MARYLAND CIVIL AND ENVIRONMENTAL ENGINEERING | FALL 2024

CIVILREMARKS

Key Bridge: The Lessons Learned

UMD ENGINEERING EXPERTISE IS HELPING TO SHAPE THE STATE AND NATIONAL RESPONSE TO THE MARCH ACCIDENT.

DEAR FRIENDS,

When Baltimore's Key Bridge collapsed last spring, phones lit up at our department, as well as at other engineering schools across the region. Many, including the news media, sought out the expertise of engineering researchers as they attempted to understand the reasons for the collapse. Was it a design issue? Could stronger support piers have helped? Were the right materials used? Many were surprised to find out that bridges, in general, are not built to withstand such a collision, just as planes are not built to survive impact with terrain. The forces unleashed are simply too great.

As Maryland looks ahead to the Key Bridge's eventual replacement, certainly much attention will be paid to minimizing the risks of future incidents. It is also important, however, to look beyond bridge engineering per se and consider the topic from a systems engineering perspective. The Key Bridge, after all, was a node in a system. Its loss has had effects throughout the system, leading to higher costs, longer travel times, and slower delivery of goods. Thus, in addition to planning for the replacement of this part of the network, we must also seek to bake more resilience into the network as a whole. That includes building in redundancies and avoiding single points of failure.

At the University of Maryland's (UMD) Department of Civil and Environmental Engineering, we've helped lead an ongoing conversation about the aftermath of the Key Bridge collapse and the way ahead. You'll find an overview of our activities in this issue of Civil Remarks. In May, just weeks after the incident, we hosted a landmark roundtable on the topic, drawing representatives of academia, government, and industry from around the country. Our frank, in-depth discussions led to recommendations which we have shared with state and federal agencies. We continue to make our expertise available both to decision-makers as well as the media and the general public.

In addition to highlighting our activities related to the Key Bridge, our Fall 2024 issue also showcases work being done at the department in areas involving artificial intelligence (AI) and machine learning (ML). There can be little doubt that these rapidly emerging technologies will intersect with practically every domain of engineering research in the years to come. Faculty, post-doctoral researchers, and graduate students at our department are already applying AI and ML in bold new ways that promise to improve services, products, and quality of life in tangible ways. These include making our railway systems, a backbone of commerce and the economy, more efficient, reliable, and safe.

Exciting work is being done here. I invite you to learn more about it in the pages that follow.

Best regards,

Nii Attoh-Okine
PROFESSOR AND CHAIR,
UNIVERSITY OF MARYLAND
DEPARTMENT OF CIVIL AND
ENVIRONMENTAL ENGINEERING

FEATURE

DEPARTMENTS

CIVILREMARKS

PUBLISHER
Department of Civil and Environmental Engineering
Nii Attoh-Okine, PROFESSOR AND CHAIR

EDITORIAL & DESIGN STAFF
Robert Herschbach, EDITOR AND WRITER
Laura Figlewski, ART DIRECTOR

CONTRIBUTING WRITERS
Isabella Cooper, Ph.D.

PHOTOGRAPHERS
Al Santos
Thai Nguyen

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KEY BRIDGE

THE LESSONS LEARNED

UMD ENGINEERING EXPERTISE IS HELPING TO SHAPE THE STATE AND NATIONAL RESPONSE TO THE MARCH ACCIDENT

Six lives were lost, and the human cost could have been even worse.

If the Key Bridge had collapsed at another time of day, especially rush hour, dozens of cars might have dropped into the Patapsco River, along with their drivers and passengers. As it was, a group of construction workers had no time to escape the early morning incident, which occurred when the cargo ship Dali, hobbled by an equipment failure, struck one of the bridge's support piers.

The collision not only destroyed a beloved Maryland landmark, but dealt a further blow to a U.S. economy already hit by supply chain bottlenecks and geopolitical turmoil.

In the aftermath of the March 26 bridge collapse, state and federal officials continue to map out plans for a replacement. Meanwhile, the engineering community is being called on to contribute more than expertise about bridge design and construction. Engineers also help to shape a larger vision that reflects the nation's need to protect critical infrastructure from threats that are both natural and man-made—whether in the form of rising sea levels or attempts at sabotage staged by adversaries and malicious actors.

Nii Attoh-Okine, chair of the UMD civil and environmental engineering department, led the event, which drew more than 120 attendees to UMD's College Park campus.

DID YOU KNOW?

Around 252 bridges in Maryland, representing 4.2% of the total number of bridges in the state, have been classified as "structurally deficient." According to 2018 data from the State Highway Administration, these include four bridges along the Capital Beltway.

"We need to address critical infrastructure, including bridges, from a systems perspective," said Nii Attoh-Okine, chair of the University of Maryland (UMD) civil and environmental engineering department, which hosted a roundtable on the subject in May. "Supply chains and their supporting infrastructure have become heavily interconnected in the 21st century, a trend which boosts efficiency but also creates risks, as a single point of failure can produce cascading effects throughout the system," Attoh-Okine said.

Connectivity across global supply chains, based on the design and interaction of critical infrastructure, can threaten resilience. Under some circumstances, networks can propagate individual shocks across the broader economy and the community, he said.

Indeed, the effects are very much in evidence. Trucks carrying hazardous material, for instance, now have to take lengthy detours around Baltimore City, since they are prohibited from using Baltimore's tunnels and can no longer use the bridge. The detours mean longer trips and greater consumption of fuel. These translate into higher costs for consumers, who are already reeling from high inflation in the post-COVID era.

Not only that, but the port of Baltimore—the nation's largest port for roll-on/roll-off cargo—was out of operation for 11 weeks while crews removed around 50,000 tons of bridge wreckage and extricated the cargo ship Dali, which had caused the collapse after suffering an engine malfunction.

The Dali has now left Baltimore and the port is open again, but the economic repercussions could be felt for much longer. Moreover, the bridge collapse brings out into the open a latent security headache: adversaries, real or potential, are also aware of the cascading effects set in motion by disrupting critical infrastructure.

Risks like these mean that the post-collapse conversation will be about much more than building a new bridge. Just as importantly, it will be about baking more resilience into the system, Attoh-Okine believes.

"We have to do much more than put up a new bridge," he said. "We need to look at the bigger picture. And we need to boost resilience."

SOME COMMON BRIDGE TYPES

CABLE STAYED
This type of bridge features a fan-like pattern of cables that run from the bridge towers to the deck; these cables directly support the road deck.

SUSPENSION
San Francisco's Golden Gate Bridge is among the most famous examples of this kind of bridge, in which the cable system supporting the roadway is itself supported by cables that run between bridge towers.

TRUSS ARCH
As the name suggests, this design combines arches with a structural framework known as a truss. Advantages include durability and span capacity.

CONTINUOUS TRUSS
This type of bridge features a truss extended across three or more supports, without any joints or hinges.

The roundtable, organized by the CEE department and sponsored by ASCE, featured 25 speakers and six panel sessions. Pictured: Chris Hendrickson, Professor Emeritus and Director, Traffic21 Institute, Carnegie Mellon University.

UMD ROUNDTABLE DRAWS ENGINEERS, POLICYMAKERS

Engineering experts from around the country gathered at UMD on May 22 to share insights about the collapse of Baltimore's Key Bridge and to provide recommendations on protecting bridges and other infrastructure.

During a day-long roundtable, "Lessons Learned From the Francis Scott Key Bridge Collapse: Enhancing Resilience in Critical Infrastructure Systems," they discussed ideas that spanned bridge design, management of port traffic, improved communication systems, and utilization of sensors and other emerging technologies. The roundtable was co-sponsored by the American Society of Civil Engineers (ASCE).

Nii Attoh-Okine, chair of the UMD civil and environmental engineering department, led the event, which drew more than 120 attendees to UMD's College Park campus.

The wider impacts of the collapse must be examined along with the incident itself, Attoh-Okine stressed in his opening remarks, describing the loss of the bridge as a "multi-dimensional event involving multiple systems."

