

# **I**Optimum

Cullen College of Engineering  
Industrial Engineering Magazine | Fall 2016

## **HITTING THE TARGET**

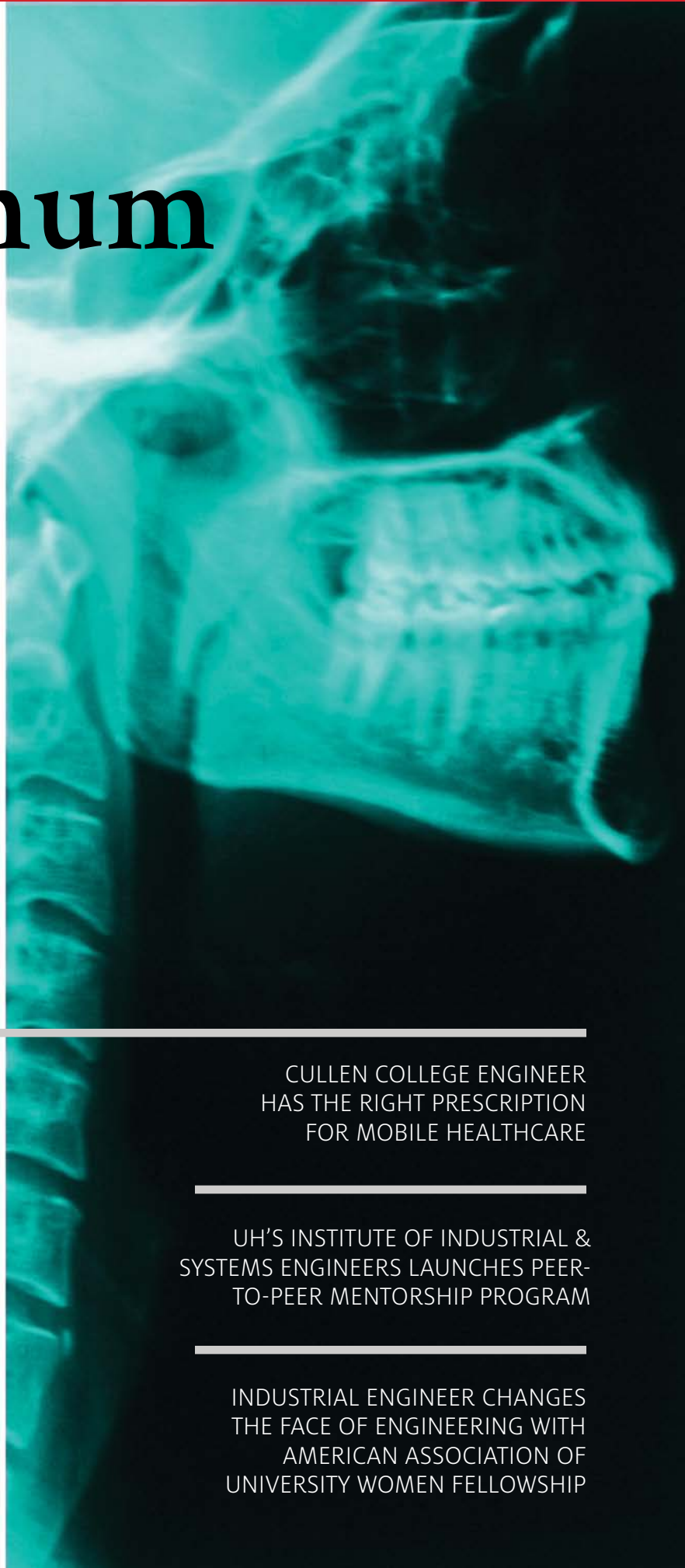
**INDUSTRIAL ENGINEERING  
PROFESSORS EARN GRANT  
TO IMPROVE PROTON  
THERAPY FOR CANCER**

**PG. 12**

CULLEN COLLEGE ENGINEER  
HAS THE RIGHT PRESCRIPTION  
FOR MOBILE HEALTHCARE

UH'S INSTITUTE OF INDUSTRIAL &  
SYSTEMS ENGINEERS LAUNCHES PEER-  
TO-PEER MENTORSHIP PROGRAM

INDUSTRIAL ENGINEER CHANGES  
THE FACE OF ENGINEERING WITH  
AMERICAN ASSOCIATION OF  
UNIVERSITY WOMEN FELLOWSHIP





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HEALTHCARE

PG. 11

CONTENTS



- 2// INTRODUCTION  
By the Numbers
- 4// DEPARTMENT NEWS  
Faces of IE: Q&A with Rodrigo Bolaños
- 7// UH NEWS  
UH rated among best colleges for undergraduate education by *Princeton Review*
- 10// LEAD NEWS  
Hitting the target: industrial engineering professors earn grant to improve proton therapy for cancer
- 15// FACULTY  
IE department welcomes two new faculty members
- 16// STUDENTS  
Industrial engineer changes the face of engineering with American Association of University Women Fellowship
- 18// ALUMNI  
Meet IE alumna Yamile Jackson
- 22// SUPPORT & GIVING  
Compelled to give: Q&A with Randal Sitton
- 24// PHOTOS & CULTURE
- 26// PUBLICATIONS

IE Optimum

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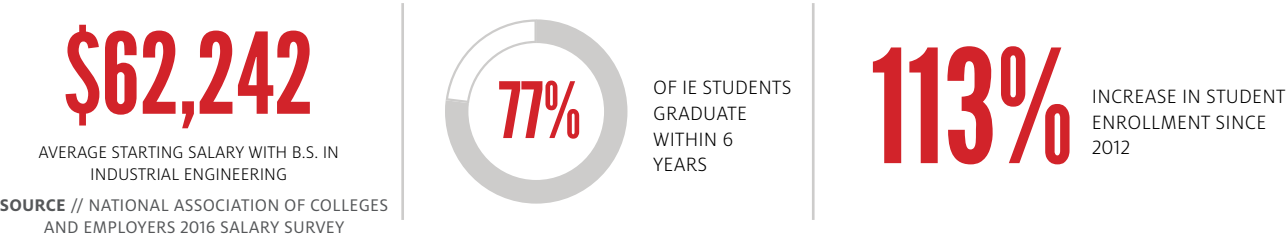
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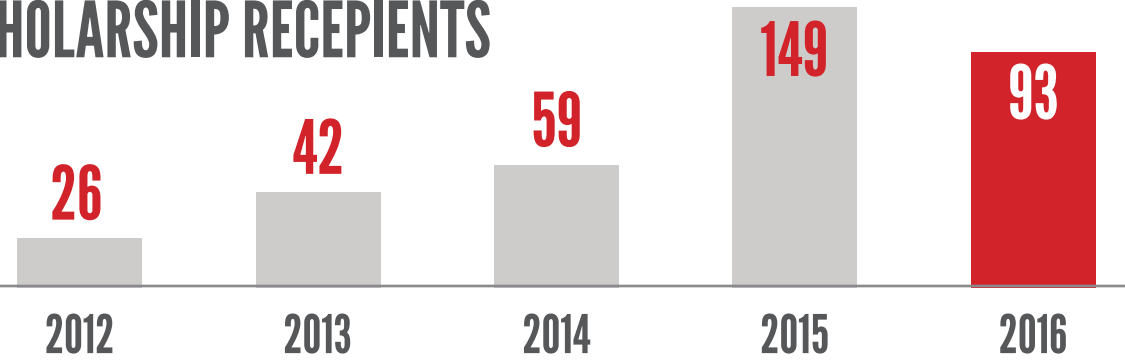


