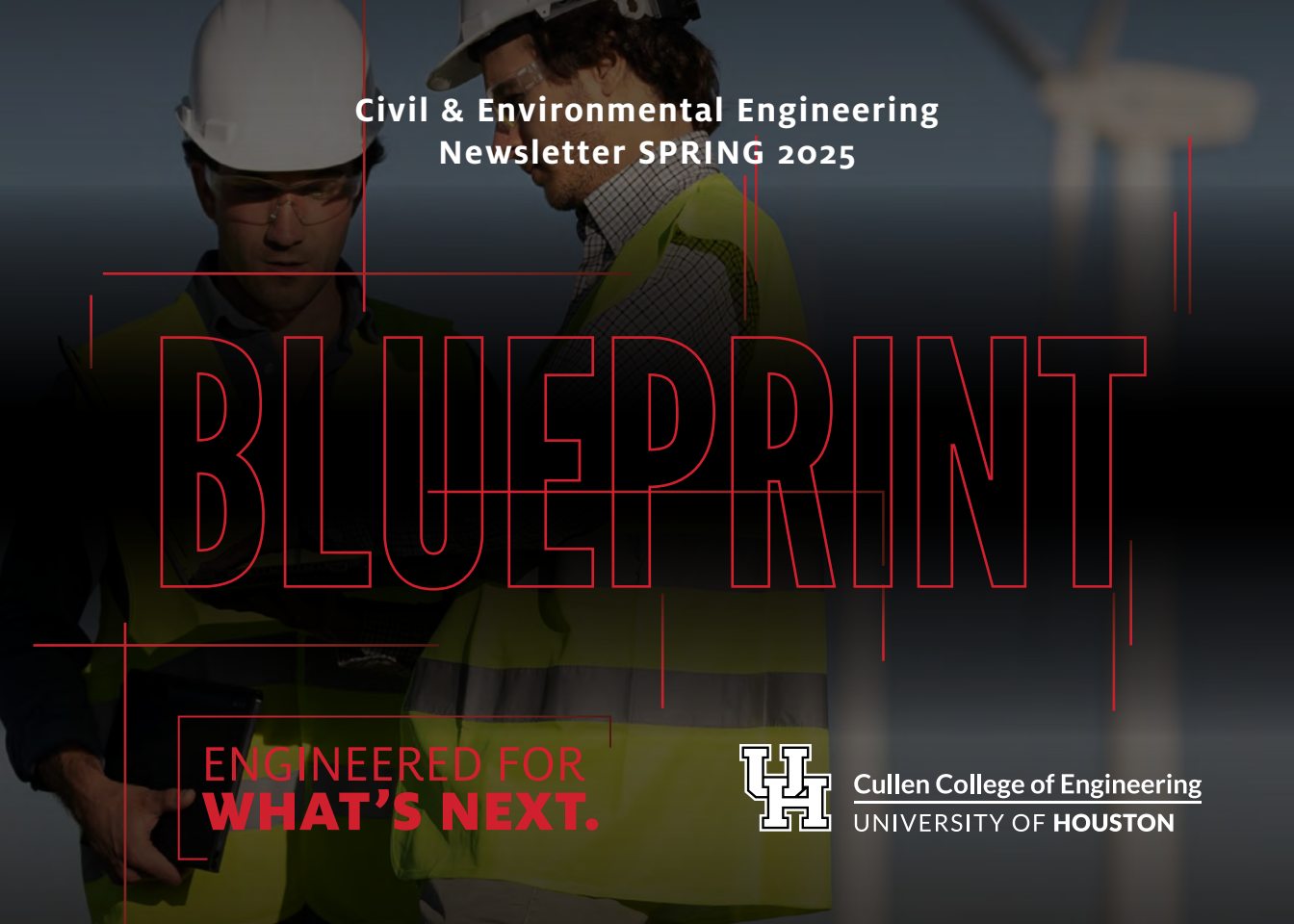


Civil & Environmental Engineering
Newsletter SPRING 2025

BLUEPRINT

ENGINEERED FOR
WHAT'S NEXT.

Cullen College of Engineering
UNIVERSITY OF **HOUSTON**

SHAFFER MAKING CLEAN WATER MORE ACCESSIBLE

When you drink a nice refreshing glass of water, do you ever think, “Gee, I’m glad that polymeric desalination membrane did its job!”