The collapse, which occurred when a cargo ship, Dali, struck one of the bridge's support piers, temporarily shut down the port of Baltimore, which is among the top 20 ports in the nation in terms of tonnage and cargo handled. According to the U.S. Chamber of Commerce, it is the country's largest importer and exporter of vehicles, with 800,000 vehicles transported through it in 2023, and is the second largest exporter of coal.

DID YOU KNOW?

The state of Maryland has an estimated 5,473 bridges, with the most famous including the Chesapeake Bay Bridge (officially known as the Gov. William Preston Lane Jr. Memorial Bridge), the Monocacy River Bridge, southern Maryland's Governor Thomas Johnson Bridge, and the state's six covered bridges, of which five have been designated historic.

WHAT WILL REPLACE THE KEY BRIDGE?

PROFESSOR CHUNG C. FU SAYS BRIDGE DESIGN PREFERENCES HAVE CHANGED SINCE THE KEY BRIDGE WAS BUILT IN THE 1970S. ITS REPLACEMENT WILL LIKELY REFLECT THAT FACT.

Baltimore's Key Bridge was a notable example of a continuous truss bridge, a design popular in the 1970s, but it will probably be replaced with a different kind of design, according to UMD Civil and Environmental Engineering Professor Chung C. Fu.

Fu, a structural engineer and bridge expert, spoke at the Key Bridge roundtable hosted by UMD on May 22.

He said cable-stayed bridges have become an increasingly popular choice for longer bridges. Unlike a suspension bridge, with its gracefully arcing cables, a cable-stayed bridge works by connecting the deck directly to one or more pylons, by means of a fan-like set of supports.

Such bridges are able to accommodate higher decks and longer center spans, with comparatively wide distances between support piers. That makes them especially advantageous at a time of climate-induced rises in water levels combined with increases in the volume of shipping.

"The most recent port bridges built in the United States, such as those in Houston and Charleston, have been cable-stayed bridges," Fu said. "It's easy for this kind of bridge to become a landmark. It's visually appealing and durable, and can cover long spans."

While Fu sees cable-stayed as the leading contender, the exact design won't be known until 2025, when the State of Maryland chooses a contractor and proposal.

Whatever bridge design is chosen, it will almost certainly include protective barriers that are more robust than those utilized by the Key Bridge. The support piers will likely be surrounded by a ring of concrete, forming a kind of island, and the piers themselves may be equipped with rubber fenders that could help cushion collision impacts.

"A good protection system depends on a more solid material and greater distance between the shipping lane and the pier," Fu said.

Winter Weather: How Well Do AVs Perform?

ARTIFICIAL INTELLIGENCE CAN HELP TRAIN AUTOMATED VEHICLES TO UNDERSTAND AND RESPOND TO PARAMETER CHANGES CAUSED BY INCLEMENT WEATHER.

Wintry weather conditions are a challenge for human drivers, and they also can present problems for autonomous vehicles (AVs), which may not know how to adjust to snowy or iced-up roadways. A UMD team led by Associate Professor Xianfeng "Terry" Yang is developing new simulation tools that can help assess AV performance under such conditions.

"Snow or ice reduces the friction between the tire and the roadway surface," Yang explains, "If the vehicle is still applying a control algorithm that was designed for good weather conditions, then it might drive too fast, or it might skid when handling curves or making turns."

Associate Professor Xianfeng "Terry" Yang

Compounding the problem, little research has been conducted so far on the performance of AVs under such conditions. Yang and his team, which also includes Xiaobai Liu, associate professor of computer science at San Diego State University, hope to change that.

With support from the National Science Foundation, the researchers are building a cosimulation platform—that is, one that blends vehicle and traffic simulators—that can model randomly patterned, or stochastic, vehicle behavior under a variety of adverse driving conditions.

The platform models traffic scenarios in which human drivers respond to winter weather events. They may drive more slowly or cautiously, for example, or keep greater distances between themselves and other vehicles to avoid sudden braking. Machine learning processes, fed by data from roadside cameras, help the system constantly train itself, delivering ever more precise renditions of actual winter traffic.

With the traffic model in place, a vehicle dynamics model can be added, demonstrating how an AV algorithm is likely to perform within the modeled traffic environment. After validating the combined models with field data, the project will connect the simulations with existing automated driving systems for testing.

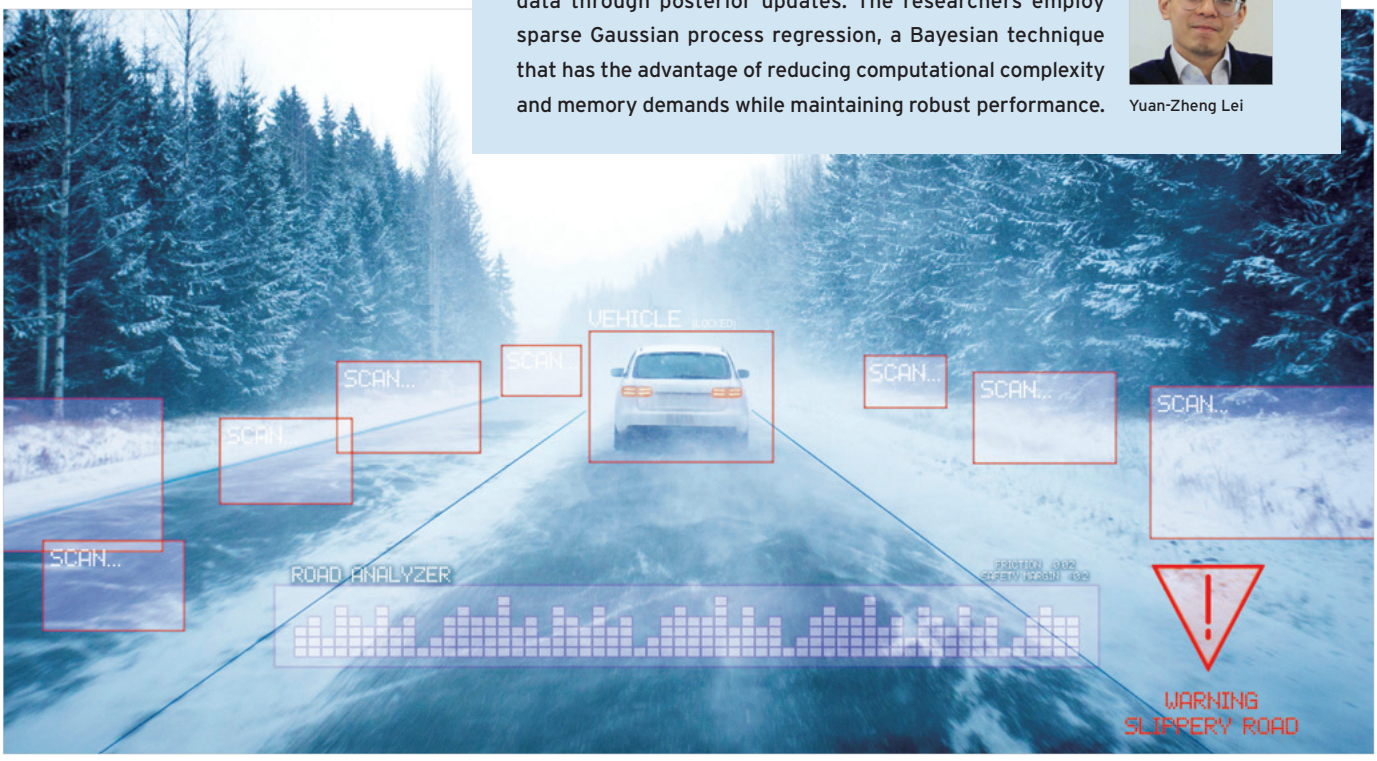
Finally, Yang and his collaborators plan to integrate the combined traffic and vehicle models into an open-source software package and ultimately into a public cloud-based platform.