# INDUSTRIAL ENGINEERING BY THE NUMBERS

## CORE RESEARCH AREAS



## SCHOLARSHIP RECIPIENTS



DEGREE	B.S.	M.S.	PH.D.	TOTAL
ENROLLMENT	135	173	18	326
DEGREES AWARDED (2016)	27	90	5	122

IE STUDENT ENROLLMENT FAST FACTS

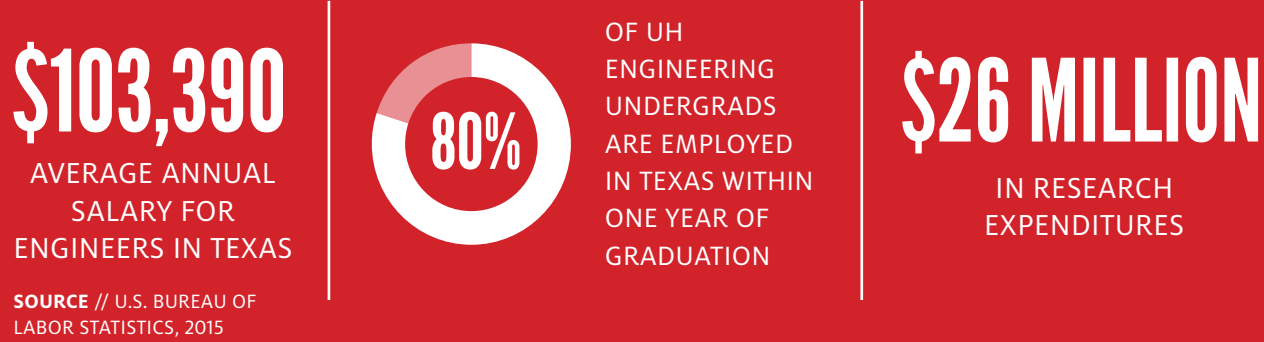
# CULLEN COLLEGE OF ENGINEERING BY THE NUMBERS



BEST ENGINEERING  
SCHOOL OF 2017

**22:1** UNIVERSITY-WIDE  
STUDENT TO  
FACULTY RATIO

SOURCE // U.S. NEWS & WORLD REPORT



**13** NATIONAL ACADEMY OF ENGINEERING FACULTY MEMBERS

**5,000+** STUDENTS ENROLLED IN CULLEN COLLEGE OF ENGINEERING

**129** TOTAL FACULTY

**1300** AVERAGE SAT SCORE OF ENTERING FRESHMAN

**19,000+** TOTAL ALUMNI OF THE CULLEN COLLEGE



**Rodrigo Bolaños**  
(BSIE '82)

General Manager, League Collegiate Outfitters

# FACES OF IE:

Q&A WITH

## RODRIGO BOLAÑOS

By Natalie Thayer

Since receiving his bachelor's degree in industrial engineering from the UH Cullen College in 1982, Bolaños' career has taken him to manufacturing facilities throughout the United States and Central America. Over the years, Bolaños improved production lines, implemented new manufacturing processes and programmed software for planning material usage and labor costs.

Today, Bolaños serves as the general manager for League Collegiate Outfitters, a manufacturing facility in his home country of El Salvador. The role allows him to apply his engineering expertise to his other true passion – helping others.

League is much more than your average manufacturing facility and Bolaños is much more than your average manager. He has revolutionized the workplace by instituting an inclusive hiring approach – League employs many elderly individuals, disabled individuals and former gang members – and implementing resources for better work-life balance, including engineering courses, English classes, childcare and meal plans.

Bolaños' groundbreaking ideas and commitment to improving the lives of others earned him a coveted spot on the list of

2016 Engineers Who Make a Difference in *Industrial Engineer Magazine*, a publication by the Institute of Industrial Engineers (IIE). He has also been featured by national and international media outlets including the *New York Times*, *National Public Radio* and the *BBC* for his work at League.

Read our Q&A with Bolaños to learn about his dedication to the League Collegiate Outfitters community and how his UH experience allowed him to pursue his dreams!

**Q: What inspired you to study industrial engineering?**

**A:** I've always enjoyed working with people and looking for ways to improve processes. These interests led me to programming computers and applying them in manufacturing. In college, I also found that I liked operations research, which is the study of how to make better decisions using advanced analytical methods.

**Q: How did your experience at the Cullen College prepare you for your career and your work with League?**

**A:** While attending the University of Houston, I was able to see how engineering pro-

fessors were also involved in the community as volunteers.

For example, I learned a lot from [professor emeritus] Dr. John Hunsucker, who was involved with the Red Cross and who volunteered for a company that hired blind employees to assemble Bic pens. He was a balanced individual – he was both a great professor and a great leader.

**Q: What is your hiring philosophy at League Collegiate Outfitters?**

**A:** At League, we believe that everybody deserves a second chance. We believe in a community that is inclusive.

We have opened our arms to ex-prison inmates, to gang members who want to leave the life of crime and begin their rehabilitation process and to individuals who have been deported from the United States for entering illegally. We have also created opportunities for many other disenfranchised individuals, including those with physical impairments and non-traditional lifestyles. Additionally, we hire our employees' family members because we feel this helps family ties grow stronger.

**Q: You have implemented programs to offer League employees courses in English and two-year technical degrees in biomedical, electrical and mechanical engineering. Why is it important to invest in programs like these that go beyond the workplace?**

**A:** We want to give our employees the tools to succeed in life. Education is a way to give people hope and we're trying to build an environment that can give back to all of our employees. Many of our employees came from poverty or had very few options in life, but we are encouraging them to dream about success.

It takes a lot of effort and vision to create an environment where second chances mean that, regardless of past mistakes, there is a way out of crime, poverty and misery. The work we do [at League] on a daily basis reaches out to these individuals and provides a path for a brighter future.

A lot of Salvadorans want to leave the country because they don't think there is anything for them in El Salvador. But at League, morale is high because the employees know that we are providing opportunity and it's no longer necessary for them to leave the country to become successful. This is a huge success for us!

I believe every country has to offer their citizens a land of opportunity. Thirty-three percent of the population in El Salvador has left – I see this as a sign of failure by its leaders. But, we can turn this around if we get involved in finding ways to give our citizens a road for success and a second chance.

**Q: What advice can you share with current industrial engineering students at the Cullen College?**

**A:** As an industrial engineer, your work will involve machines, and the people operating and working with those machines. It's important to remember that human component. You will greatly benefit from meeting people who are doing the jobs throughout the production process. Leadership is personal and people will work hard for a leader who shows interest and connects at the personal level. ■



## INDUSTRIAL ENGINEERING INDUSTRY ADVISORY BOARD HOLDS BIENNIAL MEETING

On June 3, the UH Cullen College of Engineering's Industrial Engineering (IE) Industry Advisory Board (IAB) held its first meeting of the year on the UH campus.

Gino Lim, chairman of the industrial engineering department at the Cullen College, led discussions on ABET certification, Capstone design projects and new initiatives in the department. Meeting attendees included Nilesh Kulkarni, UH alumnus and senior manager of inbound optimization and operations research at Sysco Foods; Eric Ayanegui, UH alumnus and director of operations engineering solutions at Cintas Corporation; Arun Adat, UH alumnus and global supply management at Hewlett Packard; Nancy Currie-Gregg, UH alumna, former astronaut and principal engineer at NASA; Wayne Mausbach, UH alumnus and government/environmental director at Intuitivum Group; Jeff Applegate, chief executive officer at Texas Injection Molding; and Sandy Fine, UH alumnus and retired industrial engineer.

The IE IAB meets twice a year to discuss the future of the department and to give advice on tailoring the curriculum to address current industry needs and fill workforce gaps. ■

## UH'S INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS LAUNCHES PEER-TO-PEER MENTORSHIP PROGRAM

The University of Houston's Institute of Industrial & Systems Engineers (IISE) student chapter is making a name for itself on the UH campus and around the city of Houston.

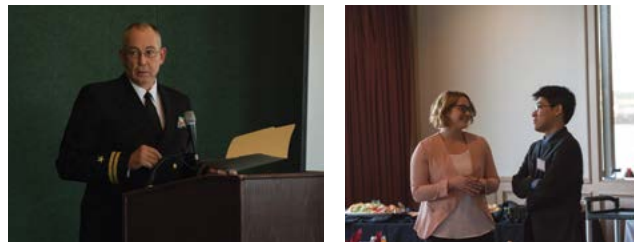
"We want this organization to serve as a focal point and central resource for industrial engineering students," said Christopher Avalos, UH IISE president and senior industrial engineering student. "We want to connect people to opportunities to make an impact and give back to the community."

This fall IISE launched a new mentorship program on campus. By pairing senior and junior industrial engineering students with sophomore and freshmen students in the department, the program will provide students with leadership experience and networking opportunities within the campus community.

IISE students also have the opportunity to tour companies in the greater Houston area, attend regional conferences and volunteer with various organizations throughout the city, including the Houston Food Bank.

To find out more about the UH IISE student chapter, visit [facebook.com/groups/iiseuh](https://facebook.com/groups/iiseuh) ■





## IE HONORS AND AWARDS BANQUET

By Natalie Thayer

On April 14, the Cullen College's industrial engineering (IE) department hosted its annual IE Honors and Awards Banquet at Brady's Landing.

The event brought together IE students, alumni, faculty and staff to celebrate outstanding students with scholarships and awards, including the Dr. Ben Amaba Scholarship, the Melody Kathryn Snider-Porter Women in IE Scholarship and many more. Department chair Gino Lim also recognized instructional associate professor Eylem Tekin with the Outstanding Teacher Award.

Attendees also paid tribute to Benjamin Ostrofsky, an influential IE faculty member who passed away earlier this year.

Associate professor Lawrence Schulze introduced IE student chapter officers and Lim and Jose Pedroz, president of UH's Institute of Industrial Engineers student chapter, provided closing remarks.

