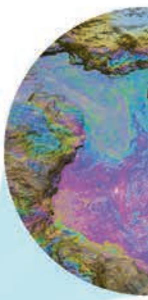
McCormick School of Engineering and Applied Science

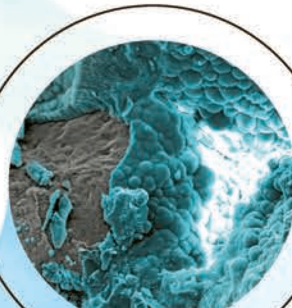
NORTHWESTERN ENGINEERING

FALL 2025



TURNING THE TIDE

DEVELOPING TECHNOLOGIES TO PROTECT, MANAGE, AND RECOVER WATER RESOURCES



TRACKING WATER QUALITY IN THE FIELD

Joaquina Noriega, a Northwestern Engineering PhD candidate, deploys a water quality monitoring instrument at Gensburg-Markham Prairie—the largest remaining prairie in Illinois. The instrument is part of the SMARTWATER project, a multi-institutional collaboration with partners in the United Kingdom set to transform how communities understand and manage water pollution. It collects real-time data to study how ecosystems influence water flow and pollution.

inset, top Noriega is pictured leading a field demonstration with PhD candidate Upasana Larson, undergraduate Alexander Barb, and visiting Texas A&M University master's students Lois Williams and Alejandro Juarez, to explore how land, water, and climate interact.

inset, bottom Technicians with the US Geological Survey, the nation's largest water, earth, and biological science and civilian mapping agency, partner with the Northwestern team to deploy a similar instrument at another site.

By combining environmental sensing, data science, and local expertise, SMARTWATER aims to predict pollution "hotspots" in Chicago-area rivers. This high-frequency monitoring is uncovering how land use, rainfall, and climate shape contamination—insights that could guide city planning and targeted interventions to protect water quality.

Photos courtesy of Joaquina Noriega

"I AM INSPIRED BY THE CONTINUED MOMENTUM FOR OUR SCHOOL. WE HAVE COME TOGETHER TO MEET THIS MOMENT, AND I KNOW OUR EFFORTS WILL CONTINUE TO PAY DIVIDENDS."

GREETINGS FROM NORTHWESTERN ENGINEERING

Like many universities across the country, we began this school year still facing significant headwinds. Yet at the same time, we welcomed a record undergraduate class, an outstanding cohort of new faculty, and exceptionally strong classes of MS and PhD students. As our students returned to campus, I was inspired by the energy and excitement they brought.

That is because engineers prosper in times of uncertainty. Watching our students, faculty, and staff innovate in both the lab and classroom—creating solutions that benefit society—is one of the true pleasures of my job. This issue highlights just some of the wide range of projects that both solve problems and lay the groundwork for a bright future.

One area of immediate impact is water. Our faculty members are working to help people access safe drinking water by developing technologies to detect and remove contaminants from water supplies. They are also studying how to put those contaminants to new and better uses.

This issue also features our impact in materials research—a longtime strength of Northwestern Engineering. Our teams are using new methods to design materials that can help batteries last longer and structural materials that are stronger and more sustainable.

Finally, to lay the groundwork for the future, we continue to focus on providing adaptive and innovative education that meets and anticipates the needs of today and tomorrow. You might wonder how we are handling the rise of generative AI tools in our computer science courses. We want our students to learn the fundamentals of CS without using shortcuts, but we also know that students need to understand how to use these tools in their careers. I hope you'll read more about our approach.

I am inspired by the continued momentum for our school. We have come together to meet this moment, and I know our efforts will continue to pay dividends. I'm grateful to the alumni and friends who have shared their support over this past year, and I'm excited to move forward together.

CHRISTOPHER A. SCHUH
Dean, McCormick School of Engineering and Applied Science

On the Cover
Northwestern Engineering faculty and students are working to create safe, reliable water supplies while innovating to both control water and harness its full potential. Read more on page 12.

Northwestern Engineering is published by the Robert R. McCormick School of Engineering and Applied Science, Northwestern University, for its alumni and friends.

Northwestern | McCORMICK SCHOOL OF ENGINEERING

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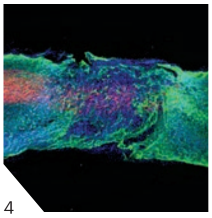

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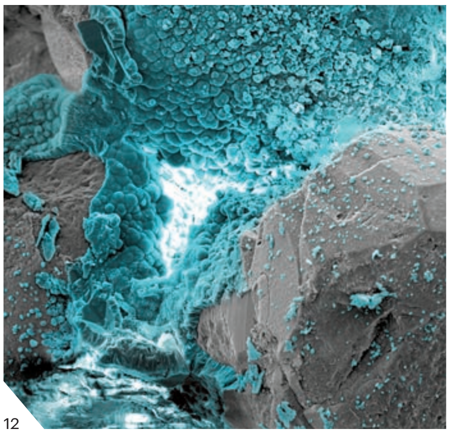

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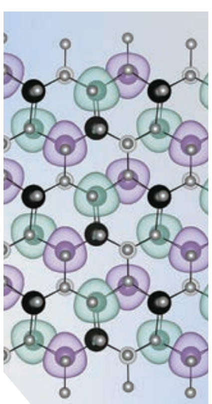

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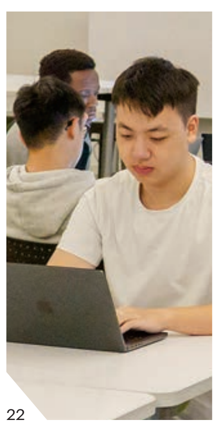

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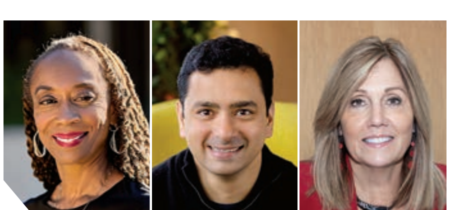

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NORTHWESTERN ENGINEERING
FALL 2025

NEWS

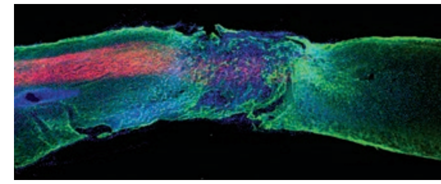
"Dancing Molecules" Treatment Receives FDA Orphan Drug Designation

"Dancing molecules," the promising new treatment developed at Northwestern for acute spinal cord injuries, has received orphan drug designation from the US Food and Drug Administration.

Developed by Professor Samuel I. Stupp, the therapy harnesses molecular motion to reverse paralysis and repair tissues after traumatic spinal cord injuries. Stupp, a regenerative nanomedicine pioneer, first introduced the platform in 2021 in a study published in the journal *Science*. In that study, a one-time injection administered 24 hours after severe injury helped mice regain the ability to walk just four weeks after treatment.

The FDA's Orphan Drug Designation Program is designed to encourage and support the development of treatments for rare diseases or conditions. The designation's benefits include financial incentives such as tax credits for clinical trials, exemption from user fees, and up to seven years of market exclusivity after approval.

Amphix Bio, a company spun out from Stupp's Northwestern laboratory, is targeting late 2026 for the first trials in spinal cord injury patients and is now completing safety studies required for regulatory approval to begin human trials.



The FDA's Orphan Drug Designation Program is designed to encourage and support development of treatments for rare diseases or conditions.

After just one injection, Stupp's therapy reversed paralysis in mice four weeks after treatment.

"WE ARE ON THE RIGHT TRACK IN DEVELOPING A NEW SOLUTION TO TREAT THIS DEBILITATING AND VERY CHALLENGING CONDITION."

Samuel I. Stupp
Board of Trustees Professor of Materials Science and Engineering, Chemistry, Medicine, and Biomedical Engineering

Northwestern Scientists Start Projects Using the Vera C. Rubin Observatory

With the recent release of its first images, the Vera C. Rubin Observatory in Chile is one step closer to launching its Legacy Survey of Space and Time (LSST)—a decade-long astronomical investigation with the potential to transform humanity's understanding of the universe.

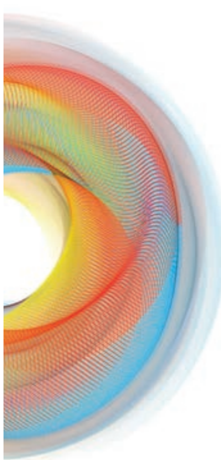
Several Northwestern scientists have played integral roles in LSST since 2014, contributing scientific leadership and innovation to help shape the endeavor. Members of Northwestern's Center for Interdisciplinary Exploration and Research in Astrophysics and the NSF-Simons AI Institute for the Sky will develop and refine AI tools capable of processing LSST's unprecedented amounts of data. They will also lead projects to understand the evolution of stars, search for the origins of heavy elements, and uncover new cosmic explosions.

AMEET MALLIK SHARES LESSONS THAT SHAPED HIS INNOVATION

At the 2025 PhD Hooding and Master's Recognition Ceremony held June 16 at Welsh-Ryan Arena, Ameet Mallik ('94, MS '95) said his time at Northwestern sparked new ways of approaching problems. The CEO of ADC Therapeutics, Mallik recalled four guiding lessons from Northwestern that have helped him throughout his career: Be a lifelong learner, do things that fulfill a sense of purpose, nurture relationships, and live an intentional and balanced life.

"Make space for what fuels you," he said. "Work is just one part of life, and integrating it with your passions and personal priorities will ensure that life doesn't just happen to you—instead you'll actively shape it."

NORTHWESTERN NETWORK FOR COLLABORATIVE INTELLIGENCE TO EMPOWER UNIVERSITY-WIDE USE OF DATA SCIENCE AND AI



The network will harness Northwestern's interdisciplinary strengths to advance responsible, high-impact research and education in data science and AI.

"I LOOK FORWARD TO CONNECTING WITH KEY LEADERS THROUGHOUT THE NORTHWESTERN COMMUNITY TO HELP SHAPE THIS EXCITING, CROSS-DISCIPLINARY INITIATIVE."

V.S. Subrahmanian
Walter P. Murphy Professor of Computer Science

Northwestern has launched an institutional network dedicated to the integration of data science and AI across all aspects of research and education.

The Northwestern Network for Collaborative Intelligence will bring together University experts in data science and AI to empower all Northwestern faculty and students to use and benefit from AI tools in their work. The NNCI aims to create a robust ecosystem of collaboration between Northwestern researchers and external organizations—including businesses, government agencies, and nonprofits—to leverage AI in addressing societal needs. The network also will help to ensure that all students have access to a baseline education in data science and AI to prepare them for the demands of an evolving workforce.

"The Northwestern Network for Collaborative Intelligence is a unique model that recognizes the immense potential of data science and AI to transform nearly all aspects of higher education," Northwestern Provost Kathleen Hagerty says.

Computer science professor V.S. Subrahmanian has been appointed as one of the founding co-directors of the NNCI. An international leader in the use of AI for national and global security, he is also the founding director of the Northwestern Security and AI Lab.

Housed within the Office of the Provost, the NNCI will act as a central hub that connects to and supports units throughout the University. This will include initiatives based in individual schools as well as research centers and institutes dedicated to cross-disciplinary study of specific topics or needs. The model is designed to be adaptive over time, allowing new initiatives to arise and connect to the central network to promote innovative applications of these transformational technologies.

NNCI will sponsor a number of events for the Northwestern community to explore the impact of AI on topical areas. It will also build experiential learning opportunities for Northwestern students at all levels.

Pioneering Medical Research Institute Launches with Gift from Kimberly Querrey

Northwestern University Trustee Kimberly K. Querrey ('22, '23 P) made a $10 million gift to create and enhance the Querrey Simpson Institute for Regenerative Engineering at Northwestern University (QSI RENU), bringing her total giving to the institute to $35 million. The new institute will advance the development of medical tools that empower the human body to heal, focusing on the regeneration or reconstruction of tissues and organs such as the eyes, cartilage, spinal cord, heart, muscle, bone, and skin.

Building on the University's longstanding excellence in cross-disciplinary team science and Querrey's two decades of visionary support of the biosciences at Northwestern, QSI RENU will tackle the most complex challenges in regenerative medicine. As part of a University-wide priority to advance the biosciences, the large-scale institute will help accelerate patients' recovery from injuries and surgeries, develop bioengineered tissues and organs to reduce reliance on donor transplants, and more.

The institute's inaugural director is Professor Guillermo Ameer, a leader in regenerative engineering.