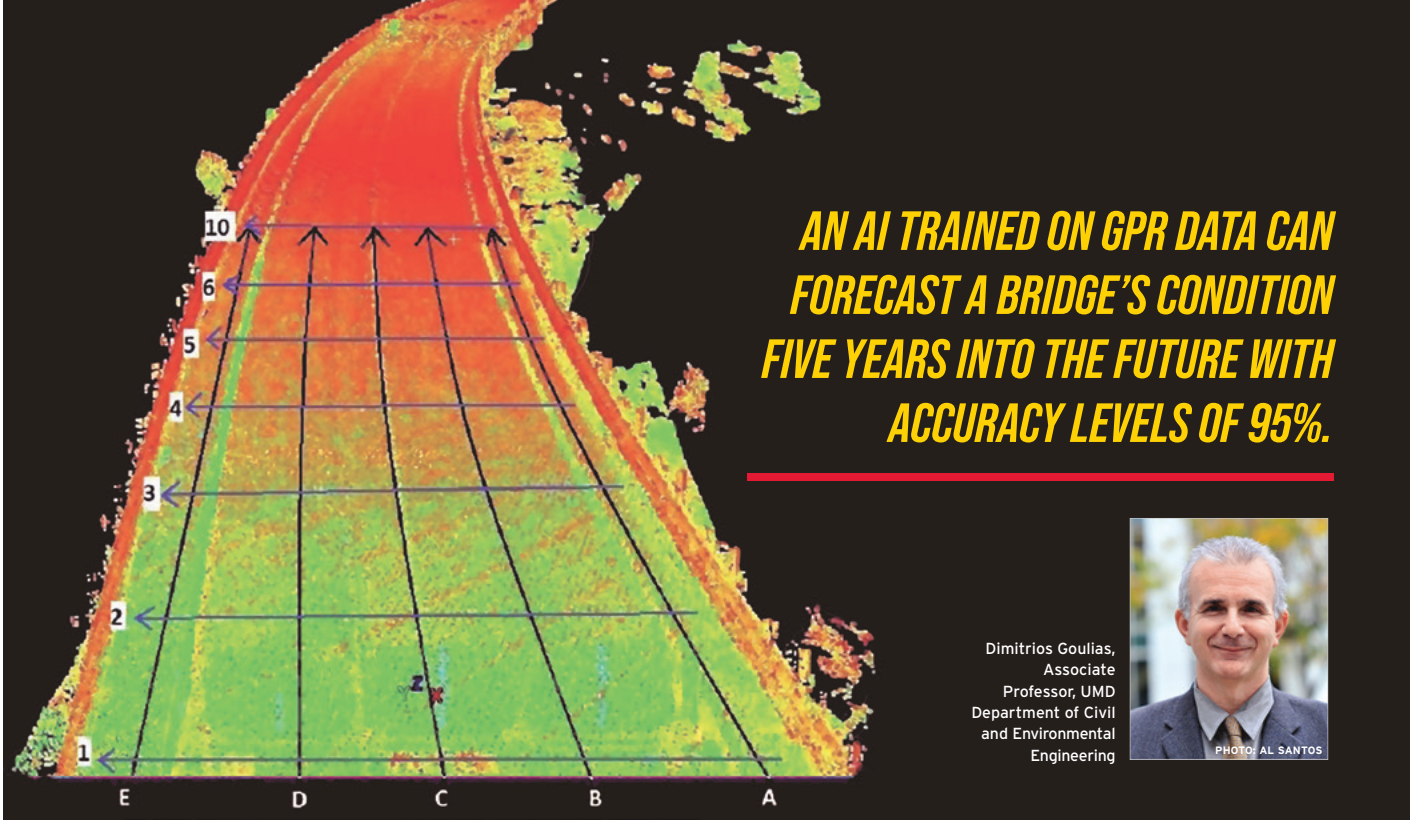
"You'll be able to submit your AV driving algorithm and test how the vehicle will perform in different scenarios and what the crash risks are," Yang said.

A BAYESIAN APPROACH TO TRAFFIC MODELING

Modeling traffic flow is important both for planning and traffic management, but conventional models, which are deterministic in nature, struggle to convey the inherent uncertainties. To address this problem, UMD doctoral student Yuan-Zheng Lei and his advisor, Associate Professor Xianfeng "Terry" Yang, are experimenting with the use of a Bayesian model that is better able to handle the indeterminate, the fluctuating, and the unknown. This more flexible approach allows for incorporation of real-world data through posterior updates. The researchers employ sparse Gaussian process regression, a Bayesian technique that has the advantage of reducing computational complexity and memory demands while maintaining robust performance.

Yuan-Zheng Lei





Ground-penetrating radar (GPR) provides a non-destructive look at the insides of a bridge, but advanced computing power is needed to parse the resulting data.

AI Could Help Keep Bridges in Good Condition

RESEARCH BY DIMITRIOS GOULIAS SUGGESTS THAT AI CAN NOT ONLY ASSESS THE CONDITION OF BRIDGES MORE QUICKLY COMPARED TO CONVENTIONAL METHODS, BUT WILL DELIVER MORE ACCURATE RESULTS.

No one wants to drive over an unsafe bridge. But monitoring the condition of bridges across the United States is a formidable task.

According to the American Society of Civil Engineers (ASCE), the number of bridges in the U.S. totals 614,387. In the state of Maryland alone, thousands of bridges need to be surveyed at regular intervals to ensure their continued safety.

The time, effort, and expertise required can be daunting—not to mention the cost. To help improve and streamline the process, UMD Civil and Environmental Engineering Associate Professor Dimitrios Goulias has been developing fast, accurate, cost-effective, and non-destructive condition assessment methods, making use of ground-penetrating radar (GPR) combined with machine learning.

An AI trained on GPR data, he says, can forecast a bridge's condition five years into the future with accuracy levels of 95%.

"With this approach, we don't have to send teams out every year to conduct on-site tests," he said. "As we experiment with different materials intended to address sustainability concerns, we need to be able to assess performance in a way that is both accurate and economically feasible. Combining GPR with AI allows us to do that."

Goulias's technique involves sending an electromagnetic wave through a structure and then examining the reflection that comes back. If there has been a change in the time it takes for the wave to go there and back, then degradation may have occurred. Other parameters, such as amplitude and signal polarity, can also indicate problems such as or delamination.

Promising as the approach sounds, the complexity of the data produced has posed a barrier. Incorporating AI solves that problem by providing the needed computational power.

Goulias is now looking at other data sources besides GPR that could be fed into an AI, and he's also experimenting with systems that include multiple AI modules. By harnessing all these tools, he hopes to produce the most robust analytics possible.

He's also been applying the approach to other uses besides bridge monitoring, such as assessing different concrete mix blends—again, he says, a task made urgent by the need to achieve greater sustainability.

"The industry is experimenting with many novel kinds of mixes, and we need to be able to predict how well these will perform," he said.

"The promise of AI in general is that it can produce more indelible models while also reducing human labor," he said. "The AI, of course, is only going to be as good as the data it is trained on, so it's important to obtain the right data. If we have robust data sets and an accurate model, then we can significantly reduce the need for testing and inspections and actually get better results. This, in turn, will help transportation agencies in their planning for maintenance, renovation, and future construction."

A High-Tech Boost to Pedestrian Safety

WITH PEDESTRIAN AND CYCLIST DEATHS REACHING FORTY-YEAR HIGHS, INTEREST IN HIGH-TECH DETECTION SYSTEMS IS ON THE RISE.

The data is sobering. A 2023 study by the Governors Highway Safety Association found that pedestrian fatalities the previous year had reached a 40-year-high of 7,500. Experts point to a number of possible contributing factors, including high speeds, distracted driving, lack of adequate pedestrian infrastructure, and the widespread popularity of SUVs.

The situation for those who ride bikes isn't any more reassuring. After declining to its lowest point in 2010, the number of cyclist fatalities and injuries has ramped back up, reaching a level not seen since the mid-1970s.

