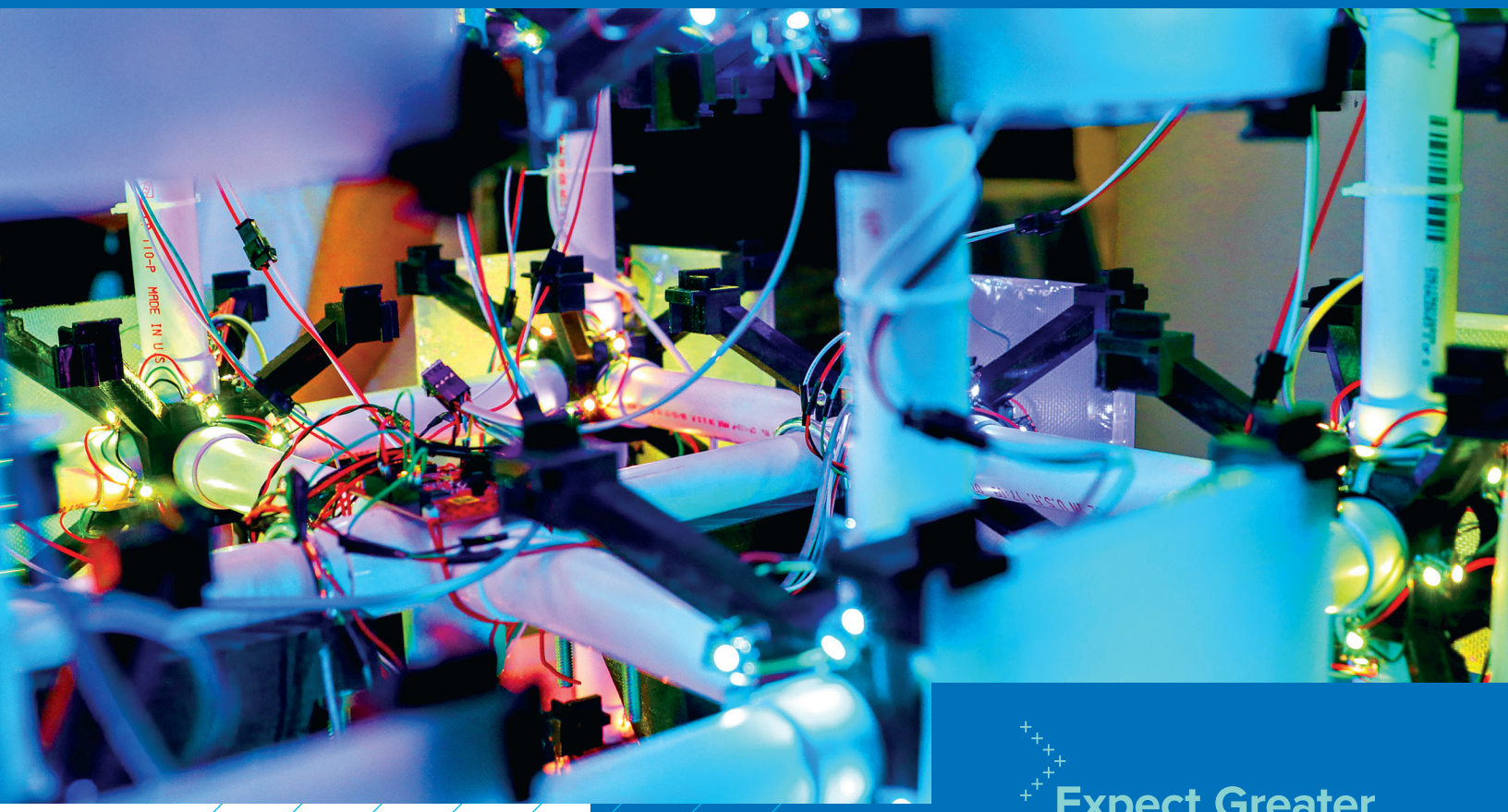
UC DAVIS
COLLEGE OF ENGINEERING

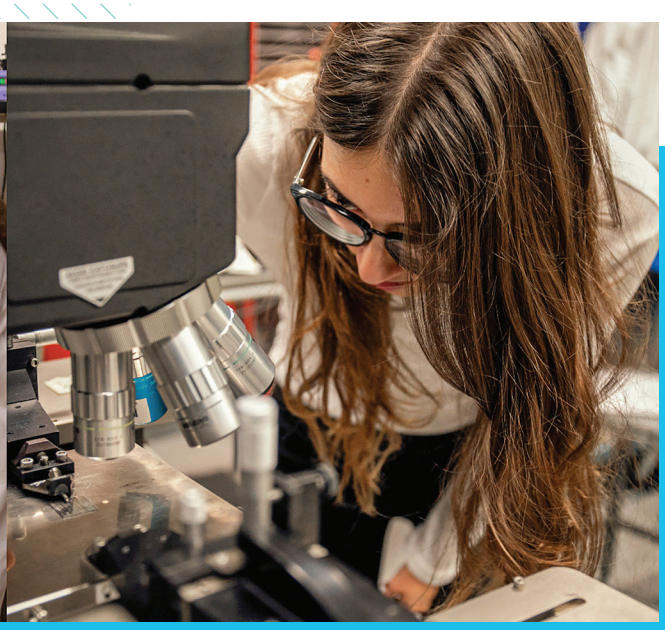
Building a

Better Tomorrow

THE UC DAVIS DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING



Expect Greater
From UC Davis. For the World.



Advances in electrical and computer engineering are redefining how we live today and how we imagine our future.

They're transforming health care—from the cardiologist using robotic surgery to perform a heart transplant, to the first responder using AI to help deliver fluids to a trauma patient at the scene of an accident. They're allowing us to reinvent global business and industry—from the cybersecurity system that helps a bank avert a fraud attempt, to quantum cryptography that secures a diplomatic message. And they're changing the course of daily life—from smart irrigation sensors that help grow much of today's grocery produce, to self-driving cars that could soon be at the doorsteps of tomorrow's independent living facilities.

Every day and across the globe, electrical and computing engineering innovations like these power and protect our world. And all of them started with the ingenuity of engineers who asked, **"How can we build a better tomorrow?"**

Today, UC Davis' electrical and computer engineers are driven by that same question. We believe that solving tomorrow's urgent challenges requires the expertise and foresight to anticipate problems and opportunities that the world hasn't yet seen.

To keep building toward a better world, we also have to prepare our students—the future innovators who will take up these challenges—to lead the way in industries that have yet to be created.

Our faculty are taking on some of the most critical challenges of the 21st century, with transformational impacts from medicine to the global marketplace. Their work is breaking new ground in high-performance and power-efficient computing, high bit-rate communication, pervasive sensor networks, radio frequency technologies, machine learning and computer vision, big data and cybersecurity, nanomanufacturing and energy harvesting, and more. Working alongside our faculty and leveraging our proximity to Silicon Valley, our students gain the hands-on, collaborative experience that will prepare them to build even further on this work as tomorrow's leaders.

