracing app, working with teams at the Paul G. Allen School of Computer Science & Engineering (CSE) and Microsoft Research.

Improved epidemiological models and forecasting

UW ECE professor Les Atlas, UW ECE graduate student Mike Rhoads and CSE professor Abie Flaxman, also of the UW Institute for Health Metrics and Evaluation (IHME), have been selected as a finalist team in the COVID-19 Symptom Data Challenge. Their approach significantly improves forecasts for COVID-19 and other pandemics by quantitatively merging IHME's epidemiological models with daily and local COVID-19 test results. The resulting system is expected to be helpful for travel and policy decisions.

The Office of Naval Research partially funds this work.

Disease monitoring and accurate screening

Researchers in the UbiComp Lab, led by UW ECE and CSE professor Shwetak Patel, developed a smartphone-based rapid diagnostic test result scan (RDTS-can), which uses computer vision techniques to assist the user in capturing a high-quality image of their completed test for an infectious disease, combined with an algorithm that automatically analyzes the result. This improves the accuracy and consistency of test results while also enabling researchers and public health officials to gather data about community-level disease prevalence. After initially focusing on infectious diseases such as malaria and influenza, the team is currently building out a new open-source RDTS-can library that will enable developers to extend these capabilities to new COVID-19 RDTs as they come onto the market. The development team can be reached at: **RDTScan@cs.washington.edu.**

Help monitor the incidence of COVID–19 by taking a survey

The CoronaSurveys project is a collaborative endeavor by researchers at several universities and institutions, including UW ECE professor and Associate Chair of Advancement Payman Arabshahi. Data about COVID-19 cases is collected via anonymous open surveys (all the data collected is openly available) and used to create estimations on the incidence and evolution of COVID-19. You can help by regularly completing the anonymous survey: **https://coronasurveys.org/**

Professor Lillian Ratliff receives Dhanani Endowed Faculty Fellowship

Story by Wayne Gillam

Lillian Ratliff, a UW ECE assistant professor in Data Science and Robotics and Controls, is a prolific researcher who is considered to be a rising star. She is well known for her work in machine learning, mathematical optimization and game theory (the mathematical study of decision-making, conflict and strategy), and her research has wide applications to autonomous systems with which people interact, such as online marketplaces. She is also known for being highly collaborative, having co-authored papers with several UW faculty and researchers across the country, and she has made strong contributions to teaching, service and leadership within UW ECE.

In recognition of her outstanding work, Ratliff was recently awarded a Dhanani Endowed Faculty Fellowship from UW ECE, which will provide substantial support for her research and give her greater flexibility in recruiting and retaining graduate students.

"Professor Ratliff is a leading creative force at the intersection of machine learning and game theory, engaged in building the foundations of widely-used algorithms and methods," said Eric Klavins, UW ECE professor and department chair. "Her work is incredibly timely, explaining why our increasingly automated, algorithmically-controlled world actually works, when it doesn't, and how we can improve it."

The Afroze and Sherali Dhanani Endowed Faculty Fellowship was established by Sal and Amynah Dhanani, who met at the UW as undergraduates. Sal Dhanani graduated with a bachelor's degree in electrical engineering in 1996, and Amynah Dhanani received a bachelor's degree in international studies with a focus on South Asia. Sal Dhanani is the co-founder and chief operating officer of Telenav, a company that pioneered GPS navigation for mobile phones. The couple established the fellowship in 2018 after he delivered the UW ECE graduation address, and they chose to name the fellowship in honor of his parents.

> **" We were thrilled to learn that professor Ratliff was the recipient of the fellowship because her research has the potential to impact a wide range of hard problems we will face as a society in both the near and long term."**
>
> **–Sal and Amynah Dhanani**

"Our family has always been inspired by my parents, Afroze and Sherali, as forward-thinking visionaries who saw opportunities for growth in novel areas," Sal Dhanani said. "In keeping with their vision, we wanted to support groundbreaking work in fresh, new directions that meaningfully benefit mankind. We believe that the fellowship award will enable professor Ratliff to continue her exceptional work to do just that."

The Dhananis said they chose to bestow a faculty fellowship to UW ECE because this is where knowledge and greatness happen — the department's mission is fulfilled through its faculty, who then pass it on to their students.

"UW ECE has always been on the cutting edge of innovation with an interdisciplinary approach to solve interesting problems, so we decided to structure our fellowship in a way that aligns and advances the department's agenda," the couple said in a joint statement.

> **" This fellowship will support my students and me in producing research in the growing interdisciplinary field at the intersection of game theory and machine learning."**
>
> **–Lillian Ratliff**

One of the hard problems Ratliff is working on is to address some of the complexities that occur when algorithms, acting in many cases as a proxy for human decision makers, interact with each other in applications such as online marketplaces or intelligent infrastructure. The fellowship will help support Ratliff's work in this area, which uses game theory to develop artificial intelligence and machine learning algorithms. Ratliff seeks to optimize the ability of these algorithms to handle rapid, complex and often critical decisions.

"I am honored to be selected for the Dhanani Fellowship, and I'm grateful for the support and opportunities created by Sal and Amynah Dhanani. This fellowship will support my students and I in producing research in the growing interdisciplinary field at the intersection of game theory and machine learning," Ratliff said. "As a consequence, it will help to reinforce the UW ECE presence in the broader data science and machine learning community. Contributions such as Sal and Amynah Dhanani's are invaluable to the pursuit of fundamental research that seeks to have high societal impact." W

engineering ■ innovation ■ entrepreneurship

From June 1 to 7, 2020, UW ECE hosted a virtual exhibition of its annual ENGineering INnovation and Entrepreneurship (ENGINE) capstone program showcase. Working in teams of three to five, the program offers students the opportunity to tackle projects with real-world societal impact.

This year, nearly 140 students worked hard to develop over 40 industry-sponsored projects, helping to provide solutions to a wide range of challenges. Working under faculty and industry mentorship, their projects covered a number of electrical and computer engineering areas including healthcare, power and energy, transportation, the environment, and artificial intelligence.

Initiated in 2016, ENGINE is the first year-long entrepreneurial system design course sequence of its kind in the department, and develops students' skills in innovation and entrepreneurship, systems engineering, project management, and product development. The program offers select companies an opportunity to benefit from the vibrant innovation culture in the UW ECE department.

Teams work on hardware and software system design challenges that emphasize depth of analysis and synthesis in all areas of electrical and computer

engineering and computer science. During the course of a full academic year, students spend over 1,200 hours per team on their projects, presenting their final results to faculty, industry leaders, peers and researchers at the ENGINE showcase.

The past academic year posed unique challenges due to the COVID-19 pandemic, and saw our students pivoting to virtual settings while facing several new and unforeseen obstacles. Despite these hurdles, the projects were completed successfully, and our department is proud of our students' ability to adapt to such real-world challenges. We are very grateful to our sponsors for their flexibility and dedication to mentoring our ENGINE program students.

UW ECE is also enormously grateful for the vision and generosity of Milt (BSEE '60) and Delia Zeutschel, and Milt's business partner, John Reece, which has enabled us to develop the ENGINE program to its current scale. Through the magnitude of the Zeutschels' endowment of the ENGINE program, they are helping to secure the futures of UW ECE engineers and promote continued local and statewide innovation.

Learn more about the ENGINE program:
www.ece.uw.edu/news-events/capstone-fair/

/// CONGRATULATIONS TO THIS YEAR'S TOP 3 WINNING TEAMS!

INFRARED CAMERA FOR HMT-1

The RealWear team (left to right) of Richard Burberry, Nicholas Mathews and Nathan McCown worked with industry mentor Alex Rodriguez and faculty adviser Tai-Chang Chen to design, develop and test an "Infrared Camera for HMT-1" (pictured opposite), a custom PCB and 3D-printed housing for a Lepton infrared camera to interface with RealWear's HMT-1 headset, maintaining a low-profile and industrial design.

ADMINISTRATIVE AND FINANCIAL WEB PORTAL

The UW College of Engineering's group members (left to right) Jieling Wang, Haotian Yuan, Kalana Sahabandu, Batina Shikhalieva and Yimeng Li (unpictured) worked with industry mentors Ted Hanson and Bridget Faherty, and faculty adviser Payman Arabshahi to develop a web application with a background database that can be used internally for College of Engineering departments to manage, process and track administrative and financial requests for both students and fiscal staff, including purchasing, reimbursements, travel requests (booking and reimbursements) and procard document submission.

Figure 4: Main Programming Languages, Tools and Libraries
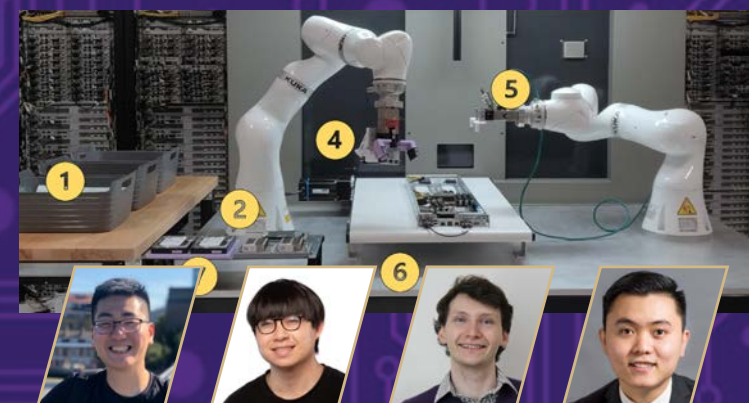
AUTOMATED SERVER REPAIR WORKCELL FOR DATA CENTERS

The Microsoft-sponsored team (left to right) of Marcus Chu, Wichwong Premvuti, Ian Good and Khai Pham worked with industry mentors Nicholas Keehn and Corina Arama and faculty adviser Howard Chizeck to develop a computer vision-based platform to repair data center servers with variable pose using two collaborative robotic arms.

