



Department of
**CIVIL AND
ENVIRONMENTAL ENGINEERING**
THE UNIVERSITY OF UTAH



Civil | Construction | Nuclear
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FROM STUDENT TO TEACHER

HOW CVEEN ALUMNI ARE SHAPING FUTURE CIVIL ENGINEERS



The impact faculty members have on an industry goes well beyond their own research, it extends to the reach of their students. Some former students from the Department of Civil and Environmental Engineering at the University of Utah are working as faculty at other universities around the world, inspiring the engineers of tomorrow.

CHUN-HSINGJUN HO, is an associate professor in the Department of Civil Engineering, Construction Management, and Environmental Engineering at Northern Arizona University. Before working as a faculty member, he was a Ph.D. student at the University of Utah in 2006 studying with associate professor Pedro Romero. During his time at the U, Ho focused his studies in materials engineering with an emphasis on construction materials and pavement systems. Meeting with Romero solidified his interest in CVEEN. "I was impressed with the lab facilities the department would provide me. More importantly, the research projects I learned from Dr. Romero were fascinating," Ho explained. "So I had the U in my mind and decided to move to Salt Lake City to start my Ph.D. journey. This was the best choice I have made for my career."

After working in the industry for more than 10 years, Ho going back to graduate school allowed him to pursue his interests in becoming an educator. "The industrial practices in transportation infrastructure systems (railroad, airport and highway) profoundly cultivated my interest to become an educator so I would share my experience and inspiration to my students," he said. "The Ph.D. admission to the U opened a door for my academic career to come true."

Ho's time at the University of Utah helped prepare him for his career in academics. He worked closely with Pedro Romero on several proposals. Once he determined his dissertation topic, he gained experience with lab work and collecting results. "With test results, procedures, along with Dr. Romero's supervision, we provided a testing methodology that eventually led to a lease of Standard Method of Test for Determining the Flexural Creep Stiffness of Asphalt Mixtures Using the Bending Beam Rheometer," Ho noted. "Dr. Romero and I also had four journal papers published or accepted for publications prior to getting my doctoral degree. For me, the academic area is so challenging but rewarding."



SEUNGYUB LEE, an assistant professor in civil and environmental engineering at Hannam University in Daejeon, South Korea, started his Ph.D. at the University of Utah in 2015 and completed his degree in 2019. During his time at the U, Lee focused on water resource engineering and worked with U civil and environmental engineering professor Steve Burian.

When deciding which university to attend for his graduate program, Lee wanted to apply at top-50 universities as well as areas that would provide safety and security for his family. The University of Utah fit his criteria while also providing ample funding opportunities for his Ph.D. program.

His initial career plans were to get a research position, but his goals shifted during his time with CVEEN. "During my Ph.D., I found some interest in teaching while working as a TA and mentoring graduate students," Lee explained. "The reason I decided to be a professor was obvious. It is the position that has the benefit of research and teaching. Unlike the research position, a professor can still work on a research project while still have an opportunity to communicate with the student."

Lee's time at the U prepared him for the international teaching roles he would take on. "I think the University of Utah gives more freedom and trains students to be more self-directed. It does not mean that students are left without caring, but more care to grow their ability to think properly." These teaching philosophies were applied in the classroom as well as in research opportunities. They prepared Lee to step into the faculty career field. "An active learning class provided me a better chance to accelerate the thinking process, and self-directed research projects and my dissertation helped me to be an independent researcher."

ERFAN GOHARIAN is an assistant professor for the department of civil and environmental engineering at the University of South Carolina. He graduated from The University of Utah with his Ph.D. in 2015 before pursuing post-doctoral work. During his time at the U, Goharian focused on water resources, something he aspired to research on since he was a child. "I remember when I was a child the familiar experience of opening the water tap during summer and there was not even a drop due to water shortage in my hometown. These experiences sparked



my motivation at a young age to pursue my education in civil engineering, and particularly in water resource management."

Goharian's credits his time at the University of Utah as an exclusive opportunity to gain skills and improve research expertise through his work with his advisors and mentors. Being in Salt Lake City provided real life experiences for him to work on while he continued his academic career. "I had a great chance working closely with local water resource managers and stakeholders. It provided me first-hand experience with real-life engineering issues and use pragmatic methods to help solve them as well as perform research that informs the decision-making process."