With your partnership, we will achieve even greater impact. Thank you for joining with us as we realize a bold vision for the future of electrical and computer engineering—at UC Davis and around the world.

Sincerely,
André Knoesen
Distinguished Professor and Chair,
Department of Electrical and
Computer Engineering

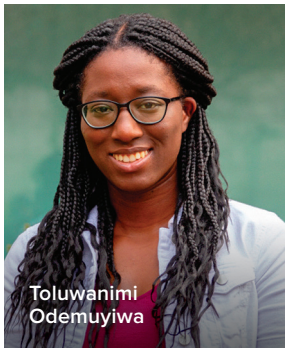
Realizing a Bold Vision

The Department of Electrical and Computer Engineering (ECE) is pursuing an ambitious vision with far-reaching impact on the world around us. Our groundbreaking leadership in engineering education, research, innovation and industry collaboration is driven forward by four key themes:

- **Informing strategic decision-making:** Enabling multidimensional technologies that meet the ever-growing demand for devices and systems that integrate information more efficiently across frequency, time and space
- **Leveraging technology to solve global challenges:** Optimizing technology-enabled collaborations across disciplines, materials, devices and systems to better address key challenges in energy, transportation, food production, water management, health care and more
- **Evolving with a world in flux:** Enhancing AI and machine-learning capabilities—from physical devices to system-level applications—to create intelligent systems that are context-aware, domain-specific and adaptive to changing environments
- **Responding to climate change:** Driving sustainable, energy-efficient environmental solutions that address global climate challenges through technological innovations and systems

Achieving this vision requires foresight, partnership and investment—in our students, in our faculty and researchers, and in the leading-edge physical environment needed to propel their work to the next level.