The event was sponsored by Cintas, Piping Technology and Products, and Randal Sitton, instructional associate professor of industrial engineering at the Cullen College. ■

## UH RATED AMONG BEST COLLEGES FOR UNDERGRADUATE EDUCATION BY PRINCETON REVIEW

By Shawn Lindsey

Just as the University of Houston kicks off another fall semester with of record enrollment, the *Princeton Review* is highlighting why more students are choosing Houston. The education services company ranks UH among the nation's best institutions for undergraduate education in the 2017 edition of its flagship college guide, "The Best 381 Colleges," based, in part, on surveys from students.

In its profile, the *Princeton Review* praises UH for being "a world-class research institution and a fixture in Texas education" and "attracting many more bright students to the university." The book quotes extensively from UH students who were surveyed. Among their comments, the school "provides some of the greatest opportunities in the world." Students attributed UH's ideal location in Houston as a strength for both academics and student life – noting UH's ties to business and industries, as well UH's proximity to "fun places to eat, party, hang out and exercise." "If you feel there's nothing you could do here... you, my friend, are wrong," said one UH student.

"Outstanding academics are the chief reason we chose UH for this book, and we strongly recommend it to applicants," says Robert

Franek, *Princeton Review's* senior vice president-publisher and author of "The Best 381 Colleges." "We make our selections primarily based on data we collect through our annual surveys of administrators at several hundred four-year colleges. Additionally, we give considerable weight to observations from our school visits, opinions of our staff and our 24-member National College Counselor Advisory Board, and an unparalleled amount of feedback we get from our surveys of students attending these schools. We also keep a wide representation of colleges in the book by region, size, selectivity and character."

The *Princeton Review* surveyed 143,000 students (about 375 per campus on average) attending the colleges. The 80-question survey asks students to rate their schools on several topics and report on their campus experiences at them. Topics range from their assessments of their professors as teachers to opinions about their school's library, career services and student body's political leanings. UH received high marks for the diversity and "dedicated spirit" of the student body, pointing out that students routinely wear red and cheer on the athletic programs.

The University has not only caught the attention of the *Princeton Review* as being a

university "on the rise in recent years," but also has potential students taking notice. Applications were up 3 percent over last year and enrollment is expected to see a similar increase.

Overall, the University of Houston continues its evolution and growth on all fronts – from the physical landscape to its academic offerings. There are several new schools, degree programs and academic opportunities debuting this fall.

The *Princeton Review's* recent recognition of UH complements previous acknowledgements in books "Colleges that Pay You Back: Schools that Give you the Biggest Bang for Your Tuition Buck." (Feb. 2016) and "Colleges That Create Futures" (Sept. 2015). UH also earned the No. 2 spot in *Princeton Review's* "2015 Top Entrepreneurial Programs" for the Cyvia and Melvyn Wolff Center for Entrepreneurship in the C.T. Bauer College of Business.

The *Princeton Review* is an education services company known for its test-prep courses, tutoring, books and other student resources. The company is not affiliated with Princeton University. ■



# CULLEN COLLEGE CLIMBS U.S. RANKINGS, EARNS SPOT ON LIST OF NATION'S BEST PROGRAMS



The UH Cullen College of Engineering is well on its way to becoming a Top 50 engineering college in the nation, earning a coveted spot on the list of the Best Engineering Schools of 2017 by *U.S. News and World Report*.

The Cullen College climbed from No. 76 to No. 73 in the most recent *U.S. News and World Report* national rankings for graduate-level engineering programs. Moreover, five graduate programs within the college – civil, mechanical, computer, electrical and chemical engineering – earned the status of Best Engineering Programs of 2017.

“We are a college on the move, and the most recent *U.S. News and World Report* rankings are a wonderful reflection of this,” said Joseph W. Tedesco, Elizabeth D. Rockwell Dean of the UH Cullen College of Engineering.

*U.S. News and World Report* is a leading source for rankings of colleges, graduate programs, hospitals, mutual funds and cars. Each year, the publication ranks professional school programs in business, education, engineer-

ing, law, medicine and nursing. The data for the rankings come from statistical surveys of more than 1,900 programs and from reputation surveys sent to more than 18,400 academics and professionals.

Suresh Khator, associate dean of graduate programs and computing facilities at the Cullen College, said the recent rankings reflect not only the success of the college's professors and students, but also the relevancy of its programs to the city of Houston and the entire nation.

“Graduate programs at the UH Cullen College of Engineering are designed to immerse students in the grand challenges of engineering represented in our city, and our programs encourage students to conduct research that finds solutions to some of the most pressing challenges facing our city and our world,” Khator said.

“UH engineers are making major contributions to society both nationally and globally, and it is wonderful to see our programs

recognized among the best in the country,” he added.

More than 5,000 students are enrolled in engineering courses – 3,759 undergraduates as well as 1,312 master's and doctoral students in biomedical, chemical, civil, computer, electrical, environmental, geosensing systems, industrial, mechanical and petroleum engineering. The college also offers interdisciplinary graduate programs in subsea, aerospace, materials, and computer and systems engineering.

The Cullen College is home to some of the country's highest ranked engineering programs, including chemical engineering (33<sup>rd</sup>), industrial engineering (53<sup>rd</sup>), civil engineering (62<sup>nd</sup>), environmental engineering (64<sup>th</sup>) and mechanical engineering (78<sup>th</sup>).

**FOR THE FULL LIST OF RANKINGS** from *U.S. News and World Report*, please visit <http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-engineering-schools> ■



## UH MOVES UP IN GLOBAL RANKINGS FOR ISSUED PATENTS

By Jeannie Kever

The University of Houston is among the top 100 university systems in the world for granted U.S. utility patents in 2015.

The rankings, released in July by the National Academy of Inventors and Intellectual Property Owners Association, show the UH System ranks second among Texas systems, behind only the University of Texas. The University of California System is ranked No. 1, as it has since the rankings began in 2013.

This is the first year UH cracked the top 100, tied for No. 80 with 29 utility patents issued in 2015. UT was issued 191 and ranked fourth; other Texas schools on the list included the Texas A&M University system and Rice University, tied at No. 96 with 25 patents each.

UH has put increasing emphasis on translating academic research into useable technologies over the past few years. Royalty income at the flagship campus – money generated by patents issued for technologies or products developed at UH is split between the inventor, the college in which the inventor works and the University – was \$22 million in 2015, the most generated by

any U.S. public university without a medical school. That is up from \$1.1 million in 2008.

The rankings cover utility patents, which are “issued for the invention of a new and useful process, machine, manufacture, or composition of matter, or a new and useful improvement thereof,” according to the U.S. Patent and Trademark Office, and account for about 90 percent of all patents issued.

Ramanan Krishnamoorti, interim UHS vice chancellor and UH vice president for research and technology transfer, said the rankings are a sign of the faculty's creativity and drive, along with an institutional focus on supporting research to solve society's problems.

“Whether it's a new drug or a smarter way to produce oil, academic researchers are driven not only by the search for basic knowledge, but by a desire to solve problems,” Krishnamoorti said. “The University has put an increased focus on helping researchers move their work from the lab bench to commercialization while also advancing basic science and engineering, and it is paying off.” ■

“WHETHER IT'S A NEW DRUG OR A SMARTER WAY TO PRODUCE OIL, ACADEMIC RESEARCHERS ARE DRIVEN NOT ONLY BY THE SEARCH FOR BASIC KNOWLEDGE, BUT BY A DESIRE TO SOLVE PROBLEMS.”



# CULLEN COLLEGE ENGINEERS BRING TXDOT BRIDGE RATINGS UP TO DATE

By Laurie Fickman

Take a day trip from Houston and you'll likely drive over one of the 50,000 bridges that span the great state of Texas. During your drive you probably never wondered if the weight limits on the bridges were accurate. But then, that's why we have Mina Dawood, associate professor of civil and environmental engineering in the Cullen College.

That's the way he thinks, and the Texas Department of Transportation (TxDOT) has taken notice, awarding him and two colleagues \$260,000 over the next two years to assess bridges and bring them accurate load information. His co-principal investigators are Abdeldjelil Belarbi, professor of civil and environmental engineering, and **Qianmei (May) Feng**, associate professor of industrial engineering and Brij and Sunita Agrawal Faculty Fellow.

"TxDOT is by nature conservative," said Dawood. "What we're trying to do is allow them to safely increase the loads being carried by bridges and hopefully, in some cases, not need to post loads on bridges that are being load posted now."

TxDOT regularly assesses its bridge inventory for safety and posts the safe load weight on older bridges that were built before the days of 18-wheelers and heavy intrastate traffic.

## Historically conservative

When analyzing a bridge that was built almost a century ago, there's a good chance the details of the material tests that were performed decades ago aren't available, so engineers depend on guidelines set in the American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Engineering (MBE).