The passion he has for civil engineering and his students is one of the reasons Goharian pursued a career in academics. "When students leave my class, they should be able to identify engineering problems that we are dealing with every day. And I decided to teach because I wanted to help them look for appropriate techniques and tools to solve those problems. Everyone has a specific vocation in life, and I always had this feeling that my mission as a teacher is to guide my students toward becoming an independent engineering learner and a lifetime instructor."

TAKING A LOOK BACK

ONE YEAR AFTER THE LARGEST QUAKE TO HIT UTAH IN 28 YEARS



On March 18, 2020 at 7:09 a.m., a 5.7-magnitude (M) earthquake shook Salt Lake City startling residents. Since then, University or Utah Seismograph Stations reported more than 2,500 aftershocks related to the initial earthquake through February 2021. A year later, geologists are still studying the impact the earthquake had on the community.

Utah is familiar with seismic activity as the Wasatch fault zone extends for 220 miles from near Fayette, Utah, to Malad City, Idaho. The fault zone is not a single fault extending the distance but instead a series of segments that are active and constantly moving. The earthquake that struck in March 2020 is classified as a moderate earthquake, but Utah is still at risk for a major earthquake, of M7.0 to M7.5. Civil and environmental engineering professor Chris Pantelides notes that there would be a significant impact from a strong earthquake. “The estimated short-term economic loss in such a scenario is over \$33 billion of which \$25 billion are direct building-related capital losses,” he said. “More than 80,000 households are expected to be displaced. Essential lifelines such as water, electricity, gas and sewer will be disrupted for days to months. Unreinforced masonry buildings represent a large source of expected building damage with more than 90,000 buildings predicted to be moderately damaged or totally destroyed.”

Preparation for seismic activity is a constant

process for residents and businesses in Utah. From earthquake drills in schools to structural modifications, Utahns and engineers are working to update infrastructure for when an earthquake will strike.

In 2004, restoration on the Utah State Capitol building began after identifying that the building was vulnerable, even to a moderate earthquake. By the end of the restoration efforts in 2008, 265 seismic base isolators were installed to improve safety and protect against damage caused by an earthquake. The base isolators proved effective during the moderate earthquake because no damage was reported to the State Capitol.