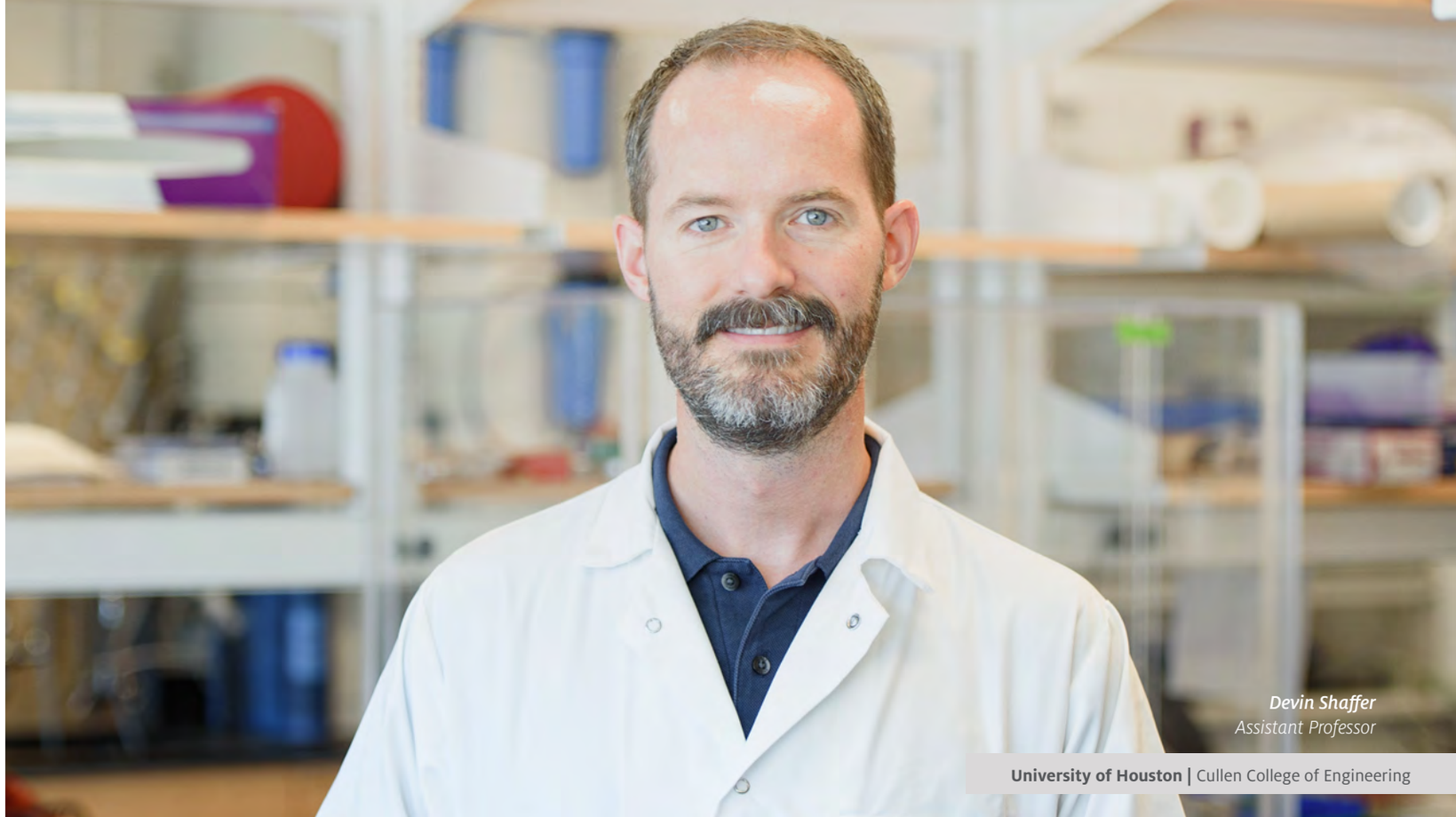
Probably not, but maybe you should.

Those thin polyamide, or plastic-like, membranes work as filters that turn salty water into fresh drinkable water. The salt-blocking membranes are widely used to turn both slightly salty water (brackish water) and seawater into fresh water.

Enter **Devin Shaffe**r, an assistant professor in the Civil and Environmental Engineering Department. He’s developed a breakthrough membrane that lets water flow through up to eight times faster while still keeping out salt, making desalination more efficient and accessible than ever before.

Shaffer’s work, published in ACS Applied Materials and Interfaces, addresses the tradeoff between how much water can pass through (permeability) and how well the membrane blocks salt and other impurities (selectivity). If the membrane lets more water through, it may also allow more salt to pass, reducing effectiveness. If it blocks more salt, it may slow down water flow, making the process less efficient and more expensive in systems like reverse osmosis and nanofiltration.

“We have developed a new type of ultrathin polyamide membrane with a unique, contorted structure that creates more open spaces, or enhanced free volume, within the material,” reports Shaffer.