ALASKA AIRLINES ADOPTS SOFTWARE TOOL DEVELOPED BY ENGINE TEAM

The team (clockwise from top left) of Shahrzad Feghhi, Grant Neuman, Batina Shikhalieva, Parsons Cai and James Mann developed the Aircraft Software Configuration Tool (ASCT) for Alaska Airlines. The ASCT is a reliable and easy-to-use web portal, which acts as a manual to help technicians at Alaska Airlines load computer software onto airplanes more efficiently. It proved to be so accurate, dependable and efficient that Alaska Airlines officially adopted the tool and will be implementing it across their entire fleet this year.
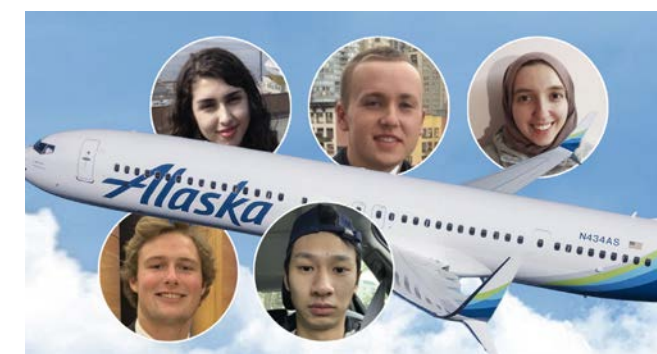
UW ECE AND CEE STUDENTS COLLABORATE ON REMOTE-CONTROLLED SENSING VEHICLE FOR WSDOT

The Hydro-CUB (Compact Utility Bot) team of Sherman White and Jina Yoo collaborated with students in UW Civil & Environmental Engineering to create a remote-controlled sensing vehicle prototype for the Washington State Department of Transportation (WSDOT) that will be used to monitor confined spaces. The team's first prototype (right) and more recent prototype (left) features a track mounted design for better traction in wet soil.

CONGRATULATIONS,
CLASS OF 2020

Due to the ongoing novel coronavirus pandemic, we honored the UW ECE class of 2020 with a virtual graduation celebration and viewing party via Zoom on Wednesday, June 10, 2020. This was in lieu of holding graduation at its traditional location in the Alaska Airlines Arena at Hec Edmundson Pavilion.

This year, a total of 350 degrees were conferred upon UW ECE graduates, including:

224 bachelor's degrees
95 master's degrees
31 doctoral degrees

The event featured a wonderful slideshow of student images prior to the event, followed by several congratulatory video messages. UW ECE professor and Chair Eric Klavins addressed attendees by offering opening remarks, including several recent department achievements and words of encouragement to graduates.

This year's keynote speaker was Booga Gilbertson, Senior Vice President and Chief Operating Officer at Puget Sound Energy and a UW ECE alumna. Gilbertson, who also graces the cover of this year's Integrator, recently gave a generous endowed "You Rock" student scholarship to the UW ECE department. More information about the scholarship and Gilbertson's life story are featured in this issue on page 28.

Graduates were also honored by video messages from several UW ECE faculty members and advising staff, who congratulated and wished them the best of luck in their future endeavors despite 2020's many unique and unforeseen challenges.

UW ECE remains hopeful that the class of 2021 will return to its tradition of holding an in-person graduation ceremony, and we invite all 2020 alumni to return to campus to take part in that celebration as well.

Learn more and watch the commencement video:
www.ece.uw.edu/news-events/graduation/

Left to right, graduates Chiva Chun, Sun Hong Lay and Lam N. Pham pose for a celebratory photo outside of the UW ECE building. Photo: Chipheng Mit

UW ECE professor Blake Hannaford enjoys the Class of 2020 virtual graduation ceremony and viewing party from the comfort of his home. Photo: Cynthia Ruggeiro

Class of 2020 graduate Jenny Yeonjin Cho celebrates her achievement at UW ECE. Photo: Alvin Cao

Top

Exhausted, but relieved, astronauts James Lovell, Jack Swigert and Fred Haise await a recovery helicopter's arrival after their Apollo 13's charred command module splashed down safely in the Pacific ocean near Samoa on April 17, 1970, less than four miles from the recovery ship USS Iwo Jima. Photo: NASA
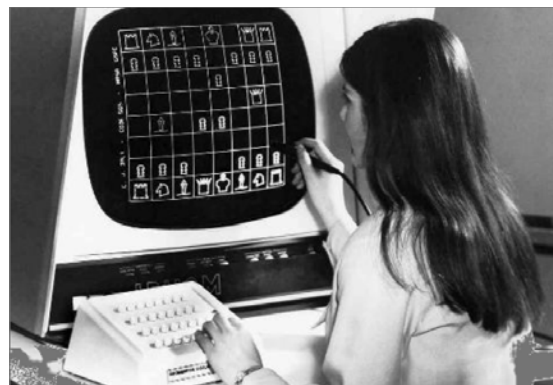
In New York City from August 31 to September 2, 1970, six chess programs using 'light pens' and IDIIOM's system of human-machine interaction on computers as far away as Texas and Alberta, Canada, competed for the title of U.S. Computer Champion.
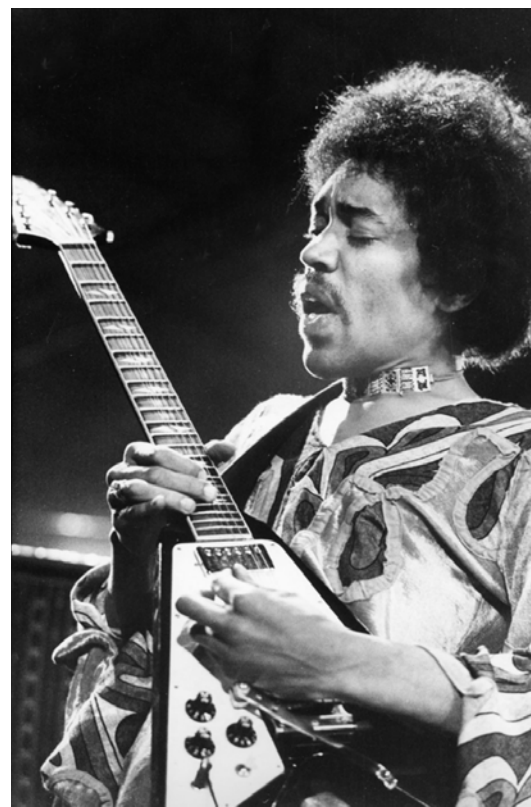
Seattle native Jimi Hendrix performs at the Isle of Wight Festival in August 1970, just one month prior to his untimely death at the age of 27. At the time, the festival was the largest such event ever held. Photo: Laurens Van Houten
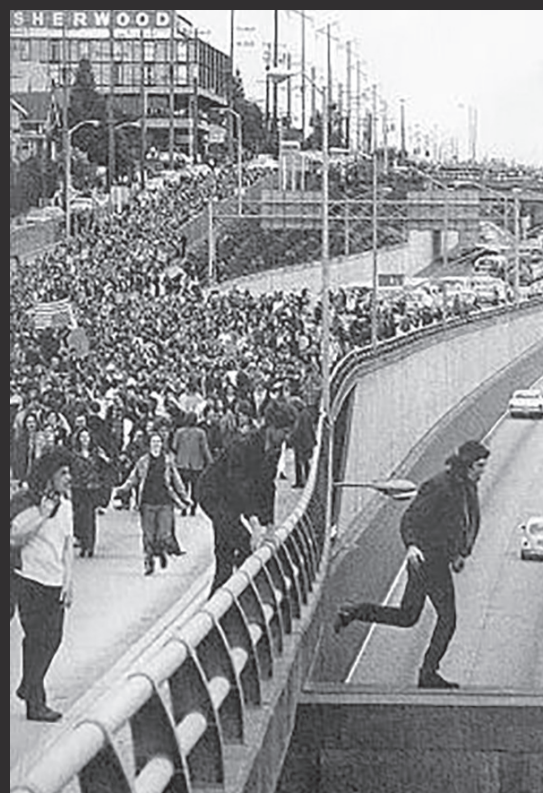
CLASS OF 1970

// 50 years ago

Photo: UW ECE photo archives

On May 5, 1970, thousands of UW students, faculty and staff were confronted by police as they blocked the I-5 freeway to protest the shooting deaths of four Kent State students the day before by members of the National Guard. Photos: Museum of History & Industry, Seattle

The year 1970 introduced the world to a tremendous, and tumultuous, decade full of change, political upheaval and no shortage of technological advancements and engineering milestones.

That year, the first ever virtual computer chess tournament took place in North America, Douglas Engelbart patented the first computer mouse, the U.S. Environmental Protection Agency (EPA) began its operations, and the North Tower of the World Trade Center was topped out at 1,368 feet (417m) in New York City, making it the tallest building in the world at the time.

To the dismay of pop music fans around the world, Paul McCartney announced that The Beatles would be breaking up, just one month after the release of their final album that spring, "Let It Be", on May 8. Even more shocking, perhaps, was the news that electric guitar virtuoso and Seattle native Jimi Hendrix had passed away on September 18 in a hotel room in London — exactly 16 days before rock musician Janis Joplin also died at a motel in Los Angeles. Both music icons were just 27 years of age.

1970 saw amazing achievements in aviation. The British and French-built Concorde aircraft made its first supersonic flight, breaking the sound barrier of 700mph, while the Boeing 747 Jumbo Jet made its maiden commercial passenger voyage from New York to London on January 22. And, in what has been referred to as NASA's "finest hour", the crippled Apollo 13 spacecraft command module splashed down safely in the South Pacific on April 17 near Samoa, following a miraculous feat of engineering ingenuity on the parts of both the space agency and the three astronauts onboard. Following an oxygen tank explosion four days earlier, the mission was aborted while en route to what would have been just the third ever manned landing on the surface of the moon.

More locally, on May 5, 1970, University of Washington students, faculty and staff took to the streets by the thousands, effectively blocking Interstate 5 in protest against the killing of four Kent State University students by National Guardsmen the previous day, as well as the bombing of Cambodia by U.S. forces during the ongoing and controversial Vietnam War.

Top

Making a difference in the Middle East by connecting talent to opportunity

UW ECE alumna Laila Abudahi (MSEE '16) is using her education and career experience to connect young engineers in Palestine and the Arab region with high-paying jobs in the tech sector, changing their lives for the better, diversifying the workforce, uplifting the local economy and empowering women in the Middle East.

Story by Wayne Gillam

In 2014, one of the deadliest conflicts in years broke out between Israel and Palestine. With war raging between the two countries, Laila Abudahi, a recent college graduate and recipient of a Fulbright Scholarship, unexpectedly found herself struggling to leave her home in the Gaza Strip to come to the U.S. for graduate school.

"It was one of the deadliest wars on Gaza. It was the longest and lasted more than 50 days," Abudahi said. "I witnessed three wars on Gaza, but that was the bloodiest one."

With courage, determination and help from others, Abudahi managed to make her way out of war-torn Gaza to Egypt, where she applied for her U.S. visa and made it to Seattle a month later. Friends such as Naseem Tuffaha, Lubna Alzaroo and Darryn Hewson helped her settle in, as well as other members of the Seattle and UW communities. She began her graduate studies that year at UW ECE (then UW EE) in the lab of professor Radha Poovendran.

