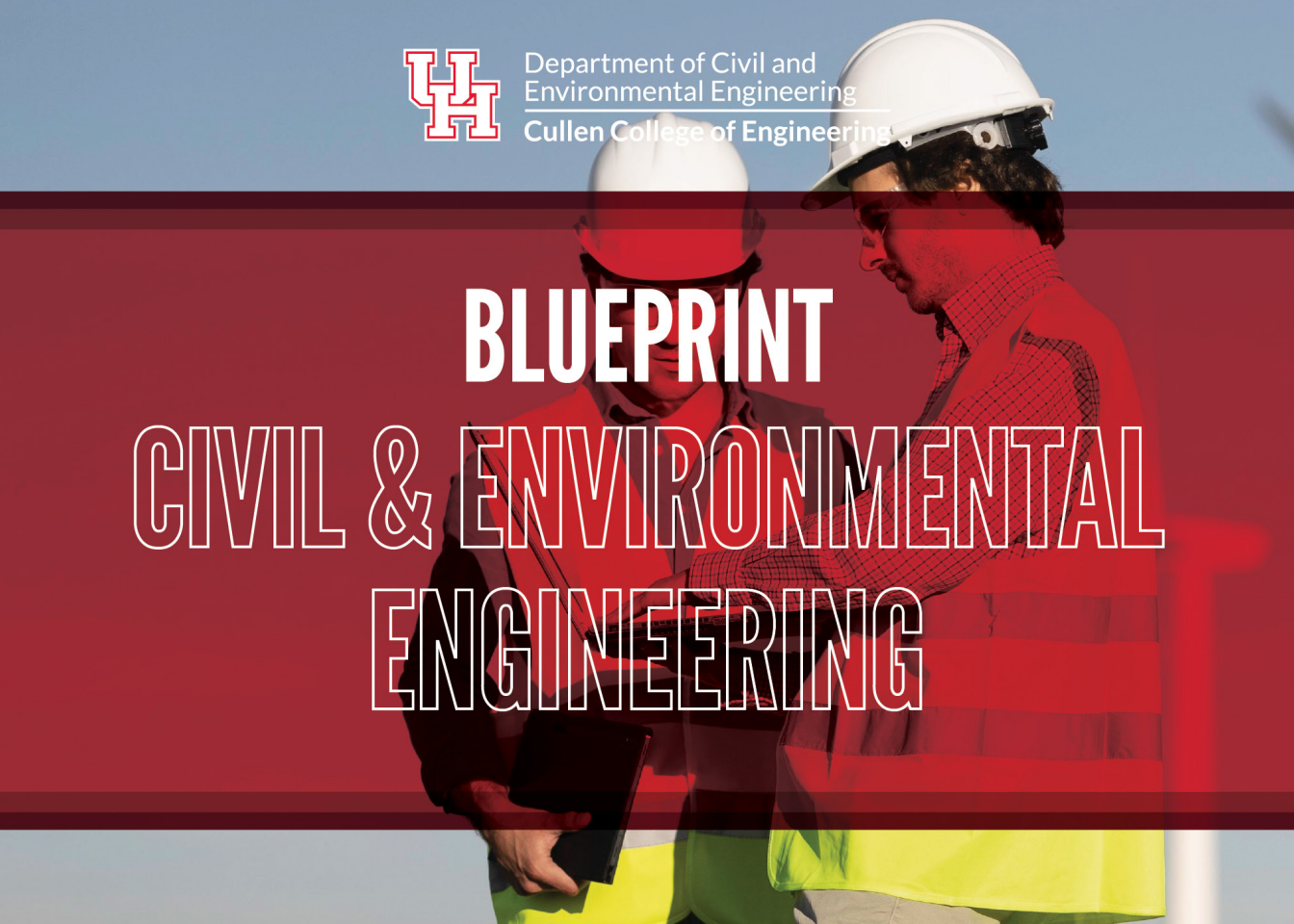

Department of Civil and Environmental Engineering
Cullen College of Engineering

BLUEPRINT

CIVIL & ENVIRONMENTAL ENGINEERING

RESEARCH ADVANCEMENT

MILILLO, INTERNATIONAL TEAM EXPOSE WEAKNESS IN BRIDGES WORLDWIDE

Study Shows North American, African Bridges Most at Risk; Scientists Propose Satellite Monitoring to Prevent Failures

A scientist at the University of Houston's Cullen College of Engineering is helping reveal the world's weakest bridges — and how to fix them before it's too late.