Segal Design Institute Teams Win Big at VentureCat 2025

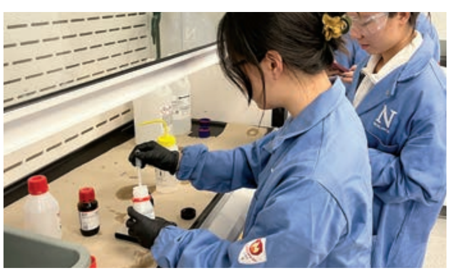
Graduate students and an alum from the Segal Design Institute earned second- and third-place honors at VentureCat 2025, Northwestern's annual University-wide startup competition, held May 28. In the competition, student-founded ventures compete across five industry tracks for a prize pool of more than $175,000.

Second place and a $50,000 prize went to MMM Program students Yutaro Nishiyama, Théry Badin, and Evan Lai (all MMM '25) for InstaEnglish, a personal English-speaking coach designed to help users achieve conversational fluency in just 10 months.

Third place and the Audience Favorite Award, totaling $30,000, went to Angie Mercurio (EDI '17, MBA '26), cofounder and CEO of nLab. Her company combines the world's smallest electronics lab with an interactive platform that teaches hands-on circuit-building—empowering learners with the skills needed for critical tech roles.

100 MILLION Strain rate per second that a new method developed by Luciano Borasi and Christopher Schuh can measure material strength

15 Percent boost in radiograph report completion efficiency with a new AI system developed by Mozziyar Etemadi



3D Printing Adds New Dimensions to Core Course on Soft Materials

Soft Materials, a core undergraduate course in the Department of Materials Science and Engineering, now provides a hands-on approach to learning outcomes that integrates fundamental principles with practical application.

The course's Resin Design Labs challenge students to develop, refine, and optimize their own materials and 3D-print their own resins. Now equipped with a dozen desktop resin 3D printers available for small teams, the course is designed to integrate a range of interdisciplinary materials science topics such as polymerization reactions and the structure-property relationships of polymers. The course was developed by Professor Ryan Truby.

VIVIAN REILLY NAMED CO-OP STUDENT OF THE YEAR

Mechanical engineering student Vivian Reilly was awarded the Walter P. Murphy Cooperative Engineering Education Program Student of the Year for 2025. The Co-op Program allows engineering students to alternate periods of academic study with periods of full-time, paid work experience. Reilly did her co-op at Austin, Texas-based Enovis, a company that produces orthopedic implants. "Working with seasoned engineers allowed me to learn so much," she says. "They were all eager to teach me everything and really embraced me as part of the team."

MATTHEW SKARUPPA HIGHLIGHTS FEAR, LOVE, AND COMPULSION IN GRADUATION SPEECH

When he delivered his address to Northwestern Engineering's undergraduate Class of 2025 on June 16, Matthew Skaruppa ('04) said there are three feelings that have driven almost every major decision in his life: fear, love, and compulsion. Skaruppa, the chief financial officer for Duolingo, challenged the graduates to view their own futures through a similar lens.

"Fear can drive achievement, but it makes every success feel hollow and fragile," he said. "Go serve that world—not because you're afraid, but because there is no greater love, no better use of your education, and no stronger compulsion than using your talents to help others. Go give your gifts to the world."

LAB NOTES

BREASTFEEDING DEVICE MEASURES BABIES' MILK INTAKE IN REAL TIME

While breastfeeding has many benefits for parents and their babies, it has one major drawback: It's incredibly difficult to know how much milk the baby has consumed. To take the guesswork out of breastfeeding, an interdisciplinary team of engineers, neonatologists, and pediatricians at Northwestern has developed a new wearable device that can provide clinical-grade, continuous monitoring of breast milk consumption.

The unobtrusive device softly and comfortably wraps around the breast of a nursing parent during breastfeeding and wirelessly transmits data to a smartphone or tablet. Because each person has differences in breast density, shape, and size, the device can be personalized through a single calibration. Parents can then view a live graphical display of how much milk their baby has consumed in real time.

To ensure its accuracy and practicality, the device endured several stages of rigorous assessments, including theoretical modeling, benchtop experiments, and testing on a cohort of new mothers in the hospital. While the current version of the device detects the amount of milk flowing out of the breast, future iterations could measure milk refilling into the breast.

"Knowing exactly how much milk an infant is receiving during breastfeeding has long been a challenge for both parents and healthcare providers," says Professor John A. Rogers, who led the device development. "This technology eliminates that uncertainty, offering a convenient and reliable way to monitor milk intake in real time, whether in the hospital or at home."

The new technology could help reduce parental anxiety and improve clinical management of nutrition for vulnerable babies in the neonatal intensive care unit.

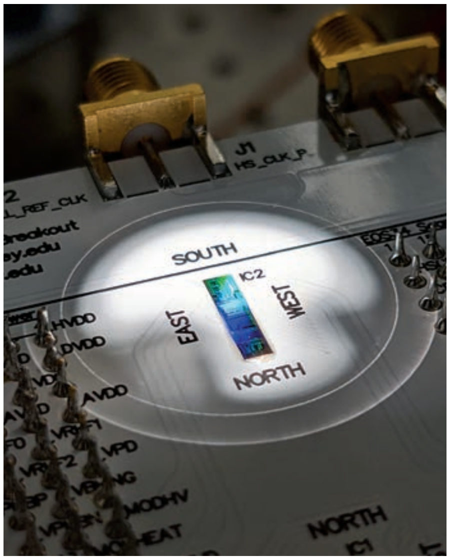
After developing prototypes, the team tested the device on 12 breastfeeding mothers. To assess whether the device was consistent and reliable over time, the researchers took multiple measurements from the same mothers over as long as 17 weeks.

Watch a video showing how the wearable breastfeeding device works.

New Strategy Doubles Chemo Effectiveness in Treatment-Resistant Cancer

In a wholly new approach to cancer treatment, Northwestern biomedical engineers have doubled the effectiveness of chemotherapy in animal experiments. Instead of attacking cancer directly, this first-of-its-kind strategy prevents cancer cells from evolving to withstand treatment—making the disease easier to target with existing drugs. Not only did the approach nearly wipe out the disease in cellular cultures, it also dramatically increased the effectiveness of chemotherapy in mouse models of human ovarian cancer.

"Cancer cells are great adapters," says Professor Vadim Backman, who led the study. "They can adapt to almost anything that's thrown at them. First, they learn to evade the immune system. Then, they learn how to adapt to chemotherapy, immunotherapy, and radiation. When they resist these treatments, they live longer and acquire mutations. We did not set out to directly kill cancer cells. We wanted to take away their superpower—removing their inherent abilities to adapt, to change, and to evade."



First Electronic-Photonic Quantum Chip Manufactured in Commercial Foundry

For the first time, scientists at Northwestern, Boston University, and the University of California, Berkeley have built a tiny photonic quantum system into a traditional electronic chip.

This first-of-its-kind silicon chip combines quantum light-generating components (photonics) with classical electronic control circuits—all packed into an area measuring just one millimeter by one millimeter. Not only does the chip generate quantum light, it also has its own built-in smart electronic system to keep that light perfectly stable. The Northwestern work was led by Professor Prem Kumar.

This photonic-electronic integration enables the single chip to reliably produce a stream of photon pairs—basic units that encode quantum information—required for light-based quantum communication, sensing, and processing. A commercial semiconductor foundry fabricated the chip, demonstrating its ability to be manufactured for large-scale production.

3 Amount, in millions of dollars, of the NSF Trailblazer Engineering Impact Award given to Professor Petia Vlahovska

$400,000 Gift from the Forsythe Family Foundation that will support the Northwestern University Center for Engineering in Vision and Ophthalmology as it develops innovative tools to better understand and treat glaucoma

"BONE-IFIED MUSCLES" COULD BE ROBOTS' NEXT FLEX

Northwestern Engineering researchers have developed a soft artificial muscle, paving the way for untethered animal- and human-scale robots. The new muscles, or actuators, provide the performance and mechanical properties required for building robotic musculoskeletal systems.

To demonstrate the artificial muscle's capabilities, the engineers implemented them into a life-size humanoid leg, complete with rigid plastic "bones," elastic "tendons," and even a sensor that enables the robot to "feel" its movements. The leg used three artificial muscles—a quadricep, hamstring, and calf—to bend its knee and ankle joints. The muscles are compliant enough to absorb impacts but still can apply enough strength and motion to kick a volleyball off a pedestal.

Each muscle weighs about as much as a soccer ball and is slightly larger than a can of soda. It can stretch up to 30 percent of its length, shrink, and lift objects 17 times heavier than itself. Perhaps most crucial to its use in robotic bodies, the muscle can be battery powered, bypassing the need for heavy, external equipment.

"Robots are typically constructed from rigid materials and mechanisms that enable precise motion for specific tasks," says Professor Ryan Truby, who led the study. "But the real world is constantly changing and incredibly complex. Our goal is to build bioinspired robotic bodies that can be flexible, adaptable, and embrace the uncertainty of the physical world."

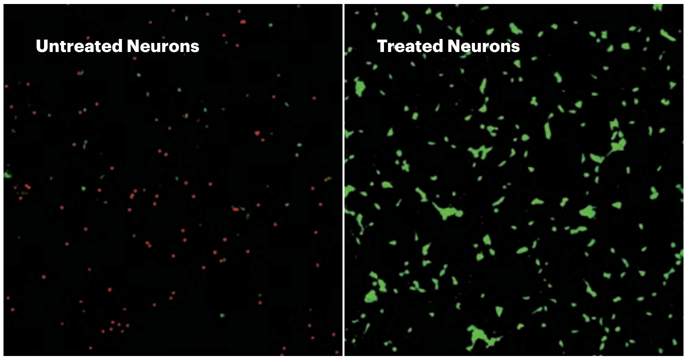
The new muscles, or actuators, provide the performance and mechanical properties required for building robotic musculoskeletal systems.

"BY ENGINEERING NEW MATERIALS FOR ROBOTICS WITH THE PERFORMANCE AND PROPERTIES OF BIOLOGICAL MUSCULOSKELETAL SYSTEMS, WE CAN BUILD ROBOTS TO BE MORE RESILIENT AND ROBUST FOR REAL-WORLD USE."

Ryan Truby
June and Donald Brewer Junior Professor of Materials Science and Engineering and Mechanical Engineering

The new bioinspired materials innovation could change how robots walk, run, interact with humans, and navigate the world around them.

See these bioinspired artificial robotic muscles in action and read more about this research.



SUGAR-COATED NANOTHERAPY DRAMATICALLY IMPROVES NEURON SURVIVAL IN ALZHEIMER'S MODEL

Scientists led by Professor Samuel I. Stupp have developed a new approach that directly combats the progression of neurodegenerative diseases like Alzheimer's disease and amyotrophic lateral sclerosis (ALS).

In these devastating illnesses, proteins misfold and clump together around brain cells, leading ultimately to cell death. Stupp's research group developed a peptide amphiphile to treat neurodegenerative diseases and added an extra ingredient: a natural sugar called trehalose. When added to water, the peptide amphiphiles self-assembled into nanofibers that effectively trap the proteins before they can aggregate into the toxic structures capable of penetrating neurons.

The trapped proteins then harmlessly degrade in the body. The "clean-up" strategy significantly boosted the survival of lab-grown human neurons under stress from disease-causing proteins.

2 CM Size of the first wearable device for measuring gases emitted from and absorbed by the skin, developed by John Rogers, Guillermo Ameer, and Yonggang Huang

Brewing Tea Removes Lead from Water

Good news for tea lovers: That daily brew might be purifying the water, too. Northwestern Engineering researchers demonstrated that brewing tea naturally adsorbs heavy metals like lead and cadmium, effectively filtering dangerous contaminants out of drinks. Heavy metal ions stick to, or adsorb to, the surface of the tea leaves, where they stay trapped. Steeping time played the most significant role in tea leaves' ability to adsorb metal ions.

The longer the steeping time, the more contaminants were adsorbed.

"We're not suggesting that everyone starts using tea leaves as a water filter," says Professor Vinayak P. Dravid, who led the study. "For this study, our goal was to measure tea's ability to adsorb heavy metals. By quantifying this effect, our work highlights the unrecognized potential for tea consumption to passively contribute to reduced heavy metal exposure in populations worldwide."

Systemically Injectable Therapy Could Prevent Heart Failure After a Heart Attack

Engineers at Northwestern and University of California, San Diego have developed a new, potent injectable therapy that can protect the heart from damage after a heart attack.

Led by Professor Nathan Gianneschi, the team developed specially designed polymers that act like proteins and "grab" onto regulatory proteins that blunt the body's natural healing process. With those proteins out of the way, the healing proteins are free to do their job—preventing stress and inflammation.

After showing success in cell culture, the scientists tested their new therapy in a rat model of a heart attack. Following a single, low-dose intravenous injection, the animals experienced decreased inflammation and cell death along with improved cardiac function and increased growth of new blood vessels.