"He was a mentor. He really believed in me and helped me in every way he could," Abudahi said. "It was so heartwarming to have an adviser who believed in me that much and enabled me to pursue my research interests, which at that time were the Internet of Things and hardware privacy. Even now, after graduation, he stays in touch and follows up."

Manara students in a Zoom session with Laila. Clockwise from top left: Abudahi, Daila Awad, Iliana Montauk and Afnan Abed

After graduation in 2016, Abudahi began her career as a software engineer in Santa Clara, California, but she continued to remain strongly connected to friends, family and business contacts back home in Palestine.

The lighthouse

In 2018, Abudahi talked with Iliana Montauk — an American friend she met in Gaza who incubated a fledgling startup of Abudahi's prior to Abudahi coming to the U.S. — about the lack of opportunities for Palestinian engineers. Through their partnership in Gaza, they had worked with many talented, highly skilled, young engineers, but they witnessed and experienced firsthand the lack of good jobs and opportunities in the area. Together, they brainstormed and came up with the idea for a company with a social impact mission that could connect recent college graduates in the region, primarily software engineers, with good jobs at technology companies worldwide. They decided to name their social enterprise "Manara," which means "lighthouse" in Arabic.

"All we know about the Middle East is what we see in the news. It's a war zone, there's conflict, there's violence, but what most people don't know about the Middle East is that it is a culture that values education and entrepreneurship, making things happen," Abudahi said. "We're trying to rebrand the region for what it is. Yes, there is conflict, but there is also highly-educated, undiscovered talent there."

Manara enlists volunteers and contacts at technology companies such as Facebook, Amazon and Google to mentor and guide young engineers from Palestine and the Middle East in "soft skills", such as interviewing and resume preparation. Abudahi and Montauk have identified this gap in soft skills — untraditional-looking resumes and the lack of relevant professional networks and referrals — as being the main reason engineers from the Middle East have difficulty finding jobs abroad that are appropriate to their level of education. Manara also helps candidates strengthen their technical skills and prepare for technical interviews.

"We like to view ourselves as the recruiting team of

the Middle East," Abudahi said. "Most of these companies overlook the region. They don't even partner with any schools on the ground. This can be challenging and hard to figure out, especially in the Arab World. So, we do that for them through our partnerships with professors, local universities, [technology] boot camps and competitive programming communities."

Expanding opportunity to others

The positive impacts Manara has on people's lives are many. In addition to diversifying and enriching the technology sector with new ideas and experiences, individuals who are placed in jobs by Manara earn an average of two to five times the salary they could earn in their home country. This income boost enables them to raise their family's standard of living and enrich the local economy, which in turn has a stabilizing effect on society. In this way, the opportunities Manara provides its participants are far-reaching and have lifetime impact, especially for women.

"In the Middle East, there are more women studying computer science than men. In Palestine, for example, 52% of computer science students are women; however, 83% of those women end up unemployed due in part to cultural norms and discrimination in the local tech sector," Abudahi explained. "For reasons like this, women are eager to work for North American and European companies, especially remotely. We make this possible by connecting global tech companies who are already looking for qualified job applicants to this undiscovered pool of high-caliber female talent."

Since their start in 2018, Manara has enrolled 80 students and graduated 50 participants, placing individuals in high-paying positions with technology companies around the world. In November 2020, they plan to launch their first female-only cohort, which at 30 students, is their largest cohort so far. They are also moving forward on plans to expand across the Middle East and North Africa. Manara was also recently accepted into the Y Combinator startup batch for winter 2021. Y Combinator, based in Silicon Valley, is known to be one of the world's best startup accelerators, providing seed funding for many companies that are now ubiquitous, such as

Laila Abudahi ('16)
Co-founder and CTO, Manara

Airbnb, DoorDash, Dropbox and Reddit.

"I believe that talent is equally distributed, but opportunity is not," Abudahi said. "Our vision is to turn the Arab World into the next Eastern Europe, which used to be an exporter of refugees, but now is a source of high-quality tech and design talent."

"Laila is a natural leader, has a very big heart and wants the best for everyone. As a student, she was always open to learning new things, and by establishing Manara, she has created extraordinary possibilities for young people studying and working in technology in the Middle East," Poovendran said. "I do not know anyone among her peers who has demonstrated such transformative leadership."

When asked how UW ECE contributed to her success and with Manara, Abudahi said, "Honestly, it's the number one reason I have a career. UW ECE gave me the network, the support and the industry exposure I never had prior to coming to the U.S.; that enabled me to get my first internship and then kickstart my career. Now, I'm working through Manara to bring to others the same sorts of opportunities that UW ECE provided for me." W

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Photo: Varunika Gupta

Pwint Htun ('97)
Founder, Mobilizing Myanmar

Using smartphone technology to build an inclusive and more equitable society in Myanmar

Pwint Htun (BSEE '97) is leveraging digital technology and using problem-solving skills she gained at UW ECE to assist the rural population in her native country.

Story by Wayne Gillam | Photos by Paula Bock

Myanmar, a country in Southeast Asia sandwiched between Bangladesh, India, China and Thailand, is one of the least developed nations on earth. It has poorly maintained roads and a weak electrical grid that is inaccessible to most people in rural areas. So, it can come as quite a surprise to learn that despite its lack of development, almost everyone in this country owns or has easy access to a low-cost, fast and reliable smartphone.

This is in large part thanks to Pwint Htun, a former refugee from Myanmar who received her undergraduate degree in electrical engineering from UW ECE (then UW EE) in 1997. After graduation, Htun went on to a successful telecommunications career, working for companies such as Hewlett-Packard, Clearwire and T-Mobile, where she was part of a team that contributed to development of the first Android smartphone.

Over the past eight years, she has focused her formidable talents and energy on solving a complex and difficult problem in her native country of Myanmar — how to connect the large, rural population to the rest of the world in order to empower people economically and ensure they don't get left behind.

"In my four years at the UW, there was a lot of focus on problem-solving, learning to ask the right questions to solve problems, and that is what has been really helpful for me," Htun said. "The problems that I solve now are different than they were before, but it's still the same methodology — tackling what may seem like a big problem and then chunking it into small pieces, figuring out 'who, what, when, how,' and then making small progress to achieve the larger goal."

By working closely with Myanmar's Ministry of Communications and Central Bank, and partners such as the Gates Foundation, Htun led an effort to make smartphone connectivity and financial services more accessible and affordable for everyone in the nation. She has made major strides in digitally connecting the country over the last eight years, drafting regulations for the mobile financial services industry and significantly improving Myanmar's telecommunications landscape.

Eight years ago, Myanmar was the third least connected country on the planet. Today, Myanmar has a smartphone penetration rate of 114%, which means there are more smartphones than people in the country. This is a higher mobile penetration rate than in either the U.S. or Germany, and the phones are speedy — over 94% of the population has 3G or 4G coverage. Also, over 64,000 mobile financial service providers across the country called "mobile money agents" — individuals who own small shops in cities, towns and villages across Myanmar and function like human ATMs — help to provide digital financial services to their communities. The country has seen digital financial transactions increase approximately 800% in the last year.

"The most important thing to know about technology is that it is a great tool, and a great enabler to reduce inequalities," Htun said. "If we choose to focus on altruistic uses of the technology, there is a huge potential to bring about change."

> **"** In the future, it's not going to be the developed world versus the developing world, it's going to be the digitized world versus the unconnected world."
>
> **–Pwint Htun**

further enhance this social safety net.

Htun is also focused on fostering economic empowerment for women, who have been shown in many societies, including Myanmar, to spread wealth throughout communities more rapidly and effectively than men. This has a stabilizing effect on the culture at-large. According to studies cited by Htun, this is because women spend, on average, 90 percent of their earned income on their families — food, education and health care — while men spend only 30–40 percent of their income on family and the community.

"It's a very big, ambitious goal to tackle — to shift more resources into women's hands," Htun said. "When we considered women in Myanmar's rural areas, we realized that the best way to get them to become more economically empowered is to get them to become more digitally literate, digitally savvy, so that the phone that is already in their hands can become a tool for them to earn more income."

Benefits and unexpected impacts of smartphones

Ease of access to smartphones and digital financial services are bringing sweeping changes and far-reaching benefits to the people of Myanmar, especially the rural population. Digital technology has made economic opportunities within the country more accessible to those in rural areas, and it enables people to connect with friends and family both inside and outside the country anywhere, anytime.

The ability to send and receive money electronically helps to create a financial safety net for people in Myanmar as well, enabling those in urban areas to send money to loved ones in rural villages and vice versa. Access to digital financial services also reduces the need to carry large amounts of cash, which has enhanced physical safety for many people, such as women and migrant workers who are more vulnerable to physical attacks and robbery.

"In Myanmar, there are many domestic migrant workers, as well as international migrant workers," Htun said. "If you're a migrant worker, you don't have access to a bank account, because banks are only open from 10 a.m. to 3 p.m. You're going to be at work then, and your salary is paid out in cash. So, what do you do? You just carry the money on your body."

With easily accessible mobile money agents all across the country, people can now digitize their cash at almost any time of day, and even receive digital payments instead of cash, which helps to provide some much-needed financial security. The government is also working on digitizing its payments to citizens, which will help to

In a rural village in Myanmar's Ayeyarwady Delta, Pwint Htun teaches midwives to download apps, part of a multisector project to improve nutrition for pregnant women in a region with the nation's highest connectivity — and also the highest rate of child stunting.

There have been a couple other significant benefits of this technology that were unexpected and unplanned by either Htun or the Myanmar government. One was nudged into existence in large part by the novel coronavirus (COVID-19), which has had the effect of putting Myanmar's move toward smartphones and digital financial services on fast-forward.

"COVID-19 has accelerated digital adoption around the country. What we told people was possible, COVID-19 is forcing them to do. For example, if you're a blind person in Myanmar, usually the only type of paid work available to you is working as a massage

therapist. COVID-19 shut these businesses down, and there is no unemployment system in Myanmar," Htun explained. "But I taught three blind people how to use mobile money, and it has spread like wildfire. They have taught each other, and hundreds of blind people in Myanmar now have opened a digital wallet, which allows them to receive money from friends, family and those who want to help. So, it's really benefiting the blind population."

The other unexpected benefit has been a rapid adoption of solar power.

"The majority of people in Myanmar don't have access to grid electricity. As of this year, only 50% of the population has access. But what has happened is that people want to be connected to their loved ones, so they buy smartphones," Htun said. "They have to figure out a way to charge the phones off the grid, so many people end up investing in inexpensive solar panels. It's the positive externality of telecommunication liberalization in Myanmar, where people in their desire to connect digitally decide that they need to have access to solar panels and prioritized that."

