SPRING 26

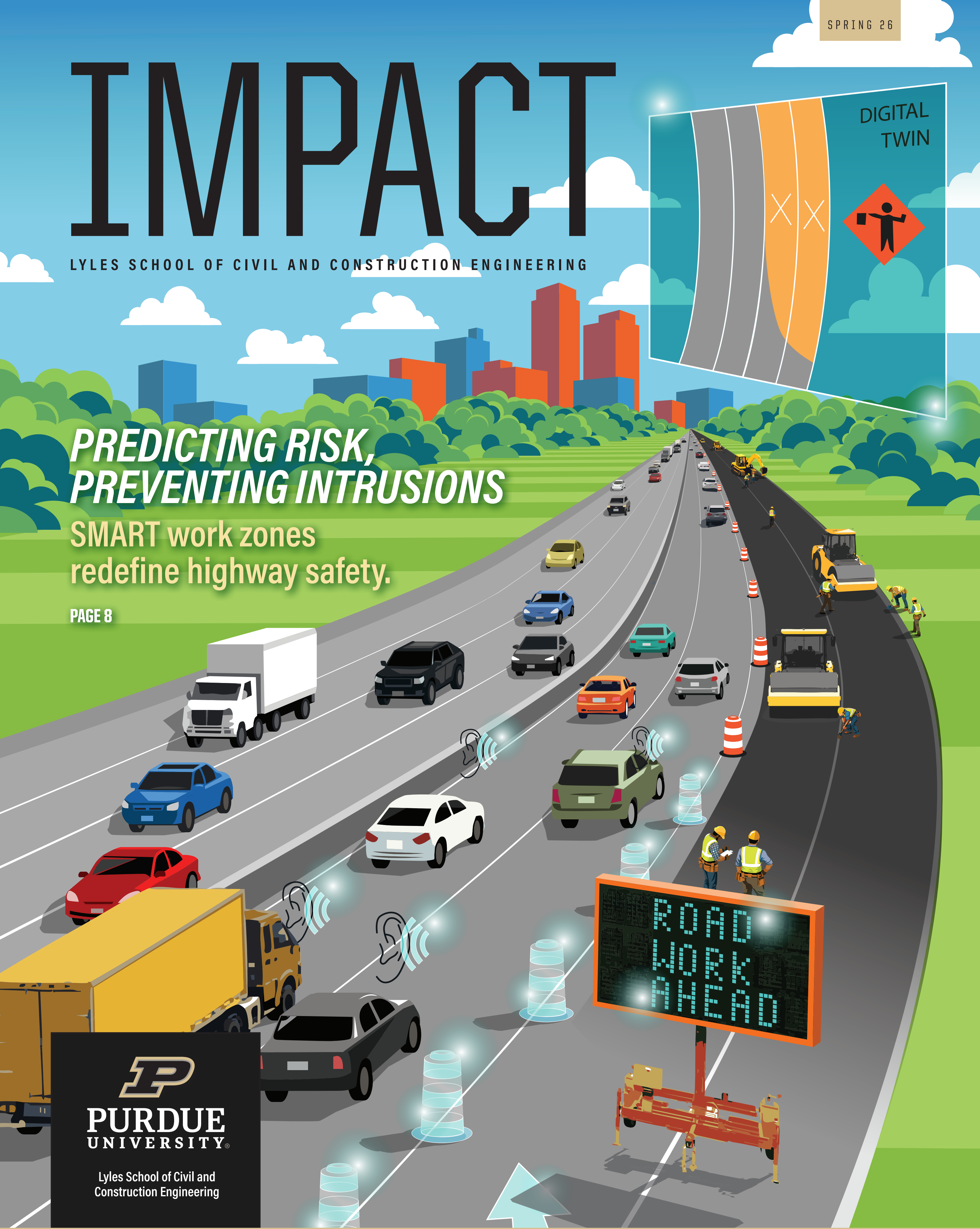
IMPACT

LYLES SCHOOL OF CIVIL AND CONSTRUCTION ENGINEERING

PREDICTING RISK, PREVENTING INTRUSIONS

SMART work zones redefine highway safety.

PAGE 8



PURDUE UNIVERSITY

Lyles School of Civil and Construction Engineering

RESEARCHERS EXPLORE 3D-PRINTING OF STRUCTURAL MATERIALS UNDERWATER | PAGE 6

MESSAGE FROM THE HEAD

More than anything, I believe the spring semester represents new beginnings.

With it, comes the new year, new classes, and — for our soon-to-be graduates — the beginning of their careers. I can already see the excitement and anticipation on the faces of the students I teach and grad students I advise. Their hard work and incredible efforts have fully taken root, and they are excited to see their opportunities bloom.