"It's a national emergency," says Cinzia Cirillo, UMD professor of civil and environmental engineering. As Maryland transportation officials look for solutions, Cirillo and her team have been helping the State Highway Administration (SHA) evaluate and test a number of sophisticated pedestrian and cyclist detection systems that combine camera or other sensors with neural networks to gauge the flow of pedestrians, cyclists, and vehicles and tweak traffic control systems, including signals, accordingly.

Such systems promise an AI-age boost over

BIL Launchbot Adds AI Twist to Grant Applications

NAVIGATING THE APPLICATION PROCESS FOR FUNDING UNDER THE BIPARTISAN INFRASTRUCTURE LAW CAN BE CHALLENGING, BUT A NEW AI-BASED TOOL CAN HELP.

Chatbots have been around for years, but advances in AI are making them able to do more and better things for their human users. A new bot developed by UMD Professor Qingbin Cui's team at the Build America Center can help stakeholders obtain customized information about the Bipartisan Infrastructure Law (BIL) and its implementation.

The 2021 law, formally known as the Infrastructure Investment and Jobs Act, earmarked $1.2 trillion in funds for transit and transportation, road infrastructure, and initiatives to promote clean water, electric grid renewal, and access to broadband. Stakeholders, including local, state, and federal officials, want to be

current methods, which typically involve sending teams out to specific intersections to assess the level of danger.

High-resolution cameras, thermal imaging, and lidar can all be used in a detection system, with companies such as Bosch, Bluecity AI, Seyond, and Teledyne FLIR already marketing the needed equipment. To determine which systems would best serve SHA's needs, Cirillo has been conducting tests at one of Maryland's most complex traffic environments: the UMD campus.

As on many college campuses, UMD students stream between classes on foot, while some ride bikes, e-bikes, or scooters—all while drivers make their way through. The volume and complexity of the traffic environment varies sharply, with the roads nearly empty while class is in session and bustling at other times.

Besides UMD, tests are also being conducted at two additional Maryland locations: a suburban neighborhood with a high volume of stroller traffic and a two-lane road that connects with a metro station.

"We need to be able to observe and model pedestrian flows much more precisely in order to make the road safer for them," Cirillo said. "Once we are able to track pedestrian behavior and observe where the most dangerous hazards are, we can do something about it. We can stop cars upstream, slow down speeds, turn on more lighting at night, or install intelligent signals that adjust their timing according to the number of people waiting."

"Ultimately, when we combine smart vehicles with smart streets, smart crossings, and AI-driven detection systems, we can make urban environments much safer for everyone," she said.

"ULTIMATELY, WHEN WE COMBINE SMART VEHICLES WITH SMART STREETS, SMART CROSSINGS, AND AI-DRIVEN DETECTION SYSTEMS, WE CAN MAKE URBAN ENVIRONMENTS MUCH SAFER FOR EVERYONE."

able to track how the funds are being used, what projects are being funded, and what kinds of outcomes are being achieved.

But nailing down the precise information a particular user wants can be tricky using conventional dashboards or information sources. Explains Cui: "Say a user wants to know how Maryland stacks up against neighboring states in terms of its BIL funding. It can be hard to pull that kind of information from a traditional dashboard. Such tools use a fixed set of parameters and don't offer users much flexibility."

That's where the Build America Center's chatbot, dubbed BIL Launchbot, comes in. Trained on data gathered by the center, and utilizing the OpenAI platform, it can respond to just about any question that a user may put to it—and deliver the answers instantaneously. Not only that, but it can provide the information in a range of formats, including tables and charts.

Development of the tool was led by Ya "Eric" Ji, a seasoned software development expert who has pioneered other innovative apps, including incenTrip, which incentivizes users to make more extensive use of multimodal transportation to reduce congestion, emissions and energy consumption.

While the team doesn't track individual queries, Cui says the most common users will likely include grant applicants, state officials interested in assessing performance, and federal program administrators who likewise want to know how specific programs are doing.

And the current version of the app is only the beginning; Cui and his team are already planning upgrades that will include embedding it in billaunchpad.com, a website built by the BAC to provide comprehensive information and data about the landmark legislation—considered the largest investment in transportation infrastructure in U.S. history.


Qingbin Cui

"We want everyone to be able to get answers to their questions readily, and to understand how the BIL can help them and their communities," Cui said.

Founded in 2022 and led by Cui, the BAC provides technical assistance and expertise related to the BIL. Four other universities—Virginia Tech, Georgia Tech, Purdue, and Stanford—are regional leads for the center, which is funded by the U.S. Department of Transportation.

FOR MORE INFORMATION VISIT bac.umd.edu

HELPING STATE TRANSPORTATION AGENCIES MANAGE THEIR ASSETS

State agencies such as the Maryland Department of Transportation and the Maryland State Highway Administration not only manage complex problems but must do so within budget constraints; thus, efficiency is key. Can machine learning help them optimize assets and resources?

Jianshu Xu

UMD civil and environmental engineering doctoral student Jianshu Xu, working with Professor Yunfeng Zhang, aims to demonstrate that it can. In his doctoral research, Xu is applying state-of-the-practice machine learning algorithms and application tools to address a broad variety of needs. These include landslide risk assessment, slope/embankment detection for geotechnical asset inventory, scarp line detection, concrete compressive strength test data modeling and prediction, and pavement marking retroreflectivity data modeling and deterioration condition prediction.

AI Can Help Sort Out Social Media Data During a Wildfire

TWEETS POSTED DURING A DISASTER OFTEN SHED LIGHT ON THE NATURE OF THE EVENT, THE COMMUNITIES INVOLVED, AND THE RESOURCES NEEDED. NATURAL LANGUAGE PROCESSING (NLP) CAN HELP DISASTER RESPONSE TEAMS SORT THROUGH A HIGH VOLUME OF INFORMATION.

Social media platforms such as X (formerly Twitter) can be a powerful tool for disaster response teams, providing them with real-time information about an event, the populations involved, and its impact. But the high velocity and volume of social media data can make it unmanageable; moreover, processes and methodologies still need to be hashed out.

Research by Zihui Ma, who completed her doctoral degree last summer under the supervision of Professor Gregory Baecher, could help fill in some of these gaps.

Ma, who is continuing on at UMD as a post-doctoral researcher, set out to test how Natural Language Processing (NLP) can help parse the influx of data during a disaster, honing in on specific topics of concern—such as where it is happening, how serious it is, and who is being impacted.

For her research, Ma merged two existing, pre-trained models—the Bidirectional Encoder Representation from Transformers (BERTopic) model and the Susceptible-Infected-Recovered epidemiological model—to build a powerful, pre-trained system that can quickly and efficiently deliver insights about key questions of concern, or "topics", during disaster response. The epidemiological model was chosen because of its ability to track how the proliferation of memes corresponds to the spread of an event, whether an outbreak of disease or, in this case, a wildfire.

After pulling data from the Twitter API for the period Sept.-Oct. 2020, with a selection of relevant keywords applied, she then fed it to an NLP built on the combined models. The NLP tracked parameters relevant to eight "topics," including the frequency and volume of messaging, the geographical location, and urgency as indicated by sentiment. Ma also included topics related to equity, with the goal of addressing a well-known problem in disaster response: disadvantaged communities often don't receive timely information about a disaster that threatens them, and may lack the means to get out.

Ma built her model using historical data, but it can easily be customized for current and future wildfire scenarios. To do so, response teams will first need to obtain access to the X API and pull in the needed data. They can then run the model and input parameters related to the specific event. The process is much quicker and easier, she says, than the conventional methods used in information-gathering, such as interviews with affected people or remote sensing.

"If the model shows that evacuation is a high-urgency topic, with a large quantity of people at a particular location concerned about that topic, then decision-makers will see that they need to implement evacuation strategies and disseminate information to the people that need it," Ma said. "We're providing decision-makers with a means to prioritize among the different topics and allocate resources effectively and equitably."