Teaching digital literacy and moving into a connected world

Of course, not every unexpected impact from Myanmar's leap into digital technology has been positive. Like many other societies around the world, the country has suffered from the spread of disinformation, which proliferates more rapidly online. Fake news (such as a popular rumor in Myanmar that onions can cure COVID-19) and hate groups can also be empowered by technology, so Htun is actively working to implement digital literacy education.

"Technology is a tool, and like any other tool, it is a double-edged sword," Htun said. "The most important thing is to teach people positive ways of using technology, so it can overwhelm negative uses of technology. I work a lot on digital literacy for that reason."

Next steps for Htun include continuing to expand Myanmar's network of female mobile money agents, implementing quick-response (QR) codes across the country to ensure accessibility, ease and speed of financial transactions, and encouraging the government to digitize all payments and bureaucratic, paperwork-driven processes to reduce friction, corruption and better serve the people of Myanmar.

"In the future, it's not going to be the developed world versus the developing world, it's going to be the digitized world versus the unconnected world. I hope that people in Myanmar become fully a part of the digitized world. They have the perfect ingredients, they just need to take that next step." W

Htun instructs trainers from grassroots women's organizations who will then teach digital literacy and livelihood skills to other village women. This sustainable approach empowers women to continue learning from each other as technology evolves.

In rural Shan state, a strawberry farmer uses Facebook Messenger to inform a buyer of how much produce she shipped to him; he pays her digitally. Because she had to quit school in the fourth grade, the farmer wants her daughters to get a good education. Her oldest daughter, who attends a distance-learning college, taught her mom to use mobile money.

Life in remote northern Chin state is like stepping back a century in time — except for the smartphone in the toddler hands of the next generation. In a nation where 38 percent of the population lives below the global poverty line, mobile money can transform society as women safely earn and save money, network with each other, escape poverty and gain power.

"The most important thing to know about technology is that it is a great tool, and a great enabler to reduce inequalities."
–Pwint Htun

After using her digital wallet to get cash from a mobile money agent at a roadside stall, this grandma wheels around on the dusty roads of northern Shan State, phone in hand. Because Myanmar has extensive network coverage and pervasive smartphone usage (even among the poor), it's an ideal place to test innovations and demonstrate how unbanked women can empower themselves using digital tools.

SPOTLIGHTS

Selected highlights from this year's most significant research, awards and achievements in The University of Washington Department of Electrical & Computer Engineering (UW ECE)

■ **Click on squares to read the full-length stories, or visit:** www.ece.uw.edu/news-events/

KAI-MEI FU TO DIRECT NEW NSF RESEARCH TRAINEESHIP FOCUSED ON INTERDISCIPLINARY QUANTUM FUTURE

The National Science Foundation has awarded $3 million to establish a NSF Research Traineeship at the University of Washington for graduate students in quantum information science and technology, or QIST.

EVE RISKIN RECEIVES PRESIDENTIAL AWARD FOR EXCELLENCE IN ENGINEERING MENTORING

The award represents the highest national honor bestowed by the U.S. government upon mentors who work to expand STEM talent. Professor Riskin has worked to mentor underrepresented students and faculty while increasing diversity and access in higher education.

UW NANOTECHNOLOGY GETS A BOOST FROM NATIONAL SCIENCE FOUNDATION

The NSF has awarded UW and OSU a five-year, $5 million grant to advance nanoscale science, engineering and technology in the Pacific Northwest. Professor **Karl Böhringer**, director of the Washington Nanofabrication Facility (WNF) and UW Institute for Nano-Engineered Systems (NanoES), leads the effort.
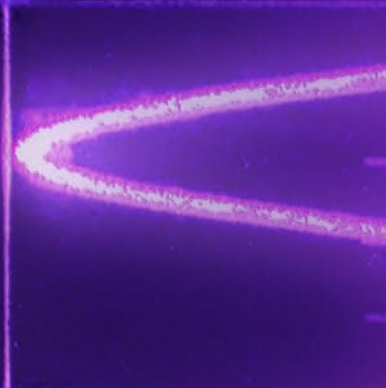
UW LAUNCHES INSTITUTE FOR FOUNDATIONS OF DATA SCIENCE

Moorthy Family Professor and Associate Chair for Research **Maryam Fazel** is leading a new, interdisciplinary research institute that brings together mathematicians, statisticians, computer scientists and engineers to develop the theoretical foundations of data science.

ENGINEERS DESIGN A TINY, IMPLANTABLE CHIP TO DEEPEN UNDERSTANDING OF THE BRAIN AND ENABLE BETTER **TREATMENTS FOR NEUROLOGICAL DISORDERS**

A UW ECE research team has designed a new chip for neural interfaces that will help increase knowledge about the brain and enable better treatments for a wide range of medical conditions such as Parkinson's disease and epilepsy.

(Pictured: associate professors **Chris Rudell** and **Visvesh Sathe**)

ARKA MAJUMDAR AND **LILLIAN RATLIFF** RECEIVE 2020 ONR YIP AWARDS

The highly competitive Office of Naval Research Young Investigator Program (ONR YIP) award supports naval-relevant research. Assistant professors Majumdar and Ratliff, who is also the Dhanani Endowed Faculty Fellow, are two of only twenty-six recipients nationwide to receive the award this year.

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UW ECE TEAM RECEIVES $800K NSF AWARD TO IMPROVE QUANTUM COMPUTING SYSTEMS

The new National Science Foundation (NSF) Convergence Accelerator Award will help dramatically increase the capacity of quantum computing and simulation systems to retain and process information.

(Pictured, clockwise from bottom: professor **Karl Böhringer,** associate professor **Mo Li,** associate professor **Arka Majumdar**)

■ **Click on squares to read the full-length stories, or visit:** www.ece.uw.edu/ news-events/

UW ECE WELCOMES ITS NEWEST FACULTY MEMBER, ASSISTANT PROFESSOR **SAJJAD MOAZENI**

Moazeni's research interests lie at the intersection of integrated system design and photonics, with applications in computing and communication, sensing and imaging, and life sciences.

JOSHUA R. SMITH HONORED AS IEEE FELLOW

Smith, the Milton and Delia Zeutschel Professor in Entrepreneurial Excellence, was named a Fellow of the IEEE in recognition of his contributions to far- and near-field wireless power, backscatter communication and electric field sensing.

AWARDS SUPPORT DEVELOPMENT OF **THERAPEUTIC NEURAL INTERFACES**

Clare Booth Luce Assistant Professor **Amy Orsborn** received two prestigious awards that will support her interdisciplinary research aimed at developing neural devices capable of healing and restoring function in the brain and body.

MARI OSTENDORF NAMED RSE CORRESPONDING FELLOW

System Design Methodologies Professor Mari Ostendorf was named one of eight corresponding fellows of The Royal Society of Edinburgh, Scotland's National Academy. New fellows comprise leading thinkers and experts from Scotland and around the world whose work has a significant impact on the nation of Scotland.

UW ECE **FACULTY AND ALUMNI** RECEIVE NSF CAREER AWARDS

Rattie Endowed Career Development Professor **Baosen Zhang** and UW ECE alumni **Andrew Clark** and **Subhanshu Gupta** have each been honored with a National Science Foundation (NSF) CAREER award, one of the nation's most coveted honors for early-career faculty.

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SPOTLIGHTS

UW ECE STUDENT

■ **Click on squares to read the full-length stories, or visit:** www.ece.uw.edu/news-events/

UW-MEDTRONIC COLLABORATION ACCELERATES RESEARCH INTO DEEP BRAIN STIMULATION TREATMENTS

UW ECE grad student **Ben Ferleger** is conducting Center for Neurotechnology (CNT) research to treat essential tremor, Parkinson's disease and other neurological disorders.

UW ECE PHD GRADUATE & POSTDOCTORAL RESEARCH SCHOLAR ACCEPT PROFESSORSHIPS

Yuanyuan Shi (left) and **Shana Moothedath** (right) will begin tenure-track assistant professorships in 2021 at the ECE departments of UC, San Diego and Iowa State University, respectively.

DOCTORAL STUDENT **VIKRAM IYER** RECEIVES 2020 MARCONI SOCIETY YOUNG SCHOLAR AWARD

This prestigious award from The Marconi Society acknowledges Iyer's innovative work developing bio-inspired and bio-integrative wireless sensor systems, including a "GoPro backpack for beetles."

PHD CANDIDATE **ZERINA KAPETANOVIC** WINS MICROSOFT RESEARCH DISSERTATION GRANT

Kapetanovic received the grant for her doctoral thesis research on *Low-Power Communication for Environmental Sensing Systems*. She is one of just 10 PhD students in North America to win this year's award.

MEGAN BUI AWARDED THOMAS SEDLOCK ICON SCHOLARSHIP

Bui, a junior studying Digital Signal and Image Processing at UW ECE, is one of just three UW undergraduates to receive the scholarship for the 2019-20 academic year.

GRAD STUDENT **LI CHEN** WRITES ALGORITHM TO DEPICT CARDIOVASCULAR RISK USING KNEE MRIS & AI

Chen and UW Medicine researchers use artificial intelligence to read radiology scans, cutting diagnostic times from hours to minutes.

WYZE CAMERA DONATION HELPS STUDENTS CONNECT WITH THEIR INSTRUCTORS AND CLASSMATES

UW engineering alum **Yun Zhang** orchestrated a generous donation of 1,000 webcams from his company to UW ECE students, faculty and staff, helping to facilitate virtual learning and work.

(Pictured left to right: **Samuel Broadwell, Katriel Looney, Kenny Lu and Tian Wang**)

STUDENTS IN THE **NEURAL ENGINEERING TECH STUDIO** ENGINEER DEVICES TO ASSIST PEOPLE WITH DISABILITIES

Students designed and engineered devices to assist people with conditions such as paralysis, autism, blindness and Parkinson's disease.

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Looking ahead to give back

YOU ROCK!

Booga Gilbertson (BSEE '85) is realizing her goal of supporting UW ECE undergraduate students by establishing the "You Rock" Endowed Scholarship in Electrical & Computer Engineering.