In a study of 744 bridges across the globe published in Nature Communications, **Pietro Milillo** and an international team found that structures in North America are in the poorest condition, followed by those in Africa. Their solution could change how infrastructure is protected worldwide: monitoring bridge stability from space to detect problems before they become disasters.

The grim bridge news correlates with the age of the bridges, as there was a peak in North American bridge construction in the 1960s, meaning many of these bridges are near or beyond their design lives. The solution — to use spaceborne monitoring of bridges via Synthetic Aperture Radar — offers frequently acquired, high-resolution imagery with global coverage and extensive historical archives.

"Our research shows that spaceborne radar monitoring could provide regular oversight for more than 60 percent of the world's long-span bridges," said Milillo, co-author of the study and an associate professor of civil and environmental engineering at UH.

Pietro Milillo
Assistant professor

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NAKSHATRALA AWARDED ARMY RESEARCH LABORATORY GRANT FOR SELF-HEALING MATERIALS

Imagine bridges, aircraft or military vehicles that can heal themselves after damage — much like skin repairing after a cut or bone after a break. It might sound like science fiction, but that's the future **Kalyana B. Nakshatrala**, the Carl F. Gauss Professor of Civil and Environmental Engineering at the University of Houston, is working to make commonplace.

He is teaming up with his experimental collaborator, Jason Patrick, Associate Professor of Civil, Construction and Environmental engineering at North Carolina State University, to make it happen.

Nakshatrala has received a $690,050 grant from the Army Research Office (ARO), a directorate of the U.S. Army Combat Capabilities Development Command Army Research Laboratory, to advance the development of self-healing composite materials, which are engineered structural materials that can self-repair internal damage. This dramatically extends the life and reliability of critical infrastructure.

The project, "MEND-SCI — Mechanics and Experimental/Numerical Development of Self-Healing Composites for Military Infrastructure," combines computational modeling and experimentation to make self-healing materials practical for real-world use. The University of Houston is the lead institution on the grant and has subcontracted a portion of the research to North Carolina State University (NCSU). Patrick serves as co-PI.

Nakshatrala will lead the development of mathematical models and predictive mechanics tools to understand how self-healing occurs in fiber-reinforced polymer (FRP) composites — lightweight materials widely used in aerospace, energy and defense applications. Patrick's lab will provide material property inputs and experimental validation to test those models and ensure they hold up under real-world conditions.