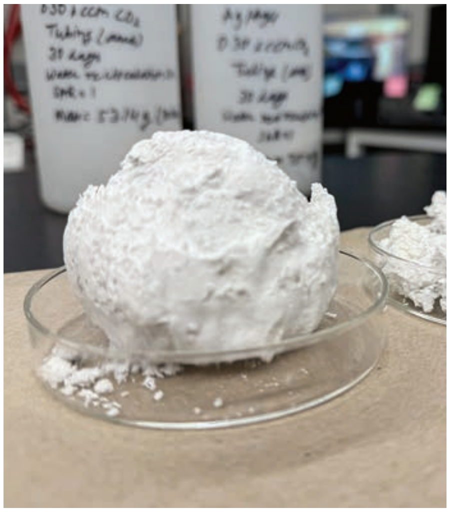
160 Number of educators, researchers, and industry professionals who convened in May to explore the role of AI in education through the interdisciplinary lens of the learning sciences

ROBOTIC TOUCH SENSORS ARE NOT JUST SKIN DEEP

Researchers at Northwestern and Israel's Tel Aviv University have overcome a major barrier to achieving a low-cost solution for advanced robotic touch.

In their study of robotic touch sensors, inexpensive silicon rubber composites used to make skin were observed to host an insulating layer on the top and bottom surfaces, which prevented direct electrical contact between the sensing polymer and the monitoring surface electrodes. That made accurate and repeatable measurements virtually impossible. With the error eliminated, cheap robotic skins could allow robots to mimic human touch, allowing them to sense an object's curves and edges, necessary to properly grasp it.

Led at Northwestern by Professor Matthew Grayson, the team provided a path forward with practical steps for validating electrical contacts, which might unknowingly be obscuring device performance.



NEW CARBON-NEGATIVE MATERIAL COULD MAKE CONCRETE AND CEMENT MORE SUSTAINABLE

As Earth's climate continues to warm, researchers around the globe are exploring ways to capture CO_2 from the air and store it deep underground. While this approach has multiple climate benefits, it does not maximize the value of the enormous amounts of atmospheric CO_2.

Northwestern Engineering scientists, including Professors Alessandro Rotta Loria and Jeffrey Lopez, developed a new strategy to address this challenge by locking away CO_2 permanently and turning it into valuable materials that can be used to manufacture concrete, cement, plaster, and paint.

To generate the carbon-negative material, the researchers inserted electrodes into seawater and applied an electric current, which split water molecules into hydrogen gas and hydroxide ions. Leaving the electric current on, the researchers bubbled CO_2 gas through seawater, which increased the concentration of bicarbonate ions.

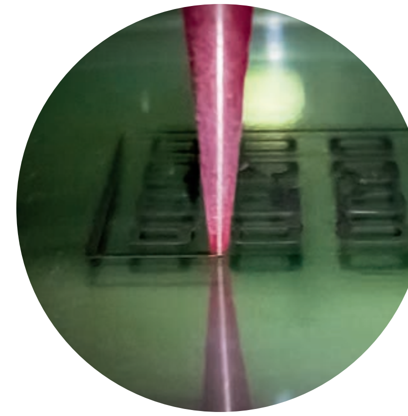
Finally, the hydroxide ions and bicarbonate ions reacted with other dissolved ions, such as calcium and magnesium, that occur naturally in seawater. The reaction produced solid minerals, including calcium carbonate and magnesium hydroxide. Calcium carbonate directly acts as a carbon sink, while magnesium hydroxide sequesters carbon through further interactions with CO_2. These materials could be used in concrete as a substitute for sand or gravel.

SYNTHESIS OF 2D COPPER BORIDE UNLOCKS NEW CLASS OF ADVANCED MATERIALS

Professor Mark Hersam and his team successfully synthesized two-dimensional copper boride, a new material with the potential to impact technologies in next-generation computing and energy storage. The discovery marks the experimental realization of a 2D metal boride, a class of materials that has primarily been limited to theoretical studies.

Crystalline structures only one or a few atoms thick, 2D materials are prized for their unique electronic, magnetic, and mechanical properties. While well-known examples such as graphene and borophene have been widely studied, 2D metal borides have largely remained out of reach because of longstanding challenges in synthesizing them.

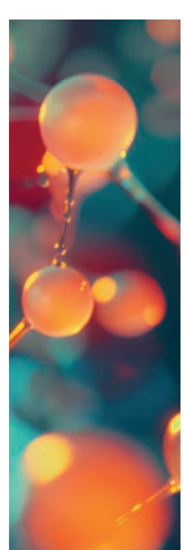
This new work shows that copper boride can be produced by depositing atomic boron onto copper surfaces at high temperatures. Proposed future work includes testing 2D copper boride in applications ranging from high-performance computing to advanced energy systems.



Printing a Superior Superconductor

Superconductor materials can power medical imaging for MRIs and allow trains to float above tracks as they move, saving energy. Yet, the more advanced superconductors have a frustrating downside: their ceramic property makes them brittle.

Professor David Dunand and collaborators from Fermi National Accelerator Laboratory developed a method to successfully produce single-crystal YBCO—a common polycrystal superconductor—using 3D printing. The researchers were able to remove the material's grain boundaries, small defects in crystal structures that can lessen a material's electrical and thermal conductivity. This presented a more effective superconducting current in a material that was less brittle.



SCIENTISTS SHOW LIVE CATALYTIC EVENT IN REAL TIME

Scientists have, for the first time, directly observed catalysis in action at the atomic level. In mesmerizing videos, single atoms move and shake during a chemical reaction that removes hydrogen atoms from an alcohol molecule. Viewing the process in real time, the researchers discovered several short-lived intermediate molecules involved in the reaction and a previously hidden reaction pathway.

Observing reactions in this manner helps scientists understand how catalysts work. These new insights could lead to designs for more efficient and sustainable chemical processes. The observations were made possible by single-molecule atomic-resolution time-resolved electron microscopy (SMART-EM), a powerful instrument that enables researchers to watch individual molecules react in real time. Professors Tobin Marks and Michael Bedzyk led the Northwestern part of this international collaboration.

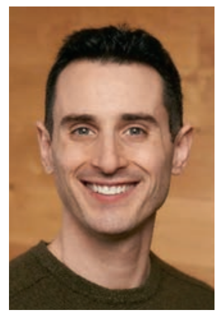

John Rogers


Julius Lucks


Xiao Wang


Yonggang Huang


James Rondinelli


Sam Kriegman


Brian Uzzi


Chris Wolverton


Liz Gerber


Joshua Leonard


Linsey Seitz


Prem Kumar


Jonathan Rivnay


Niall Mangan


Dashun Wang

Faculty Awards

John Rogers and Yonggang Huang Honored with Two Namesake Medals
The International Conference on Computational & Experimental Engineering and Sciences created the John Rogers/Yonggang Huang Medal for outstanding researchers with a history of collaboration. Texas A&M University's Hagler Institute for Advanced Study created the John Rogers/Yonggang Huang Medal to honor the best research paper by a Hagler fellow with a Texas A&M student.

Brian Uzzi Elected to the American Academy of Arts and Sciences
The Academy, one of the nation's oldest and most prestigious honorary societies, recognizes leaders across disciplines.

Two Faculty Inducted into AIMBE College of Fellows
Joshua Leonard and Jonathan Rivnay are part of the American Institute for Medical and Biological Engineering's College of Fellows Class of 2025.

Two Faculty Elected Fellows of the American Association for the Advancement of Science
Julius Lucks and James Rondinelli are part of a Fellows class that includes 471 scientists, engineers, and innovators spanning 24 scientific disciplines.

Chris Wolverton Named Fellow of Materials Research Society
He was honored as an MRS Fellow for pioneering contributions to computational materials science and its impact on materials design and discovery.

Linsey Seitz Receives Camille Dreyfus Teacher-Scholar Award
Seitz will use the unrestricted $100,000 grant from the Camille and Henry Dreyfus Foundation to advance her research in sustainable electrocatalytic technologies.

Three Faculty Named Sloan Research Fellows
The honor from the Alfred P. Sloan Foundation for Niall Mangan, Linsey Seitz, and Xiao Wang highlights their creativity, innovation, and research accomplishments.

Sam Kriegman Receives Prestigious NSF CAREER Award
With this award for early-career researchers, Kriegman and his team aim to evolve novel robots with important new capabilities that are difficult or impossible to design by hand.

Liz Gerber Inducted into ACM SIGCHI Academy
The Association for Computing Machinery's Special Interest Group on Computer–Human Interaction honored Gerber for advancing collective intelligence research.

Two Faculty Named 2025 Researchers to Know
Created by the Illinois Science & Technology Coalition, the list spotlights state leaders in innovation and includes Prem Kumar and Dashun Wang.

TURNING THE TIDE

NORTHWESTERN ENGINEERING RESEARCHERS DEVELOP TECHNOLOGIES TO PROTECT, MANAGE, AND RECOVER RESOURCES FROM OUR WATER SUPPLY.

Water—essential to life and fundamental to society—has become increasingly more threatening and under greater threat. People everywhere struggle to mitigate the effects of harmful pollutants that contaminate the water supply; droughts that endanger reserves for drinking, agriculture, and energy; and flooding and erosion that undermine infrastructure and the safety of communities.

Worldwide, nations and communities grapple with how to secure safe, reliable supplies of this most essential resource and how best to control and harness its full potential. Because of the complexity of these challenges, no single field of expertise has all the answers, and sometimes, just as water itself is known to do, research done in one discipline flows naturally into another.

Close to home

At Northwestern Engineering, research teams are detecting and removing contaminants from water supplies and studying how to put those contaminants to new and better uses. Some are discovering more efficient ways to use water for energy while their colleagues are devising methods for combatting water's power for destruction.

Their collective work benefits from a natural laboratory just steps from campus—Lake Michigan, one of the world's largest freshwater systems. "We have this incredible resource right in our backyard," says Aaron Packman, professor of civil and environmental engineering. "It gives us both the opportunity and the responsibility to develop solutions that matter locally, nationally, and globally."

Another factor nearby helps move University research into practical application: the City of Chicago's ambition to become a hub for water innovation. Collaborations with local water management experts and access to local resources create channels for municipalities, companies, and community groups to adopt University-developed technologies and strategies.

"We are front and center not only with the greatest resource we have on the planet, but also in confronting the issues," notes Julius Lucks, Margery Claire Carlson Professor of Chemical and Biological Engineering.

CLIMATE-RESILIENT COMMUNITIES

Northwestern Engineering's leadership in water research aligns with one of the school's strategic priorities: Climate-Resilient Communities. Drawing on strengths across disciplines, researchers are developing innovative ways to build, preserve, and restore urban systems that support human activities. As Northwestern addresses water issues from multiple angles, it builds resilience of water supplies, infrastructure, and a thriving water economy that can continue to serve long into the future.

A LOW-COST TEST FOR CONTAMINANTS

Though proximity to Lake Michigan means Northwestern's local community has plenty of fresh water to draw from, more than 2 billion people worldwide lack access to safely managed drinking water. Millions more live in places where water quality is uncertain or untested. These communities have an urgent need for a simple, affordable way to detect contaminants before they cause harm.

At Northwestern, Lucks has led the development of a portable, low-cost solution for detecting contaminants in water: ROSALIND. The platform uses synthetic biology to create "cell-free" reactions—biological components extracted from cells that can be freeze-dried onto paper or other materials. When these components are rehydrated with a water sample, they react to the presence of specific contaminants by producing a visual signal, often a simple color change.

"What ROSALIND allows you to do is **take the power of biology** and put it in anyone's hands to **understand their water.**"

Julius Lucks
Margery Claire Carlson Professor of Chemical and Biological Engineering

ROSALIND can be programmed to detect a wide range of targets, from heavy metals, like lead, to bacterial pathogens. Because the reactions are cell-free, the system does not require live organisms, refrigeration, or complex lab equipment, which makes it well-suited for field use even in resource-limited settings. The Northwestern team also designed the system to be user friendly, with results that can be interpreted without specialized training.

"What ROSALIND allows you to do is take the power of biology and put it in anyone's hands to understand their water," Lucks says.

SOAKING UP POLLUTANTS

Detecting pollutants in drinking water is one obstacle. Clearing them out from both freshwater sources and oceans remains another challenge.

Heavy metals, microplastics, phosphates, and other contaminants not only make water unsafe for humans, they also disrupt ecosystems, harming aquatic life in lakes and oceans.

Professor Vinayak Dravid's team has developed reusable, low-cost sponges that can improve water cleanup efforts. Coated with nanoparticles, the sponges have a high affinity for pollutants. Nanotechnology is key their effectiveness: By reducing material size, the available surface area for capturing contaminants increases dramatically, enabling "Swiss-knife" solutions that can be tailored for a wide range of pollutants, including microplastics and oil.