Booga Gilbertson's love of the outdoors is part of what drew her from her hometown of Idaho Springs, Colorado, to life as an undergraduate at the University of Washington. She was initially interested in studying geography, limnology (the study of lakes and other bodies of freshwater) and oceanography. Her interest in electrical engineering was sparked in her sophomore year when her car began to have electrical problems, and she wanted to figure out how to solve them. Here, she is shown kayaking on the Kootenai River in northwest Montana. Photo: Don Rose

Booga Gilbertson ('85)
Sr. VP and COO, Puget Sound Energy

Story by Wayne Gillam

Gilbertson at a Puget Sound Energy employee town hall, discussing the future of energy. Pictured from left to right are Mary Kipp, president and chief executive officer; Andy Wappler, vice president of customer operations and communications; and Gilbertson, senior vice president and chief operations officer. Photo: Bill Wright / Puget Sound Energy

As a young child, Booga Gilbertson appeared to have a firm sense of who she was and what she wanted out of life, right from the start. Perhaps this sense of clarity and purpose that others saw in her began with her name, "Booga," a family name that reflects her Scandinavian heritage and means "inspired or enlightened one." Or maybe it became apparent when she chose to work through math activity books instead of coloring books, conducted science experiments in the kitchen and charged her family for gift-wrapping services during the holidays — expressing her budding interests in math, science and business.

However it began, determination, resilience and being able to express a clarity of purpose were gifts that took Gilbertson from a small town in Colorado, to the University of Washington, to her current role as senior vice president and chief operations officer of Puget Sound Energy. There, she built her reputation as a highly effective and successful leader in the energy industry through hard work and by leading, learning from and working with highly skilled teams through complex, high-stakes problem solving.

"My work in the energy industry has provided an opportunity to serve my community and link my personal values and purpose to my work," Gilbertson said. "I particularly enjoy connecting with and developing people, the challenge of navigating through change, and helping people have better quality lives, especially around wellness, the environment, and the application of engineering and science."
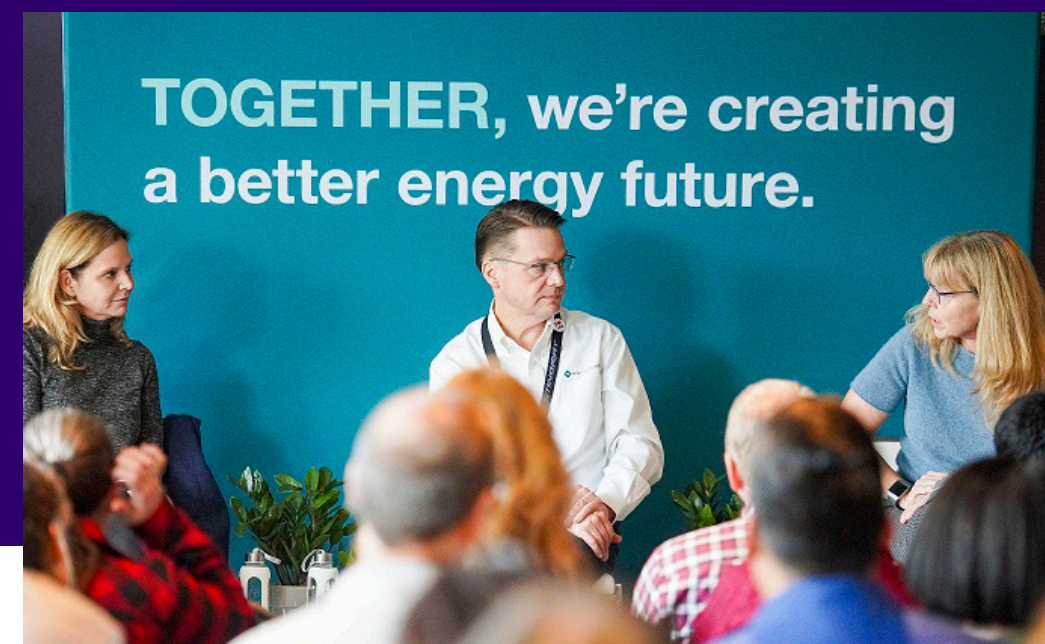
Inspired to give to others

Gilbertson enjoys helping others, and a seed for her philanthropic goals was planted when she was a UW ECE undergraduate. Toward the end of her junior year, she received a $500 gift from an anonymous donor.

"I really needed money for books and on-campus food, and it provided just enough buffer and cushion. To know that I was going to be able to make it through the end of the year before I got to my summer job...I was just in disbelief that somebody would do that and not own up to it and just be that generous," Gilbertson said. "It's been over 30 years since then, and I still haven't forgotten that. It made an impression on me then, and it has ever since."

The experience stayed with her, and to help pay it forward, she thought carefully about where she could have the most impact. Then, she turned her dreams and goals into action.

Today, Gilbertson is giving back and has been actively involved and engaged with UW ECE for several years now, contributing her visionary leadership. She has been a regular speaker in UW ECE classes such as the "Leadership Seminar Series," she was a member of the UW ECE Advisory Board from 2012 to 2015, and most recently, she gave the commencement address at the 2020 UW ECE Graduation Ceremony.

Now, she's taking her involvement with UW ECE one step further by establishing the "You Rock" Endowed Scholarship in Electrical & Computer Engineering, which will help to support undergraduate students in the department, especially those from rural communities who are the first in their family to attend college or those who may have lacked educational opportunities in science, technology, engineering, mathematics (STEM) or computer science.

"Ultimately, I decided that my experience and education through UW ECE was so transformative, and continues to be, that one of the best things I could do

> **"My work in the energy industry has provided an opportunity to serve my community and link my personal values and purpose to my work."**
>
> **— Booga Gilbertson**

TOGETHER, we're creating a better energy future.

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was to give somebody a hand into that experience," Gilbertson said. "I think it will unlock opportunities for a person to transform the world in specific ways that they want to, however they choose to direct their energy. It is a foundation that allows a person to create an impact on the future in ways that are amazing, ways that they probably would never even envision."

Gilbertson chose to include the phrase "You Rock" in the name of the endowed scholarship because, in the expression, the word "rock" is both a noun and a verb.

"It's a phrase that acknowledges, values, encourages and celebrates the awesome contributions that a person makes," Gilbertson said. "It is also a phrase that affirms the strength, sure-footedness, poise and resourcefulness that a confident and competent person exudes and brings to any situation. 'You Rock' is perfect for someone studying engineering."

Envisioning the future to achieve a dream

The "You Rock" Endowed Scholarship is the fruition of a dream Gilbertson had to help financially support a UW ECE education for engineering students. She turned this dream into a long-term goal for herself and then took action, making possible for others an educational experience that she herself found invaluable to her career.

"Over three decades ago, when I was sitting in what is now the Alaska Airlines Arena at Hec Ed Pavilion during my graduation ceremony, I didn't have the perspective to know how valuable, adaptable and durable my engineering education from the University of Washington was and is," Gilbertson said in her commencement address at the 2020 UW ECE Graduation

Gilbertson, with her life partner Don, at a family wedding in Alaska. It was Don who encouraged Gilbertson to include the phrase "You Rock" in the endowed scholarship fund's name. Photo: Nadine Schliebe
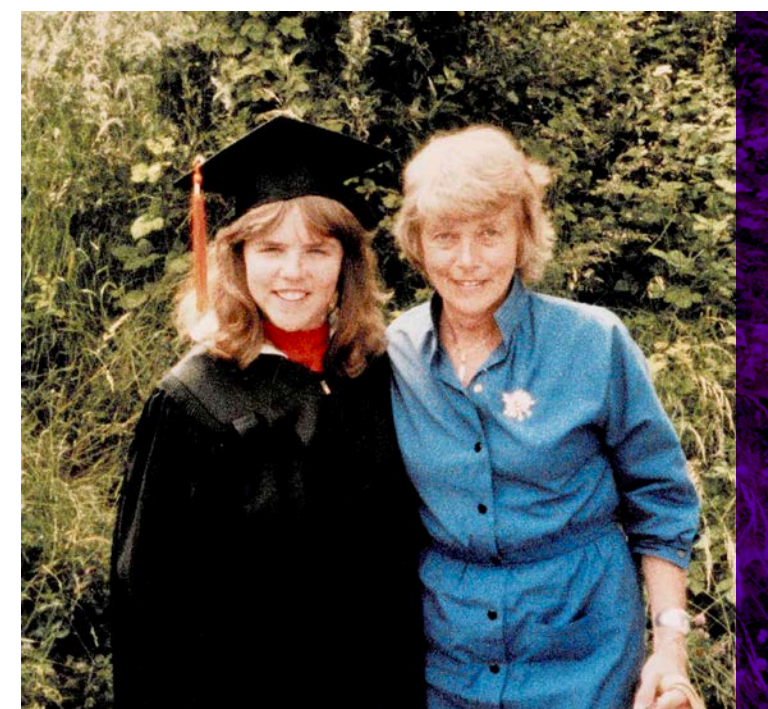

Ceremony. "With each year, I have come to appreciate my education even more."

A willingness to dream big, set concrete goals and draw inspiration from the kindness of others all came together for Gilbertson in her effort to make a difference in the lives of UW ECE students. But despite being known for clarity of purpose, determination and leadership, it might come as some surprise that although other people have seen Gilbertson as a person with clear goals and ambitions, she didn't always see herself that way, at least not at first. As she shared in her 2020 UW ECE graduation address, that kind of clarity often evolves over time.