Advances of this kind are much needed, not least of all because wildfires have been on the rise in a big way. In a study published by Nature Ecology and Evolution in June, a research team based at the University of Tasmania showed that extreme-level fires have more than doubled in frequency over the past two decades, with the trend driven largely by fires in the western United States, parts of Canada, and Russia.

"Severe weather events in general are becoming more common, so communities need to be able to boost their resilience," Ma said.

Current research focuses on data mining of U.S. and global patent databases for innovative robotics technologies.

AI and Robots on Construction Sites

RESEARCHERS SURVEY MAJOR CONSTRUCTION COMPANIES ON TWO CONTINENTS TO YIELD A CLEARER PICTURE OF CURRENT AND POSSIBLE FUTURE USES OF AI AND ROBOTICS.

The use of artificial intelligence (AI), automation technology, and robotics in the construction industry remains limited, although many see the potential for these technologies to play a much larger role. High-rise building construction is one area where automation and robots could help bring about major gains in efficiency and safety.

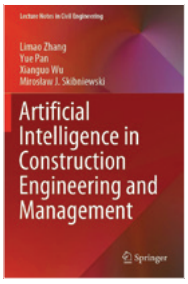
UMD Civil and Environmental Engineering Professor and Maryland Robotics Center faculty affiliate Mirosław Skibniewski co-directs a multinational research team that is exploring the current and possible future uses of robots not only in constructing high-rise buildings, but also in maintaining them.

Skibniewski and his colleagues used questionnaire surveys to learn how major construction companies in China and the United States are currently utilizing robots, how they see them being used in the future, and what they regard as the key challenges. The survey results provided a starting point for a workshop in Beijing attended by thirteen experts in robotics research development.

The team's research, and the workshop, yielded six major development priorities and key challenges. The research team includes UMD civil and environmental engineering doctoral student Heqin ("Hudson") Wang, Tsinghua University faculty and students, and Glodon Company personnel.

ASCE's Journal of Construction Engineering and Management published a paper detailing the results of the team's research. Skibniewski and Wang currently assist Clark Construction Group in developing corporate strategies for implementing robotics on future construction sites. Current research focuses on data mining of U.S. and global patent databases for innovative robotics technologies, as well as on knowledge generation for designing new applications of robotics in construction.

In a related effort, Skibniewski and academic colleagues in China collaborated on a monograph, Artificial Intelligence in Construction Engineering and Management, which was published by Springer. The book highlights the fundamental technologies and applications of AI in all stages of building project planning, design, construction, facility operations, maintenance, retrofit, demolition and recycling.



Among the issues covered are engineering project knowledge representation and discovery, fuzzy modeling and reasoning, time series prediction, information fusion from multiple sources, dynamic Bayesian networks applied in underground construction, collaborative process mining, agent based simulation, computer vision applications, and other related topics.

Current research by Skibniewski's team includes the application of blockchain technologies to smart contracts for construction, aiming at partial, and eventually full, automation of project execution activities, particularly in natural disaster recovery projects aimed at improving resilience in the built environment.

Advanced Tools for Railway Safety

For some, railways evoke a hint of nostalgia, yet today they are both innovative and vital to the nation's economy, hauling around 1.5 billion tons of freight annually. Meanwhile, U.S. railways as well as their global counterparts have embraced digital technologies to help streamline operations and improve efficiency.

UMD doctoral students working with Nii Attoh-Okine, chair of the UMD Department of Civil and Environmental Engineering and director of the Digital and Cyber Railway Engineering and Operations Center (DCREOC), are conducting forward-looking research aimed at harnessing AI, machine learning, and quantum engineering to address the cybersecurity risks associated with the rapid digitalization of U.S. and international railway networks.

A QUANTUM APPROACH TO PREDICTING TRACK DEFECTS

Dengimowei David Alabintei is using Quantum Machine Learning to develop a new predictive maintenance approach for railways, taking advantage of properties such as superposition and entanglement to tackle complex problems, potentially improving real-time defect analysis in the railway sector.

Dengimowei David Alabintei

More specifically, the project focuses on creating a Quantum Neural Network (QNN) that analyzes data to predict track defects related to profile and alignment. It will use metrics like the Ballast Fouling Index, the Ballast Thickness Index, the Layer Roughness Index, and the Moisture Likelihood Index as critical input parameters.

Alabintei also plans to address the opacity sometimes associated with QNNs by utilizing Shapley Additive Explanations (SHAP) to clarify prediction patterns and ensure alignment with engineering principles. SHAP reveals how each feature impacts predictions, enhancing interpretability and trust in results.

A TOPOLOGICAL DATA ANALYSIS FOR RAILWAY TRACK GEOMETRY SAFETY AND MAINTENANCE

Petros F. Woldemariam is investigating the application of Topological Data Analysis (TDA) in improving railway track geometry safety and maintenance. The focus is on utilizing methods such as Betti numbers, homology, and the Mapper algorithm to reveal consistent patterns and gaps in railway track geometry data that traditional methods might overlook.

Petros F. Woldemariam

One of the primary contributions of this study is the use of persistent homology, a key concept in TDA, to detect features in track geometry data across various scales. This is particularly valuable in railway engineering, where minor deviations in track alignment or cross level can lead to significant safety concerns if not detected early.

A BAYESIAN NETWORK APPROACH TO PREDICTING CYBERATTACKS

With cyberattacks continuing to rise in frequency and severity around the world, the increasingly digitized U.S. railway industry faces heightened risks. Lakisha Guinn is utilizing a Bayesian network to devise a probabilistic graphical model that can prevent, predict, and identify a set of potential attack paths for network cyberattacks against railway systems. Guinn's model will be based on the MITRE ATT&CK (Adversarial Tactics, Techniques, and Common Knowledge) framework, a knowledge base of adversary behavior and taxonomy for adversarial actions across the lifecycle of a cyberattack, and the NIST Cybersecurity framework.

Lakisha Guinn

ADDITIONAL AI-RELATED RESEARCH AT UMD CEE

Researchers at the department are applying AI and machine learning to help improve airport operations, reduce the impact of hurricane-related school closures, optimize wind farm planning, and more.

ZHUOXUAN CAO, working with **PROFESSOR DAVID LOVELL**, is using artificial intelligence (AI) methods such as Long Short-Term Memory models to classify flight trajectory data. This enables small, un-towered airports to automatically record takeoffs, landings, taxi operations, and flight training activities such as missed approaches and touch-and-gos. Cao is also recording performance parameters such as approach, landing, and takeoff speeds; flight separations; and runway occupancy times. Taken collectively, these data help to characterize the operating conditions at an airport, and can be used to help justify requests for funding support for airfield improvements like runway extensions or taxiway improvements.

Zhuoxuan Cao

Hurricane-related school closures disrupt education and community life, often for extended periods. To help better understand and alleviate these impacts, doctoral student **DIAKO ABBASI** and his advisor, **ASSOCIATE PROFESSOR ALLISON REILLY**, have developed advanced machine learning models that can predict the duration of tropical cyclone-related Prolonged Unplanned School Closures (PUSC) across school districts in the Atlantic basin. Building on this work, the researchers are now assessing the impact of future climate projections on hurricane-related school closures. This ongoing study identifies vulnerable districts under different climate scenarios, offering policymakers critical insights for enhancing educational resilience. "By prioritizing high-risk areas, our research helps guide resource allocation and mitigation strategies to reduce disruptions and improve disaster preparedness in the face of future hurricanes," Abbasi said.

Diako Abbasi

As part of a national trend toward increased use of sustainable energy sources, the State of Maryland is exploring opportunities for development and operation of offshore wind generation facilities. Under the guidance of **ASSOCIATE PROFESSOR MARK AUSTIN** and **PROFESSOR CHUNG C. FU**, doctoral student **NAIYI LI** is exploring the use of AI, machine learning, and semantic modeling and reasoning techniques to support planning of wind farm facilities, as well as robust and efficient operations. Simulations and optimizations developed by the team leverage state-of-the-art tools such as OpenFAST, OpenOA, TopFarm, and QBlade, aiming to reduce operational costs and enhance energy efficiency across wind farms.