"Nanotechnology allows us to impart specific affinity to capture pollutants that can be tailored to different pollutants," says Dravid, Abraham Harris Professor of Materials Science and Engineering, who also cofounded Coral Innovations, a Northwestern startup commercializing the lab's sponge-based reusable sorbents. "Our innovation anchors nanoparticles on pore surfaces of widely available sponges and foams for easily deployable technology at a large scale."

"Our innovation **anchors nanoparticles** on pore surfaces of widely available sponges and foams for easily **deployable technology at a large scale.**"

Vinayak Dravid
Abraham Harris Professor of Materials Science and Engineering

Letting the Conversation Flow

Northwestern is building a culture of connection around water research through a series of networking events that will bring together experts from across disciplines. The goal is to create spaces where engineers, scientists, policy experts, communicators, and community members can share ideas and to spark collaborations that address water's most complex challenges.

In January, two Northwestern research centers—NU Water and the Center for Engineering Sustainability and Resilience—hosted the Northwestern Water Jamboree. The event brought together an interdisciplinary group of faculty members for an interactive meeting geared toward the early development of a new, University-wide vision for water-related research, education, and impact.

Early results have been promising, with graduate students and faculty alike reporting new ideas and collaborations sparked by the jamboree and subsequent "Watering Hole" gatherings, which include a speaker sharing expertise on a specific topic. Upcoming Watering Hole and related events are expected to further expand the network.

The events will also highlight opportunities for interdisciplinary education, including the new Graduate Cluster in Water. This program enables doctoral students to engage in water research with faculty and peers across multiple disciplines. Through specialized training and collaborative opportunities, students can enhance the depth and impact of their research.

"When people are at ease, the ideas flow," says Sera Young, co-director of NU Water and a professor of anthropology at the Weinberg School of Arts and Sciences. "The sparks happen when we can let down our guard, even a tiny bit."

LEADING THE WAVE OF WATER RESEARCH

At NU Water, scientists aren't just studying water—they're building the collaborations and technologies needed to turn wastewater into resources, protect fresh water supplies, and strengthen the nation's supply chains.

"The center exists to connect people—across disciplines, across schools, and across sectors—so that ideas don't just live in one lab, but become shared solutions," says Professor Aaron Packman, who co-directs the center, which was previously known as the Center for Water Research.

Faculty can access support for interdisciplinary seed projects, take part in workshops that bring different specialties together, and involve students in work that spans multiple fields and partners with government, industry, and nonprofit organizations.

"Without this type of environment, research can quickly become siloed and then far less effective," says Jennifer Dunn, professor of chemical and biological engineering.

One example of NU Water's impact is work being done by Professor George Wells, who is recovering resources from wastewater to build a circular water economy for the Great Lakes region.

Wells, professor of civil and environmental engineering, serves as Northwestern's principal investigator for the Great Lakes RENEW (Recovery of Energy, Nutrients, critical Elements, and Water) Engine. Funded by the US National Science Foundation and led by nonprofit water innovation hub Current, RENEW is working to discover, develop, and deploy innovative technology to attract water-intensive manufacturers to the region, recover valuable energy, nutrient and mineral resources from wastewater, and foster workplace opportunities—all while maintaining environmental health.

RENEW will determine how to remove dangerous forever chemicals (such as PFAS), valuable minerals (such as lithium), and nutrients (such as nitrogen) from wastewater. Then, American manufacturers can reuse valuable extracted minerals and nutrients to enable domestic production of batteries and fertilizers, almost all of which are currently imported.

"The term 'wastewater' in my view is a misnomer. Most wastewaters are more accurately just lightly used water that also entrains components with significant value, like critical minerals, nutrients, and organic carbon feedstocks for bioenergy or bioproduct generation," Wells says. "The Great Lakes RENEW consortium is a unique opportunity to position Northwestern and Chicago as leading innovators in this exciting field, in order to accelerate water reuse and water quality protection, amplify resource recovery from societal waste streams, attract water-intensive industries to the region, and generate training and new jobs in the water and circular economy space."

RECOVERING VALUABLE RESOURCES

Pollutants aren't the only materials that can be extracted from water. Valuable minerals and chemicals like nitrogen can be collected and reused.

Jennifer Dunn, professor of chemical and biological engineering, analyzes existing methods to develop new, sustainable approaches for recovering and then reusing high-value minerals and elements in wastewater. One area of focus has been on recovery of copper, cobalt, nickel, and rare earths from mining wastewater. Her work not only mitigates some of the environmental impacts of mining operations, it also addresses the high demand for these minerals in sectors like communications and energy storage.

"We consider cost competitiveness, environmental performance, and social aspects of different types of technologies that can **solve linked challenges of water pollution** and increased **demand for valuable materials** in wastewater like nitrogen and minerals."

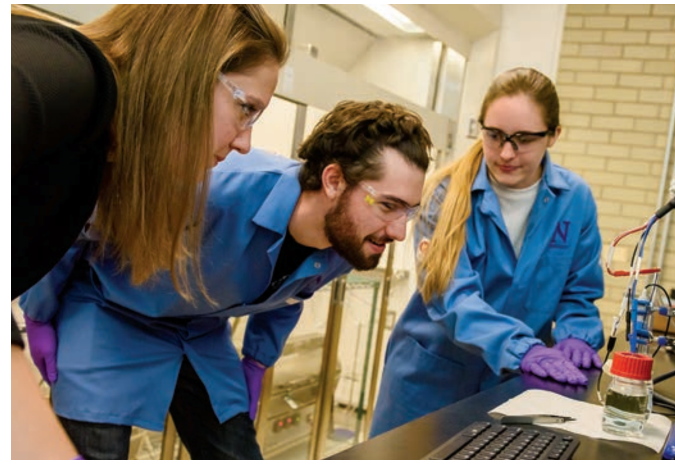
Jennifer Dunn
Professor of Chemical and Biological Engineering

Another area of promise is producing animal feed from wastewater nutrients such as nitrogen and potassium. This could lessen demand for crops like corn and soy, freeing farmland for carbon-sequestering uses.

In her work, Dunn considers the life cycles and materials used in emerging water-sustainability technologies, evaluating their cost competitiveness and environmental impact. She sees synthetic biology as one promising tool for improving these processes.

For example, engineered enzymes or cell-free systems could be designed to selectively capture specific minerals, recover nutrients under gentler conditions, or ready these byproducts for new uses—transforming nitrogen waste into feed products, for example—in ways potentially more energy efficient and cost effective than conventional methods.

"We consider cost competitiveness, environmental performance, and social aspects of different types of technologies that can solve linked challenges of water pollution and increased demand for valuable materials in wastewater like nitrogen and minerals," Dunn says.



CREATING CLEAN FUELS

Associate Professor Linsey Seitz is exploring ways to harvest yet another useful element from water: hydrogen, a clean fuel alternative.

When used as a fuel, the only byproducts of hydrogen are water vapor and heat. Hydrogen is also widely used as a commodity chemical, but scientists and engineers are still searching for better ways to produce it.

"Now that we finally know the nature of these active sites at the surfaces of the materials, we are **designing future catalysts** to **achieve optimized performance** and reduce or even completely eliminate the use of precious iridium."

Linsey Seitz
Associate Professor of Chemical and Biological Engineering

Water electrolysis—splitting water into hydrogen and oxygen using electricity—could offer a path forward, but current processes are energy intensive and expensive. Seitz is working to find better and cheaper catalysts for this reaction. Her research on iridium-based oxides, the most promising studied catalysts, enabled the design of a novel catalyst that maintains higher activity, longer stability, and more efficient iridium use, a finding that could make green hydrogen production feasible.

"Now that we finally know the nature of these active sites at the surfaces of the materials, we are designing future catalysts to achieve optimized performance and reduce or even completely eliminate the use of precious iridium," says Seitz, associate professor of chemical and biological engineering.

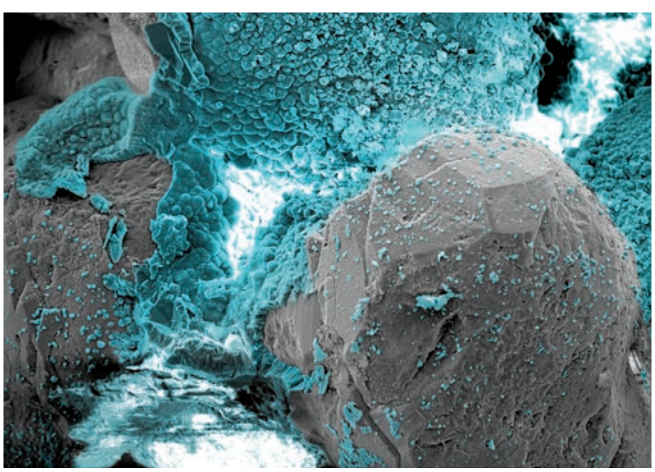
STOPPING COASTAL EROSION

While some researchers study how to harness the energy from water, Alessandro Rotta Loria, Louis Berger Associate Professor of Civil and Environmental Engineering, is working to stop its destructive power for erosion.

He developed a method that uses a mild electric current to transform loose sand into a rock-like material, offering a sustainable alternative to conventional coastal protection. In lab tests, only a few volts were needed to cement marine sand.

"The aim of this work was to develop an alternative method capable **strengthening soils and porous materials** more broadly—including rocks, ceramics, concrete, and even biological materials such as bone."

Alessandro Rotta Loria
Louis Berger Associate Professor of Civil and Environmental Engineering



Seawater's natural supply of dissolved ions enables the process: When a small current passes between two electrodes, minerals such as calcium carbonate and magnesium hydroxide form around the cathode immediately. The process stops when the current is turned off and is even reversible, if necessary, by reversing the electrodes to redissolve the minerals.

"The aim of this work was to develop an alternative method capable of strengthening soils and porous materials more broadly—including rocks, ceramics, concrete, and even biological materials such as bone," Rotta Loria says.

The method is also cost effective at about $6 per cubic meter, thanks to minimal current densities and low-cost electrodes.

CHARTING THE FUTURE OF WATER RESEARCH

Many McCormick School of Engineering teams are increasingly using AI and advanced sensing technologies to gather high-resolution data and forecast potential problems.

"Northwestern's investments in AI will boost efforts to use sensing and data science to solve water challenges, opening doors that were previously locked because we lacked the insights these new data and algorithms will provide," Dunn says.

Projects underway include developing real-time contaminant monitoring systems, creating predictive analytics for water utilities, and integrating circular water systems into industrial operations. These efforts often involve field trials where technology is tested in real-world conditions before being scaled up.

"We're facing problems that don't have single-discipline answers. The work we're doing now—**building connections**, **developing technology**, and **creating pathways** for adoption—is about making sure we have the capacity to respond when those new challenges arise."

Aaron Packman
Professor of Civil and Environmental Engineering

By combining AI, advanced sensing, and interdisciplinary expertise, these projects turn data-driven insights into practical solutions, ensuring that new technologies can be effectively tested, implemented, and scaled to meet complex water challenges.

"We're facing problems that don't have single-discipline answers," Packman says. "The work we're doing now—building connections, developing technology, and creating pathways for adoption—is about making sure we have the capacity to respond when those new challenges arise."

BRIAN SANDALOW

FROM ATOMS *TO INNOVATION*

PREDICTIVE, DATA-DRIVEN METHODS ARE RESHAPING MATERIALS DESIGN AND MANUFACTURING

For much of history, human beings have developed new materials through one process: trial and error. Those days have passed. Modern materials design has become both predictive and data driven.

Today's researchers start with a deep understanding of atomic and molecular structures, using quantum-mechanical models and AI to forecast how changes at the smallest scale will affect macroscopic performance. This approach reduces development time, minimizes costly failed experiments, and enables the creation of materials with properties that would have been difficult or impossible to achieve using conventional methods.

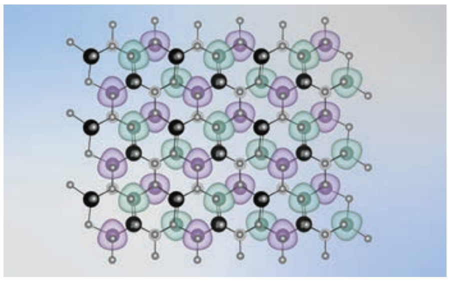
Northwestern Engineering scientists and engineers are at the forefront of this work, using insights from atomic-scale structures to guide the development of materials with improved performance and tailored properties. Their work moves fluidly among computer simulations, laboratory experiments, and factory-floor processes.

The result: new materials that make batteries longer lasting, computers more efficient, aerospace components lighter, and structures stronger and more sustainable.