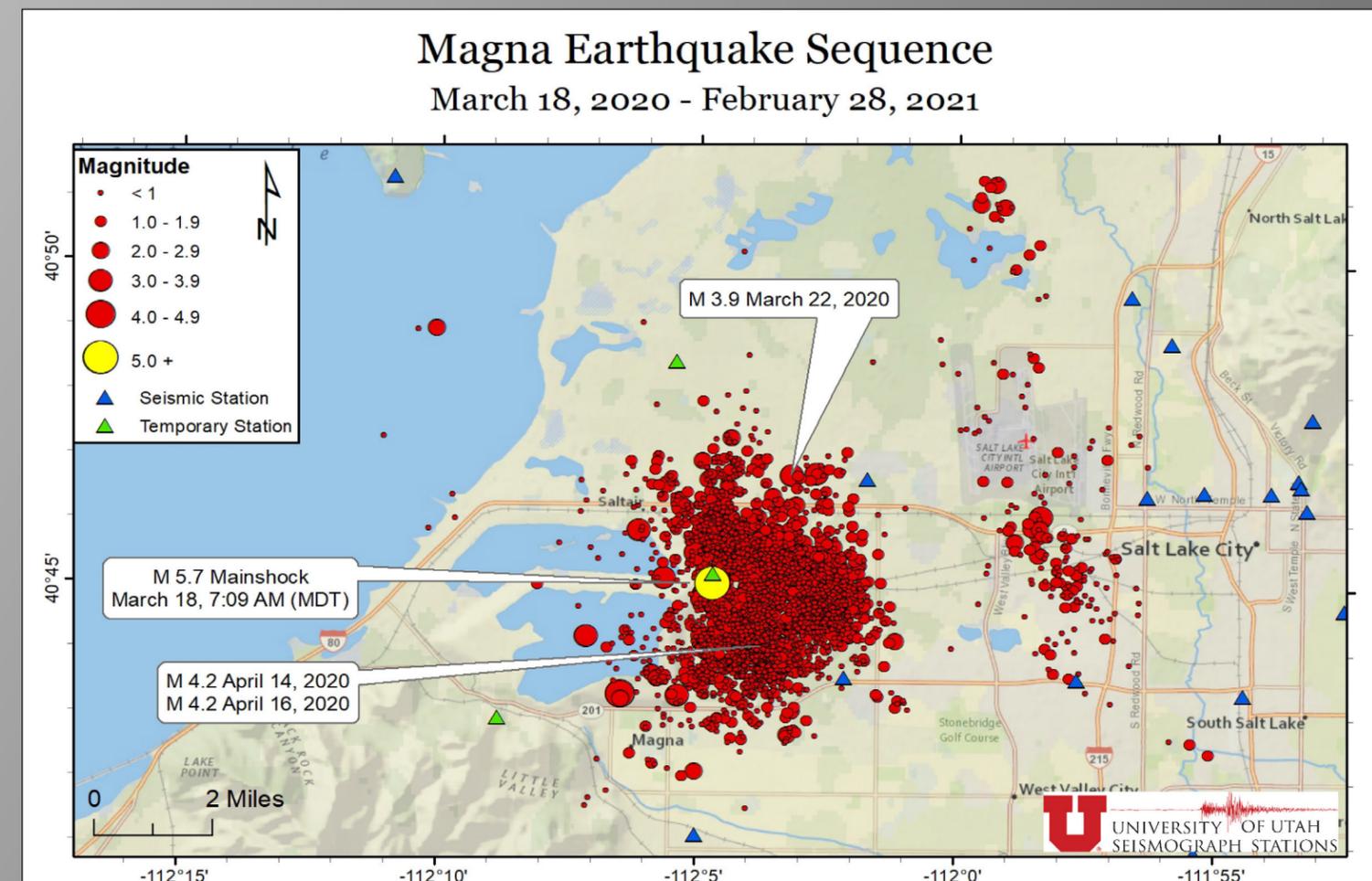
Base isolators are an important technique engineers use to protect buildings. The isolators are placed between the building’s foundation and the structure above and provide a cushion for the structure to sit on. “The isolators are very stiff in the vertical direction and can carry the vertical load of the building but are very flexible horizontally, so they enable the building to move laterally under strong ground motions” Pantelides explains. “The technique is based on reducing the seismic demand rather than increasing the earthquake-resistant capacity of a building.” In Salt Lake City, buildings such as the headquarters for planetarium show producers Evans and Sutherland, the Salt Lake City and County building, and the Utah State Capitol are equipped with base isolators.

Residents along the Wasatch Front can examine their homes to determine if updates to their infrastructure are necessary in the event of an earthquake. An inadequate foundation is a risk for homeowners. Pantelides recommends looking under your home to determine if the foundation needs updating. “If the foundation is damaged or built in the “pier and post” style, replace it with a continuous perimeter foundation,” Pantelides explains. “Look for bolts in the mudsills. They should be no more than six feet apart in a single story and four feet apart in a multistory building. Adding bolts to unsecured houses is one of the most important steps toward earthquake safety.”

Another risk homeowners need to be aware of is unreinforced masonry. This means that all brick or block walls should be reinforced. “Salt Lake City has a program for retrofitting buildings made of unreinforced masonry” Pantelides said. “If your house has masonry as a structural element, consult a structural engineer



to find what can be done. Inadequately braced chimneys are a more common problem.” Seismic activity is something civil engineers are not able to control, but they can build and modify existing infrastructure to prepare for the threat of a future seismic event.



ADAPTING TO A PANDEMIC

HOW CVEEN IS WORKING TOGETHER FOR A BETTER U

WENDY MCKENNEY

Civil and environmental engineering undergraduate advisor Wendy McKenney reflects on how working from home has provided a different experience for her interactions with students. “The last year has presented us with many challenges we’ve had to work through, but one positive change has come with virtual advising. We’ve seen a significant decrease in the number of students who have missed their advising appointments. Virtual advising has provided more flexibility when scheduling an appointment by allowing students to attend their appointment from almost anywhere, eliminating the extra time spent commuting to and from our office. We also saw a positive impact in our orientation experience this summer. Orientation is traditionally held in a group setting but last summer we had the opportunity to meet with students one-on-one and tailor each appointment to that student’s particular needs. It allowed us to spend more time connecting and getting to know our incoming students.”