Informing strategic decision-making: Next-generation data analytics


Toluwanimi Odemuyiwa

In an information-driven world, analyzing data more efficiently is a key industry challenge—especially as the nature of data itself evolves.

As one of only 45 scholars worldwide to hold a prestigious Microsoft Research PhD Fellowship, UC Davis ECE doctoral student **Toluwanimi Odemuyiwa** is working to solve this challenge.

"Our world runs on data, and these days, we're producing more data than ever before," explained Odemuyiwa. "A lot of this data is 'sparse'—that is, it contains missing information, either intentionally or unintentionally." While traditional architectures were not designed for sparse data computation, Odemuyiwa seeks to build on several recent advances, such as compressing data and designing smarter algorithms for more efficient processing.

Her fellowship positions her to advance this work while applying it directly to global industry challenges. "I have come to recognize the importance of university-industry collaborations in identifying and solving practical problems," said Odemuyiwa. "The ECE department has provided that kind of platform since I arrived; I feel fortunate that this scholarship will allow me to further expand it to Microsoft."

Leveraging technology to solve global challenges: Improving health outcomes during labor and delivery


Soheil Ghiasi

In the U.S., caesarean deliveries account for almost a third of all births. One leading reason for C-sections are cases in which doctors suspect hypoxia—insufficient blood oxygen supply that can result in fetal brain injury, developmental disorders and even death.

Fetal oxygen levels have traditionally been difficult to measure accurately, leading to frequent false alarms that result in unnecessary C-sections. Until recently, doctors relied primarily on monitoring uterine contractions and fetal heart rate to gauge health during labor and delivery—without a reliable means of monitoring fetal oxygen levels.

ECE professor **Soheil Ghiasi** was inspired by his own daughter's delivery when he developed and patented the transabdominal fetal pulse oximeter (TFO) as a non-invasive, easy to use, and relatively low-cost device that accurately measures fetal blood oxygen saturation levels through the abdominal wall. Ghiasi has since launched a startup, Storx Technologies, a medical device spinoff that could help scale this device to health facilities worldwide—reducing unnecessary C-sections and leading to better health outcomes as well as lower health care costs.

Evolving with a world in flux: Machine-learning algorithms enhancing health care


Chen-Nee Chuah

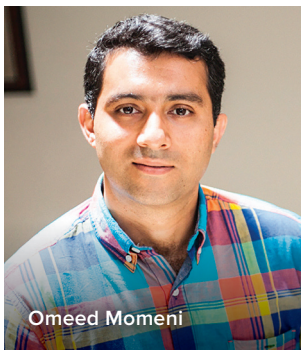
Exceptional patient care has always been a collaborative endeavor—and in today's clinics, machine-learning algorithms are vital care partners. ECE professor **Chen-Nee Chuah** is teaming with UC Davis colleagues across multiple disciplines to enhance this critical health partnership.

Chuah is examining how deep-learning algorithms impact medical care, from enabling earlier patient diagnoses by identifying data patterns a human might miss, to improving disease prognosis and advancing medical interventions like mechanical ventilators and fluid administration management. Chuah has also partnered on Covid-related applications of intelligent learning. With ICU physician **Jason Adams**, she helped design AI-driven detection of Acute Respiratory Distress Syndrome, which can assist in prioritizing care for newly infected Covid-19 patients. She is also working with mechanical and aerospace engineering professor **Cristina Davis** on an NIH-funded project to develop a breath-based Covid test.

Chuah's other collaborations include leveraging machine learning to detect life-threatening neonatal defects, a Department of Defense-funded project to optimize post-trauma care, and an NIH-funded video project that could aid early detection of autism.

These projects illustrate the remarkable scope of support that machine learning offers patients and physicians. "We aren't replacing human doctors," said Chuah. "We envision an AI-assisted clinical decision-making support system with humans in the loop."