"We believe AASHTO provides conservative guidance on material strength and, in reality, actual materials may have strengths measurably greater than the MBE guidance or what was specified in the original plans," said Dawood. "If you have more accurate data about the strength of the materials in a bridge you would calculate more accurately the capacity of the bridge."

While Dawood anticipates most load-posted bridges can take more weight, some bridges in Texas were built before World War II and environmental conditions may have hastened aging.

"On the one hand, the bridges are deteriorating, and on the other hand, we need to apply more load to the bridges on a day-to-day basis," said Dawood.

## Bridging the data gap

With TxDOT the UH group will visit different historical bridges being decommissioned

to gather test samples. The samples may include girders, braces, gusset plates, bolts or rivets – any part of the steel structure. Back at Dawood's lab, machinists will take the test samples and create pieces small enough to hold in your hand (called tension coupons) and stress testing on those pieces will begin. Machines will actually pull apart a tension coupon to note the exact weight at which it collapses or pulls apart.

Aside from test samples, the group will pull information from the TxDOT historical archives and explore existing literature. And then, Feng will take all the random variables and the pieces of information to make sense of it.

"I will look at the strength of the materials versus the stress or loads, to see how much stress the bridge can take based on the material strength," said Feng.

"We definitely need Dr. Feng's expertise with statistics," said Dawood. She will determine what strength, out of a thousand or more pieces of data, should be used to make sure that bridges are accurately measured and safe.

Once the work is completed and delivered to TxDOT, there's a good chance that state officials will have their hands full: traveling Texas, changing signs and bringing load posts up to date, the way Cullen College engineers determine appropriate. ■



# IE PROFESSOR HAS THE RIGHT PRESCRIPTION FOR MOBILE HEALTHCARE

By Laurie Fickman

The National Science Foundation isn't asking too much – just present potentially transformative research that might improve people's lives and they might be eager to give you money through their Early-concept Grant for Exploratory Research (EAGER) program.

As luck would have it, **Jiming Peng**, UH Cullen College associate professor of industrial engineering, has such a plan. It's called "Increasing Healthcare Access to At-Risk Populations in Smart Communities: Optimal Deployment of Mobile Health Clinics," a joint project with colleagues from the UT School of Public Health in Houston. The idea is to expand mobile clinics in underserved areas, which could definitely change lives for the better in Houston, where mobile clinics figure prominently in delivering healthcare to at-risk populations. In Houston, about 30 mobile clinics currently offer care ranging from routine and cancer screenings to dental work for over 1 million people.

Seeing the value and need, the NSF awarded Peng \$125,000 for two years of research beginning in September. But if this was a ballgame, Peng's research would already be on third base. In January of 2016, the Texas Medical Center awarded Peng and his colleagues a budget of \$150,000 for a pilot project to improve the lives of Texans by coming up with research-based policies for mobile health clinics.

## "I'm an optimization guy."

Peng's expertise as an optimization expert, maximizing the revenue or minimizing the loss under certain operational and budgetary constraints, makes him a perfect fit for this project. Peng is pouring over demographic data to optimize and deploy mobile health clinics to better serve the needs of Houstonians.

He's already discovered that one problem with mobile clinics in Houston is the lack of coordination in scheduling. Preliminary study in the pilot project shows him there's a better way.

"Every major hospital has a mobile clinic, but there's not enough coordination among them," said Peng. "Sometimes they have to travel too far. For example, every time the UTMB mobile clinic, located in Galveston, is scheduled to [visit] the very north part of Houston, it has to travel two-to-three hours."

That's lost time that could be spent treating patients. The next task is to make sure the mobile clinics are servicing the correct areas.

"Some of Houston's service spots are not carefully selected," said Peng. He said sometimes that's based on the relationships of certain neighborhoods and hospitals, and he believes his research will help change that.

"Once we identify the needs in the greater Houston area we can assign and coordinate

between the program providers and the local communities," he said.

Altogether, Peng says his plan to strategically re-route and locate the clinics will allow them to serve 20-30 percent more people while keeping the costs exactly the same.

## Stage two

For the NSF grant, Peng will try to predict what the future healthcare demands will be in Houston. He will develop optimization models and resolution techniques that use geographic information systems (GIS), demographic and economic population data to identify systematic, technology-based deployment of mobile health clinics as well as optimal strategies to expand the mobile clinic service to meet the future demand. That kind of future-casting puts the "smart" in smart communities from the research title.

"Based on our research we can predict the demand for this kind of service in the future," said Peng.

It looks like Houston is going to need it. According to Peng, moderate estimates in a recent study indicate the population in the metropolitan Houston area will be over 8 million in 2030 and over 10 million by 2050.

That's a lot of healthcare needed, but with Peng on the job, the solutions will no doubt be optimized. ■



# HITTING THE TARGET:

## INDUSTRIAL ENGINEERING PROFESSORS EARN GRANT TO IMPROVE PROTON THERAPY FOR CANCER

By Audrey Grayson

Two industrial engineering professors at the UH Cullen College of Engineering received a grant from the Cancer Prevention & Research Institute of Texas (CPRIT) to optimize the clinical effectiveness of proton therapy for cancer patients.

The competitive three-year, \$879,362 grant was awarded to research assistant professor **Wenhua Cao**, who will serve as principal investigator, and **Gino Lim**, Hari and Anjali Agrawal Faculty Fellow and chairman of the industrial engineering department. Researchers from two other Texas institutions – the University of Texas MD Anderson Cancer Center and Rice University – are included in the collaborative cancer research project.

Working with industrial engineering graduate students, Cao and Lim will investigate the biological and physical factors affecting patients' responses to proton therapy, a highly-effective form of advanced radiation therapy.

Proton therapy works by precisely delivering a prescribed amount of radiation to a tumor site inside of the body, while minimizing the radiation exposure to nearby healthy tissues.

Although proton therapy is generally considered a superior form of radiation therapy, not all cancer patients respond equally to the treatment.

"A review of nearly 20 years of research into proton therapy has claimed that the treatment is 10 percent more effective than a traditional photon therapy, such as intensity modulated radiation therapy [IMRT]. However, our preliminary research revealed that's really not the case," Cao said. "This percentage of effectiveness of proton therapy varies a lot from patient to patient. It's not across the board."

Preliminary results have shown that biological tissues respond very differently to radiation particles; some tissues are more resistant to radiation, while other tissues readily absorb the radiation particles.

"It all depends on the kind of patient and the biological tissue response to radiation," Cao said.

In his own research, Cao observed that for some cancer patients proton therapy was only 5 percent more effective than standard photon therapy, while in other patients it was 20 percent more effective. Cao and Lim said they are determined to find out why the treatment is so much more effective in some patients.

"We need to move away from cookie-cutter approaches and toward personalized medicine, which is very important for the future of cancer therapies," Cao said. "You can't assume just because two people have a similar background, ethnicity or age that the same treatment approach will work for both patients."

In order to move toward more personalized treatments for cancer patients, researchers must first learn how to optimize proton therapy for each patient.

"With proton therapy, precision is key," said Cao. "If the protons aren't delivered to the exact site of the tumor every single time, then it can drastically compromise the effectiveness of the therapy."

Proton particles are heavier than photon particles. When proton particles hit their target inside of the body, they stop immediately. If the proton therapy is delivered with precision to the tumor site, no damage is caused to surrounding healthy tissues and patients experience far less side effects as a result of the radiation.

But determining how to deliver the protons to the site of the tumor in the most effective way requires solving a massive optimization problem. For starters, patients must be positioned in the exact same way each time they receive the proton-delivered radiation, which can be up to five days a week for several weeks. During this time, if the patient loses or gains weight, the changes in their tissue can alter the location of the tumor and require changes to how the radiation is delivered.

And even if the patient is correctly positioned for each session, providers must take into account all of their involuntary movements, such as the rise and fall of the chest while breathing, that can shift the location of the tumor and result in an incomplete dose of radiation.

Then there's the angle at which the proton beams are delivered to the tumor. If there are 36 possible angles to deliver radiation to the tumor site and physicians must choose somewhere between two and four angles that combine to provide the best treatment, that leaves them with 72 million combinations to choose from. This problem is so complex that a supercomputer would be required to solve it.

"It's very difficult to simulate the interactions between the radiation particles and body tissues computationally," Lim said.

Cao and Lim, then, are developing a new method called the "Advanced Monte Carlo simulation approach," which will allow any doctor with a graphical processing unit (GPU) to enter in basic information on a patient and receive a detailed analysis on how to deliver the proton therapy to achieve the best possible clinical outcomes.