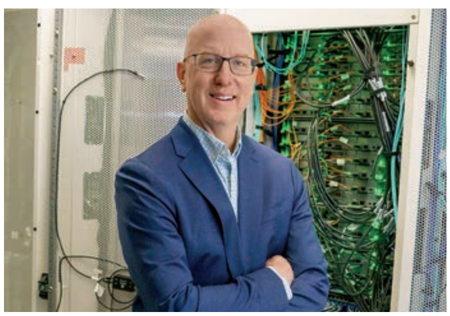
CONCURRENT MATERIALS DESIGN

Northwestern Engineering's work in this age of new materials aligns with one of the school's strategic priorities: Concurrent Materials Design. The school's strengths in materials science, generative AI, and machine learning enable researchers to design materials at the atomic and microstructural level concurrently with the products for which they will be used. These efforts are pushing the boundaries of materials innovation in electronics, batteries, quantum technologies, aerospace, and more.

FROM SIMULATION TO **Substance**



James Rondinelli



Chris Wolverton

Creating new materials begins by combining the power of computation with huge datasets. Chris Wolverton, Frank C. Engelhart Professor of Materials Science and Engineering, screens vast numbers of known and hypothetical compounds for properties like stability, performance, and sustainability. By simulating how these materials perform under real conditions, his team can focus on only the most promising candidates to synthesize and test.

Professor James Rondinelli takes a different approach: using quantum mechanical calculations and symmetry analysis to design materials with targeted electronic, optical, or magnetic properties.

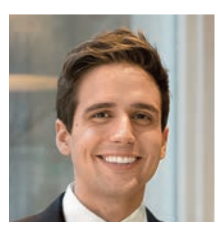
These two researchers offer examples of an integrated model for materials design—one that starts in the digital space, narrows the possibilities with precision, and accelerates the path from discovery to manufacturing.

"If you can know ahead of time which materials are going to work and which aren't, you can save an enormous amount of time, money, and resources," Wolverton says.

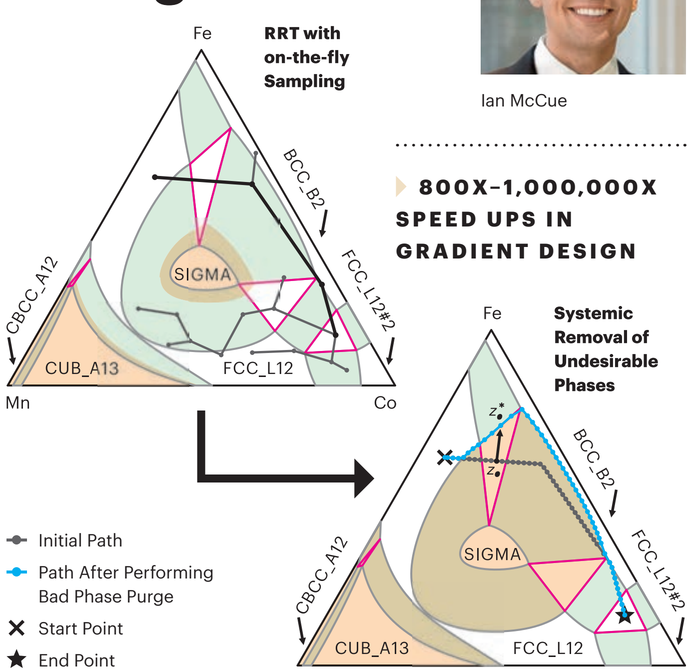
That ability to pinpoint the right materials early is matched by the breadth of expertise across the University, spanning every stage of the design process.

"We have researchers across Northwestern who operate at all different length scales of materials design," says Rondinelli, Walter Dill Scott Professor of Materials Science and Engineering. "Success in moving through the continuum from concept to commercialization really relies on having experts that can interact at every level."

DESIGNING FOR **Strength**



Ian McCue



800X–1,000,000X SPEED UPS IN GRADIENT DESIGN

In many engineering fields such as aerospace, lightweight yet stronger materials can offer a significant advantage. With this in mind, the McCormick School of Engineering's Ian McCue developed a computational framework to rapidly identify optimal composition gradients between dissimilar materials that avoid deleterious phases, enabling the creation of stronger, lighter multi-material systems.

"Optimal solutions to practical problems can be generated in a matter of hours rather than weeks or months," says McCue, Morris E. Fine Junior Professor in Materials and Manufacturing.

While McCue's work accelerates the design of stronger, lighter materials, understanding how those materials perform under real-world conditions is equally crucial. A group led by postdoctoral researcher Luciano Borasi in the lab of Dean Christopher Schuh developed a method to evaluate a material's hardness across 11 orders of magnitude in strain rate. From slow deformation over minutes to impacts occurring in billionths of a second, the methodology unifies multiple experimental techniques within a single framework that applies consistent definitions.

This new approach could improve materials design and modeling to help ensure optimal materials are used for specific needs. "Now we can provide much more data and improve their accuracy," Borasi says.

LINKING DISCOVERY AND PRODUCTION

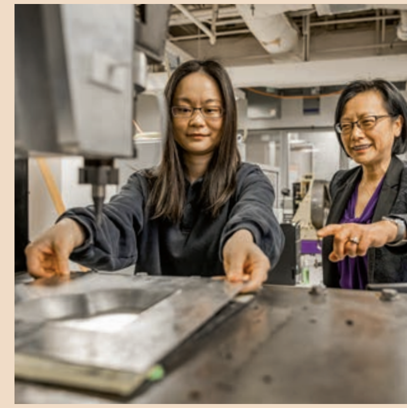
To design materials, scientists and engineers must connect a material's atomic makeup and structure to the way it is processed and the performance it ultimately delivers. Modern materials design spans discovery, engineering, and ultimately, deployment through manufacturing, aiming to create materials that meet exact practical needs.

At Northwestern, this integrated approach is accelerated by initiatives that unite faculty from materials science, mechanical engineering, chemistry, and beyond.

HYBRID AUTONOMOUS MANUFACTURING, MOVING FROM EVOLUTION TO REVOLUTION ENGINEERING RESEARCH CENTER (HAMMER ERC)

A large multi-institutional collaboration, including Northwestern University, the US National Science Foundation-sponsored HAMMER ERC will create autonomous manufacturing systems that precisely control a part's material properties and its geometry in real time. This capability will enable rapid customization of high-performance components—for example, adjusting strength, weight, or heat resistance to meet specific applications—without slowing production or compromising quality.

Wei Chen, Wilson-Cook Professor of Engineering Design, is co-leading HAMMER's design research. A design researcher who integrates computational modeling, optimization, and uncertainty quantification with experimental validation, Chen says, "HAMMER allows us to connect the design of new materials with the manufacturing processes from the very beginning through digital twins so we can ensure what we design can actually be made with high quality."



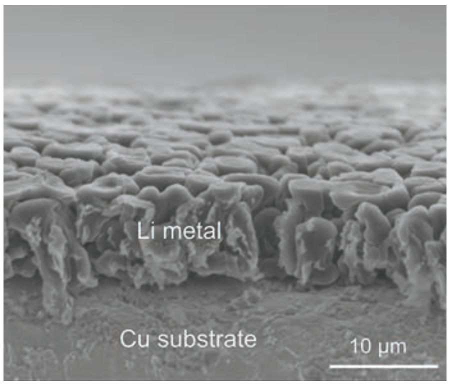
NORTHWESTERN INITIATIVE FOR MANUFACTURING SCIENCE AND INNOVATION (NIMSI)

To meet the ever-increasing demand for rapid manufacturing and to satisfy hyper-individualized needs, NIMSI seeks new solutions that address the complexity and scalability of manufacturing systems using predictive digital tools across length and time scales.

Jian Cao, Northwestern's associate vice president for research and Cardiss Collins Professor of Mechanical Engineering, directs NIMSI. She describes it as a hub for collaboration in manufacturing science and innovation, uniting experts from multiple disciplines to address four notoriously challenging aspects of manufacturing: long history-dependent properties, complex geometric features, high dimensionality of design and control space, and interwoven societal impacts.

"Through the co-design of materials, manufacturing processes, and part geometry, we provide computational tools and physical instruments for lowering the barrier for adoption and realization of advanced manufacturing, as reflected in the HAMMER ERC and DARPA RADICAL projects," Cao says.

DESIGNING FOR
Sustainability



Jeffrey Lopez

As reliance on clean energy sources like wind and solar increases, so does the need for better batteries to store that energy. One way to design better batteries is to use different materials that can store more charge.

Lithium metal anodes are great for storing energy but react poorly with the electrolyte in batteries, causing instability. Many researchers have made progress solving this issue by adding stabilizing fluorine-based chemicals to the electrolyte, but these are "forever chemicals" or PFAS (per- and polyfluoroalkyl substances) that don't break down in the environment.

To address this, Professor Jeffrey Lopez's team is developing new electrolyte materials that work just as well—without relying on PFAS.

"Materials design challenges us to think bigger picture about our work—to not, for example, only design the best battery, but also the most sustainable and recyclable one," says Lopez, assistant professor of chemical and biological engineering.

"Materials design challenges us to think bigger picture about our work—to not, for example, only design the best battery, but also the most sustainable and recyclable one."

Jeffrey Lopez
Assistant Professor of Chemical and Biological Engineering

DESIGNING FOR
Performance

Building on efforts to make batteries more sustainable at the chemical level, researchers are also looking inside batteries to see how materials behave during manufacturing and use—with the goal of designing batteries that perform better and last longer.

Professor Jeffrey Richards currently leads a US Department of Energy-funded project that uses neutron scattering—a powerful technique that requires a nuclear reactor—to peer inside the electrodes of lithium-ion batteries at the nanoscale, observing physical and chemical changes during manufacturing and operation. The properties of neutrons allow them to pass through these materials without causing structural damage, ideal for revealing critical changes during battery operation. By better understanding how and why batteries fail, scientists will be able to develop a more accurate framework for designing battery materials with improved performance and lifespan.

"As engineers, we're looking to minimize the impact of our products and manufacturing processes on the environment," says Richards, associate professor of chemical and biological engineering.

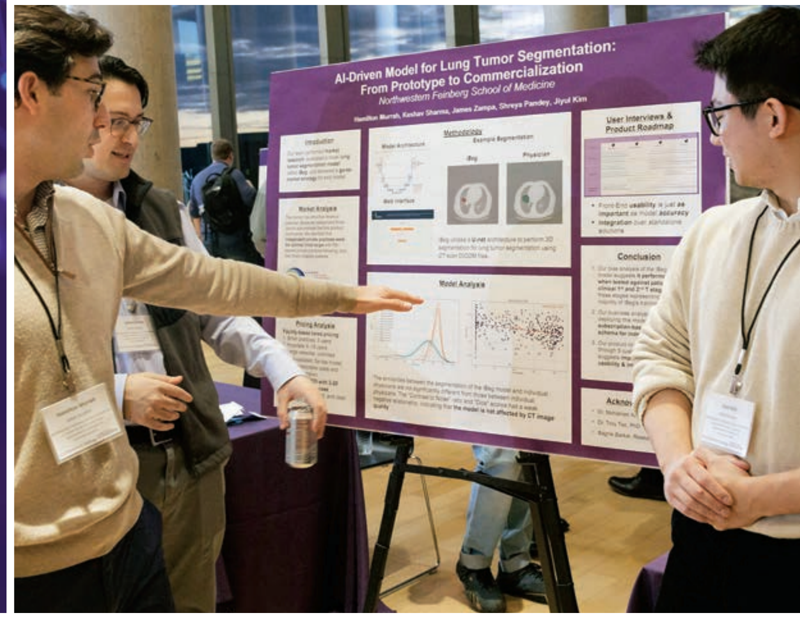
BRIAN SANDALOW

"AS ENGINEERS, WE'RE LOOKING TO MINIMIZE THE IMPACT OF OUR PRODUCTS AND MANUFACTURING PROCESSES ON THE ENVIRONMENT."

Jeffrey Richards
Associate Professor of Chemical and Biological Engineering

Cracking the Code: Preparing Students for an AI-Driven Future

Northwestern Computer Science faculty strike a balance between mastering core skills and leveraging generative AI in CS education.



NORTHWESTERN COMPUTER SCIENCE LEADERS SAMIR KHULLER AND SARA OWSLEY SOOD ARE NO STRANGERS TO TIDAL SHIFTS IN THEIR DISCIPLINE'S TECHNOLOGY.

In June 2007, Sood graduated from Northwestern Engineering with a PhD in computer science, advised by AI pioneer Kristian Hammond. The same month, Apple released the first iPhone—unlocking a new era of mobile-first computing and the global developer marketplace of the app economy.