"Reflecting on my own experience, if asked when I graduated what my vision and purpose was and what difference I wanted to make, I didn't have a well-developed answer, but I did have a strong sense that I wanted my work to make a positive difference in my community, " Gilbertson said. "Now that I have more life experiences, I refined things and know that I'm motivated by helping people have better quality lives, especially around wellness, using resources wisely and the environment. Knowing my vision and purpose helps guide my actions, decisions and solutions — especially during challenging times." W

Gilbertson with her mother, Colleen Nyland, at Gilbertson's graduation from UW ECE (then UW EE) in 1985. Nyland passed away earlier this year, and Gilbertson used part of the inheritance from her mother to fund the "You Rock" Endowed Scholarship. Gilbertson said that using her inheritance in this way helped to align what was important to her mother with her own set of values. She found the experience of doing this to be constructive and healing, and she is pleased that together, she and her mother will be creating a permanent legacy for others. Photo: Graig Gilbertson

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Gilbertson (far right) with her siblings (from left to right) Mary, Judy and Graig at a family wedding in Alaska. Gilbertson grew up with her brother and sisters in the small mountain town of Idaho Springs, Colorado. As a youngster, she enjoyed adventures in the Colorado mountains and Utah desert canyons with her family. Gilbertson said of her siblings, "They are very special to me and great role models for building community, family, faith and friendship." Photo: Nadine Schliebe

> "Ultimately, I decided that my experience and education through UW ECE was so transformative, and continues to be, that one of the best things I could do was to give somebody a hand into that experience."
>
> – Booga Gilbertson

Gilbertson is the senior vice president and chief operations officer of Puget Sound Energy. She is known to be a highly effective and successful leader in the power industry, and she has built her reputation leading teams through complex, high-stakes problem solving. Photo: Bill Wright / Puget Sound Energy
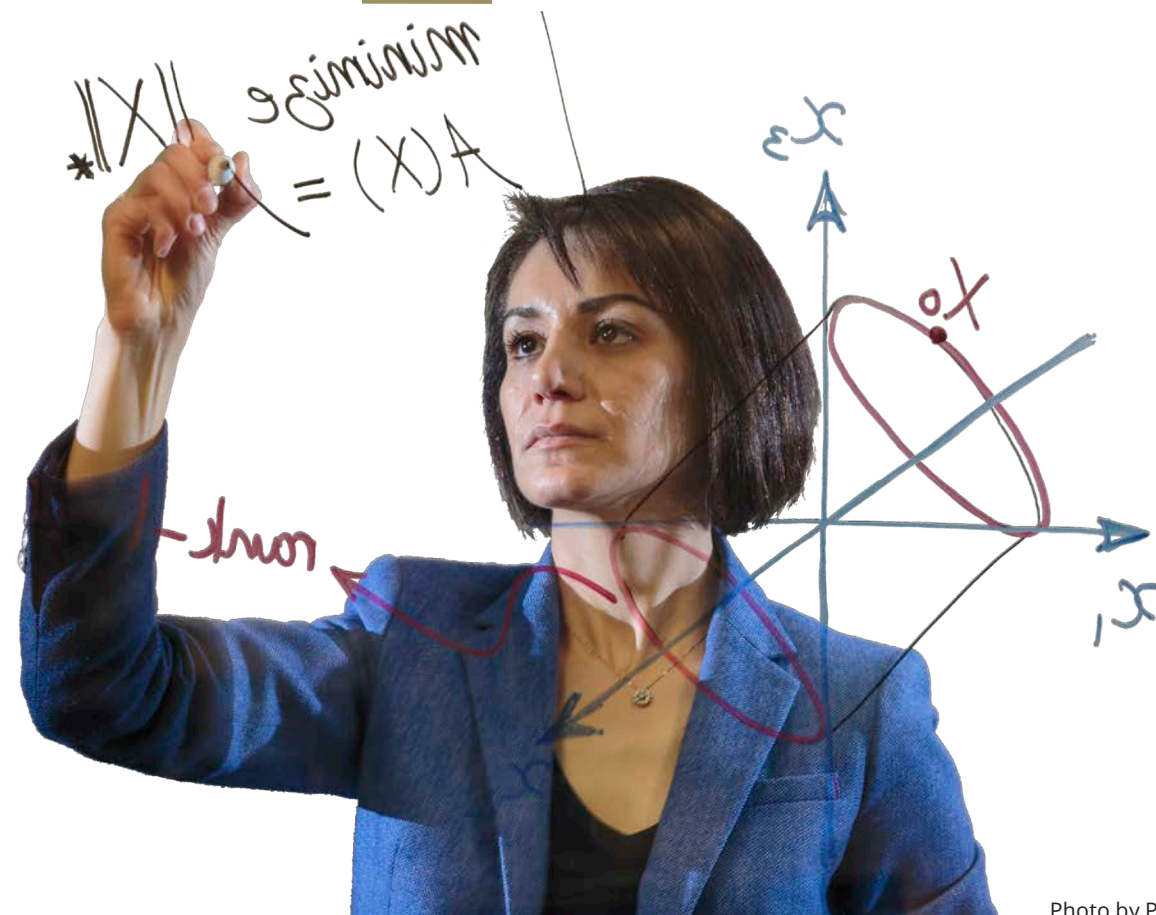
UW ECE TRAILBLAZERS

UW ECE trailblazers are honored for the work they do to effect positive change in the world. Our academic pioneers' far-reaching research has created important paths for other electrical and computer engineering scholars to build upon, while our industry leaders' groundbreaking enterprises have provided important solutions that improve lives.

Photo by Patrick Bennett

Maryam Fazel receives Moorthy Professorship, launches new Institute for Foundations of Data Science

Adapted from articles by Wayne Gillam (UW ECE)
and Jackson Holtz (UW News)

Maryam Fazel has built a solid reputation throughout her career as a trailblazer, dissolving barriers between electrical engineering, computer science, statistics and math. She is known for the high caliber of her research work and for finding innovative ways to apply mathematical methods from one field to solve problems in another.

"So often, you find people in different areas of engineering and the sciences who are working on the same foundational mathematical problems but using different terminology and techniques," Fazel said. "Making connections through shared mathematical formulations and building bridges between disparate areas has been a strong theme in my research."

As a professor and Associate Chair for Research in the University of Washington Department of Electrical & Computer Engineering (UW ECE), Fazel has earned the respect and admiration of her peers. Her current research focuses on addressing pressing computational and statistical challenges in data science algorithms.

"Professor Fazel is one of the world's experts on the theory of mathematical optimization and its applications to machine learning, signal processing and control systems," said UW ECE professor and Chair Eric Klavins. "She is a dedicated teacher, adviser, mentor and leader. In her role as the Associate Chair for Research in our department, her guidance and collegiality are indispensable."

In recognition of her outstanding, innovative work as a researcher and educator, Fazel was recently named the inaugural recipient of the Moorthy Family Inspiration Career Development Professorship. This generous endowment was established in 2019 by Ganesh and Hema Moorthy for the purposes of recruiting, rewarding and retaining UW ECE faculty members who have demonstrated a significant amount of promise early on in their careers.

"I am grateful to the Moorthy family for their vision and generosity in establishing this professorship. I feel truly honored to be chosen as the first recipient," Fazel said. "I am especially excited that my group's current research focus on foundations of data science and

machine learning will directly benefit from this support."

Fazel also has plans for using the professorship award to assist the UW ECE department, including improving remote-work setups, hosting visiting research collaborators, helping to sponsor special lectures and tutorials, and filling in funding gaps for graduate students engaged in research.

"As the UW ECE Associate Chair for Research, I appreciate that this gift will impact the scholarship and innovation of its faculty recipient for many years to come. It's a gift to the future of our whole department," Fazel said.

For the past several years, Fazel has focused on producing algorithms capable of reaching accurate conclusions despite limited or corrupted data. For example, her work on the problem of estimating low-rank matrices or "matrix completion" connected an approach from the field of signal processing to solving mathematical problems in recommender systems and dynamical system identification. These research findings significantly impacted the fields of machine learning and control systems, and the paper has been cited by other scholarly publications over 3,000 times.

In another project, Fazel's team observed that recent technological advances in robotics and artificial intelligence were enabled by machine-learning methods that were commonly used but not well understood. Her team has been filling this knowledge gap by combining the viewpoints of machine learning and control theory (examining the behavior of dynamical systems) to better understand these methods and be able to improve them in a principled manner. Through this new understanding, they are finding ways to make machine-learning methods more robust and resilient in uncertain, ever-changing environments.

"Hema and I are very happy to learn that Maryam Fazel will be the inaugural recipient of the professorship," Moorthy said. "Her fields of interest in data science and machine learning are exciting areas of contemporary innovation, and we are very pleased that our endowment may support further advances in her areas of focus."

> **I am grateful to the Moorthy family for their vision and generosity in establishing this professorship."**
>
> –Maryam Fazel

Strengthening the foundations of data science

In addition to her UW ECE roles, Fazel also launched and is leading the new Institute for Foundations of Data Science (IFDS), a collaboration between the UW and the Universities of Wisconsin-Madison, California Santa Cruz, and Chicago, with a mission to develop a principled approach to the analysis of ever-larger, more complex and potentially biased data sets that play an increasingly important role in industry, government and academia.

The IFDS is supported by a $12.5 million grant from the National Science Foundation (NSF) and its Transdisciplinary Research in Principles of Data Science, or TRIPODS, program. The NSF named IFDS as one of two institutes nationwide receiving the first TRIPODS Phase II awards. TRIPODS is tied to the

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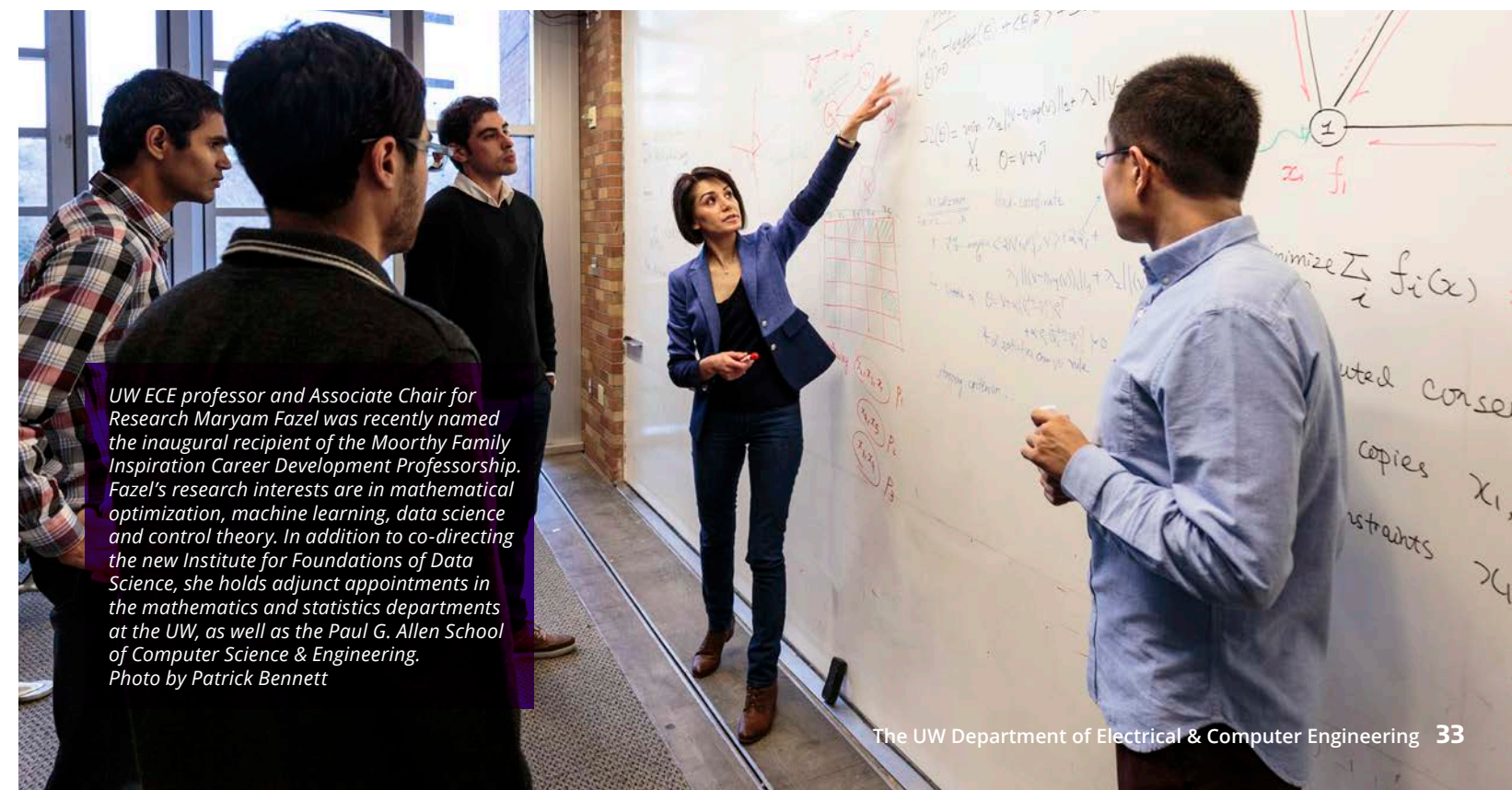
UW ECE professor and Associate Chair for Research Maryam Fazel was recently named the inaugural recipient of the Moorthy Family Inspiration Career Development Professorship. Fazel's research interests are in mathematical optimization, machine learning, data science and control theory. In addition to co-directing the new Institute for Foundations of Data Science, she holds adjunct appointments in the mathematics and statistics departments at the UW, as well as the Paul G. Allen School of Computer Science & Engineering.
Photo by Patrick Bennett