As for myself, and for the Lyles School of Civil and Construction Engineering, we face a significant new beginning as well. After more than a decade serving as head of our school, Rao "G.S." Govindaraju has taken a new position at Purdue University as the vice president for Institutes and Centers at Discovery Park District. We could not be happier for G.S. and know he will be a great success and take our university to even greater heights in the years to come.

The search for a new head is underway. As you can imagine, becoming the head of one of the premier civil and construction engineering schools in the world is something that is highly sought after and it will take time to find the perfect fit, but I am confident we will have a wealth of incredible candidates to choose from.

In the meantime, I have the privilege to serve as the interim head of the school. I am confident that during this time, our faculty, students, alumni, staff and partners will continue to strive toward making the next giant leap in both education and research — and I look forward to sharing their efforts and accomplishments.

Speaking of successes in both education and research, in this edition of CCE Impact, you will find just that. From taking our first steps toward creating a new concentration in bridge design to revolutionizing the future of roadways, our school continues to innovate how we impact the world through both education and research.

These, of course, are just a few examples of the outstanding work conducted at the Lyles School of Civil and Construction Engineering, and I look forward to seeing — and sharing — their future successes with you.

Best regards,

Habib, A. Fa

Ayman Habib
Acting Head and Thomas A. Page Professor of Civil Engineering
Lyles School of Civil and Construction Engineering

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ON THE COVER

Through the SMART Work Zone Project, an interdisciplinary research team is developing an intelligent, adaptive safety ecosystem designed to predict instrusion risk in real time and warn workers before a vehicle enters the construction site.

Illustration by Daniel Hertzberg

CCE Impact is published biannually for alumni and friends of the Lyles School of Civil and Construction Engineering. We welcome your comments, opinions and questions.

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NEWS & EVENTS

CONGRATULATIONS GRADUATES

In December, the Lyles School of Civil and Construction Engineering saw 61 undergraduates and 52 graduate students earn their degrees. We are incredibly proud of their achievements and wish them the best of luck in their future endeavors.

FROSCH RECOGNIZED BY AMERICAN CONCRETE INSTITUTE

Congratulations to Robert Frosch, professor of civil engineering and vice provost for academic facilities. He was awarded the Charles S. Whitney Medal by the American Concrete Institute in recognition of his advancement of engineering knowledge.

Frosch's structural engineering research has resulted in substantive changes to engineering practice, including codes for buildings and bridges, and as vice provost he works to advance facilities additions and renovations across Purdue's campus. He has also helped create research- and student-centered buildings, including Purdue's Flex Lab and Bechtel Innovation Design Center.

SYMPOSIUM ON STEEL TO CONCRETE CONNECTIONS

The first International Symposium on Steel to Concrete Connections (SySCCon 2026) will take place Aug. 3-5 at Purdue. This symposium will serve as a dedicated platform for researchers, academics, practitioners and industry professionals to come together and engage in meaningful discussions on the latest innovations and research in anchorage, bond and composite construction.

Professor Mohammad Jahanshahi reviews data with undergraduate researchers Minhea Thomas and Ava Aupperle.

AI MEETS ASPHALT

Faculty startup helps cities manage roads with speed and precision

A Purdue-connected startup is leveraging AI to help public works departments across multiple Indiana cities automate road condition assessments and maintain local road infrastructure.

Since January 2025, PaveX has surveyed and assessed more than 3,400 miles of Indiana roads. CEO and founder Mohammad Jahanshahi, associate professor in the Lyles School of Civil and Construction Engineering, said the company's solution builds on more than a decade of research and development, using a data collection system that can be implemented for only a few thousand dollars.

"Our patent-pending platform uses advanced computer vision algorithms to assess pavement conditions quickly and objectively," he said.

PaveX's platform improves upon traditional assessment methods in several ways:

- Reduced cost because there is no need for specialized vehicles or expensive sensors
- Improved consistency because artificial intelligence ensures standardized and repeatable assessments
- Increased speed because roads can be assessed in a fraction of the time

"Local governments can implement the PaveX system with minimal training and equipment, which leads to enhanced accessibility," Jahanshahi said. "They receive actionable insights without the need for in-house data analysis expertise, all while eliminating costly hardware in favor of inexpensive advanced sensors that speed up data collection."

Jahanshahi developed the AI platform and disclosed it to the Purdue Innovates Office of Technology Commercialization, which applied for a patent to protect the intellectual property and granted PaveX the exclusive license to commercialize the technology.

Undergraduate researchers Ava Aupperle and Minhea Thomas, both civil engineering majors, joined the team in the fall of 2025 and were tasked with data and image review.

"It's been an eye-opening experience to see the condition of the roads and how this new technology is able to track it," Aupperle said. "The work being done here will make a lasting impact for drivers and road agencies."

Thomas added, "It's exciting to see what's being done here and knowing how great of a benefit this could potentially be to municipalities. We all rely on the roads and we need them to be in the best shape possible, and this device will help make sure that happens."