Devin Shaffer
Assistant Professor

RAHIMI NAMED TO 40 UNDER 40 CLASS BY AAEES

An assistant professor in the Civil and Environmental Engineering Department at the Cullen College of Engineering has been recognized as a rising star in environmental engineering and science, thanks to his research on electrochemical carbon capture.

Mim Rahimi is part of the 2025 cohort for the American Academy of Environmental Engineers and Scientists' 40 Under 40 Recognition Program. Founded in 1955, the AAEES has more than 3,000 members and is one of the preeminent organizations for environmental engineers and scientists.

"I am deeply humbled and honored to be recognized with this prestigious award," Rahimi said. "It is a testament to the hard work and dedication of my research team and the support I have received throughout my career."

According to the AAEES, the program was introduced to recognize talented individuals who have been responsible for helping to advance the fields of Environmental Science or Environmental Engineering in a demonstrable way within the last 12 months. A nominee must be under 40 at the end of the calendar year in which they are nominated. The distinction dates back to 2022, and this is the first time a University of Houston professor has been recognized.

Earlier this year, Rahimi received an NSF CAREER award for his research into electrochemical carbon capture. His research proposal, "Leveraging Liquid-Liquid Interfaces for Innovative Electrochemical Carbon Capture," was selected for $537,719 in funding. He also provided insight into carbon dioxide removal for the University of Houston's Energy magazine, Energy @ Scale.

"I want to express my deepest gratitude to my incredible research team, especially my Ph.D. students, whose dedication and innovation make achievements like this possible," he said. "I also extend my sincere thanks to Professor **Roberto Ballarini**, our department chair, for nominating me for this honor, and to Professor **Hanadi Rifai** for her invaluable mentorship and guidance throughout my academic journey."

Mim Rahimi
Assistant Professor

PH.D. CANDIDATE KHONDAKER IDENTIFIES NEW APPROACH TO IMPROVE HURRICANE FORECAST ACCURACY

A paper recently co-authored by **Md Murad Hossain Khondaker**, a civil and environmental engineering Ph.D. candidate at the University of Houston, may hold key insights that allow for better predictions of catastrophic flooding produced by hurricanes in the United States.

"Weather prediction models still struggle to accurately forecast hurricanes, even with recent advances in computational power," said Khondaker. "Our research focused on the idea that current weather models overestimate how much hurricanes' kinetic energy spreads out or diffuses."

They hypothesized that over-estimations of diffusivity lead to weaker intensity forecasts, which creates a discrepancy between forecast and reality.

"Our research was motivated by the significant impact of hurricanes: the most destructive and costly natural disasters in U.S. history. We observed that current models often underestimate hurricane intensity, leading to critical gaps in disaster preparedness. Our goal was to improve existing forecasting methods to reduce the devastating effects of hurricanes by enhancing both intensity and rainfall predictions," he added.

Khondaker and his supervisor, assistant professor of civil and environmental engineering **Mostafa Momen**, Ph.D., saw the paper published in the August 2024 issue of the Journal of Hydrometeorology.

Md Murad Hossain Khondaker
Ph.D. candidate

MILILLO, YISMAW PUBLISH COMPREHENSIVE REMOTE SENSING REVIEW IN IEEE XPLORE

A review article authored by civil and environmental engineering assistant professor **Pietro Milillo** and postdoctoral fellow **Yismaw Wassie**, "Interferometric Synthetic Aperture Radar Multitemporal Deformation Monitoring: A review of machine learning techniques," was recently published in the trusted journal IEEE Xplore.

According to Wassie, the review "brings together key methodological advancements and benefits of machine learning and deep learning (ML/DL) methods to the existing interferometric synthetic aperture radar (InSAR) domain."

Milillo's research focuses on "using remote sensing data from different sensors and converting the data into knowledge related to climate science, such as glacier monitoring, damage mapping, and other topics related to resilience."

His goal, in his own words, is to "use this data to improve our society."

"We're in a situation where radar technologies — specifically InSAR — are entering our everyday lives like never before," said Milillo. "When I approached this field of science, there were only a few satellites around to provide data sets. With the advancing technology and science, these satellites are now answering questions that pertain to our everyday lives."

An area the size of a county could yield billions of InSAR data points, and that number reaches the order of trillions on a countrywide scale. When combined with ever-improving available technologies and methods, these already-large numbers are always increasing in quantity and complexity, far beyond what is analyzable by humans.