Institute for Foundations of Data Science

NSF's Harnessing the Data Revolution (HDR) program, which aims to accelerate discovery and innovation in data science algorithms, data cyberinfrastructure and education and workforce development.

"With NSF's $25 million investment, these interdisciplinary teams will be able to tackle some of the most important theoretical and technical questions in data science," said NSF Division Director for the Division of Mathematical Sciences Juan Meza.

IFDS research will lead to algorithmic decision-making processes that tackle incomplete or ambiguous datasets and are better able to respond and act in changing environments. The team will also study some of the ethical implications of data-driven algorithms.

"As data science is increasingly incorporated in all facets of our lives, its success is uncovering pressing challenges that call for new theories," said Fazel, who is lead principal investigator for the IFDS. "We need the expertise of all core disciplines to understand the mysteries and to address the pitfalls of data science and artificial intelligence algorithms."

The UW IFDS team, clockwise from top left: Maryam Fazel, Zaid Harchaoui, Kevin Jamieson, Yin Tat Lee, Abel Rodriguez and Dmitriy Drusvyatskiy. Photos: University of Washington

"The success of the UW team in establishing the IFDS stems from having fantastic faculty from four departments, representing both arts and sciences and engineering, working collaboratively on the most important foundational questions of data science," said Nancy Allbritton, dean of the College of Engineering. Dan Pollack, dean for the Natural Sciences, added, "We are confident that this multi-institutional, multi-disciplinary effort will shape the future of the field."

Fazel and the UW team of investigators have been laying the groundwork for IFDS during the past three
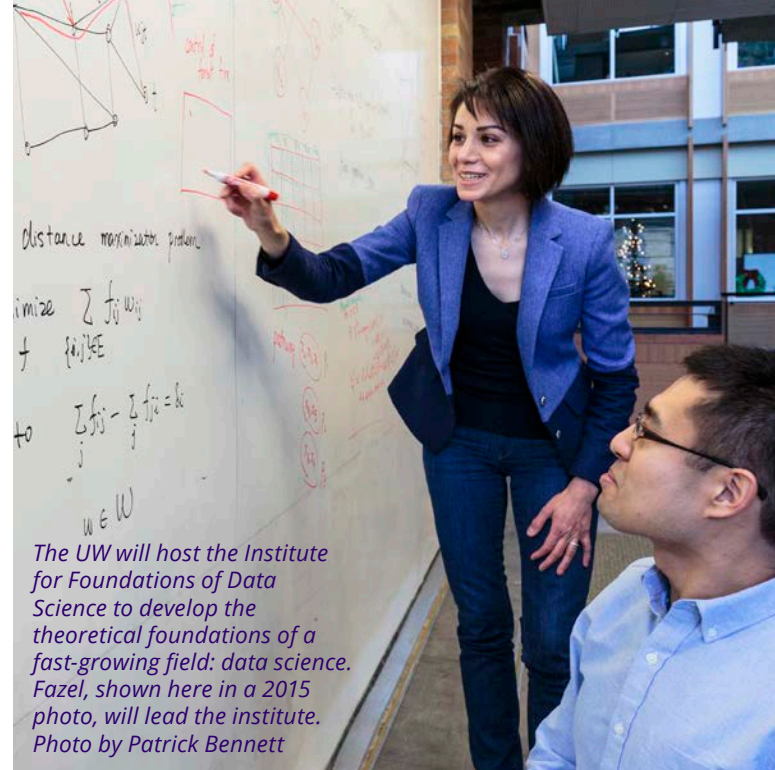
The UW will host the Institute for Foundations of Data Science to develop the theoretical foundations of a fast-growing field: data science. Fazel, shown here in a 2015 photo, will lead the institute. Photo by Patrick Bennett

years. UW's Phase I TRIPODS Institute was established in 2017 with a $1.5 million award from the NSF. Since then, the team has collaborated across disciplinary boundaries to address reliability and scalability of data science algorithms, and has also forged new partnerships.

"The strategic partnership between Washington and Wisconsin was crucial to the success of IFDS in the Phase II competition, and we are excited to build on this relationship over the next five years, " said Stephen Wright, a professor of computer science who headed the TRIPODS Phase I effort at the University of Wisconsin.

In 2018, Fazel and the UW team received three additional awards from the NSF's new TRIPODS+X program, through which members of the team partnered with other researchers to address data science challenges in fields such as robotics and epidemiology.

"IFDS is an exciting culmination of these Phase I efforts," said Fazel. "It opens the door to further collaborations across our partner institutions and with practitioners in academia and industry, and helps place the UW and Seattle prominently in the national data science research effort."

IFDS will cultivate existing ties with the UW eScience Institute, as well as work with the newly-announced NSF AI Institute, in which UW also participates.

In addition to Fazel, the UW IFDS team includes Zaid Harchaoui, associate professor of statistics, Dmitry Drusvyatskiy, associate professor of mathematics, as well as Kevin Jamieson and Yin Tat Lee, assistant professors in the Paul G. Allen School of Computer Science & Engineering. The original UW team was recently joined by Abel Rodriguez, professor and chair of the statistics department, who comes to the UW from the University of California, Santa Cruz and serves as the diversity liaison for the Institute. Ⓦ
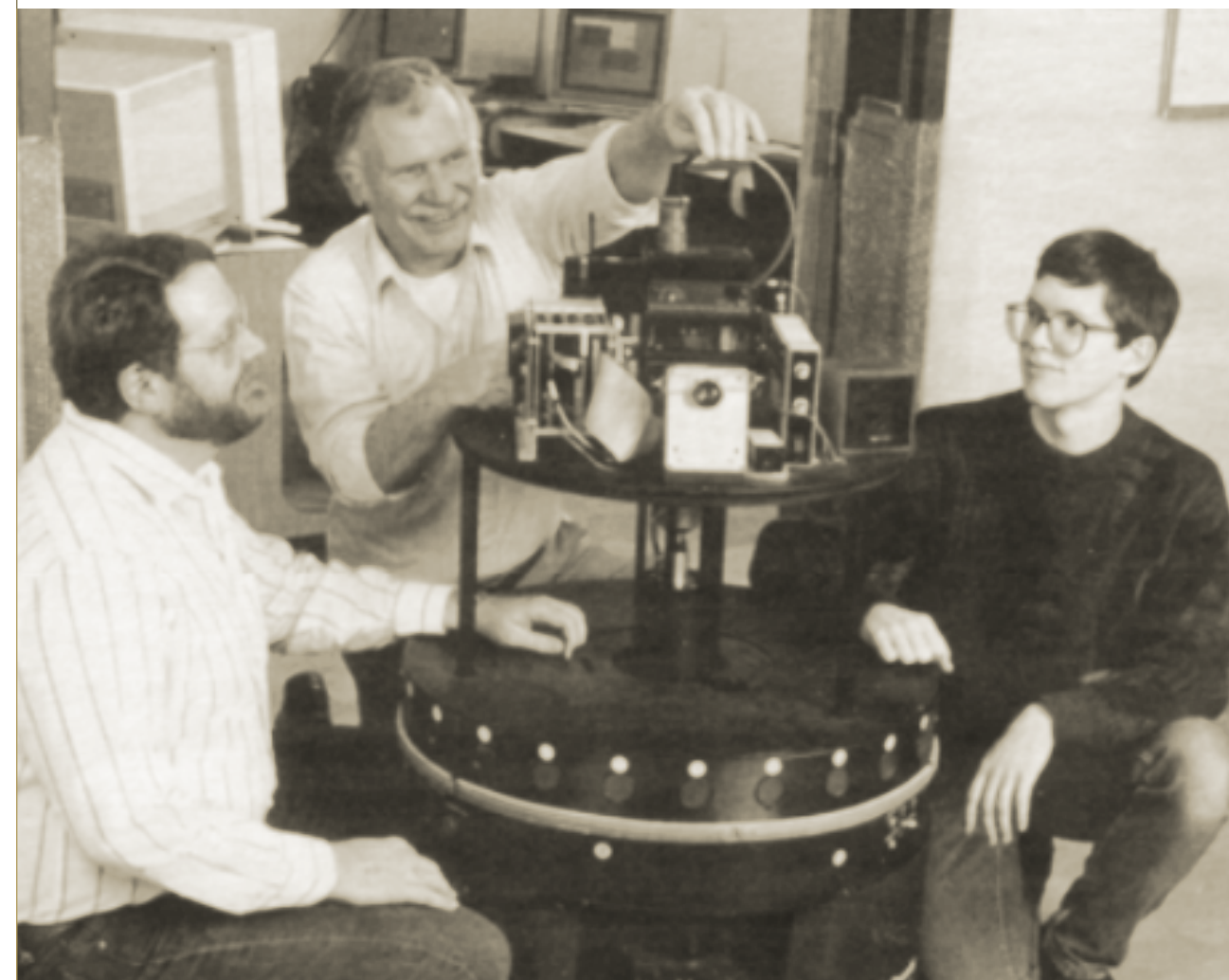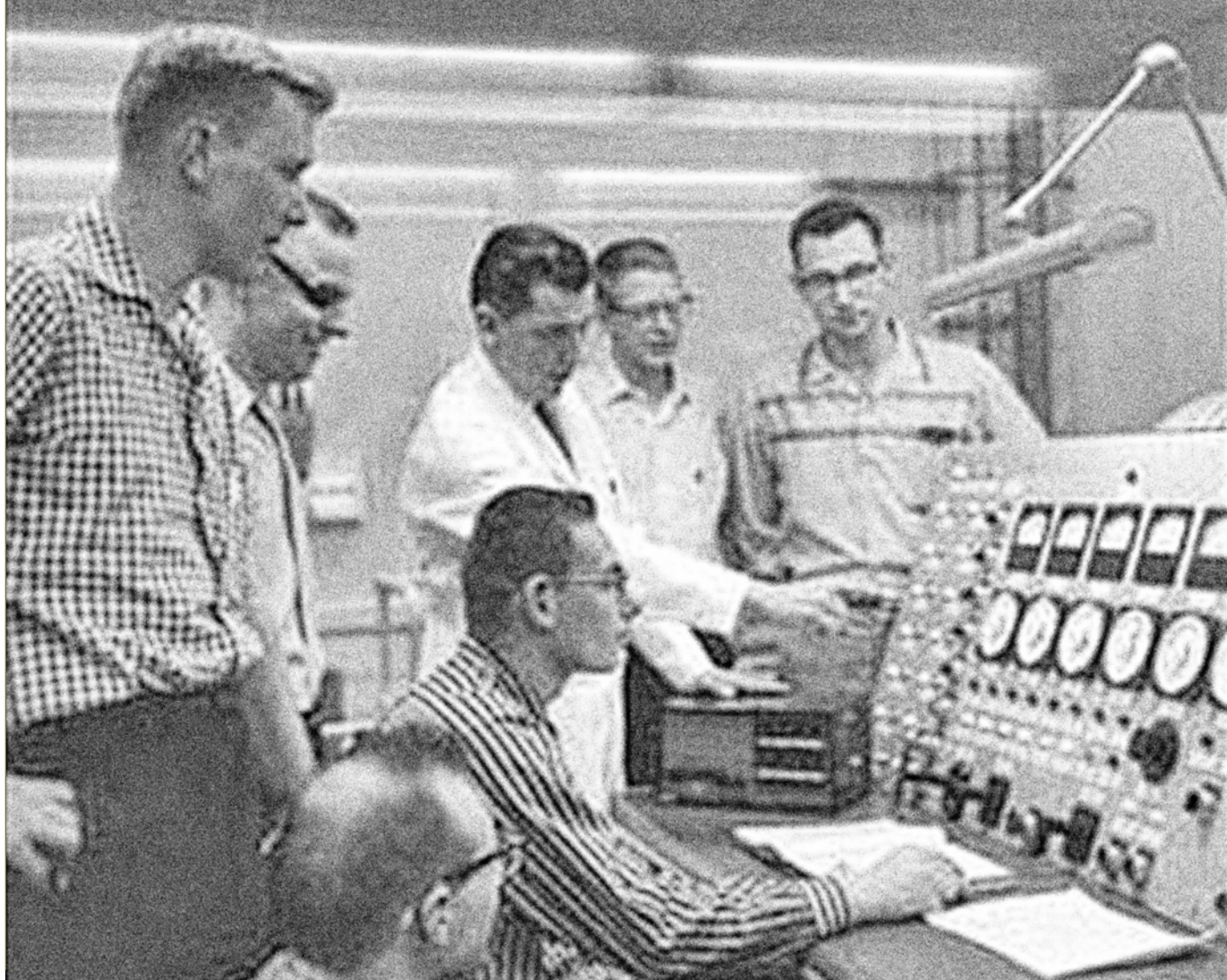
IN MEMORIAM