Jahanshahi and his team have been actively engaged in pavement assessment training initiatives led by the Indiana Local Technical Assistance Program (LTAP) and are eager to implement these strategies in practical, real-world settings. Indiana LTAP is optimistic about the potential of emerging technologies, such as PaveX, to enhance transportation asset management. As a member of the national network of technology transfer centers established by the Federal Highway Administration, Indiana LTAP remains committed to advancing the performance, efficiency and innovation of transportation agencies throughout the state.

Jahanshahi said PaveX is expanding to support pilot projects in other states, including California, Illinois, Michigan, North Carolina and Utah.

AGING DAMS RISING DANGERS

Aging dams in the U.S. pose a significant risk, with more than 16,000 labeled a high hazard. Researchers with the NSF-funded Institute for Geospatial Understanding through an Integrative Discovery Environment (I-GUIDE) initiative use advanced modeling to help communities prepare for rare but catastrophic dam failures. Professor Venkatesh Merwade, graduate student researchers Sang Woo Bae and Aiden Griggs and undergraduate student researcher David Wilson develop and test two-dimensional inundation models to turn complex data into actionable emergency plans to save lives and reduce damage.

"The National Inventory of Dams reports over 92,000 dams in the United States, averaging 64 years old," Bae said. "Of these, 16,841 are high hazard, where failure or mis-operation could cause loss of life and significant damage."

The team concentrates on dams most likely to cause loss of life and damage — those classified as high hazard, over 50 feet tall or in unique regions. This targeted approach anchors the research, ensuring the team's modeling has real, broad impact.

Using a comprehensive suite of tools to simulate dam failures, the team models rainfall-runoff and inflow hydrographs with HEC-HMS, simulates breach processes and downstream flooding using HEC-RAS and creates detailed flood maps in ArcGIS. They ensure accuracy by collecting essential data — terrain features, reservoir levels, surface characteristics, precipitation and land-use information — using dynamic datasets such as Digital Elevation Models (DEMs). Their latest work focuses on a scalable modeling approach for robust analysis of dam breach scenarios and identifying regions most at risk.

Merwade provides overarching direction for the research, shapes methodology and ensures the project aligns with I-GUIDE's objectives. He leads collaborations with Purdue and other partners and oversees access to the computing resources vital for large-scale simulations.

"It is exciting to see our graduate and undergraduate students collaborate and work together to use the modeling skills they have learned in classes, and apply them very meticulously to address the critical problem of flooding with broader societal impacts," Merwade said.

Aiden Griggs, David Wilson, Venkatesh Merwade, and Sang Woo Bae analyze dam-failure scenarios using two-dimensional hydraulic modeling.

Dam-failure research brings unique challenges: real-world breaches are unpredictable, and large-scale simulations require significant computing power. Researchers must make informed assumptions about breach size, rainfall patterns and other variables — choices that can dramatically affect the predicted impact of downstream flooding. To address both uncertainty and computational demands, the team uses Purdue's Anvil supercomputer to rapidly run countless scenarios. This enables systematic testing of assumptions, revealing both worst-case possibilities and a spectrum of realistic outcomes. Ultimately, this approach makes dam safety assessments smarter, more comprehensive and more valuable for protecting at-risk communities.

Because dam-failure inundation maps are inherently uncertain, the team uses multiple strategies to ensure reliable results. By validating their models against government maps, following United States Army Corps of Engineers and Federal Emergency Management Agency guidelines, and integrating critical data like elevation, reservoir levels, land use and precipitation, they deliver robust, credible simulations. This rigorous approach equips communities with the tools they need to prepare for and reduce the devastating impacts of dam failures.

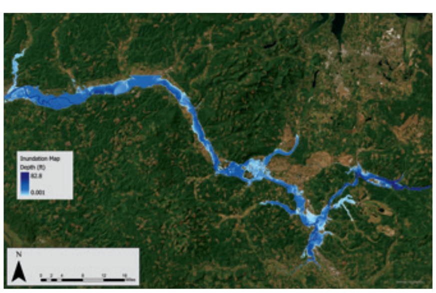


Figure 1 – Regional Dam-Failure Inundation Map (Overview)

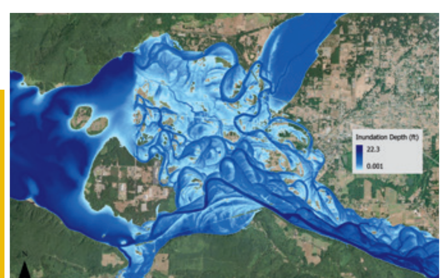


Figure 2 – Inundation Map Focused on the Urban Area

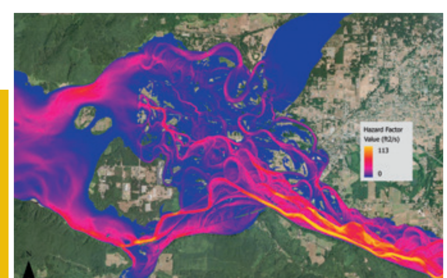


Figure 3 – Hazard Factor Distribution in the Urban Area

Hazard factor is an index combining water depth and velocity to evaluate the potential danger flooding poses to people, infrastructure, and emergency response. Higher hazard zones (shown in warmer colors) indicate locations where fast, deep, or forceful flows may cause severe impacts during a dam-failure event.