Kalyana B. Nakshatrala
Carl F. Gauss Professor and Associate Chair

XIE RESEARCHING IMPROVEMENTS TO SEAFLOOR MOTION MONITORING FOR EARTHQUAKE HAZARD ASSESSMENT

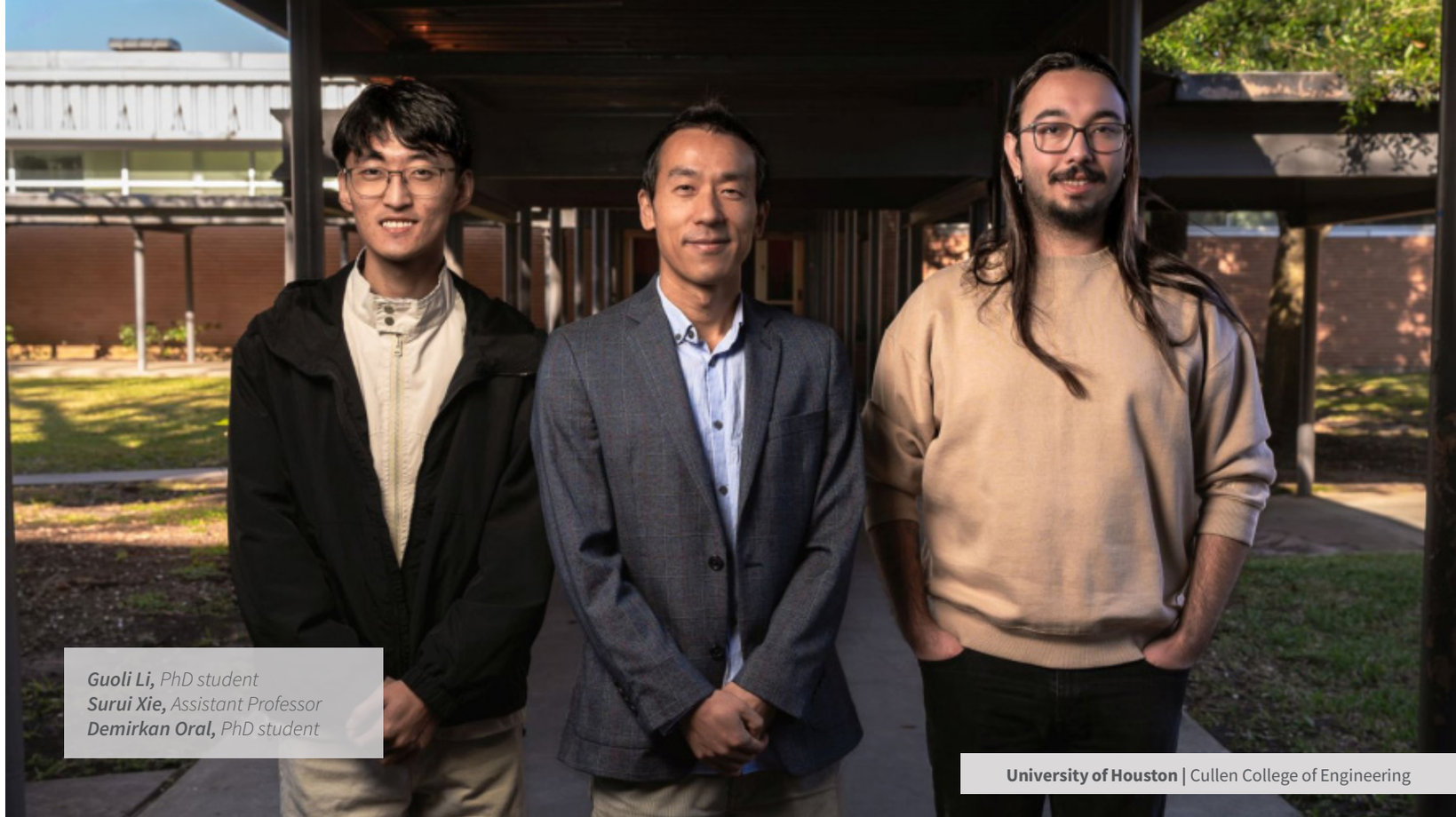
An assistant professor at the Cullen College of Engineering has received a $690,000 grant to explore a new method to measure seafloor motion, an important component when it comes to assessing offshore earthquake and tsunami potentials.

Surui Xie, an assistant professor in the Civil and Environmental Engineering Department, is the PI for “Novel Designs of GNSS-Acoustic Surveying for Low-Cost Seafloor Geodesy.” This is a collaborative research grant from the National Science Foundation jointly with a research team at the University of California San Diego.

Xie pointed to the 2004 Indian Ocean earthquake and tsunami, and the 2011 Tōhoku earthquake and tsunami off the coast of Japan, as examples of devastating events that prove the need for more extensive monitoring. Similar events will likely hit the US Pacific Northwest and Alaska in the future. While there are methods to measure seafloor movement now, typically using a combination of GPS positioning and acoustic ranging, they are too expensive to implement at scale.

“This type of measurements is costly,” he said. “To determine the motion of a single site on the seafloor, at least three pieces of underwater equipment are needed, and each one costs approximately $50,000. The high cost makes it too expensive to install enough stations to cover large areas of the ocean.”

In contrast, Xie’s group will attempt to get reliable results by using just one piece of expensive monitoring equipment.



Guoli Li, *PhD student*
Surui Xie, *Assistant Professor*
Demirkan Oral, *PhD student*

University of Houston | Cullen College of Engineering

RESEARCH ADVANCEMENT

KALLIONTZIS TAPPED FOR 2026 UMERC BOARD OF DIRECTORS

Civil and environmental engineering assistant professor **Dimitrios Kalliontzis** was recently appointed to the 2026 University Marine Energy Research Community (UMERC) Board of Directors. UMERC, under the Department of Energy's (DOE) Water Power Technologies Office (WPTO), is a national organization that promotes marine energy in the United States. UMERC was founded in early 2021 by the WPTO to act as a unifying organization for marine energy research across US American universities.