"When you want to look at aquifer drought conditions, or glaciers melting, or subsidence, or infrastructure monitoring or infrastructure at risk of collapse, or fault motions — any kind of Earth science focus — it is clear to us that you can't possibly bring together enough people to even look at this data. We have a finite number of researchers and a finite amount of funding. It is natural for us to want to focus on machine learning that could help us automate all of these tasks," Milillo said.

Pietro Milillo
Assistant professor

EAA HONORS STUDENTS AT 2025 INDUSTRY AWARD NIGHT

A total of 25 students from different organizations received more than $13,000 in scholarships and awards at the 2025 Industry Awards Night, hosted by the University of Houston's Engineering Alumni Association at the Athletic/Alumni Center.

The keynote address was given by Kelvin King, a graduate of the Electrical and Computer Engineering Department and the chief delivery officer of Gaine Technology, LLC.

The following awards were given out:

Biomedical Engineering Award
- Be-Once Marsh

Brown & Gay Engineers' Ronald L. Mullinax Endowed Scholarship (Civil Engineering)
- Sofia Diaz
- Zeus Gallo
- Pichpiseth Long
- Deena Mir
- Diego Ramirez

WSB Inspiration Award (Civil or Environmental Engineering)
- Christian White

Conoco Phillips' Engineering With SPIRIT (Petroleum, Chemical, Mechanical or Electrical)
- Hanna Vu
- Omotolase Osisanlu

The Huerta Scholarship (Civil Engineering)
- Liliana Perez Villarreal
- Brenda Roman

Petroleum Engineering Advisory Board's (PEAB) Dr. John Lee Engineering Legacy Award
- Alexandra Montana

PEAB Petroleum Engineering Minds Awards
- Aarati Kumari Agri
- Steven Garrett
- Azamat Sabyrov
- Francisco J. Santibanez

PEAB Dr. Thomas Holley Engineering Professionalism Award
- Christina Renee Castillo

Draco Spring Mfg. Co.'s Spring Forward Award (Any Major)
- Alexis Castillo

Blackline Engineering Innovative Award (Any Major)
- Melody Nguyen

Nathan and Carol Schmidt Engineering Scholarship (Chemical or Mechanical)
- Angel Rosa

American Society of Indian Engineers and Architects' Indian Engineers Engineering the Future (Any Major)
- Rajvi Patel

EAA's Excel in Engineering Award (Any Major)
- Jay Lim

EAA's Emerging Engineering Leader Award (Any Major)
- Kathryn Kalchik

UH EWeek Sponsorships (Any Major)
- Jonathan Gaucin
- Katlinh Nguyen

Left to right: *Diego Ramirez, Deena Mir, Pichpiseth Long, Zeus Gallo and Sofia Diaz are presented the Brown & Gay Engineers' Ronald L. Mullinax Endowed Scholarships by Kenneth Flakes (BSME '02), the Director of Communications for the Engineering Alumni Association.*

FROM SPACE TO GROUND PH.D. STUDENT VOELKER LEADS TEAM TRANSFORMING REMOTE SENSING-BASED EARTHQUAKE ASSESSMENT PROCEDURES

A doctoral candidate from the University of Houston's Department of Civil and Environmental Engineering has co-authored a transformative study that redefines approaches to assessing earthquake damage using cutting-edge remote sensing technologies.

The findings, now featured in the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, offer valuable perspectives for enhancing disaster response strategies in the wake of the 2023 Turkey-Syria earthquakes.

Brandon Voelker, working closely with his advisor, **Pietro Milillo**, Ph.D., Assistant Professor of Civil and Environmental Engineering at UH, led the Earthquake Engineering Field Investigation Team's (EEFIT) mission remote sensing team. The research utilized Synthetic Aperture Radar (SAR) and high-resolution optical imaging to map the structural damage across the earthquake-impacted regions of southeastern Turkey, providing a rapid, large-scale view of the destruction.

The February 2023 earthquakes wreaked havoc, claiming thousands of lives and devastating infrastructure across the region. Voelker's work underscores the crucial role of remote sensing in facilitating swift damage assessments – a vital component for directing emergency relief and planning recovery efforts.

"Integrating satellite data with direct field observations is a game-changer for disaster response," Voelker said. "It enables teams on the ground to zero in on the most affected areas, ensuring their efforts are both efficient and effective."

In collaboration with an international consortium of researchers, the study harnessed satellite data from the European Space Agency and processed by the NASA's Jet Propulsion Laboratory and the German Aerospace Center, among other sources. The team employed a hybrid approach, blending remote sensing insights with ground-based data to produce detailed, actionable damage maps. These maps proved invaluable for directing field surveyors to a variety of sites, capturing a nuanced picture of the region's resilience and structural challenges.