HAIR CARE NOT AS HARMLESS AS IT SEEMS

Common heat-based styling routines release dangerous nanoparticles

A typical morning hair care routine can expose you to as much immediate nanoparticle pollution as standing in dense highway traffic, report Purdue engineers.

A research team led by Nusrat Jung, an assistant professor in the Lyles School of Civil and Construction Engineering, and PhD student Jianghui Liu found that a 10- to 20-minute heat-based hair care routine exposes a person to upward of 10 billion nanoparticles that are directly deposited into their lungs. These particles can lead to serious health risks such as respiratory stress, lung inflammation and cognitive decline.

"This is really quite concerning," Jung said. "The number of nanoparticles inhaled from using typical, store-bought hair care products in conjunction with heated styling tools was far greater than we ever anticipated."

Until this study, Jung said, no real-time measurements on nanoparticle formation during heat-based hair styling had been conducted in full-scale residential settings. Their research addresses this gap by examining temporal changes in indoor nanoparticle number concentrations and size distributions during realistic heat-based hair styling routines.

"By providing a detailed characterization of indoor nanoparticle emissions during these personal care routines, our research lays the groundwork for future investigations into their impact on indoor atmospheric chemistry and inhalation toxicity," Jung said. "Studies of this kind have not been done before, so until now, the public has had little understanding of the potential health risks posed by their everyday hair care routines."

What makes these hair care products so harmful, Liu said, is when they are combined with large amounts of heat from styling appliances such as curling irons and straighteners. When combined with heat exceeding 300 degrees Fahrenheit, the chemicals not only rapidly release into the air but also lead to the formation of substantial numbers of new airborne nanoparticles.

"Atmospheric nanoparticle formation was especially responsive to these heat applications," Liu said. "Heat is the main driver — cyclic siloxanes and other low-volatility ingredients volatilize, nucleate and grow into new nanoparticles, most of them smaller than 100 nanometers."

Undergraduate student researcher Rashmika Manipati said the research has been eye-opening and has impacted her own hair care routine.

"You never would think something that has been accepted as both safe and common for so long could be so potentially hazardous," Manipati said. "What the research is revealing is something everyone needs to be aware of."

As for how to avoid putting oneself at risk of inhaling mixtures of airborne nanoparticles and volatile chemicals, Jung and Liu said the best course of action is simply to avoid using such products — particularly in combination with heating devices. If that is not possible, Jung recommends reducing exposure by using bathroom exhaust fans for better room ventilation.

"If you must use hair care products, limit their use and ensure the space is well ventilated," Liu said. "Even without heating appliances, better ventilation can reduce exposure to volatile chemicals, such as D5 siloxane, in these products."

To more fully capture the complete nanoparticle formation and growth process, Jung said future studies should integrate nano mobility particle sizing instruments capable of detecting particles down to a single nanometer. The chemical composition of these particles should also be evaluated.

"By addressing these research gaps, future studies can provide a more holistic understanding of the emissions and exposures associated with heat-based hair styling, contributing to improved indoor air pollution assessments and mitigation strategies," Jung said.

BENEATH THE SURFACE

Undergraduate researcher Riya Raj helps Purdue engineers push 3D concrete printing into new underwater frontiers

When Riya Raj (BSCE ’25) talks about how much she’s learned about research at Purdue, her enthusiasm is unmistakable. She still laughs about the day steel fibers jammed a concrete-printing hose in the Bowen Laboratory for Large-Scale Civil Engineering Research. The failed experiment for her 3D Printing for Infrastructure Applications course forced her project team to rethink its approach. Moments like that — equal parts messy and illuminating — are what pulled her deeper into the world of 3D concrete printing.

Her curiosity led her to an undergraduate research position with a group exploring whether structural materials can be 3D-printed underwater. The research team is co-led by Jan Olek, the James H. and Carol H. Cure Professor in Civil Engineering; Jeffrey Youngblood, professor of materials engineering; and Pablo Zavattieri, the Jerry M. and Lynda T. Engelhardt Professor in Civil Engineering. Raj worked on the project under the mentorship of graduate researchers David Cubillos and Xinyu Lu.

Together, they’re aiming to demonstrate that durable structures can be printed on the bottom of the ocean without relying on traditional concrete.