REMEMBERING OUR FRIENDS | HONORING THEIR LEGACIES

Below: Albrecht (center) with two students, next to "Miss Marple," a mobile robot designed and engineered in 1992.

ROBERT ALBRECHT:
A professor's long career and vision for the future leaves an ongoing legacy
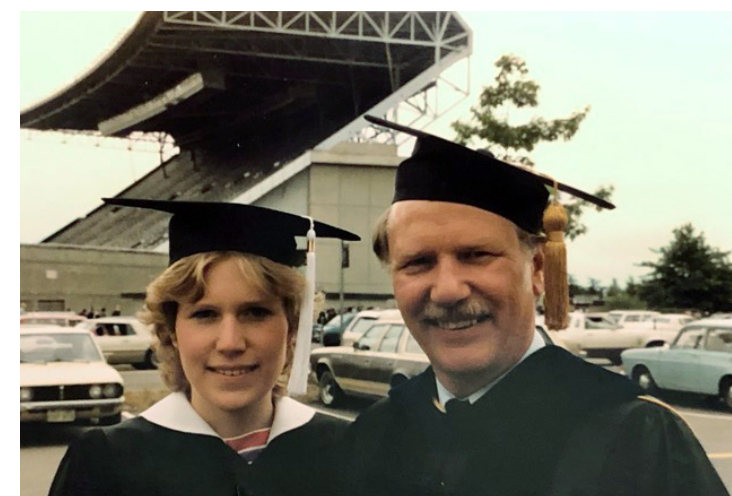
Story by Wayne Gillam

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A photo of Albrecht's pilot license. Albrecht always carried it with him in his wallet, even after having to give up flying because of health reasons.

Albrecht next to a Beechcraft Bonanza he piloted as a member of the Lynn Air Flying Club.

Opposite page:
Albrecht (far left, checked shirt) is shown here as a graduate student at the University of Michigan. He earned his master's and doctoral degrees in nuclear engineering with a fellowship from the Atomic Energy Commission, graduating with his Ph.D. in 1961. He was the first member of his family to attend college.

Albrecht and his daughter, Liz Behlke, at her graduation from the UW.
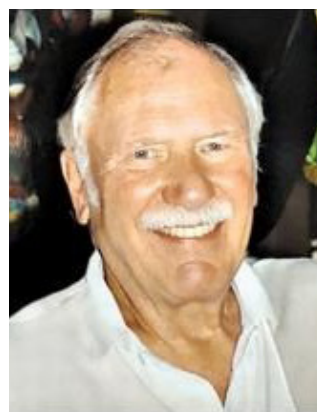
On June 6, 2020, UW ECE Professor Emeritus Robert (Bob) Albrecht passed away at his Seattle home from complications arising from inclusion body myositis. He was 85 years old.

Albrecht joined the UW in 1961 as a professor of nuclear and electrical engineering. In 1984, the Nuclear Engineering Department was dissolved, and Albrecht's focus shifted to teaching electrical engineering full-time. In 1989, he became the Associate Chair of Research and Development in UW ECE (then UW EE). During his 40-year career, Albrecht mentored many graduate students, taught classes at all levels, and consulted at nuclear plants and research facilities around the world. In his last decade teaching at the UW, he created an autonomous robotics lab to do early work on mobile robotic control, navigation and integration of artificial intelligence. He was known for being visionary, bold, frank and straightforward.

"One of Bob's mobile robots was recruited to lead a UW ECE graduation ceremony in Husky stadium back in the 1990s, and one of his robots also brought out the ball for the first pitch at a Husky baseball game," UW ECE professor Bruce Darling said. "I was so sorry to hear about Bob's passing. It's more than just losing a friend and colleague; it feels like losing an institution."

"Bob used to push for us to pursue telepresence as the next big research area for electrical engineering. Most faculty members groaned in response. But Bob was prescient," UW ECE professor Les Atlas recalled. "His examples of telepresence anticipated teleconferencing, which is an integral part of our lives now."

A love for engineering, and for flying

Albrecht's long career at the UW demonstrated his passion for engineering, and he loved to fly. In fact, he fell in love with his wife while both were working at Boeing the summer before they graduated with their Bachelor of Science degrees in engineering from Purdue University in 1957. That summer, Albrecht also had the opportunity to work in flight testing for the Boeing 367-80 jet aircraft. After earning his Master of Science and doctoral degrees in nuclear engineering from the University of Michigan in 1958 and 1961, he earned his private pilot license and flew whenever he had a chance.

"One thing that Dad's colleagues will remember about him is his love of flying," Albrecht's daughter Liz Behlke said. "He often would fly graduate students out to see the Hanford Site or take visiting colleagues on sightseeing trips around the Puget Sound."

Albrecht enjoyed flying Beechcraft Bonanzas as a member of the Lynn Air Flying Club for many years. He continued to carry his pilot's license in his wallet long after his medical condition forced him to give up flying.

A lifelong support for education

Albrecht was known as having an unflagging support for higher education and for being an optimistic, engaging storyteller with a big heart. He remained intellectually active after retiring in 2001, establishing the Wednesday Lunch Bunch (WLB), which welcomed retired UW faculty and all-comers for weekly discussions and camaraderie at the University of Washington Club. He presided over these lunches for 20 years, with a sense of humor, as the self-appointed "Grand Poobah." He also wrote and published a book, "Introduction to the Beauty of Calculus," at the age of 81. His friends and colleagues remember him as someone who was always intellectually sharp, well-read and never afraid to engage in a friendly debate.

"Bob was a well-respected member of UW ECE, and he was well-loved by many in our community," said UW ECE professor and Chair Eric Klavins.

Albrecht was a person unafraid of new, big ideas. His hopeful vision of the future encompassed forward-thinking technologies and his legacy continues today in the lives of those he touched, both nearby and far away.

"I was personally inspired by Bob and challenged to make new things happen in the future," Atlas said. "As I think about it, that's likely why I pursued certain research projects, which over time ended up as what are now my most-cited papers."

"He introduced me to the idea of mobile robotics in the courses I took from him in the early 1990s," said Jesus Savage, one of Albrecht's former graduate students. "This gave me a foundation for the work I currently do as a robotics professor at the School of Engineering of the National Autonomous University of Mexico. I'm very grateful for this knowledge."

Albrecht is survived by his wife, Mary; his son, Robert Albrecht Jr., with daughters Renee and Amelia; and his daughter, Liz Behlke with her daughter Aurora. A bench memorializing Albrecht will be installed on the UW campus after campus operations temporarily halted by the novel coronavirus pandemic have resumed. ⓦ

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Students in Rania Hussein's EE 475 Embedded Systems capstone course, winter quarter 2020. Photo: Ryan Hoover

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