Responding to climate change: Optimizing irrigation one leaf at a time


Omeed Momeni

Sustainably maximizing crop production while minimizing climate impacts is a global challenge—and one that takes on special urgency in California, whose bountiful agricultural sector is vital to feeding the nation and the world, but also accounts for approximately 80% of all water use in the state.

ECE professor **Omeed Momeni** is tackling this challenge leaf by leaf, partnering with UC Davis plant sciences colleagues to advance a new precision irrigation solution that could significantly reduce agricultural water usage by helping farmers avoid inadvertently overwatering plants. Momeni's lab is developing a tiny, low-power sensor that can be easily attached to the back of a leaf and monitor water content for months without needing to be recharged.

His team has already successfully tested a prototype of the sensor that achieved record results in terms of resolution and accuracy of measurement. Now, they are working to make the sensor even more efficient by increasing the frequency of its measurements while reducing its size and power consumption—innovations with the potential to transform water management practices in the field.

Partnering for a Brighter Future: The Philanthropic Opportunities

With the support of philanthropic and industry partners who share our vision to build a better tomorrow, we will rise to the challenges of an ever-changing world—and prepare the next generation of innovators who will lead the way.

Ensuring successful student outcomes

An investment in our ECE students is an investment in the global thinkers who will change the world. Our driving vision is to create an educational atmosphere where every electrical and computer engineer has the resources they need to achieve their greatest potential.

Name undergraduate scholarships that foster diversity, advance academic excellence and open doors to a world-class engineering education

GOAL: $1 MILLION TO ENDOW OR $50,000 ANNUALLY

Establish graduate fellowships that facilitate diversity and academic excellence while supporting tomorrow's technology innovators

GOAL: $1 MILLION TOTAL

$500,000 TO ENDOW A FELLOWSHIP OR $50,000 ANNUALLY PER FELLOWSHIP

Create a student emergency assistance fund providing small grants for computers, books and other vital forms of short-term support

GOAL: $150,000 TO ENDOW OR $7,500 ANNUALLY

Fund travel awards that expand opportunities for professional learning and networking

GOAL: $250,000 ENDOWMENT OR $25,000 ANNUALLY TO FUND 15 AWARDS PER YEAR

Developing state-of-the-art infrastructure

Preparing tomorrow's leading engineers to be creative problem-solvers starts with state-of-the-art teaching and learning environments. Our faculty, students and staff can thrive in spaces that inspire unconventional thinking and provide access to the latest technologies.

Expand and upgrade teaching laboratories to support hands-on learning

GOAL: $500,000 TOTAL

Maintain cutting-edge equipment that supports faculty and student innovation

GOAL: $2 MILLION ENDOWMENT OR $50,000 ANNUALLY

Providing flexible departmental support for sustained excellence

Unrestricted philanthropic support provides an important funding source for emerging opportunities and pressing student, faculty and staff priorities.

Contribute unrestricted gifts to an excellence fund that supports meeting new challenges and responding to emerging opportunities

GOAL: $1 MILLION TO ENDOW OR $100,000 ANNUALLY

Advancing innovative research and faculty expertise

Philanthropic support plays a crucial role in accelerating discovery, amplifying the impact of faculty teaching, catalyzing technology transfer and championing innovation.

Endow positions to recruit and retain world-class faculty in strategic areas, including:

- AI and Machine Learning
- Data Science and Engineering
- High-Frequency System Impacting and Next-Generation Communication and Imaging Technologies
- Sensor Interfaces and Data Conversion
- Signal Detection, Parameter Estimation and Random Processes

GOAL: AT LEAST 2 NEW ENDOWED POSITIONS

$2 MILLION TO ENDOW A CHAIR; $1.5 MILLION TO ENDOW A PROFESSORSHIP OR $50,000-$80,000 ANNUALLY PER POSITION

Provide seed funding for early-stage innovative research ideas

GOAL: $1 MILLION ENDOWMENT OR 3 GRANTS OF $30,000 PER YEAR

Bring researchers and thought leaders to campus by supporting a distinguished lecture series

GOAL: $500,000 ENDOWMENT OR $20,000 ANNUALLY

UC DAVIS COLLEGE OF ENGINEERING

For more information, please contact College of Engineering Development and External Relations at engrdev@ucdavis.edu