"We want to try to understand the biological effects of proton beams. Once we have a better understanding of the tissue response to proton beams, then I'm sure we'll do a much better job with proton therapy – far beyond the current practice of using photon beams," Cao said.

The CPRIT was authorized by Texas voters in 2007 to issue \$3 billion in bonds to fund groundbreaking cancer research and prevention programs and services in the state. CPRIT's goal is to expedite innovation in cancer research and product development and to enhance access to evidence-based prevention programs throughout the state. ■



Wenhua Cao



Gino Lim



# IE CHAIR WORKING TO IMPROVE SAFETY FOR HOUSTON DRIVERS DURING FLASH FLOODING

By Natalie Thayer

The city of Houston experienced historic flash flooding over the Memorial Day weekend last April, with areas of the city receiving nearly 18 inches of rain. There were eight fatalities during the storm, including three motorists who drove into floodwater.

**Gino Lim**, chair of the industrial engineering department at the Cullen College, has been working with Houston city officials to increase drivers' safety during flash flooding. He developed early warning sensors that have been installed throughout the city in flood-prone areas and is working to install electronic gates at flood-prone underpasses and crossings.

Lim's research was featured in the *Houston Chronicle* last April in the article titled, "Officials pledge action after flooded roadway deaths."

"Sometimes it is very difficult to see the water levels when someone is not used to the area," Lim said. "Based on what we know, which location was flooded often, we can set the priority and put gates in those locations."

Following the Memorial Day floods in 2015, Houston officials identified 27 locations where warning systems would be installed so drivers could avoid high water. As of last April, warning systems had been installed at 19 of those locations.

The sensors installed throughout the Greater Houston area already feed information to a flood-monitoring database created by Lim in 2010. The information collected by the sensors is fed into algorithms written by Lim that analyze and display the data on real-time, web-based flood maps. The user-friendly flood maps resemble Google maps, and intuitively display information on water levels at specific points throughout Houston. ■

# IE DEPARTMENT WELCOMES TWO NEW FACULTY MEMBERS

By Natalie Thayer

The UH Cullen College of Engineering proudly welcomes two new faculty members to the industrial engineering department in the 2016-2017 academic year.



**Taewoo Lee**  
Assistant Professor

Lee will join the Cullen College in the spring of 2017 as an assistant professor. His research interests include the development of inverse and robust optimization techniques for improved decisionmaking. He said he is particularly interested in investigating methods that have the potential to impact the healthcare field, such as cancer therapy, diabetes treatment and lifestyle changes.

"I hope to find approaches that offer new opportunities to make better use of data," he said, adding that he believes it is important to enable efficient and cost-effective personalized healthcare and treatment protocols.

Lee received his Ph.D. in mechanical and industrial engineering from the University of Toronto in 2015 and will complete a postdoctoral fellowship in the computational and applied mathematics department at Rice University this year. ■

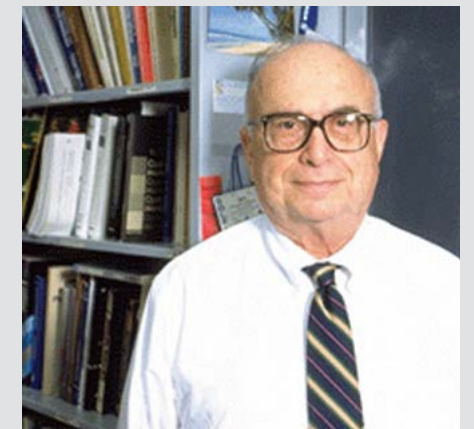


**Yaping Wang**  
Instructional Assistant Professor

Wang joined the UH Cullen College of Engineering this fall as an instructional assistant professor. Her current research interests include design and analysis of optimization algorithms for large-scale computational problems, such as rigid point set registration and big data analytical modeling. As a professor, she aims to provide students at all levels with hands-on technical skills and advanced computational methods.

"I'm committed to preparing students to meet the pressing demands for analytics talent in today's industrial job market," Wang said.

Wang earned her Ph.D. in industrial engineering from Texas A&M in College Station in 2016. ■



## COLLEGE MOURNS PASSING OF FORMER UH INDUSTRIAL ENGINEERING PROFESSOR

The University of Houston community mourns the passing of **Dr. Benjamin Ostrofsky**, an influential former faculty member from the Cullen College of Engineering and the Bauer College of Business.

After completing his doctorate in engineering at UCLA in 1968, Ostrofsky joined the faculty at the University of Houston as a professor of both industrial engineering in the Cullen College of Engineering and operations management at the Bauer College of Business.

As an engineering professor, Ostrofsky exhibited excellence in both research and teaching. He was awarded the President's Award for Merit from the Society of Logistics Engineers in 2002, which recognizes society fellows who have made significant contributions to the organization. Ostrofsky also won all of the society's three most prestigious awards: the Armitage Medal in 1978, the Eccles Medal in 1988 and the Founder's Medal in 1993.

Ostrofsky conducted research in the fields of logistics and distribution throughout much of his career. The professor also played an active role in the development, application and maintenance of the high standards of the Professional Certified Logistician Examination since the board's inception in 1973. ■



# CNN INTERVIEWS UH ENGINEERING EXPERT ABOUT AIRFARE OPTIMIZATION



**Andrew Boyd**  
*UH adjunct professor of industrial  
engineering*

By Natalie Thayer

Anyone who has purchased an airline ticket knows that it can feel like navigating a maze full of twists and turns in the form of price hikes and drops. *CNN* provided a behind-the-scenes look into the “method behind the madness” that is airfare pricing in its article and video segment titled “Seating secrets: How airlines decide what fare you pay,” released last September.

*CNN* spoke to UH adjunct professor of industrial engineering **Andrew Boyd** to get the details on airline revenue management – the science of adjusting fares in real time so that airlines can maximize revenue. Boyd previously served as a chief scientist at a company that supplies revenue management systems to airlines.

“Revenue management is really, fundamentally about looking at what the market is willing to pay,” he said. To predict this, airlines use complex software that takes into account various factors, from overall global conditions to flyer profiles and individual preferences and perks.

**LEARN MORE ABOUT AIRLINE PRICING SECRETS AT**  
<http://www.cnn.com/2016/09/16/aviation/airline-pricing-secrets> ■



## INDUSTRIAL ENGINEER CHANGES THE FACE OF ENGINEERING WITH AMERICAN ASSOCIATION OF UNIVERSITY WOMEN FELLOWSHIP

By Natalie Thayer

Women make up less than 15 percent of professional engineers in the United States, according to a 2012 report by the Congressional Joint Economic Committee, but the American Association of University Women (AAUW) is working to change those statistics.

This year, the AAUW awarded **Zaida Hernandez**, an industrial engineering graduate student at the UH Cullen College of Engineering, a 2016–2017 Selected Professions Fellowship, which is intended to support women in traditionally male-dominated fields, such as law, medicine, science and technology. Hernandez will receive an award of nearly \$12,000 to cover tuition for her graduate studies and related expenses through the fellowship.

“AAUW is in the business of making sure that no doors are closed to women and girls, because we know that true innovation can only happen when everyone has a place

at the table,” said Gloria Blackwell, AAUW vice president of fellowships, grants and global programs. “We are proud to support women’s entry into underrepresented professions that will ultimately benefit society as a whole.”

Hernandez, a native Houstonian and first-generation college student, has been committed to defying the odds as a female engineer since she was in high school. She first landed an internship with NASA Johnson Space Center as a high school senior – an experience that inspired her to pursue a bachelor’s degree in mechanical engineering at the Cullen College.

Hernandez continued to intern at NASA during her undergraduate and graduate studies, exploring thermal protection systems and prototyping as a member of the thermal design team. She said her experiences at NASA motivated her to continue her education at

UH. She is pursuing her master’s in industrial engineering so she can combine her mechanical expertise with a deeper understanding of design, prototyping and human factors. Ideally, she hopes to continue her career at NASA as a technical expert.

Hernandez also said serving as a role model and mentor to incoming female engineers at the Cullen College underscores all of her achievements thus far.

“Although the percentage of women enrolled in engineering programs is increasing, we are still a minority,” she said. “I feel very fortunate to have [AAUW] as a support system and am extremely honored to have been awarded this unique fellowship.”

**LEARN MORE ABOUT THE AAUW AT**  
[www.aauw.org](http://www.aauw.org) ■





## ENGINEERING UNDERGRADS SHOWCASE CUTTING-EDGE RESEARCH AT 2016 UNDERGRADUATE RESEARCH DAY

By Audrey Grayson

More than 200 UH undergraduate students presented their research at the 2016 Undergraduate Research Day held at the Elizabeth D. Rockwell Pavilion on October 13.

A total of 40 UH engineering students participated in the campus-wide event, presenting research on a wide array of topics ranging from medicine and health to energy and materials. Four engineering students won poster awards at the event.