“We’re not only testing how to 3D-print structures underwater,” Raj said. “We’re also experimenting with mixtures that use about 90 percent seafloor materials.”

The team mixes clay, sand and epoxy into pastes thick enough to hold their shape when extruded. Raj designed and 3D-printed custom molds at the Bechtel Innovation Design Center to hold the sticky mixes until they harden and can be used for flexural testing at Hampton Hall.

Each sample is loaded into a materials testing machine that presses down until the material bends or cracks, helping the team understand whether a particular mixture behaves in a ductile or brittle manner. The data reveals which formulations can withstand underwater forces, pressure and long-term degradation.

“We have a goal to test around 500 samples,” Raj said. “It’s a lot of samples, but each one tells us something new.”

Once a mixture shows promise after flexural testing, the team takes it to Bowen Lab to conduct an extrusion test. In this next phase, a large format 3D concrete printer is programmed to create bioinspired architected structures that could one day be used to build and repair underwater infrastructure such as pipelines and bridges.

WHY PRINT UNDERWATER?

Subsea infrastructure is more extensive — and more vulnerable — than most people realize. Communication cables, sometimes stretching thousands of miles, run along ocean floors and are encased in protective tunnels. When those tunnels degrade or crack, repairs require costly vessels, specialized divers and significant safety risks.

“Being able to print directly on the ocean floor using local materials could make repairs safer and much more efficient,” Raj said.

The Purdue team has already tested small-scale underwater printing setups, submerging a nozzle to extrude material into controlled containers. Future systems could be mounted on a vessel, printing through a conduit onto the seafloor.

The challenge isn’t just the environment — it’s geometry. There’s a need to build structures like arches and overhangs that are difficult even for conventional 3D printers.

“We’re trying to prove that more complex shapes can be printed underwater too,” she said.

WHEN INSPIRATION STRUCK

Raj’s entry into 3D concrete printing began with that infrastructure applications class taught by Olek, Youngblood and Zavattieri. What struck her wasn’t only the technology but the biological inspiration behind it — the helicoidal structure found in the shell of the mantis shrimp, a recurring theme in Zavattieri’s work.

“I loved that connection between biology and civil engineering,” Raj said. “It made me want to learn more.”

Working in the Bowen Lab during that class introduced Raj to real-world 3D printing challenges. It sparked a desire to go further, eventually leading her to the underwater printing project.

Olek sees undergraduate involvement as essential. “Students like Riya bring perspectives shaped by diverse academic paths and personal experiences, and that diversity is what drives creativity and innovation in our research,” he said. “Their unique viewpoints allow us to approach complex engineering problems in ways we might not otherwise consider.”

Raj graduated in December and is pursuing a career in engineering mechanics and infrastructure. She’s been interviewing with companies performing advanced materials and structural testing — roles that closely mirror the work she’s done in Zavattieri’s lab.

“This project showed me how much I love structural mechanics,” she said. “I want to do work that has real purpose, whether that’s rebuilding after natural disasters or improving the way we design materials.”

SMART WORK ZONES

Digital twin system uses real-time data and AI to keep road crews safe when seconds matter most

Highway work zones are among the most dangerous places to work in the country. Drivers speed through narrowed lanes, barriers are minimal and construction crews often stand mere feet from live traffic. For many workers, the difference between a normal day and a life-altering injury can be a single second.

An interdisciplinary research team co-led by Sogand Hasanzadeh, assistant professor of civil and construction engineering, is working to change that. Through the SMART Work Zone Project, funded by the U.S. Department of Transportation's SMART Grant program, the research group is developing an intelligent, adaptive safety ecosystem designed to predict instrusion risk in real time and warn workers before a vehicle enters the construction site.

"Highway workzone safety systems have traditionally been reactive," Hasanzadeh said. "We want to shift the entire culture to one that is predictive and proactive. With the right sensing and analytics, we can recognize danger before workers are put in harm's way."

The Purdue team includes professors Yiheng Feng, Behzad Esmaeili and Lu Su as well as representatives from the Indiana Department of Transportation.

BUILDING AN INTELLIGENT WORK ZONE

The research integrates cameras, LiDAR, radar, GPS devices and AI-driven analytics into an interconnected digital twin system that constantly monitors work zones. These sensors track workers, vehicles, lane shifts and barriers — any element that could influence risk. The data streams into a cloud-based digital twin of the jobsite, where an AI model evaluates patterns and flags high-risk driver behavior, such as a late lane change, excess speeding or a drifting vehicle, in real time.

When the system detects a high-risk scenario, it triggers an immediate warning to drivers through sirens and customized messages while sirens and flashing lights simultaneously alert workers.

"In some intrusion cases, workers may have only one second to react, which is basically no time at all," said Nathan Weston, an undergraduate research assistant on the project. "If our system can give three or four seconds instead of one, that's potentially lifesaving."