Naiyi Li

For Engineering Students, A New Way to Build Global Experience

STUDY ABROAD COURSES OFFER INTERNATIONAL EXPERIENCE BUT DON'T ALWAYS FIT INTO A STUDENT'S ACADEMIC PLAN. REGULAR COURSES PROVIDE NEEDED CREDIT HOURS BUT USUALLY DON'T INVOLVE ANY TRAVEL.

A recently launched course at UMD, Green Global Challenge, combines the best of both worlds. It's a three-credit, semester-long course that is held primarily on the UMD campus and counts as an elective across many engineering departments.

The projects are centered around a green sustainability engineering competition held in Denmark. And the course culminates with a trip to the Scandinavian country, during which students receive professional-grade feedback from Danish academics and professional engineers.

Birthe Kjellerup, professor of civil and environmental engineering (CEE) and chair of the department's Diversity, Equity, and Inclusion committee, developed the course in collaboration with UMD's Office of Global Engineering Leadership.

Professor Birthe V. Kjellerup

The idea, she said, is to "introduce students to the engineering landscape in northern Europe, specifically Denmark, and to give them the opportunity to participate in an international design competition."

The contest, Grøn Dyst (Green Challenge), is sponsored by the Technical University of Denmark (DTU) and requires entrants to submit proposals geared towards reducing human impact on the environment. Students pitch their ideas to panelists that include academics, sustainability experts, and professional engineers—an experience Kjellerup sees as particularly valuable for the students.

"It's a chance for students to become acclimated to a rigorous professional engineering environment in an international context," she said.

UMD Team Takes First Place in Copenhagen

In 2024, the second year of the UMD program, a team of Maryland students came away from Grøn Dyst with the top prize in the bachelor's-level category. Madison DeVane, Nathan Jacobs, and Robert Mayo won the award for a proposal that will help reduce the number of birds killed each year during collisions with wind turbine blades.

Four UMD teams participated in this year's competition, having prepared for it during the spring semester as part of the Green Global Challenge course, which combines a regular three-credit course experience with a study abroad component.

Around one million birds die each year by flying into the turbines, mainly because of a phenomenon known as "motion smear." When turbine blades spin at high speeds, the eye loses the ability to perceive them correctly. Avians fly into what appears to be empty space, only to be killed by the spinning blades.

In addition to decimating bird populations, such collisions also damage the wind turbines, which must then be taken offline for repair.

Working with Kjellerup, the UMD students proposed using ultraviolet (UV) paint to add a pattern of thin, staggered stripes to the front and back of one of the three blades used in a turbine. The resulting pattern appears vibrant to birds, which can register UV frequencies, yet invisible to humans.

"Originally, we knew that we wanted to somehow improve upon the existing wind energy sector, but only reached our final solution through collective brainstorming and lots of critical discussion," said Jacobs. "It was inspiring to see how the pooling of our diverse ideas and mutual support for one another led to outcomes none of us could have achieved alone."

In all, four UMD teams participated in this year's competition.

"IT WAS INSPIRING TO SEE HOW THE POOLING OF OUR DIVERSE IDEAS AND MUTUAL SUPPORT FOR ONE ANOTHER LED TO OUTCOMES NONE OF US COULD HAVE ACHIEVED ALONE."

NATHAN JACOBS
GREEN GLOBAL CHALLENGE PARTICIPANT

Improving Access to Electric Vehicles Though Crowdfunding

UMD-LED RESEARCHERS PARTNER WITH THE MARYLAND CLEAN ENERGY COALITION ON A PLAN TO BUILD CHARGING STATIONS IN ECONOMICALLY DISADVANTAGED NEIGHBORHOODS.

Qingbin Cui, Professor and Director, Build America Center.

Transitioning to electric vehicles (EV) can go a long way towards meeting emissions reduction targets and reining in climate impacts. But a lack of charging stations in lower-income areas threatens to limit access and exacerbate inequities.

With support from a $15 million federal grant, Maryland is addressing the problem by constructing dozens of charging stations in economically disadvantaged parts of the state—and the UMD-led Build America Center (BAC) is helping to spearhead the effort.

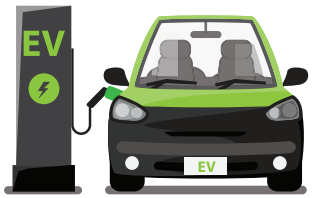
The BAC, led by Civil and Environmental Engineering Professor Qingbin Cui, specializes in assisting states and municipalities as they seek funding opportunities through the landmark Bipartisan Infrastructure Law (BIL), passed in 2021. Funds from that legislation have now been made available to the Maryland Clean Energy Center (MCEC) to provide 58 new charging stations.

To implement the plan, the MCEC will be working with the Maryland Equitable Charging Infrastructure Partnership (MECIP), which includes the BAC as well as nearly 20 corporate and municipal partners. Implementation will be based on a crowdfunding plan drawn up by Build America Center researchers.

The plan adopts a crowdfunding model for financing the charging stations, with ownership of charging stations offered to members of Historically Disadvantaged Communities (HDC) at a steep discount. Through such an approach, owners would be incentivized not only to invest in the stations, but also to maintain their upkeep.

"By providing ownership opportunities, community members become active stakeholders in the project, aligning their interests with the success and sustainability of the EV infrastructure," noted Cui and his co-authors in a paper detailing the proposal. "This approach not only fosters a sense of ownership and pride but also ensures that the benefits of the charging stations directly flow back to the community."

In a hypothetical Montgomery County test case, the team found that rates of return for the community investors could be as high as 68%. In addition to developing the crowdfunding plan, BAC supported MCEC's application for the $15 million grant by conducting emissions and equity analyses. BAC will continue to provide technical assistance to MCEC during project implementation, track/monitor/verify emission reductions, and assist with public engagement.



Professor Nii Attoh-Okine (right), Chair of the UMD Department of Civil and Environmental Engineering, led the roundtable. Also pictured: Marsia Geldert-Murphey, ASCE 2024 Global President.

Roundtable on Bipartisan Infrastructure Law

Civil and environmental engineering department heads joined federal and state officials and representatives of private industry at UMD in late 2023 as the UMD Department of Civil and Environmental Engineering hosted a landmark roundtable on the Bipartisan Infrastructure Law (BIL) and its implications.

The goal: to chart a roadmap for educational institutions as they prepare students to meet the workforce needs created by the BIL, a historic 2021 package of legislation that earmarks approximately $108 billion to renovate and upgrade the U.S. transportation system and its associated infrastructure, as well as increase broadband access, support clean water initiatives, and renovate electric grids.

"An investment of this size brings with it a corresponding need for trained professionals, many of whom will come from civil and environmental engineering," said CEE Department Chair Nii Attoh-Okine, who led the roundtable. "In many cases, infrastructure renewal means leveraging digital technologies. Engineering departments must be prepared."

With its rich array of expertise and nationally known centers and labs, UMD is well positioned to help accelerate the effort, he said.

"UMD is a leading example of how educational institutions can contribute to achieving

"My mission is to explore the soil-water-environment nexus and develop engineering solutions that enhance the sustainability and adaptability of geo-systems and infrastructure in response to the pressing challenges of climate change."

EUN JOINS UMD CIVIL AND ENVIRONMENTAL ENGINEERING FACULTY

Jongwan Eun, assistant professor in UMD's Department of Civil and Environmental Engineering, brings a focus on geotechnical engineering, geoenvironmental challenges, and infrastructure resilience to the department.

"My mission is to explore the soil-water-environment nexus and develop engineering solutions that enhance the sustainability and adaptability of geo-systems and infrastructure in response to climate change," Eun said.