Electrical and computer engineering student Lillian Lin, advisee of Aaron Becker, received a poster award for her research on controlling swarms of micro-robots.

Tara Mars, a chemical and biomolecular engineering student, received a poster award for her work on flow and transport of complex fluids in porous media. She worked closely with faculty adviser Jacinta Conrad on this project.

Another chemical and biomolecular engineering student, Phillip Reid, earned a poster award for his research conducted with Peter

Vekilov on assessing the effects of combined antimalarial drugs on treating malaria.

Serra Reed, a mechanical engineering student working with faculty adviser Pavel Dutta, received a poster award for her work on antireflection coatings for thin film photovoltaics on flexible substrates.

Other projects presented at the event covered the use of fish oil supplements to treat arthritis and lupus; identification of novel catalysts for the synthesis of ammonia; enhanced oil recovery methods; evaluation of how the brain experiences art; and the development of aqueous batteries.

**WATCH OUR VIDEO** from the 2016 Undergraduate Research Day at [www.egr.uh.edu/undergrad-research-day-2016](http://www.egr.uh.edu/undergrad-research-day-2016)

**VIEW PHOTOS** from this year's Undergraduate Research Day and other recent events at [www.egr.uh.edu/news/photo-gallery](http://www.egr.uh.edu/news/photo-gallery) ■

## WOMEN IN MANUFACTURING EVENTS HOSTED AT UH ENGINEERING



By Audrey Grayson

There was a time in the not-so-distant past when women in manufacturing jobs were hard to come by. It wasn't until World War II when, faced with a depleted workforce, American women rolled up their sleeves and went to work in factories and shipyards across the country.

It was the first time in American history that women filled a significant number of jobs in the manufacturing industry, and though we've come a long way since then, women still only account for 27 percent of the manufacturing workforce. Over the next decade, 3.5 million manufacturing jobs will need to be filled, but 2 million of those jobs will remain unfilled due to a shortage of skilled manufacturing talent.

The Manufacturing Institute tackles this issue head-on with its annual Step Forward networking events, inviting women in manufacturing to connect with their peers, mentor female students and stay up-to-date on the latest trends and best practices in their industry. The goal of the events is to encourage, retain and advance women in the manufacturing industry.

With help from sponsors BASF, Deloitte, the Lumina Foundation and the UH Cullen College of Engineering, the Manufacturing Institute's Step Forward events were held at the Cullen



College on October 6. The theme for the event was "pay it forward," bringing together women from different ages and backgrounds to mentor one another and share lessons learned from their personal and professional lives.

The event kicked off with an outdoor science festival tailored specifically for 65 high school girls from the Alief Independent School District. UH engineering students hosted stations for the highschoolers to get their hands dirty with engineering activities and demos. The UH engineering students guided the high school girls through building catapults out of popsicle sticks and testing out oximeters and stethoscopes on their classmates. Students also took turns touring the Texas Alliance for Minorities in Engineering (TAME) trailer, a mobile science museum filled with fascinating exhibits and hands-on activities, such as using a joystick to control a robotic arm to perform specific tasks.

The morning events even attracted *Houston Chronicle* reporter Andrea Rumbaugh, who documented the girls' experiences in her article "Manufacturers make pitch to girls, young women."

Afterwards, more than 75 female science, technology, engineering and mathematics (STEM)



students from across the UH campus attended a networking lunch and roundtable discussion with leaders in industry.

The Manufacturing Institute will host another Step Forward networking event on February 2, 2017 at the Sam Houston Hotel in Houston. The free reception will include talks from industry leaders, networking opportunities with other manufacturers in the region and roundtable discussions that delve into workplace issues such as finding work-life balance.

**FOR MORE INFORMATION** on the Manufacturing Institute's Step Forward events sponsored by BASF, please visit [www.themanufacturinginstitute.org/Initiatives/Women-in-Manufacturing/STEP-Forward/STEP-Forward.aspx](http://www.themanufacturinginstitute.org/Initiatives/Women-in-Manufacturing/STEP-Forward/STEP-Forward.aspx)

**TO VIEW PHOTOS** from the Step Forward Manufacturing Day events and other recent Cullen College events at [www.egr.uh.edu/news/photo-gallery](http://www.egr.uh.edu/news/photo-gallery) ■



# WHERE ARE THEY NOW?

## MEET IE'S RECENT PH.D. GRADS!

By Natalie Thayer



**Maryam Zaghian**  
(Ph.D. IE '15)

**Maryam Zaghian** received her doctoral degree in industrial engineering from the Cullen College in the fall of 2015. At the Cullen College, she worked closely with her faculty adviser Gino Lim, Hari and Anjali Agrawal Faculty Fellow and Chairman of the industrial engineering department, to research ways to optimize radiation and proton treatment planning. The project, a collaboration with MD Anderson Cancer Center, allowed Zaghian to tap into her passion of improving people's lives and provided her a deeply rewarding experience.

"Essentially, industrial engineering is the study of how to minimize unwanted results and increase the probability of preferred outcomes," she said. "That's the window I view the world through, and applying this perspective to patient care was extremely fulfilling."

The hands-on experience played a pivotal role in shaping Zaghian's future path. She now works as a senior systems engineer in the Office of Performance Improvement at MD Anderson Cancer Center.

"I gained valuable exposure to the world of healthcare [through my research at UH] and I decided to continue doing my best for patient care," she said. ■



**Khaled Eldressi**  
(Ph.D. IE '16)

**Khaled Eldressi**, one of the Cullen College's most recent industrial engineering doctoral graduates, received his Ph.D. in industrial engineering last spring. Eldressi said he was drawn to the industrial engineering field because of its versatility. He ultimately decided to pursue his doctoral degree at UH because he was excited by the opportunities available at the Cullen College to apply his technical skills to the business sector and explore his primary research interests, including engineering economic and advanced manufacturing techniques.

Eldressi spent nearly four years as a teaching assistant (TA) at the Cullen College, an experience he said prepared him for his current role as an IE lecturer at Benghazi University in his native country of Libya.

"The most significant opportunity I had in college was the chance to build my teaching and learning abilities at the same time," he said. "[As a TA], I learned how to communicate with others, work effectively in a group, motivate students and deal with conflict faster than ever." ■

# ON BEHALF OF ZACHARY

It's no secret that having a baby is a life-changer. But in 2001, when **Yamile Jackson's** (BSIE '91, MSIE '94, Ph.D. IE '00) son, Zachary, was born 12 weeks prematurely, it changed her professional and personal life in ways she never imagined.

BY AUDREY GRAYSON

Before Zachary's birth, Jackson worked as an engineering management consultant in the oil and gas industry. In 1998, she opened her own consulting firm, Ringstones Consulting International, Inc., serving energy-giant clients including BP, Exxon and Chevron.

A few years later, Jackson became pregnant with Zachary.

During a routine prenatal check-up, doctors told Jackson she was suffering from severe preeclampsia, a dangerous complication that causes high blood pressure and organ damage in pregnant women. Jackson's condition was so serious that doctors recommended she immediately terminate the pregnancy to save her own life.

Two hours later, Zachary was born in Houston, Texas, weighing less than 2 pounds. Be-

fore the new mom could even touch her son for the first time, the newborn was rushed to the neonatal intensive care unit (NICU).

"It was a tragic moment. My son was born to save my life and I had to find ways to help save his," Jackson said.

For the next five months, Jackson remained at Zachary's side for 12 to 14 hours a day in the NICU – a place she said she didn't know existed before Zachary spent his first months in this world inside of one.

### THE PAIN AND POWER OF TOUCH

It's difficult to imagine how unnatural a baby looks inside of an incubator before you see it yourself, Jackson said as she turned the pages of a large, homemade scrapbook. She stopped at a page with a photo of Zachary



“  
EVEN  
THOUGH  
I HAD TO  
LEAVE HIM,  
HE COULD  
STILL  
SMELL ME,  
HE COULD  
STILL FEEL  
MY TOUCH  
AND  
WARMTH.”



inside of an incubator, tubes covering his tiny chest.

Many of Zachary's first experiences with human touch were not warm and loving – they brought the pinch of a needle or the poke of a tube. Babies like Zachary who have prolonged stays in the NICU often develop an aversion to touch as a result of these distressing experiences. Knowing this, Jackson spent as much time as possible holding and touching Zachary, hoping he would learn that touch doesn't always bring pain – it can bring warmth, love and healing, too.

“To me, unless the parent is very involved in comforting the baby, the NICU must feel more like a prison to the newborn. They are in complete isolation, away from any positive stimulation, confined to a glass box, and often swaddled without the possibility of moving,” Jackson said.