Weston, a senior construction engineering major from New Salisbury, Indiana, has been central to developing the worker-tracking and predictive components of the system. He created a wearable GPS device that transmits worker positions to the digital twin and he collaborated with postdoctoral researcher Woei-Chyi Chang (MSECE '25, PhD CE '25) to design an AI model that can fill in gaps when the signal temporarily drops.

"Losing track of a worker for even two seconds could matter," he said. "So we trained a model to estimate short-term movement and keep the system situationally aware."

The project is being piloted in partnership with the INDOT and Kiewit Corporation in Dallas. During field testing, Weston experienced real-world work zone conditions, standing only a few feet from cars traveling far too fast for the environment.

"Seeing vehicles cut through cones at close range really clarified how important this work is," he adds.

CHANGING SAFETY CULTURE ON AMERICA'S HIGHWAYS

While the underlying technology is complex, Hasanzadeh emphasizes that the project's purpose is human-centered.

"This research isn't about automation replacing people," she said. "It's about using intelligent systems to protect the people doing essential, hands-on work. Our objective is simple: every worker should go home safely."

She also stresses that the system is designed to be location-based, not person-based — reducing concerns about privacy or individual tracking for construction workers. Alerts focus on where danger is occurring, not on which worker is being monitored.

The work stands out internationally. Very few research groups are integrating sensing, AI prediction and digital twins into a single safety platform for highway construction.

"We're building something that could genuinely change how our industry approaches safety," Weston said.

Majoring in construction engineering while earning a minor in AI and machine learning has given Weston a rare intersection of skills. The project has deepened both.

"Research helps you take classroom theory and apply it," he said. "Being trusted with real responsibility for this research project has made my entire Purdue experience stronger."

Weston plans to continue in Hasanzadeh's lab as a graduate student, helping develop the next phase of the system.

As tests expand and the technology matures, the team sees vast potential for safer highway workzones, better-protected crews and a shift toward an occupational culture where risk is anticipated, not endured.

"Predicting danger before it happens is no longer theoretical," Hasanzadeh said. "It's becoming part of how we keep America's infrastructure workforce safe."

Undergraduate research assistant Nathan Weston had a central role in developing the worker-tracking and predictive components of the SMART work zone digital twin system.

MAPPING ACCURACY

Professor Ayman Habib reviews the latest digital mapping data.

CO-INSTITUTIONAL CENTER SETS NATIONAL STANDARDS FOR GEOSPATIAL DATA USE

As access to geospatial technologies grows, so does the likelihood of data misinterpretation — possibly to the detriment of entire communities.

With each passing year, the cost of geospatial technologies such as sensors, platforms, and AI-enabled processing becomes both more accessible and affordable to anyone from private businesses to home hobbyists. Unfortunately, this comes with several impactful downsides.

"We have been seeing a great many businesses and government agencies utilize geospatial tools for a great number of matters from land surveys to city planning, but there are no set guidelines for any of them to follow," said Ayman Habib, the Thomas A. Page Professor of Civil Engineering and acting school head of the Lyles School of Civil and Construction Engineering. "What we seek to do is to ensure that geospatial data and product users have the framework in place so they can properly utilize and interpret geospatial data and products for well-informed decision making."

To ensure the United States is better equipped to process geospatial data going forward, Purdue has teamed up with The Ohio State University and St. Louis University to form the Center for Accurate Georeferencing of the Environment (CAGE) to unite top researchers, industry partners and government agencies to redefine how the U.S. collects, processes and applies geospatial data. Habib will serve as site director at Purdue. His team will apply expertise in critical quality assurance and control processes to the project.

With support from a $2.25 million National Science Foundation grant, CAGE researchers will lead an Industry-University Cooperative Research Center (IUCRC) to strengthen the economic competitiveness of the U.S. geospatial industry. Member organizations and industry partners are expected to contribute an additional $2.5 million to the center over the next five years.

One example where this is especially needed, Habib said, is in the field of connected and autonomous vehicles (CAVs).

"As we enter into this new era of smart and self-driving vehicles and connected cities, accurate infrastructure data collection and interpretation is absolutely vital," Habib said. "We need to ensure the availability of relevant geospatial information describing the readiness of our transportation infrastructure to support the needs of CAVs to safely operate."

Beyond research, CAGE will serve as a national hub for workforce development, cultivating the next generation of geospatial scientists, engineers and leaders. The center will partner with schools, universities and industry to expand training opportunities and inspire a diverse talent pipeline — from high school to doctoral programs. Over the course of the year, Habib said his team will also look to add undergraduate and graduate student researchers to the team.

CAGE researchers will work closely with industry partners to ensure the center's priorities align with current technology and workforce needs. Site directors and industry engagement offices at each university will collaborate to identify small and large businesses that could benefit from joining the center.