With a background in advanced sensing techniques and artificial intelligence (AI), Eun is at the forefront of research aimed at addressing climate change challenges. His work includes the development of geo-technical solutions that can predict, test, and calibrate environmental impacts with unprecedented precision. Eun's research emphasizes practical applications such as mitigating flood risks and improving soil's water absorption under changing climate conditions.

A graduate of the University of Wisconsin-Madison, Eun spent eight years at the University of Nebraska-Lincoln as a faculty member and conducted research in Abu Dhabi, United Arab Emirates, where he explored how desert ecosystems and frozen soil conditions interact with climate variability. His work on frozen soil infiltration, funded by a National Science Foundation Early Career Development Program grant, aims to improve flood predictions by studying the effects of snowmelt and rainfall on soil during rapid temperature changes.

Recently, Eun's research has expanded to include nuclear energy storage materials. By incorporating AI into testing and validation processes, Eun aims to improve the safety and sustainability of nuclear waste repositories. His long-term goal is to develop a "physically informed neural network" that integrates AI with physical and numerical testing to advance this critical area.

"I'm excited to pursue my work here at UMD, particularly in collaboration with the Clark School of Engineering's strong risk assessment programs," Eun said.

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the objectives of the BIL," Attoh-Okine said. "Implementation is most effective when it is grounded in data, and at UMD we have the research expertise and facilities needed to support data-driven approaches."

The roundtable featured keynote addresses from Firas Ibrahim, Director of the U.S. Department of Transportation's (USDOT) Office of Research, Development, and Technology; Marsia Geldert-Murphey, 2024 Global President, American Society of Civil Engineers; Todd Lang, Director of Transportation Planning, Baltimore Metropolitan Council; Rebecka Pritchard, Associate Partner, McKinsey and Company; and Tim Smith, former Administrator, MD State Highway Administration.

Moderated panel sessions were held on the infrastructure job market, preparing for the future infrastructure workplace, the implications for college engineering curricula, preparing the next generation of infrastructure researchers, and emerging technologies such as digitalization and AI.

UMD resources in the transportation field include the Build America Center, a UMD-led, nationally funded center for transportation excellence which assists in BIL implementation and provides technical assistance to states, localities, and other stakeholders. The BAC is housed at the CEE department and directed by Professor QIngbin Cui.

The department is also home to several additional labs and centers with a focus on transportation. The newly-established Digital and Cyber Railway Engineering and Operations Center (DCREOC) aims to advance the use of high-tech tools to secure the U.S. railway system against threats while also improving efficiency in safety.

In 2023, meanwhile, UMD was selected by the U.S. Department of Transportation to establish the Center for Multi-Modal Mobility in Urban, Rural, and Tribal Areas (CMMM), a Tier One University Transportation Center (UTC) with a focus on improving the mobility of people and goods, particularly among disadvantaged populations. The department is also part of two other UTCs awarded funding in 2023: the Sustainable Mobility and Accessibility Regional Transportation Equity Center, led by Morgan State University, and the Research and Education in Promoting Safety Center, led by Howard University.

These newer organizations complement existing resources such as the Maryland Transportation Institute (MTI), a major interdisciplinary research hub that brings together experts from across the University of Maryland System; and the Center for Advanced Transportation Technology (CATT), whose affiliated CATT Lab hosts the world's largest transportation database, the Regional Integrated Transportation Information System (RITIS).

YANG WINS AASHTO HIGH VALUE RESEARCH AWARD

A team of researchers led by UMD Associate Professsor Xianfeng "Terry" Yang has been recognized by the American Association of State Highway and Transportation Officials (AASHTO) for their paper "Improving Roadway Debris Clearance for Chart Responders." AASHTO selected the team for a regional award in the High Value Research and Supplemental Category. Yang and coauthors Yaobang Gong and Sayantan Tarafdar will present their work, which is sponsored by the Maryland Highway Administration, at the 2025 Transportation Regional Board Annual Meeting in January.

Ayyub Leads Use of Climate Information for Infrastructure Adaptation

Professor Bilal Ayyub is a project leader on a NOAA initiative aimed at creating online climate projection methods and tools that can help decision-makers plan for future conditions.

LEARN MORE AT go.umd.edu/ayyub24

Civil Empowerment Seminar Series Hosts Hering, Nielsen

The UMD Department of Civil and Environmental Engineering's Diversity, Equity, and Inclusion Committee, chaired by Professor Birthe Kjellerup, hosted two inspiring seminars during 2024 as part of its Civil Empowerment Seminar Series. In March, the seminar series featured Torben Orla Nielsen, science attaché at the Innovation Centre Denmark at the Danish Consulate in Boston. Nielsen focuses on building connections in life sciences, health research, green technology, and quantum engineering. As part of his work, he seeks to bring together stakeholders in academia and industry, including startups.

The fall seminar featured National Academy of Engineering member Janet Hering, whose research has contributed to breakthroughs in ensuring clean water by identifying processes that produce arsenic, and by developing effective extraction methods. Hering, who has held positions at the University of California, Los Angeles and the California Institute of Technology, is also a retired director of the Swiss Federal Institute of Aquatic Science and Technology—and the first woman ever to be appointed director of a federal scientific institute in Switzerland. Her seminar focused on the continuing barriers faced by women in academia, particularly in STEM fields, and how to overcome these. In addition to her Civil Empowerment seminar, Hering also delivered this year's Kirlin Lecture, organized by Professor Alba Torrents.

Torben Orla Nielsen, science attaché at the Innovation Centre Denmark.

Janet Hering, Swiss Federal Institute of Aquatic Science & Technology.

FACULTY PROMOTIONS


Shelby Bensi was promoted to Associate Professor


Birthe V. Kjellerup was promoted to Professor


Zachary Vander Laan was promoted to Senior Faculty Specialist


Xianfeng "Terry" Yang was promoted to Associate Professor

UNDERGRADUATE STUDENT SPOTLIGHT

Jack Howes:
EXCELLING IN ACADEMICS AND ON THE FIELD

TERP SENIOR HAS RACKED UP ACCOLADES IN FOOTBALL WHILE PURSUING HIS ENGINEERING DEGREE.

Howes secured the team's bowl hopes with a late-game field goal, and went on to score the longest-ever field goal in the teams's bowl history.

Jack Howes knows what it's like to perform under pressure. Not only has he chosen civil and environmental engineering as his major, but he's racked up achievements and accolades as a kicker for the UMD football team. His field goal against Nebraska as the clock ticked down secured the team's bowl hopes in November 2023 and earned him recognition as Big Ten Special Teams Player of the Week.

And Jack was just getting started. He'd go on that year to achieve the longest made field goal (49 yards) in Maryland bowl history.

An accomplished athlete during high school, Howes chose UMD in part because of its excellence in sports. But there was another reason as well: he wanted to study at a school with a strong civil and environmental engineering program.

"UMD checked both those boxes," he said.

Engineering runs in the family. Howes's father studied the subject as an undergraduate at Georgia Tech and worked as a project manager at Sea World and Universal. Indeed, when Jack decided to go into the field, he envisioned a career building roller coasters himself.

Football success has changed those plans—he's setting his sights on being drafted by the NFL. But a civil engineering career isn't out of the question, either, for Jack hasn't lost his interest in roller coasters. As a student on the Transportation/Project Management track, he'll have a world of career opportunities open to him after graduation.

No one would describe the study of civil engineering as a breeze, and he's playing football at a level that requires the utmost dedication. How does he manage both? A flexible schedule helps; he takes most of his classes in the morning and then heads out to the field for practice. He's managed to also be active in student life, serving as representative for the Student Athletic Advisory Committee. And though free time might seem elusive, you will often find him at the UMD golf course.

Classes may be hard, but he is studying what interests him. So far, his favorite course has been in engineering design; as part of the course, he and a group of classmates worked together to design and build a robot.