A discipline marked by profound waves of innovation, computer science has always advanced at breathtaking speed. Few shifts have felt so sudden and consequential as the arrival of generative AI and its rapid integration into everyday tools. Systems like ChatGPT, GitHub Copilot, and Claude are transforming not only the tools of the trade, but also the very definition of programming. According to analysis by Deloitte, generative AI will likely be embedded into nearly every company's digital footprint by 2027.

The result is a field in flux—for students, researchers, and professionals alike. To excel in this rapidly changing landscape, students need AI literacy and readiness training.

"Just as we adapted to train students with the newest version control systems, integrated development environments, and tool kits, now we must ready our students to join the workforce fortified with extensive experience with generative AI tools, knowledge of current best practices, and a strong ethical framework on how and when they should be used in the software engineering process," says Sood, Chookaszian Family Teaching Professor of Instruction and associate chair for undergraduate education in the McCormick School of Engineering.

"JUST AS WE ADAPTED TO TRAIN STUDENTS WITH THE NEWEST VERSION CONTROL SYSTEMS, INTEGRATED DEVELOPMENT ENVIRONMENTS, AND TOOL KITS, NOW WE MUST READY OUR STUDENTS TO JOIN THE WORKFORCE FORTIFIED WITH EXTENSIVE EXPERIENCE WITH GENERATIVE AI TOOLS, KNOWLEDGE OF CURRENT BEST PRACTICES, AND A STRONG ETHICAL FRAMEWORK ON HOW AND WHEN THEY SHOULD BE USED IN THE SOFTWARE ENGINEERING PROCESS."

Sara Owsley Sood
Chookaszian Family Teaching Professor of Instruction,
Associate Chair for Undergraduate Education

Because the fundamentals remain key to building essential skills like algorithmic thinking, analytical reasoning, and navigating multiple layers of abstraction to define problems and design solutions, Northwestern CS students are generally prohibited from using generative AI tools in introductory (100- and 200-level) courses. In these courses—required for all CS majors and prerequisites for CS master's degree programs—students gain proficiency in multiple languages, tools, and programming paradigms. They also learn core concepts including debugging, time and space complexity analysis, abstraction, and writing secure and robust code.

Students in advanced (300-level and above) courses, however, have considerable latitude. In certain courses, faculty highly encourage or mandate the use of generative AI as long as it does not distract or deviate from the learning objectives. Each instructor determines whether and how to incorporate these tools and specifies the usage policy in the syllabus.

> "The way we learn to think like computer scientists is in the practice of decomposing problems, designing programs, weighing efficiency tradeoffs, and struggling with bugs. If students outsource this process to AI, they will not master the fundamentals."
>
> **Samir Khuller** Peter and Adrienne Barris Chair of Computer Science

Sood, Khuller, and the Northwestern CS faculty agree that striking the right balance and timing on the use of generative AI in the learning process is essential. At the heart of the department's teaching philosophy is the belief that education is a journey and shortcuts shortchange the learning process. Mastery requires more than getting the right answer or getting something done. By focusing on teaching how to think and reason, Northwestern CS equips students with skills that extend well beyond the classroom.

"Unfortunately, having generative AI tools at one's fingertips has great potential to deny students critical learning opportunities," says Khuller, Peter and Adrienne Barris Chair of Computer Science. "The way we learn to think like computer scientists is in the practice of decomposing problems, designing programs, weighing efficiency tradeoffs, and struggling with bugs. If students outsource this process to AI, they will not master the fundamentals."

In advanced courses, students also gain technical depth and explore areas such as human–computer interaction, quantum computing, computer vision, and security. They learn to approach challenges from both algorithmic and systems perspectives while exploring the evolving layers of the software and hardware stack. By rapidly mastering new problem domains, students take on increasingly complex work, innovate effectively, and strengthen their ability to navigate ambiguity and uncertainty.

"Generative AI tools have great potential to amplify students' learning in upper-level courses," Sood says. "From quickly prototyping a system to transforming data into a different format to producing graphs or visualizations of data, generative AI tools can alter what students can accomplish in project-based courses, enabling them to showcase their creativity and innovate."

Photos by Carlos Javier Ortiz and Joel Wintermantle

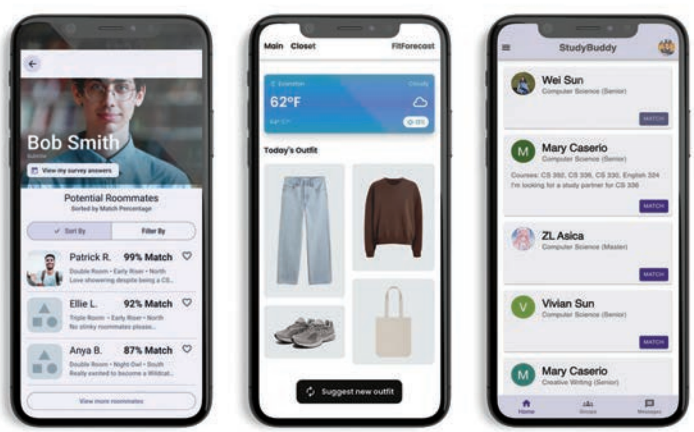
Inside the Classroom: Leveraging AI in Advanced Courses

DEVELOPING SOFTWARE THROUGH REFLECTIVE ANALYSIS AND ITERATION

- **COMP_SCI 392: Rapid Prototyping for Software Innovation**
- **COMP_SCI 394: Agile Software Development**

INSTRUCTOR **Chris Riesbeck, Associate Professor of Computer Science and Director of the Master of Science in Computer Science Program**

Except for a few learning exercises, Chris Riesbeck doesn't restrict students' use of generative AI in his team-based, full-stack mobile and web software application project courses. "If it's permitted in industry, it's permitted in the class," he says.



Third- and fourth-year undergraduates and master's degree students come to CS 392 and 394 with strong programming backgrounds. Coding takes a backseat to applying critical reasoning, reflective analysis, and cross-functional team-building skills to iteratively develop prototypes that meet client requirements. Mid-class surveys show that most students use generative AI tools, but sparingly. So far, students who learned to code traditionally find AI-powered coding tools disruptive to their flow.

"Students want to solve the program logic themselves," Riesbeck says. "But they use generative AI to help explain bugs, fix errors, and handle messy boilerplate code like CSS."

Riesbeck encourages experimentation with safe, business-oriented uses of generative AI, such as writing module tests, mocking up demos, and comparing manually written code with AI outputs. This fall, CS 392 students completed one project using generative AI extensively to create several prototypes rapidly. "Generative AI is great for building throw-away prototypes and iterating on ideas," Riesbeck says.

EXPERIMENTING WITH AI-ASSISTED CODING

- **COMP_SCI 397: Applied AI for Software Development**

INSTRUCTOR **Hamilton Murrah (MBAi '25), Adjunct Professor of Computer Science**

In this course, a mix of fourth-year undergraduate, combined BS/MS, and master's degree students draw on their foundational programming knowledge to experiment with generative AI using increasingly sophisticated AI-assisted coding tools. Student teams first test how tools like ChatGPT, Cursor, and Claude handle tasks such as debugging, refactoring, and exploring natural language coding. They then pair-program a full-stack, Twitter-style application, documenting each step of their decision-making processes via an architecture design document.

"You have to use the right tool for the right job," Hamilton Murrah says. "What's really important is having people who know how to interact with and get the best results from generative AI systems while also being able to think critically about what is needed to solve a specific problem."

ANALYZING AND EXPLAINING AI MODEL BEHAVIOR

- **COMP_SCI 396: Fairness in Machine Learning**

INSTRUCTOR **Zach Wood-Doughty, Assistant Professor of Instruction**

No single metric of fairness applies to all machine learning (ML) models. That makes reasoning abstractly about algorithmic bias and its high-stakes implications difficult. In the Fairness in Machine Learning course, student teams design, evaluate, and critique ML autograders using a published dataset of anonymized essays. As a class, they set goals and requirements of the AI-assisted graders, which leverage large language models to assess writing assignments.

To simulate fairness challenges, Zach Wood-Doughty randomly introduces modifications—such as sophisticated vocabulary, misspellings, or grammatical quirks—that could create irrelevant or unintended shortcuts for grade predictions. Students then apply interpretability methods to uncover and explain the model's behavior, exploring how altering the model, data, or optimization affects fairness.

"If we artificially inflate grades for essays with four-syllable words, we're building in bias that equates fancy words with quality," Wood-Doughty says. "The model becomes a sandbox for how we detect this bias and what the implications are for other data categories. Suppose you're deploying this model to score SAT essays. What measures would you prioritize, and what tradeoffs in fairness, accuracy, and performance would you accept?"

ITERATING TO MAXIMIZE USER VALUE

COMP_SCI 397: Software Studio

INSTRUCTOR **Anastasia Kurdia, Professor of Instruction and Assistant Chair of Computer Science**

In this course, Anastasia Kurdia welcomes all modern tools. Students work in agile development teams to iteratively build a public-facing software-as-a-service application and use GitHub Copilot, a context-aware code generator, to enhance productivity. Kurdia intends the course to reflect the methodology, programming languages, and development tools in software development jobs—for example, test-driven development, collaborating via version control software, and pair programming.

"Students demonstrate technical skills, fluency, and fearlessness—when they have to deal with six technologies that are new to them, they're not afraid of the seventh," she says. "What we are able to build in one quarter used to take two semesters. Students build on each other's strengths and deliver working projects because they are not too busy debugging unfamiliar code."

Team members alternate roles from sprint to sprint, taking turns as a customer representative seeking to prioritize features. "Developers learn from users," Kurdia says. "Understanding how users interact with a product allows us to maximize value with each iteration. One can envision and build almost anything, but success comes from deploying, learning, building, and deploying again."

INTEGRATING TOOLS TO BUILD USER-CENTRIC SOLUTIONS

MSAI 495 SPECIAL TOPICS: AI Platforms

COORDINATOR **Mohammed Alam, Assistant Professor of Instruction and Deputy Director of the Master of Science in Artificial Intelligence (MSAI) Program**

INSTRUCTORS **William Johnson, Arvind Periyasamy, Julia Heseltine, and Pablo Salvador Lopez (Microsoft)**

Given the flexibility and scalability of industry-standard platforms like Amazon Web Services (AWS), Google Cloud, and Microsoft Azure, developers are increasingly building end-to-end applications in the cloud. "One way our students can differentiate themselves from the moment they join industry is by demonstrating fluency in how to develop user-centric, generative AI solutions in the cloud," Mohammed Alam says.

In the five-week course, MSAI students train with a Microsoft team to develop, deploy, and manage a chatbot using Azure's AI tech stack. Students select and integrate the relevant portfolio of services that fulfill the project scope requirements—including generative AI text generation, machine-learning image recognition, AI workflow automation, and dynamic problem-solving.

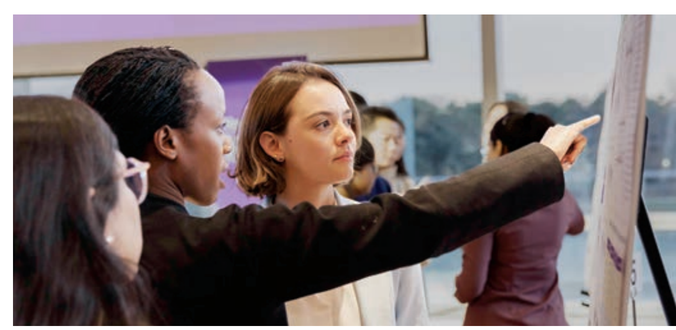
They practice skills, including connecting a company's database with the Azure platform and building a retrieval-augmented generation architecture that trains the chatbot's large language model with domain-specific, proprietary enterprise data. "Students are connecting tools and APIs to produce one big solution for the problem they define," Alam says. "Platforms like AWS and Azure provide the blocks and MSAI students build powerful AI systems while developing a deep understanding of how those blocks fit together."

TACKLING LIVE BUSINESS PROBLEMS CROSS-FUNCTIONALLY

MBAI/MSAI-490: Capstone Project

INSTRUCTORS **Mohammed Alam and Andy Fano, Clinical Professor of Computer Science and Director of the MBAi Program, a joint degree from Northwestern Engineering and Northwestern's Kellogg School of Management**

Hybrid teams of MBAi and MSAI students partner with industry clients in this quarter-long capstone focused on finding scalable solutions to complex business problems, often through generative AI and large language models. But Andy Fano cautions against putting the cart before the horse. "It's not about plugging in a technology, it's about solving a live, domain-specific problem," he says. "Teams sharpen underspecified objectives, negotiate project scope, analyze workflows, manage noisy or incomplete data, and articulate the business value of a technology solution."



This fall, 17 teams collaborated with 17 companies, from Fortune 100s to startups. Baxter and Ecolab are exploring new ways to train customers on their devices and systems, while CDW is pursuing strategies to ensure product page accuracy.