As a scientist, Jackson wondered how a baby as small as Zachary could survive, grow and thrive in such a harsh environment, so unlike the comfort of a womb. As an engineer, she was determined to find the answers to her questions and to provide Zachary with the warmth of knowing she was there and she loved him.

“I had a lot of tools in me that I acquired in my life and my profession in industrial engi-

neering. I had to tap into everything I knew, everything I had,” Jackson said.

So while Zachary began healing, Jackson began drawing on her industrial engineering background, ergonomics theories, data and methods to find ways to optimize human well-being. Traditionally, industrial engineers apply ergonomics to adults and adult processes, equipment and systems, but Jackson dreamed of tailoring it for Zachary.

“I saw ergonomics all around the NICU – in the equipment and devices that medical staff would use to help the babies. But I didn't see ergonomics applied specifically to help with the development, nurturing and growth of the babies,” Jackson said.

#### ON BEHALF OF ZACHARY

“My professors said that the best engineers and ergonomists were those who experienced and understood a problem firsthand before they attempted to find a solution,” Jackson said. “I was determined to apply my skills and my background in ergonomics and human factors to make Zachary's life in the NICU as full of love, warmth and nurturing as possible. Only I could do that for Zachary.”

Three weeks into Zachary's stay at the NICU, Jackson's resolve was put to the test when Tropical Storm Allison hit the Texas Gulf Coast,

causing devastating flooding throughout the Houston region and shutting down all power to the hospital. Zachary's life-support systems were disconnected and the hospital staff tried desperately to evacuate him and the other 78 NICU babies to other hospitals.

The NICU staff, Jackson and her husband, Larry, worked for nine hours to keep their critically ill son alive. Jackson held Zachary to her bare chest to keep him warm while her husband and the medical staff took turns pumping oxygen into his lungs by squeezing a small rubber bag.

“I promised Zachary that his fight to survive would not be in vain,” Jackson said. “I promised him that I would do something to help other babies like him – not in his memory, but on his behalf.”

After experiencing firsthand the importance of skin-to-skin contact and family involvement in neonatal care practices, Jackson began researching how she could use the warmth of her touch to nurture Zachary – even after visitors' hours ended at the hospital and she was forced to leave her son overnight.

“A mother's hands, a mother's touch – these are so vital to premature babies,” Jackson said. “Leaving Zachary alone and going home without him each night was pure agony. As a mother, I knew my hands held the power to heal my son. As an engineer, I was determined to use that knowledge to save Zachary and help other premature babies and their parents.”

And so, a few days after Zachary was born, so was “The Zaky.”

#### THE ZAKY

The first prototype of The Zaky was a gardening glove filled with soft beads and infused with Jackson's scent. When she was able to hold her son in the hospital, Jackson held his tiny body in The Zaky glove. When she had to leave him in the evening, she would place Zachary in the glove just as he had been when she was holding him.

“Even though I had to leave him, he could still smell me, he could still feel my touch and warmth,” Jackson said.



Zachary was 5 months old when he was discharged from the hospital. Soon after, nurses in the NICU began asking Jackson about the homemade glove that gave Zachary so much comfort. Within a few weeks, Jackson made 100 more pairs and left them with the NICU staff.

Instead of returning full-time to her career as an energy industry consultant, Jackson decided to apply her industrial engineering skills to researching, testing and developing a new, more ergonomic prototype of The Zaky that would help with positioning, transitions and bonding for every baby, regardless of size, medical condition or developmental stage.

After three years of research and development, Jackson launched her company, Nurtured by Design, and began selling The Zaky, the world's only evidence-based, ergonomic and multifunctional tool for providing nurturing developmental care to babies. The company has launched more products since then, including The Kangaroo Zak, a safe and ergonomic device to facilitate skin-to-skin contact between parents and newborns. Both The Zaky and The Kangaroo Zak are used in over 300 hospitals and thousands of homes across the world.

Within months of launching the company, Jackson began winning national and international awards for her invention. In 2010, Jackson won the Blazing Star Award from the Women's Chamber of Commerce of Texas, and she was named one of the top 20 Latino innovators of 2012 by *NBC Latino*. Two years later, Jackson and Zachary accepted a Standing O-Vation Award from Toyota and Oprah Winfrey, which included a \$25,000 grant to continue Nurtured by Design's mission.

Over the years, Jackson's story has served as the subject of newspaper and magazine articles, documentaries and even a made-for-TV movie. But the best vote of confidence for her work, Jackson said, has come from e-mails and phone calls from parents wanting to thank the woman who engineered a more loving world for their child to enter into.

“I hear from mothers, fathers, nurses and medical staff from all over the world who tell me how our products changed their babies' lives for the better. That is my motivation to keep going – that and, of course, Zachary,” Jackson said.

Today, Zachary is a happy, healthy and active 15-year-old with an impressive title – Chief Inspirational Officer (CIO) of Nurtured by Design. Like his mother, Zachary is inspired to pursue engineering as a career and said he wants to attend the University of Houston.

Jackson hopes that her story will also inspire more women to pursue engineering as a career, and for more engineers to apply their talents to help women and children all over the world.

“We need more engineers working for mothers and children. We need more women to pursue engineering because we can view, analyze and solve problems from a different perspective,” Jackson said. “I am glad that I use my ergonomics and human factors background to make a difference in the lives of the most vulnerable members of our society – on behalf of Zachary.” ■



# COMPELLED TO GIVE

## Q&A WITH RANDAL SITTON

Randal Sitton (BSChE '85, MSIE '88, Ph.D. IE '92) has seen life at the UH Cullen College of Engineering from all angles and perspectives – once a UH Engineering student, then an alumnus, and now a proud faculty member and donor, Sitton says the University of Houston had such a profound impact on his life that he “just couldn’t seem to leave.” Sitton has given back to the Cullen College not only by serving as a world-class teacher and mentor to UH Engineering students, but also by supporting the annual Industrial Engineering (IE) Banquets and providing general donations to the IE department. Sitton has previously served as the president of the UH Engineering Alumni Association and on the industrial engineering department’s Industry Advisory Board.



**What is your connection to the University of Houston?**

I like to joke that I’ve gone to UH my entire life! Both of my parents, my sister, my uncle and aunt – most of my family went to UH. My father was pursuing his degree at UH when I was a child. When I was in elementary school, he used to take me to the general reference section of the MD Anderson Library and I would work on my homework assignments while he worked on his. My mother also took 21 hours of classes a semester at UH while working as well. I spent a lot of time on the UH campus as a kid!

I earned my bachelor’s degrees in chemical and industrial engineering and my master’s and doctoral degrees in industrial engineering from the UH Cullen College of Engineering. Now I’m an instructional associate professor in the industrial engineering department, so I’ve been a student, alumnus and faculty member at UH!

**What made you decide to attend UH?**

When I was looking at universities, there were three very specific things that had to align for me at the time: I wanted to play my euphonium in the UH marching band under the nationally recognized director Dr. William C. Moffit; I wanted to stay close to home; and I wanted to pursue chemical engineering at the time – my dad was a chemist – so I was looking at universities with strong chemical

engineering programs. Remarkably, UH met all three of my requirements: it was right in my backyard, it had a great marching band and its chemical engineering program was ranked in the top 10 nationally.

**When you started college at UH, did you notice that the campus had changed since the time your parents were attending school here?**

It’s funny, actually – when I was growing up, my parents were the ones showing me all around the campus. By the time I was a freshman at UH in the chemical engineering department, the campus had changed and grown so much that my parents didn’t recognize it. The situation was reversed totally, and I was the one showing them around the campus.

**Now that you’re a faculty member at UH, do you notice any differences between students today versus students when you were attending college?**

The biggest difference is technology. When I was a student, almost everything was taught face-to-face. Today, students would like everything on-demand, and we have to bring face-to-face classes into the Internet age. This is compelling us as educators to create hybrid classrooms, where students can attend classes in person or access videos of lectures online, as well as interactive discussions and other course materials. It’s opened up education to more people, which I think is a really great thing.

I also want to add that I think millennials oftentimes get a bad rap in the media. I have some amazing students, and I am so proud of them. We baby boomers are either retiring or nearing retirement – and trust me, we need the millennials to replace us! I, for one, am so pleased to see this generation be able to take our place. I couldn’t be more comfortable in passing along the torch to them.

**How did the University of Houston impact your life?**

UH played a very important role throughout my entire life. High school wasn’t a very memorable time for me. When I finished high school, I never wanted to go back for a homecoming football game or go to a class reunion. UH, on the other hand, played such a big role in my life that I never really left!