Brandon Voelker
Ph.D. student

CULLEN TEAMS TAKE TOP 2 SPOTS IN UH'S COOGS FOR ENERGY HACKATHON EVENT

The University of Houston's inaugural "Coogs for Energy" Hackathon has crowned its champions, with the top two teams heavily featuring students from the Cullen College of Engineering.

The event, hosted by UH's Division of Energy and Innovation's Energy Transition Institute, pitted 10 teams against each other to find the best solutions to some of the region's most pressing challenges. The competition was sponsored by the Glen Bailey Foundation and ran on Feb. 21 and Feb. 22.

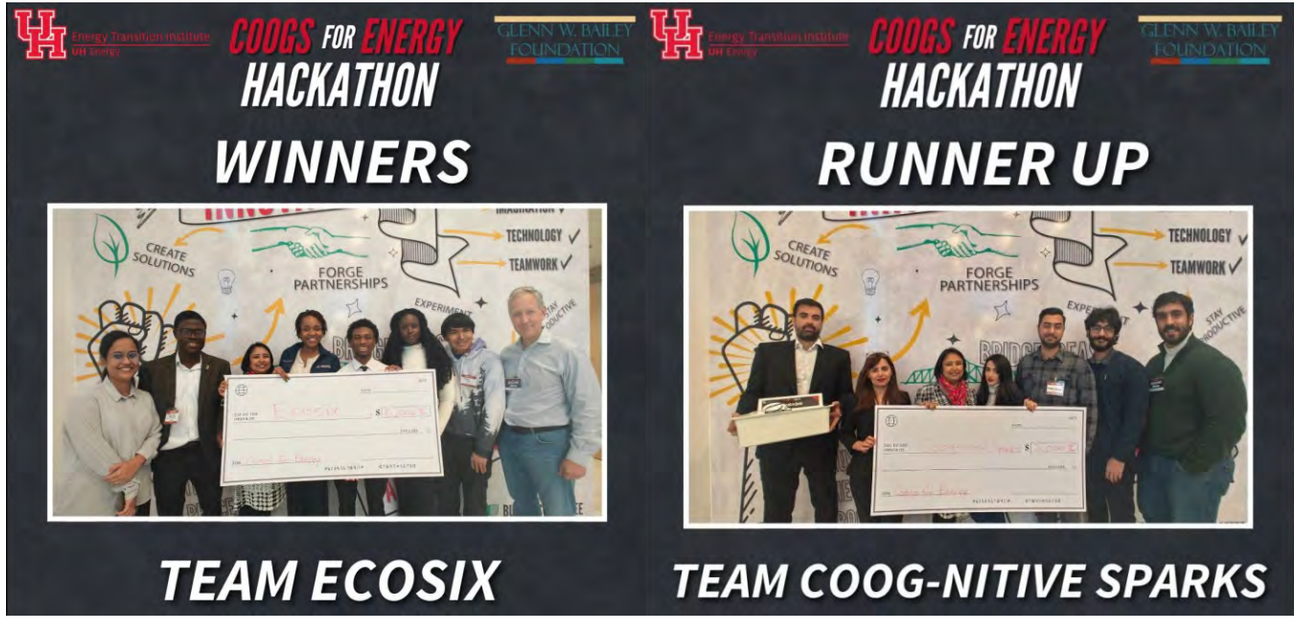
Team Ecosix took first place, followed by Coog-nitive Sparks. They earned cash prizes of $6,000 and $3,000 respectively.

Team Ecosix consisted of:

- Olanrewaju Daramola, Chemical and Biomolecular Engineering
- David Odim, Computer Science in NSM
- Afra Azim, Chemical and Biomolecular Engineering
- Israel Trejo, Computer Science in NSM
- Glenys Yevi, C.T. Bauer College of Business
- Koseku Buzugbe, Chemical and Biomolecular Engineering

The members of Coog-nitive Sparks are:

- Milad Rezaie, Civil and Environmental Engineering
- Fateme Sabet, Civil and Environmental Engineering
- Parisa Yousefi, C. T. Bauer College of Business
- Bardia Nabavi, Mechanical and Aerospace Engineering
- Abdollah Zakeri, Electrical and Computer Engineering
- Delaram Mehrabaneshtehardi, Education



CULLEN COLLEGE

The University of Houston
Cullen College of Engineering

The University of Houston Cullen College of Engineering addresses key challenges in energy, healthcare, infrastructure, and the environment by conducting cutting-edge research and graduating hundreds of world class engineers each year. With research expenditures topping $40 million and increasing each year, we continue to follow our tradition of excellence in spearheading research that has a real, direct impact in the Houston region and beyond.

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