SPANNING THE GAP

INNOVATIVE BRIDGE ENGINEERING PROGRAM DESIGNED TO MEET INDUSTRY DEMAND

Purdue is taking the next giant leap forward as it aims to set a new national model in structural engineering education.

In response to increasing industry demands, the Lyles School of Civil and Construction Engineering is introducing new courses, seminars and — in the future — a concentration to address the United States' bridge infrastructure workforce gap. As a unique and first program of its kind, the Bridge Engineering Education Program will serve as a national model to fill a growing need in the transportation industry.

"Launching a bridge-focused concentration is a natural next step for applying LSCCE's historic strengths to industry's needs," said Robert J. Connor, the Jack and Kay Hockema Professor in Civil Engineering. "This is a first-of-its-kind concentration that answers a real need voiced by professionals to see engineering graduates with a greater understanding of bridge design, preservation, inspection and construction."

In support of this new engineering concentration, the American Institute of Steel Construction (AISC) provided LSCCE with a $1 million grant to aid in its launch.

"AISC is incredibly proud to support Purdue's new comprehensive Bridge Engineering undergraduate and graduate curricula, which is one of the first ever bridge-focused college programs in the country," said Brandon Chavel, AISC vice president of bridges. "Armed with a Purdue education focused on bridge design, fabrication, construction and inspection, graduates can hit the ground running when they enter the workforce, helping to address infrastructure needs in both the public and private sectors."

The first steps toward the new concentration began in August 2025 with the introduction of two new courses: Loading and Analysis for Steel Bridge Design and Evaluation and Advanced Design of Steel Bridge Flexural Members.

"We are still in the beginning stages, but the response from both students and our industry partners has been encouraging," said Francisco J. Bonachera Martin, course lecturer and visiting professor. "As we continue to expand the program and grow it into a full concentration, our graduates will have a knowledge base and expertise that truly sets them apart from other graduates throughout the U.S."

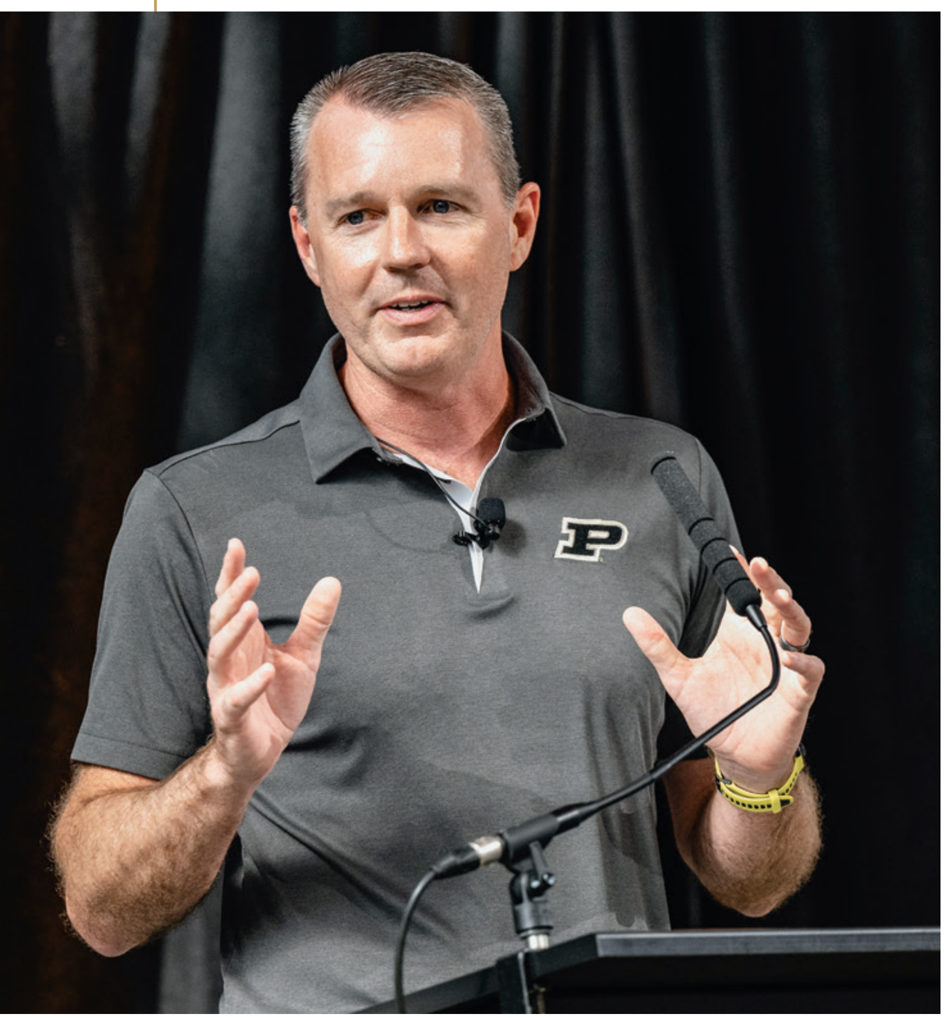
Undergraduate student Caden Fortino is currently enrolled in the Loading and Analysis for Steel Bridge Design and Evaluation course and says it has quickly become one of his most impactful classes.