Past projects tackled challenges such as structuring hospital pharmacy data for Accenture, designing sugar-harvesting automation for John Deere, and developing an AI textbook generator for ViewSonic. Fano emphasizes that while some graduates will build generative AI tools with major tech firms, most will join companies that use an evolving range of AI and ML capabilities. "Generative AI is the big new thing, but in terms of what's actually deployed in the business world, the value is in the more traditional machine learning that we take for granted, like credit card fraud detection. Things might change."

MICHELLE MOHNEY

POWERPLAY

NORTHWESTERN'S FORMULA RACING TEAM TAKES TO THE TRACK WITH ITS FIRST DRIVABLE ELECTRIC CAR.

Maristella Heo ('26) stood in stunned silence, eyes fixed on the track. After years of late nights fixing electrical glitches, building custom parts, and refining workflows, the Northwestern Formula Racing Team's NFR25 electric car had finally made its debut. It drove. It raced. It worked.

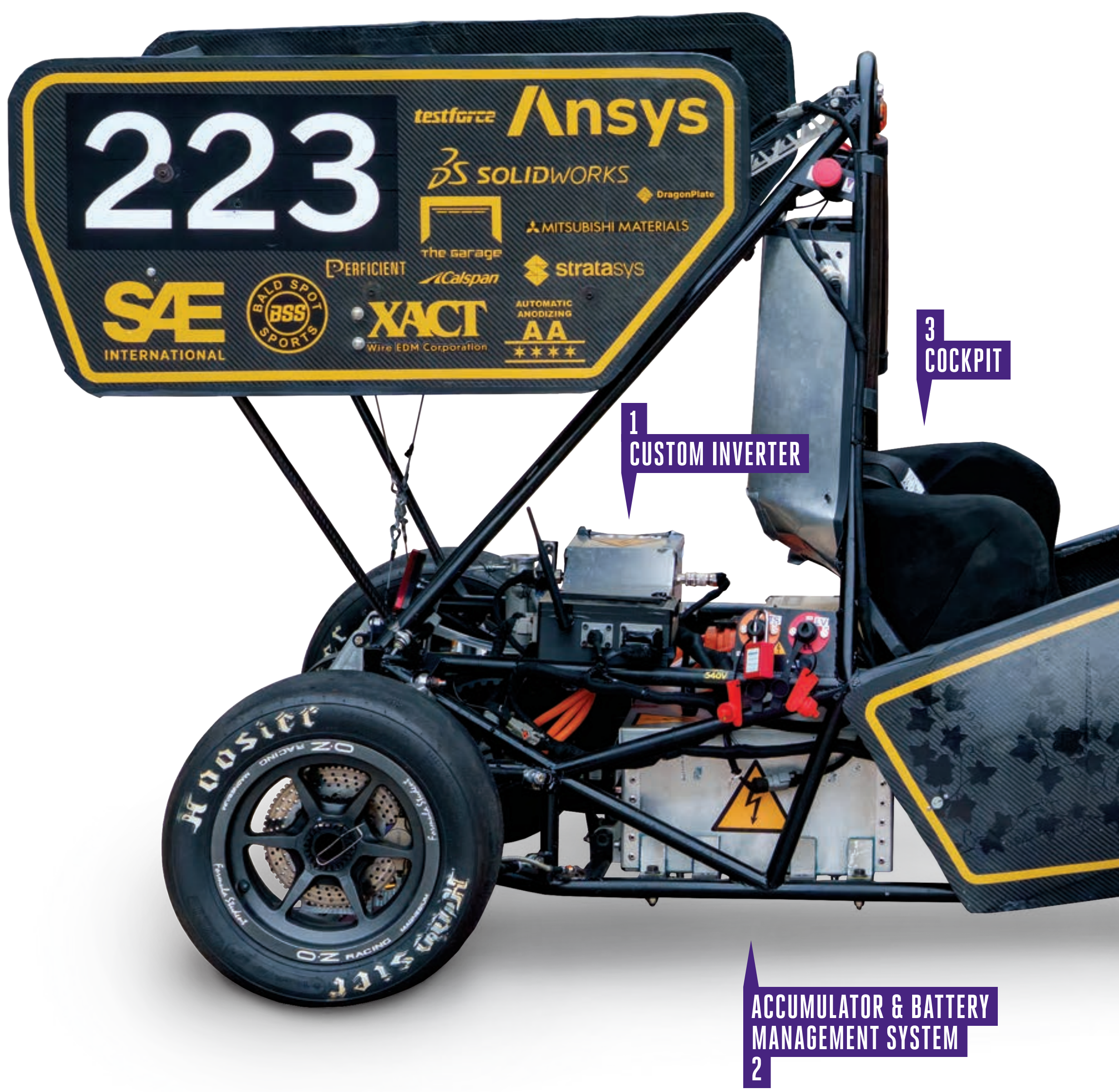
"It was surreal," said Heo, NFR25's project manager. "There are no words for seeing it drive for the first time."

The car's appearance at the June 2025 Formula SAE Electric competition at Michigan International Speedway marked a breakthrough. Although the Northwestern team has built electric cars before, NFR25 was the first to pass all technical inspections, compete in every event, and drive on track successfully.

The Formula SAE competition challenges university teams to design and build small, formula-style cars that compete in separate competitions for internal combustion, hybrid, and electric vehicles. Since 2023, Northwestern has raced exclusively in the electric competition with its rigorous safety standards and pre-race inspections.

Competing teams are judged in three static events (presentation, cost, and design) and four dynamic events (acceleration, skidpad, autocross, and endurance). Having placed in the top third in this year's competition, the team is already gearing up for NFR26, aiming to debut hub-mounted motors for a faster, more reliable car optimized for endurance.

ERICA MASINI



The Northwestern Formula Racing Team at the June 2025 Formula SAE Electric competition at Michigan International Speedway.

Pictured left to right:

rear row Drake Vogelpohl, Benji Sobeloff-Gittes, Lance Locker, Evan Bertis-Sample, Arda Noyan Kacar, Cam Estrada, Yassine El Haboussi, Ben Smith, Ryan Boyle, Oliver Dominguez-Holler, Matias Ketema, Aidan Gregoire, Danish Galebotswe, Ryan Chung, Anton Walvoord, Matt Hosemann

middle row Marah Taqatqa, Cheresa Turek, Rahwa Tesfay, Anna Murray, Carol Klingler, Nil Ozcevik, Jason Lin, Nathan Lee, Du Chen, Matt Martinez

front Stella Heo, Charlie Seifert

1

CUSTOM INVERTER

Instead of buying an off-the-shelf part, the team built its own inverter, a system that controls how power flows from the battery to the motor. Because few teams take this route, the Northwestern team gained an edge at competition.

2

ACCUMULATOR & BATTERY MANAGEMENT SYSTEM

Fully developed by the team, the accumulator and battery management system is compact, clean, and efficient—a major upgrade from previous years and a standout with judges. The system monitors and manages the interactions among the battery, inverter, and overall power system to make sure everything runs safely and smoothly.

3

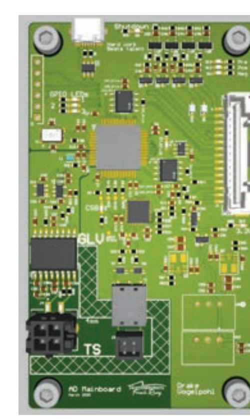
COCKPIT

Memory foam seat, leather-lined headrest, and zero clutter proved a winning combination. One judge called it the most comfortable cockpit he sat in all day.

4

AERODYNAMICS PACKAGE

The nearly wrinkle-free carbon-fiber finish on the nose cone was a study in attention to detail, with clean edges that cut down on drag.



CIRCUIT BOARDS

The battery management system is composed of a main circuit board that controls and communicates with several daughterboards, which perform the sensing and balancing.

Read more about Northwestern's Formula SAE team—and see NFR25 in action.

Image of NFR25 race car by Joel Wintermantle

Energized by Curiosity

DEBRA EVANS'S DISTINGUISHED CAREER IN MATERIALS SCIENCE ACROSS MULTIPLE INDUSTRIES BEGAN WITH ASKING QUESTIONS AT NORTHWESTERN.

While attending a Northwestern University program for high school students contemplating science careers, Debra Evans ('79) received a Northwestern student handbook. For Evans, a wide-eyed, science-loving teen from Chicago's West Side, the manual shared far more than information on courses, degrees, and academic standards; it delivered inspiration.

"I fell in love with the idea of going to Northwestern and built my entire high school experience around that book," she says.

Contemplating medicine when she first arrived on the Evanston campus in 1975, Evans's thoughts gradually shifted to engineering. A work-study job at nearby Saint Francis Hospital in Evanston provided her a front-row seat to the healthcare environment. After talking to doctors, interns, and residents about their daily work and observing the clinical grind, Evans abandoned thoughts of medical school.

Over the past five decades, Evans's curiosity has fueled groundbreaking work for powerhouse enterprises innovating in fields like defense, communications, and medicine. At Hughes Aircraft, she contributed to defense radar programs and the revamping of the F/A-18 airplane. At Motorola, she managed automotive electronic and telematic programs for partners like Mercedes, Jaguar, and Ford.

Evans has spent the past 25 years in pharmaceutical and medical products. She's led projects to enhance the absorption of cancer drugs at Baxter, developed a new infusion pump for Pfizer, and steered the development of rare disease therapeutics at Takeda. Since 2022, she's been the director of medical program management for specialty products at AbbVie, overseeing efforts to produce new anti-infectives and pipeline drugs for HIV, obesity, and pulmonary fibrosis.

"This industry provides a way to help people and society, which is incredibly energizing," Evans says.

> "Northwestern gave me a life I never could have imagined."

At the same time, materials science piqued her interest. She marveled at the energy of Professor Lyle Schwartz ('59, PhD '64) and was drawn to a small undergraduate program pushing its students to explore.

More than that, Evans appreciated the interdisciplinarity of materials science—its blend of physics, chemistry, and engineering—and the challenge of unpacking mysteries. For her senior thesis, she used methods like electron microscopy to investigate the composition and fabrication methods of an antique metal bell from Nigeria.

"I'm glad I was open-minded enough to take it all in, ask questions, and go toward something I was interested in rather than doing what others expected of me," Evans says.

While enjoying a distinguished professional career and raising two children, both of whom followed her into scientific fields, Evans has consistently given back to her alma mater. She has served on the Department of Materials Science and Engineering Advisory Board and remained active with the Northwestern University Black Alumni Association.

"Northwestern gave me a life I never could have imagined," she says.

DANIEL P. SMITH

NAVIGATING AI WITH CONFIDENCE

ADI KURUGANTI CREDITS SKILLS HONED AT NORTHWESTERN—CRITICAL THINKING, COLLABORATIVE ACTION, DATA-FUELED ITERATION—FOR HIS SUCCESS IN DISCOVERING NEW AI SOLUTIONS.

On a warm August afternoon in northern California, Adi Kuruganti ('99, MBA '06) sits in a nondescript office. He is calm and confident, his words thoughtful and precise.

It counters the typical pace in Silicon Valley, where business generally runs at two speeds: fast and faster. Ironically, as the AI revolution takes off, Kuruganti's patience and control are helping to propel his company to new heights faster.

As chief product and technology officer at Automation Anywhere, a San Jose-based company providing AI-powered automation solutions, Kuruganti directs teams developing specialized offerings for clients across diverse industries—financial services, healthcare, and manufacturing among them. The work requires collaboration, a skill Kuruganti learned back at Northwestern.

"This is exactly what I did as an electrical engineering student," he says. "We collaborated to build a model, returned to the data to see what we could improve, and learned to win as a team."

In 1995, Kuruganti traveled 7,800 miles from his native India to Evanston to pursue a top-tier education. A self-described "STEM person," Kuruganti fretted about his exact direction. He spent his first two years on campus exploring computer engineering, industrial engineering, and computer science before finding electrical engineering to be a compelling blend of various disciplines.

In Kuruganti's newfound discipline, a cohort of smart students who valued connections and collective progress elevated his experience. He pored over projects with his peers and participated in design competitions. He sharpened his ability to cooperate with others and honed his data-driven decision-making. He learned how to endure struggle and discern new paths.

"I credit Northwestern for giving me the flexibility to discover," he says.

After graduation, Kuruganti spent four years consulting. Even as he studied and applied his tech skills in a variety of industries, he yearned to own product development from end to end. He returned to school, secured an MBA from Northwestern, and joined Salesforce, a global leader in customer relationship management software.

During his 15 years with Salesforce, Kuruganti helped to launch multiple product lines, including Sales Cloud, Chatter, and B2B Commerce. In 2013, he led the creation of Experience Cloud, a platform for clients to build branded, personalized digital experiences, and steered it from inception to $1.5 billion in revenue and more than 28,000 customers.