CARLOS OROZA

Civil and environmental engineering assistant professor Carlos Oroza implemented new teaching techniques to bring back to his in-person courses. “Although I really miss working with students in-person, adapting to COVID has positively impacted my teaching in certain ways. In particular, teaching remote asynchronous classes required me to be more intentional in my course design and organization, expanded my use of interactive online tools, and generally made my courses more active. I still feel like I have a lot to learn, but I’m excited to take some of these elements and integrate them into my future courses, even as we move back in-person. A huge “thank you!” to the Center for Teaching and Learning Excellence for their tireless efforts and everyone else across the department and university who came together to help each other out as we adapted to this challenge.”



CODY NIZINSKI

Students in CvEEN has shown incredible resilience, working tirelessly to continue their education. CvEEN Ph.D. candidate, Cody Nizinski worked on his nuclear engineering research from home. “During this work-from-home research effort I looked into uncertainty quantification for convolutional neural networks, and evaluated the generalizability of deep learning classifiers to out-of-distribution scanning electron microscopy data related to the surface morphology features of uranium oxides, all of which was carried out between my home desktop computer and the Scientific Computing and Imaging Institute’s (SCI) GPU clusters. The results of this effort may help to identify critical research needs for nuclear forensics morphology databases, and will be presented at the upcoming American Chemical Society Spring 2021 Conference. As the U began to safely reopen lab facilities with frequent COVID tests for students and social distancing protocols in place, I was able to resume my typical laboratory work synthesizing and analyzing uranium materials, without missing a beat.”



RACIAL PROFILING IN TRAFFIC STOPS



Civil and environmental engineering associate professor Cathy Liu is part of a team of researchers studying if racial profiling exists when motorists are pulled over by police.

Current events inspire faculty to pursue research in order to better the community. For Liu, a transportation engineer, and a team of researchers she is working with, studying racial profiling by police became a topic of interest. The team was awarded a grant from the National Science Foundation to determine if racial profiling exists among police who pull over motorists.

“The study was motivated by the flashpoint incidents happening around the country in recent years where police officers around the nation killed several African American men,” Liu said. These events started a discussion that evolved into a potential collaboration. “The multidisciplinary work was linked through a long-standing history of collaboration. I and Ran Wei have long engaged in collaborative research and have an extensive collective research profile in spatial modeling of transportation network, and urban geography analytics.”

Cathy Liu is working with Arizona State University School of Criminology and Criminal Justice associate professor Danielle Wallace and University of California, Riverside, public policy associate professor Ran Wei are starting work that will provide insight into a field where there has been little research conducted examining police profiling in traffic stops. “Commonly known as the “denominator problem” in criminology, no one in academia—be it criminologists, economists, geographers, urban planners, or statisticians—has accurately estimated the risk of police contact that people of color face when driving,” Liu explained. “Our study aims to advance a multidisciplinary method of solving the denominator problem by creating valid estimates of driving patterns by race/ethnicity, as well as constructing and validating appropriate benchmarking techniques to identify racial profiling in traffic stops.”

The research focuses on a variety of cities in California and in Madison, Wis. These cities were chosen because of their high-quality data on police traffic, pedestrian stops, and accident data. These areas are also part of oversamples from the National Household Travel survey. The oversamples enable the ability to add rich data about the race/ethnicity of drivers to the modeling.

“The goal of the project is to build upon this dataset, develop novel measures, methods and models for exploring and analyzing the impacts of racially motivated traffic stops, and develop a deeper understanding of how this impacts communities of color,” Liu said.

In the end, the research team hopes to inform policymakers and law enforcements agencies about potential biases and provide a blueprint to improve the outcomes and reduce distrust between law enforcement and communities of color.

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XIANFENG (TERRY) YANG

Congratulations to Civil and environmental engineering assistant professor, Xianfeng (Terry) Yang! Yang was awarded an NSF Early Career Grant for his proposal on machine learning in transportation.

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