Ultimately, his twin vocations—football and engineering—share a common denominator. Both require concentration, hard work, and a willingness to embrace high-pressure situations. As Jack explains, "I like a challenge."

Isabella Kolar, Ph.D., contributed to the story.

STUDENT ACHIEVEMENTS

CONGRATULATIONS TO ALL CEE STUDENTS WHOSE ACADEMIC AND RESEARCH ACHIEVEMENTS WERE RECOGNIZED IN 2023-24, INCLUDING:

Bechtel Graduate Award
DIAKO ABBASI

CEE Best Doctoral Research Award
KHASHAYAR AGHILINASROLLAHABADI

Graduate School Outstanding Graduate Assistant Award
LAVAN TEJA BURRA

Graduate School Outstanding Graduate Assistant Award
SHIH-HUAI CHENG

UMD Adele's Circle of Women Scholarship
ZAHRA HALIMI

Dr. Matthew W. Witczak Graduate Award
EREN KAYA

UMD James W. Dally Prize for Outstanding Instructional Support
NAIYI LI

Graduate School Summer Research Fellowship
ALIREZA MOGHADDASI

Clark Doctoral Fellowship, Lieutenant General John W. Morris II Graduate Fellowship
MIA RENNA

Lieutenant General John W. Morris II Graduate Fellowship
MOHAMMAD SAFARITAHERKHANI

CEE Best Master's Research Award
SAEED SALEH NAMADI

Clark Doctoral Fellowship
QADRI SHAHEEN

Harkins Group Fellowship
YU WANG

Stanley R. Zupnik Fellowship
MOHAMMADREZA YAZDISAMADI

Graduate School Outstanding Graduate Assistant Award
YI ZHANG

Lieutenant General John W. Morris II Graduate Fellowship
YI ZHANG

UMD Maryland Transportation Institute Fellowship
YI ZHANG

Civil's New Home in Stanley R. Zupnik Hall

WITH AMPLE LAB SPACE AND HUBS FOR INTERDISCIPLINARY RESEARCH, UMD'S NEWEST BUILDING IS DESIGNED TO MEET THE NEEDS OF A CHANGING FIELD.

With the building close to completion, the UMD Department of Civil and Environmental Engineering (CEE) is looking ahead to its future home at the newest building on campus, Stanley R. Zupnik Hall.

A total of 37,000 square feet in the 162,667-foot facility have been allocated to CEE, which will move its main offices, centers, and labs there when it opens in 2026. The building also includes space for other A. James Clark School of Engineering labs, including shared labs intended to encourage interdisciplinary research.

"Zupnik Hall meets multiple needs," said Nii Attoh-Okine, chair of the CEE department. "Firstly, as a growing department, we need space for our existing facilities as well as for new ones dedicated to emerging areas of research. At the same time, we are seeing an increased need for collaboration across engineering fields."

"The building will be a modern space addressing various grand challenges of our time, and will serve the needs of all our students," he said.

Two entire floors have been allocated to CEE, providing space for 39 faculty offices, 11 environmental engineering research labs, graduate research workspaces, and the chair's suite, which will also serve as the headquarters for the department's Digital and Cyber Railway Engineering and Operations Center. In addition, separate space in the building has been earmarked for two new civil engineering labs, focused respectively on Building Information Modeling and on Intelligent Infrastructure.

Meanwhile, a Connected Autonomous Vehicles lab, covering 3,401 square feet, will be jointly shared by the CEE, electrical and computer engineering, and mechanical engineering departments. Finally, a Quantum Technology Suite, to be located in the basement, will break new ground as the only quantum technology teaching lab in the nation.

A student focus is strongly evident in plans for the building, which will house the offices of three student organizations—the National Society of Black Engineers, the Society of Hispanic Professional Engineers, and the Society of Women Engineers—and includes gathering spaces for student events as well as a multi-story student lounge.

Windowed walls in labs, meanwhile, will showcase the work being done there while amplifying the collaborative, interdisciplinary, and silo-breaking aspirations of the Clark School.

The building will be named for Stanley R. Zupnik '69. Zupnik is one of its founding donors, together with the A. James and Alice B. Clark Foundation, which made a substantial gift as part of its historic $219.5 million Building Together investment in the Clark School. Funding is also being provided by the State of Maryland.

Architectural rendering of Zupnik Hall.

ALUMNI SPOTLIGHT

Wing-Mei Ko and Vasilios Plangetis:

Bridging College and the Engineering Workplace

THE TWO 2018 GRADUATES KNOW WHAT IT'S LIKE TO TRANSITION FROM COLLEGE TO PROFESSIONAL LIFE. NOW THEY'RE SHARING EXPERIENCES AND ADVICE TO CURRENT STUDENTS THROUGH THE DEPARTMENT'S MENTORING PROGRAM.

PHOTO CREDIT: CATRECE ANN MARIANO.

Ko and Plangetis, now married and working as professional engineers, met during their senior year at UMD.

Wing-Mei Ko and Vasilios Plangetis met in 2016 in an Engineering for Sustainability class taught by UMD faculty member Natasha Andrade. They eventually became teammates on the UMD Concrete Canoe mix design team, and co-project managers in their senior year.

The Terp couple, who married in 2023, went on to pursue careers in their respective tracks. Ko, a site civil engineer, is an assistant project manager at the Rockville office of the Maryland-based firm Soltesz, while Plangetis, whose focus is geotech, is a project engineer with Schnabel Engineering, also in Rockville.

As experienced professionals, they are sharing tips, advice, and know-how with current UMD civil and environmental engineering (CEE) undergraduates as participants in the CEE department's mentoring program. Led by Andrade, who is associate chair for undergraduate programs, the mentorship initiative aims to help ease the transition from academic to professional life.

The mentees in the program tend to be highly motivated, Plangetis said. "Very often, in terms of their preparation for the real world, they're already 95% there. We try to help them with the other 5%." he said.

Students often don't realize that professional engineers are willing to answer questions and provide insights into what they do on a day-to-day basis. "Although it can seem intimidating to reach out to someone at a company or organization, many are willing and even eager to help," Ko said.

"We hope that through the mentoring program we can help relieve some of the anxiety that students feel by enabling them to know more about what it's like to actually work in the field, and how work differs from the classroom—because it can be quite different," she said.

For instance, she said, the workplace often requires collaborating with people from across a wide range of fields, from engineering to computer science to marketing, whereas the student experience tends to be more discipline-specific.

When they think back on their UMD CEE education, Ko and Plangetis remember coursework that was rigorous and rewarding—and extracurriculars that helped them build valuable out-of-classroom skills.

Even as they kept up with their demanding academic workload, the two students found time for a plethora of outside activities, including not only Concrete Canoe but also competitions held by the American Concrete Institute and the Solid Waste Association of North America.

"The experiences that I got through being involved with student organizations provided a lot of great networking opportunities and also taught me to work on a team," Ko said. "I gained project management experience, technical design experience, and critical thinking and problem-solving abilities."

"Balancing classes, labs, and extracurriculars can be a challenge, but we always encourage students to seek out these kinds of opportunities," Plangetis said. "Ultimately they make you a more well-rounded engineer."

A. James Clark
School of Engineering

Department of Civil and
Environmental Engineering
1173 Glenn L. Martin Hall
4298 Campus Drive
University of Maryland
College Park, MD 20742

CAPSTONE DESIGN EXPO

Jeremiah Hannon, Daniela Martinez-Ramos, Thilini Amarasinghe, and Owen Schweitzer won the Department of Civil and Environmental Engineering award at the A. James Clark School of Engineering's inaugural Capstone Design Expo, held on May 1. Their project, developed with the guidance of Clark Distinguished Chair Deb Niemeier, proposes an alternate approach to upgrading Baltimore's conduit system in response to the Central Avenue Design-Build project. Team is pictured here with Dean Samuel Graham, Jr., (far left) and CEE Chair Nii Attoh-Okine (far right). **LEARN MORE AT** go.umd.edu/Expo2024

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