"Wave Energy is one of the few renewable energy resources in the United States that remains largely untapped," said Kalliontzis. "Most technologies are in their first steps of development and high levelized costs have so far inhibited wide adoption. However, harvesting only 1/10th of the available wave energy can cover nearly 6% of the electricity generation in the United States. These factors along with my background on multiphysics and fluid-structure interaction have motivated me to steer my attention toward wave energy."

Kalliontzis's research on wave energy has steadily increased with support from two recent DOE WPTO awards totaling over $600,000; his PhD student, Vasileios Kotzamanis, has been working on a project that "explores the energy capture of multimodal wave energy conversion on a fundamental scale that has not been investigated before."

Dimitrios Kalliontzis
Assistant Professor

MILILLO, ITALIAN SPACE AGENCY DELIVER UNPRECEDENTED VIEW OF ANTARCTICA GLACIER TO PREDICT SEA-LEVEL RISE

A University of Houston scientist has teamed with international partners to examine how Antarctica's massive glaciers are shifting and how that could predict sea level changes. Their latest collaboration offers the most precise mapping to date in Antarctica of grounding lines, the points where glaciers lift from bedrock and begin to float on the ocean.

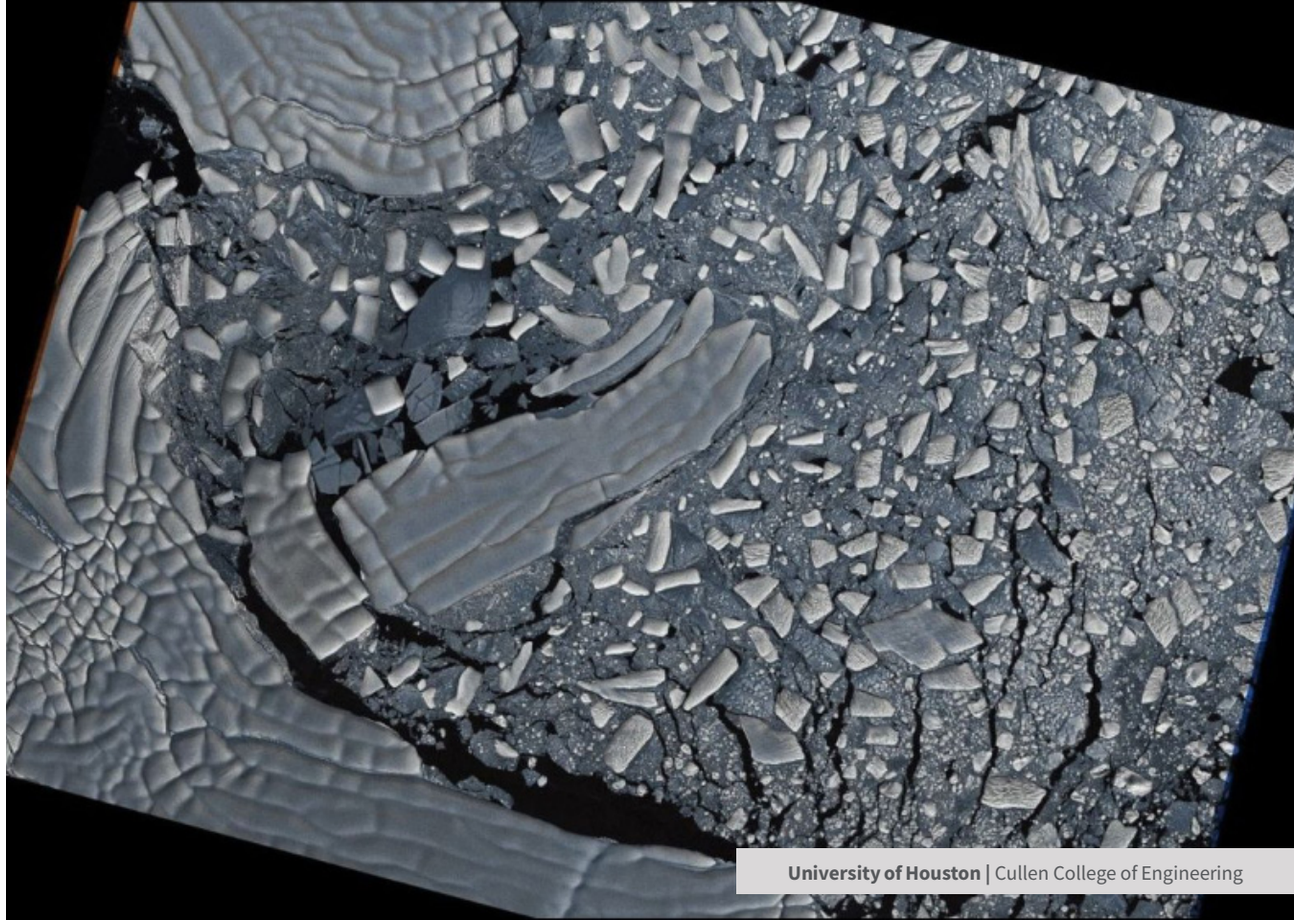
On Earth today, only two ice sheets, or continental glaciers, exist — one in Antarctica and the other in Greenland. Over thousands of years of snow compacting and compressing, the ice sheets formed and now cover most of the land in those areas.