"I am very much interested in bridge design, so when I heard about this course offering, I knew this would be a perfect class for me," Fortino said. "To have a class this early on that focusses on bridges specifically has been an amazing learning opportunity."

Additionally, two steel bridge-focused courses became available for the 2026 spring semester: Design and Evaluation of Steel Highway Bridges and Advanced Design of Steel Bridge Axial Members and Gusset Plate Connections. A seminar series with leading experts in steel bridge design, fabrication and inspection will also commence this spring.

CORNFIELDS TO THE COSMOS

Jason Williamson named as crewmember of the all-Boilermaker Purdue 1 spaceflight



Jason Williamson's career journey is marked by curiosity, determination and an enduring passion for building and space exploration. Raised in a small-town Indiana by two hardworking, blue-collar parents, Williamson (BSCE '97) gravitated toward hands-on discovery — wandering cornfields, constructing model airplanes and rockets, and piecing together Erector Sets and Legos. This early fascination sparked his decision to attend Space Camp in high school, seizing what he saw as his best chance to get close to space. His relentless desire to learn led him to civil engineering, where he found a natural outlet for his love of problem-solving and innovation. Purdue played a transformative role in Williamson's life, shaping his values and career.

"My journey with Purdue has been transformative, truly a launching pad for every stage of my life," he said. "It was at Purdue that I learned the value of discipline, teamwork and vision. These lessons have guided me at every step of my career and life, not only academically but also as a leader and as a person. It's where I discovered the intersection of engineering, leadership and service."

Williamson's career exemplifies the diverse opportunities in civil engineering. As senior vice president of the multidisciplinary design firm Dunaway, he manages complex projects by merging strategic vision with hands-on expertise, while also mentoring future engineers and building strong partnerships. For Williamson, a registered professional engineer, civil engineering is more than just a profession — it's a platform to turn dreams into real-world impact, shape communities and foster lifelong growth and leadership.

PURDUE 1 SPACEFLIGHT

Building on its tremendous space legacy, Purdue is pursuing a groundbreaking opportunity — research and learning aboard a Virgin Galactic suborbital spaceflight with an all-Boilermaker crew. The flight, dubbed Purdue 1, is expected to lift off in 2027.

Williamson's connection to Purdue 1 began unexpectedly. After joining Virgin Galactic's "NXTGEN" astronaut program, he gained access to the Galactic 06 mission at Spaceport America in New Mexico in 2024. At this event, he stood among Virgin Galactic team members and noticed many Purdue alumni — researchers, astronauts, instructors and leaders — who were integral to commercial spaceflight.

Within months, Williamson was invited to witness the historic commercial flight of VSS Unity, Galactic 07. There, he encountered Steven Collicott, professor of aerospace engineering, who flew on Galactic 07 with a Purdue rotational slosh experiment, further strengthening the university's reputation in space research.

Collicott and Williamson have been named two members of the five-person crew expected to fly on the Purdue 1 suborbital mission. Williamson's selection for Purdue 1 was based not only on his professional achievements but also on his commitment to inspiring others. Through years of mentoring students, engaging underserved communities and serving as a Purdue ambassador, he has embodied the mission's spirit: highlighting Boilermakers who strive for excellence while supporting those around them.

Preparation for the Purdue 1 mission is both rigorous and exciting. Williamson and his fellow crew members will complete a multi-day training program at Spaceport America, covering all aspects of the spacecraft, launch vehicle, flight procedures, spacesuit systems and mission gear. Training includes hands-on preparation and full mission walkthroughs to ensure every specialist and private astronaut is ready for spaceflight.

A key highlight of premission training is parabolic flight, where the crew will briefly experience simulated weightlessness, providing a preview of microgravity. To prepare for the physical demands of launch and re-entry, the team will also complete centrifuge training to acclimate to the intense G-forces of the mission.

The core of the Purdue 1 mission is scientific discovery and academic advancement. For the first time, Purdue researchers and students will oversee and conduct experiments in microgravity, setting a new standard for university-led access to space. The onboard research will focus on fluid behavior in zero gravity, a crucial area for future innovations in spaceflight design and fuel management.

As the mission approaches, final preparations and experiments are still in development, with the team pushing the boundaries of suborbital research. The anticipated 2027 flight will last about 90 minutes, including a parabolic arc that provides approximately four minutes of true microgravity.

"More than anything, I'm looking forward to the moment when I cross the threshold to space, fulfilling a dream that has been with me since childhood," Williamson said.

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