Kuruganti departed Salesforce in 2021 for a position with Automation Anywhere, excited to help businesses leverage AI to reduce operating costs, heighten efficiency, accelerate revenue, and improve customer service. Competing against tech powerhouses like Microsoft, Kuruganti unlocks opportunities for clients to automate mission-critical operations. It's a disruptive endeavor demanding critical thinking, collaborative action, and data-fueled iteration—a challenge Kuruganti has embraced since his undergraduate years.

"It all starts with Northwestern," he says. "That's where I developed the foundational skills to navigate a competitive, fast-paced world with confidence."

DANIEL P. SMITH

"I CREDIT NORTHWESTERN FOR GIVING ME THE FLEXIBILITY TO DISCOVER."

> "NOT ONLY DID WE LEARN HOW TO WORK AS A TEAM, BUT WE ALSO LEARNED HOW TO LOOK AT THE BUSINESS FROM A COMPREHENSIVE PERSPECTIVE. IT BROUGHT ALL THE COURSES TOGETHER AND GAVE AN EXTENSIVE OVERVIEW THAT HELPED PREPARE ME IN MANY WAYS FOR THE SEAT I SIT IN TODAY."

AMPLIFYING INNOVATION

CHRISTINE SCHYVINCK CONTINUES TO BREAK NEW BARRIERS IN SOUND AS CEO AT SHURE.

CHANCES ARE THAT ANYONE WHO'S SEEN MUSICIANS PERFORM LIVE IN CONCERT OR ONLINE HAS ALSO SEEN A SHURE MICROPHONE AT WORK.

"Shure's heritage is in the performance arena," says President and CEO Christine Schyvinck (MEM '99). "Our legacy is seeing Shure microphones on stage in front of your favorite musicians as they perform your favorite songs."

Founded in 1925, Shure began selling radio parts as the Shure Radio Company and has developed more than 50,000 different electronics products over the past century. The Niles, Illinois-based company designs and manufactures professional-grade and consumer audio products that include microphones, headphones, in-ear monitors, mixers, digital signal processors, and conferencing systems.

At Shure, Schyvinck uses her Northwestern Engineering education to help customers in more than 120 countries have more productive meetings, give better performances, and create clearer recordings. She's dedicated to achieving the best audio quality possible.

"That's what we're all about," Schyvinck says. "In order to capture sound, you need a transducer that takes that sound wave and converts it into some other form of energy that can be amplified or reproduced. We use software and artificial intelligence in our solutions to make them hassle-free. But at the heart of it, you still need physical things to capture sound, so it's a great combination of technologies."

ASPIRING TO LEAD

Working with physical objects is what drew Schyvinck to mechanical engineering as an undergraduate at the University of Wisconsin-Madison. "I like seeing things. I like touching things. I definitely have a mechanical bent," she explains. "I had summer jobs working in manufacturing and really liked it."

In 1989, when Shure offered her a position as a manufacturing quality control engineer in the Chicago area, Schyvinck decided to give audio electronics a shot. Working with teams to problem-solve and maximize production got her thinking about leadership roles. When a management position opened in the quality group, Schyvinck applied. She didn't get the job, but the experience showed her how much she wanted to be a leader.

"It took me several days to build up courage, but I went to the vice president of quality and asked what it took to get a management job and why didn't I get that one," she says. "His reaction was interesting. He said, 'Oh, it seems like you like your job. We didn't know you wanted to be in management. Let's figure this out.'"

Her mentor suggested she pursue a master's degree that combined technical and management courses and noted that Northwestern was close to Shure's Evanston headquarters at the time. Once Schyvinck discovered the Master of Engineering Management (MEM) program, she was sold.

CLIMBING THE LADDER

One of few women to hold an executive position in the professional audio industry, Schyvinck credits her MEM degree with helping to propel her upward in the company. The program's curriculum and project-based learning prepared her for leadership roles in quality, manufacturing, and eventually sales and marketing functions at the company.

Schyvinck moved into management roles while she was in the MEM program, and shortly after became vice president of corporate quality. She found MEM's focus on business fundamentals and team dynamics incredibly valuable, but she credits the capstone simulation for helping advance her strategic thinking and ability to navigate organizational change.

"Not only did we learn how to work as a team, but we also learned how to look at the business from a comprehensive perspective," she remembers. "It brought all the courses together and gave an extensive overview that helped prepare me in many ways for the seat I sit in today."

MOVING BEYOND MICROPHONES

Schyvinck's leadership has been integral to the steady growth and profitability of Shure. Since becoming president and CEO in 2016, she reduced material costs without sacrificing product quality, dramatically improved on-time delivery, and globalized manufacturing operations. Fostering an innovative, collaborative culture and leveraging Shure's audio technology expertise is part of her focus.

She uses what she learned at Northwestern to drive the company's growth strategy into new areas, including a product that features a microphone array, video components, room controller, digital signal processors, and software in one complete package.

"Our microphone arrays are a huge growth engine for the company," she says. "The holy grail is leading us toward simplicity, with end users being able to plug and play their systems, which opens the door for Shure to go beyond microphones. You need to continually look for new things, new customers, and new ways to transfer your knowledge to other applications."

Today, Schyvinck gives back to Northwestern by sharing her expertise and serving on the MEM Advisory Board. "This program helped shape me," she says. "It's a great way to stay connected with students. I give advice, but I learn just as much from them, and it helps me understand what they're looking for in a company. You want to keep those tethers with academia so you know what's happening, and you can help shape it a little, too."

SARA LANGEN

IN MEMORIAM

Professor Emeritus Robert Chang

Robert Chang, professor emeritus of materials science and engineering who was honored for his contributions to plasma science and technology, diamond research, high-temperature superconductivity, carbon nanotubes, and perovskite solar cells, passed away at age 83 on June 21. He will be remembered for both his scientific innovation and commitment to educating the next generation of engineers.

Following 15 years on the technical staff at AT&T Bell Labs, Chang arrived at Northwestern in 1986 as a professor of materials science and engineering and of electrical engineering and computer science. He transitioned to professor emeritus status in 2021.

Chang served as director of the Northwestern University Materials Research Center and the National Center for Learning and Teaching in Nanoscale Science and Engineering. He also served as the president of the Materials Research Society and as a general secretary and president of the International Union of Materials Research Societies.

Chang's research interests included photonic crystals, amorphous semiconducting oxide films, solar cell design and fabrication, and nanostructured materials. A coauthor of more than 500 academic papers, Chang's work was cited more than 36,000 times.

"Bob Chang was a visionary scientist whose work shaped multiple fields within materials science, from plasma physics to nanotechnology," Northwestern Engineering Dean Christopher Schuh said. "He exemplified the McCormick spirit of excellence in both research and teaching, and his legacy will continue to inspire generations of engineers."

Professor Hani Mahmassani

Hani Mahmassani, William A. Patterson Distinguished Chair in Transportation, director of the Northwestern University Transportation Center, and professor of civil and environmental engineering, passed away July 15 at age 69. He will be remembered for his expertise in transportation, his passion for mentorship and collaboration, and his ability to communicate charismatically and clearly to the public.

After holding professorships at the University of Texas at Austin and the University of Maryland, Mahmassani joined the Northwestern Engineering faculty in 2007. His areas of specialization included multimodal transportation systems, dynamic network modeling and optimization, transit network planning and design, dynamics of user behavior and telematics, large-scale human infrastructure systems, and real-time operation of logistics and distribution systems.

In 2021, Mahmassani was elected to the National Academy of Engineering. In 2023, he received the Robert Herman Lifetime Achievement Award in Transportation Science from the Institute for Operations Research and the Management Sciences (INFORMS) and was part of the 2024 class of INFORMS Fellows. He received numerous other awards and was a prolific and frequently cited author. Around the world, government agencies, research institutions, and companies relied on his expertise.

"Hani was an influential scholar who profoundly advanced the field of transportation science and logistics," said Karen Smilowitz, Associate Provost for Undergraduate Education, and James N. and Margie M. Krebs Professor of Industrial Engineering and Management Sciences. "With his broad research interests, he built bridges across research communities. He supported the careers of countless scholars and will be sorely missed."

Robert W. Smith '45
Arthur F. Dewsberry '51, '59
Lawrence G. Jenewein '51
Richard N. Herman '55, '59
Henry L. Marschall '55
Robert W. Selgrad '56
J. Neal Greene '57, '62
Kenneth E. Olson '57
James A. Fisk '58

William D. Hamilton '58
Anthony S. Ferraro '59
Avrun B. Rivel '59
James E. Schueler '60
Thomas J. Keilman '61, '62
Lowell E. Kohlrust '61
Roger F. Salava '62
Lonnie E. Haefner '63, '69
Carl A. Osterberg '64
Wayne S. Zunas '65

Robert W. Barsch '66
Thomas E. Fane '66
Terrell J. Harris '66
Christopher Grant '67
Ronald E. Carlson '68, '70
Douglas E. McGovern '68
Richard L. Lewandowski '69
Luis D. Pascual '69

Stephen W. Bockemeier '70
Joseph A. Cavalier '70
Patrick B. Briley '71, '72
H. Wayne Bryan '72
Joseph W. Ratterman '73
Ronald J. Tabar '73
James Robert Happ '75
William A. Horin '76
Dale C. Bowyer '78
Adrienne F. Widell '82

David E. Lee '84
Robert Frederick Wise '92
Mami F. DuHadway '93
Melissa A. Lane '97, '98, '01
Matthew J. Cole '98
Carson Brown '02
Brett A. Lane '02
Sydney Grace Zink '16
Emmy E. Morgan '23

Getting AI to Think with You, Not for You

PROFESSOR LIZ GERBER SHARES FIVE TIPS ON HOW TO USE AI IN IDEA GENERATION

"AI creates persuasive content, but it's not always factual."

Liz Gerber
Professor of Mechanical Engineering

Generating new ideas can appear daunting. The rise of tools like ChatGPT and Claude AI can create a temptation to toss the bulk of the task to an AI chatbot.

LIZ GERBER, professor of mechanical engineering and codirector of Northwestern's Center for Human-Computer Interaction + Design, cautions against that. She says the key to success when using AI tools lies in the details and how you manage them.

Gerber offers **five pieces of advice to harness AI's power** without letting it do all the thinking for you.

1

Start with your own ideas

Yes, you could ask ChatGPT for a thousand ideas, but that sidelines your valuable expertise and weakens your creative muscle. The more you hand over creative thinking to AI, the less skilled you become.

Put down your devices. Start with pen and paper and use your own brain. Lay out what you already know. Write everything down. Identify what's top of your mind before your thinking gets anchored.

2

Expand your perspectives

AI can push your ideas in new directions. Liz Gerber's favorite prompts: Imagine money is no object. Imagine physics doesn't exist. Make up something my mother would hate.

Better yet, brainstorm with another person first, then bring in AI as a third partner. That way, you'll have a creative boost plus a human reality check.

3

Spot weaknesses or vulnerabilities

Ask AI to poke holes in your ideas. What assumptions are you making? What problems might arise?

You can treat it like quick user testing. Ask for 10 critiques from the perspective of your target audience.

4

Question solutions

Keep your critical thinking hat on. AI creates persuasive content, but it's not always factual. It's like auto-complete on steroids. AI takes your prompts and makes its best guesses with no value judgment.

Just as AI can generate images that appear real but are not, AI's words can sound convincing without being true.

5

Stay mindful of bias

AI is trained on massive amounts of historical and often biased data. For example, one study found it advised women to negotiate lower salaries than men for the same job. That's one instance when history was definitely not the best teacher.

ERICA MASINI

OTHER THINGS TO KEEP IN MIND

Prioritize your privacy.

When using AI, assume you're shouting in a public square. Don't share intellectual property. Delete chats. Use enterprise solutions. And monitor for compliance updates.

Consider hidden costs.

AI is convenient, but each prompt comes with unseen environmental costs. ChatGPT's daily water usage alone averages that of a small town's entire household consumption, according to the US Environmental Protection Agency.

Northwestern | McCORMICK SCHOOL OF ENGINEERING

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2145 Sheridan Road
Evanston, Illinois 60208–3100

SMARTER MATERIALS, FASTER

Northwestern researchers have created a breakthrough AI-driven system that designs and 3D-prints—often in just minutes—materials able to morph their shape in response to heat, light, or other triggers. By combining physics, computation, and 3D printing, the team developed an end-to-end framework that autonomously generates these adaptive materials, which often resemble living systems. The advance could fuel new possibilities for robotics, medical devices, and technologies that must quickly respond to changing environments.

Image courtesy of Alexander Evenchik

Watch as these shape-morphing materials are printed and respond to heat.