About five years ago, the Italian Space Agency began examining Antarctica's glaciers during its dedicated COSMO-SkyMed mission, meant to observe the earth using its constellation of four synthetic aperture radar satellites, first launched 17 years ago.

And now, after transcription and interpretation, these observations reveal tidal movements and retreat rates in Antarctica of up to 700 meters — or about a half mile — per year in some regions, providing an unprecedented view of glacier evolution.

Antarctica is a significant contributor to global sea level rise, with the potential to substantially increase sea level by the end of this century.

"Continuous monitoring of Antarctic evolution is important to understand ice sheet dynamics, minimizing uncertainties in sea level rise projections, and develop strategies to mitigate the risks posed by rising sea level," said **Pietro Milillo**, assistant professor of civil and environmental engineering. "This dataset provides the most detailed view yet of how Antarctica's glaciers are interacting with the ocean. For the first time, we can monitor fast-flowing glaciers at a continental scale using high-frequency radar observations."



NAKSHATRALA ELECTED TO EMSL USER EXECUTIVE COMMITTEE

Kalyana Nakshatrala, Carl F. Gauss Professor and Associate Chair of the Civil and Environmental Engineering Department at the University of Houston's Cullen College of Engineering, has been elected to the Environmental Molecular Sciences Laboratory (EMSL) User Executive Committee (UEC).

This is a distinguished, national leadership role within the U.S. Department of Energy research community. His three-year term started in October 2025.

EMSL is a scientific user facility sponsored by the U.S. Department of Energy's Office of Science and operated as part of the Pacific Northwest National Laboratory (PNNL). The facility supports thousands of researchers by providing state-of-the-art experimental, computational, and analytical capabilities to advance the understanding of molecular and environmental processes central to national scientific priorities.

The UEC serves as a vital advisory body for the EMSL user community, offering strategic guidance on facility operations, research direction, instrument development and the annual EMSL User Meeting.

Nakshatrala is one of three newly elected members of the UEC and will represent the Computing, Analytics, and Modeling science area.

"EMSL is a national asset, and I am honored to join EMSL's User Executive Committee," Nakshatrala said. "Its unique integration of experimental capabilities with advanced computational resources creates an unparalleled environment for scientific discovery. I look forward to contributing to EMSL's mission and supporting the evolving needs of the user community."

Jay Bardhan, Ph.D., group leader of Computing, Analytics, and Modeling at EMSL, said, "We are excited and grateful that Professor Nakshatrala has joined the EMSL User Executive Committee. His expertise and perspectives will help us improve users' experience in working with EMSL, which is critical to advancing the community's interests in computing, analytics, and modeling (CAM) research."

Kalyana B. Nakshatrala
Carl F. Gauss Professor and Associate Chair

STUDENT SUCCESS

PARAJULI AWARDED CONCRETE MASONRY ENGINEERING SCHOLARSHIP BY NCMA

Samvid Parajuli, a PhD student and graduate research assistant in the Department of Civil & Environmental Engineering, has been awarded the Paul and Helen Lenchuk Engineering Student Scholarship for the 2025-2026 academic year by The National Concrete Masonry Association (NCMA) Education and Research Foundation.

This scholarship recognizes "full-time students engaged in the pursuit of an engineering graduate degree at eligible colleges and universities in the United States and Canada… while encouraging innovative design, application, or utilization of manufactured concrete masonry and hardscape products in the built environment."

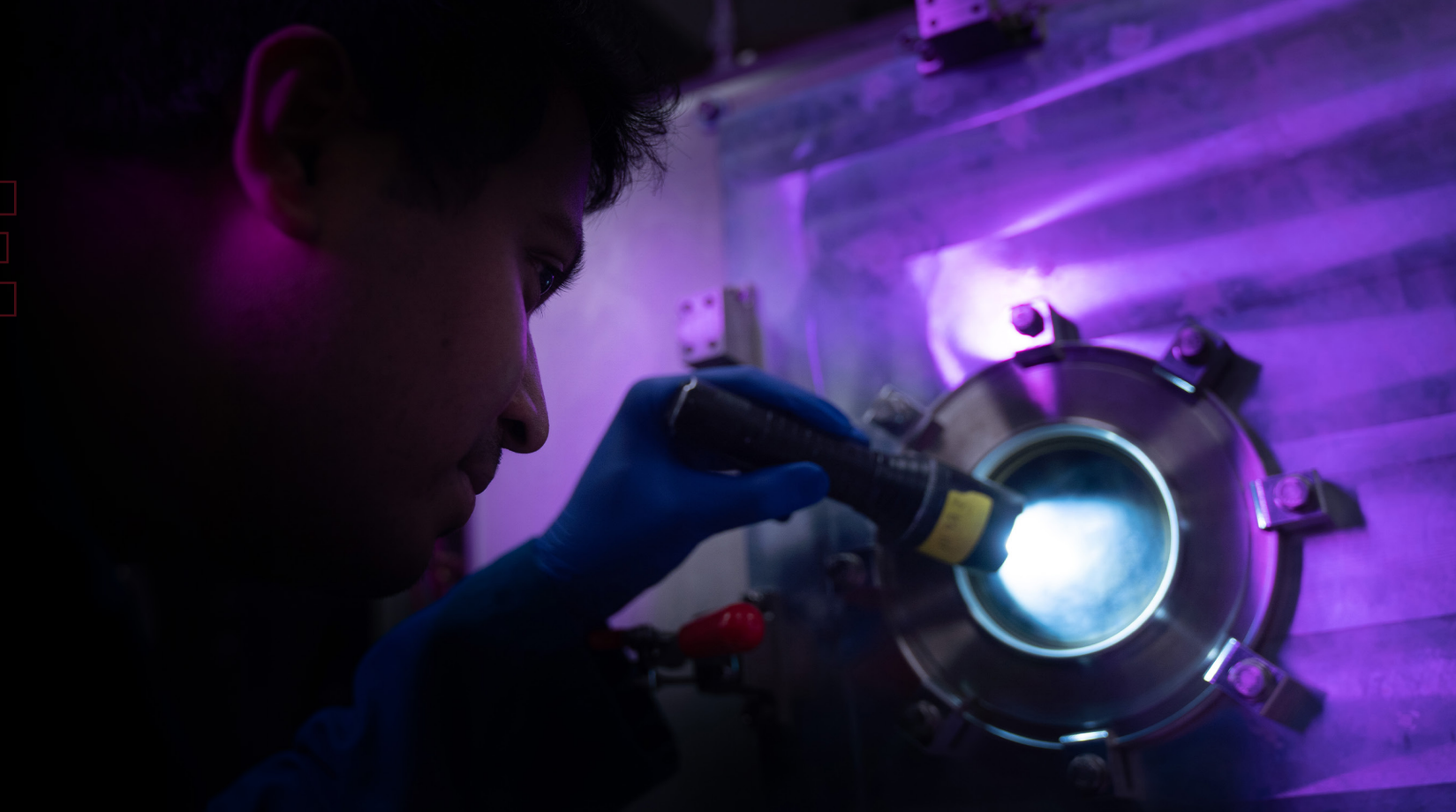
Parajuli's work concerns our understanding of how masonry structures behave when exposed to hurricane-induced flooding and storm surge, focusing on the interaction between flood pressures and masonry walls through both experimental testing and numerical modeling to reveal how these systems respond under extreme water loads.

"I was truly honored and grateful [to receive this award]," he added. "It felt rewarding to see my work on masonry resilience recognized and supported. At the same time, I felt a greater sense of responsibility to work even harder and contribute more meaningfully to advancing masonry research and resilience efforts."

Samvid Parajuli
PhD student and graduate research assistant

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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