**Why were you compelled to give back to the University of Houston?**

College was the absolute best time of my life. I want other students to have that same experience. I wouldn’t be who I am now without UH. ■

# THANK YOU

## RANDAL SITTON

&

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DONORS AND SUPPORTERS

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UNIVERSITY of  
HOUSTON

CULLEN COLLEGE of ENGINEERING  
Department of Industrial Engineering





## 2016 E-WEEK RECEPTION



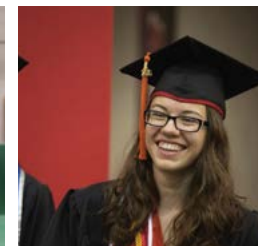
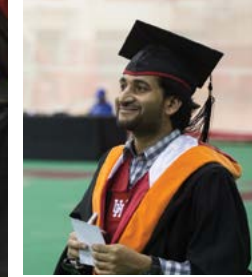
The Engineering Alumni Association (EAA) hosted its annual EWeek Reception last February in honor of National Engineers Week. Approximately 200 people attended the event at the UH Hilton, which raised over \$45,000 in scholarships for 66 students and several student organizations.



## 2016 CONVOCATION & COMMENCEMENT



Nearly 500 Cougar engineers celebrated with their families and friends at the Cullen College of Engineering convocation and University-wide graduation ceremony last May.



## 28<sup>TH</sup> ANNUAL OFFSHORE INDUSTRY CRAWFISH BOIL



Students, alumni, faculty, staff and friends of the Cullen College kicked off the Offshore Technology Conference week at the 28<sup>th</sup> annual Offshore Industry Crawfish Boil in May.



## 2016 “GIRLS ENGINEERING THE FUTURE!” DAY



The inaugural “Girls Engineering the Future!” event, sponsored by Chevron and hosted by the Cullen College last April, introduced over 300 girls in grades 4<sup>th</sup> through 8<sup>th</sup> to engineering principles through fun, hands-on activities on campus.





DEPARTMENT OF  
INDUSTRIAL ENGINEERING

Faculty Publications and Grants

CHUNG, CHRISTOPHER  
PUBLICATIONS: 2015 - 2016

Chung, C.A., Comparison of Cross Culture Engineering Ethics Training Using the Simulator for Engineering Ethics Education, Science and Engineering Ethics. Volume : 21 Issue: 2, Pages 471-478, Published Apr 2015

FENG, QIANMEI  
PUBLICATIONS: 2015 - 2016

2016:  
Shu, Y., Feng, Q., Kao, E., Liu, H., Levy Driven Non-Gaussian Ornstein-Uhlenbeck Processes for Degradation-Based Reliability Analysis. IIE Transactions. (in print)

Feng, Q., Jiang, L., Coit, D.W., Reliability Analysis and Condition-based Maintenance of Systems with Dependent Degrading Components based on Thermodynamic Physics-of-Failure. International Journal of Advanced Manufacturing Technology, 86(1), 913-923, September 2016.

Song, S., Coit, D.W., Feng, Q., Reliability Analysis of Multiple-Component Series Systems Subject to Hard and Soft Failures with Dependent Shock Effects. IIE Transactions. (Online February 6, 2016)

Kheirkhah, P., Feng, Q., Travis, L.M., et. al, Prevalence, Predictors and Economic Consequences of No-shows, BMC Health Services Research, 16(13): 1-6, January 2016. DOI:10.1186/s12913-015-1243-z5032289931709319

2015:  
Shu, Y., Feng, Q., Coit, D.W., Life Distribution Analysis Based on Lévy Subordinators for Degradation with Random Jumps. Naval Research Logistics, 62(6):483-492, September 2015.

Rafee, K., Feng, Q., Coit, D.W., Condition-Based Maintenance for Repairable Deteriorating Systems subject to Generalized Mixed Shock Model. IEEE Transactions on Reliability, 64(4): 1164-1174, December 2015.

Jiang, L., Feng, Q., Coit, D.W., Modeling Zoned Shock Effects on Stochastic Degradation in Dependent Failure Processes. IIE Transactions, 47(5):460-470, May 2015.

Q. FENG, GRANTS: 2014 - 2016  
“Texas Mill Test Information for Load Ratings,” with Drs. Mina Dawood (PI) and Abdeldjelil Belarbi, Texas Department of Transportation, \$260,476.38; Role: Co-PI

“Collaborative Research: Integrated Modeling and Optimization of Manufacturing Variability and Product Reliability for Advanced and Evolving Technologies,” with Rutgers University (Dr. David Coit), Leading Institute: UH (sole PI at UH), CMMI-0970140, National Science Foundation, 09/01/2010-08/31/2015, \$230,000. Role: PI

“Center of Excellence for the Study of Natural Disasters, Coastal Infrastructure and Emergency Management,” with Drs. Gino Lim (PI) and Hamid Parsaei, Department of Homeland Security, 07/01/2008-06/30/2015. \$975,998. Role: Co-PI

PENG, JIMING  
PUBLICATIONS: 2015 - 2016

J.Q. Hale, E.L. Zhou and J. Peng. A Lagrangian Search Method for the K-Median Problem. Forthcoming in J. Global Optimization, 2016.

L. Mujkerjee, J. Peng, T. Sigmund and V. Singh. Network flow formulations for Learning Binary Hashing, European Conference on Computer Vision (ECCV), 2016.

J. Peng and X. Chen. A new analysis on sparse solutions to random standard quadratic programming problems and extensions. Mathematics of Operations Research, 40(3):725-738, 2015.

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J. Chen, L.M. Feng and J. Peng. Optimal deleveraging with nonlinear temporary price impact. E.

J. Operations Research, 244(1), 240247, 2015.

J. Peng, T. Zhu, H. Luo and K. Toh. SDP relaxations for quadratic assignment problems based on non-redundant matrix splitting. J. Comp. Optimi. Applications, 60(1), 171-198, 2015.

J. PENG, GRANTS: 2015 - 2016

“Increasing Healthcare Access for At-Risk-Populations: Research-based Policies for Mobile Health Clinics”. TMC Health Policy Institute, \$150000. Role: Co-PI.

“Alternate Direction Method: A New Recipe for Non-convex Quadratic Programming with Applications”. NSF, \$220000. Role: PI.

“Increasing Healthcare Access for At-Risk-Populations in Smart Communities: Research-based Policies for Mobile Health Clinics”. NSF, \$250000. Role: Co-PI.

LIM, GINO  
PUBLICATIONS: 2015 - 2016

L. Liao, G. J. Lim, Y. Li, J. Yu, N. Sahoo, H. Li, M. Gillin, X. Zhu, A. Mahajan, S. J. Frank, D.R. Grosshans, Q. Nguyen, D. Gomez, and X. Zhang, “Robust optimization for intensity modulated proton therapy treatment plans with multi-isocenter large fields,” accepted for publication, International Journal of Particle Therapy, August 2016

G.J. Lim, A. Mobasher, J.F. Bard, A. Najjarbashi, “Nurse Scheduling with Lunch Break Assignments in Operating Suites,” Operations Research for Health Care, 10, pp. 35-48, September 2016.

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W. Xiang and G. Lim, “Pareto set-based ant colony optimization for multi-objective surgery scheduling problem,” Open Cybernetics and Systemics Journal, vol. 8, pp. 1211-1218, 2016.

T. Biobaku, G. Lim, S. Bora, J. Cho, and H. R. Parsaei, “An optimal sonar placement approach for detecting underwater threats under budget limitations,” Journal of Transportation Security, 7(1), pp17-34, June 2016.

S. Lin, G. Lim, and J. Bard, “Benders Decomposition and an IP-based Heuristic for Selecting IMRT Treatment Beam Angles,” European Journal of Operational Research, 251(3), pp715-726, June 2016.

G.J. Lim and M.R. Baharnemati, and S. Kim, “An Optimization Approach for Real Time Evacuation Reroute Planning,” Annals of Operations Research, 238(1), pp375-388, March 2016.

M. Akladios, G. Lim, and H.R. Parsaei, “How Does Effectiveness of Student Learning Differ: a Comparison between Online vs. Face-to-Face formats,” International Journal of Business, Humanities and Technology, 5(6). pp18-21, December, 2015.

Xiang W\*, Yin J, Lim G, “An ant colony optimization approach for solving an operating room surgery scheduling problem,” Computers and Industrial Engineering, 85, pp. 335-345, July 2015.

W. Cao\*, G. Lim, Y. Li, X. Zhu, and X. Zhang, “Improved beam angle arrangement in intensity modulated proton therapy treatment planning for localized prostate cancer,” Cancers, 7(2), pp574-584, June 2015.

T. Biobaku, G. Lim, S. Bora\*, J. Cho, H. Parsaei, “Literature survey on underwater threat detection,” Transactions on Maritime Science, 4(1), pp 14-22, April 2015.

Xiang W\*, Yin J, Lim G, “A short-term operating room surgery scheduling problem integrating multiple nurses roster constraints,” Artificial Intelligence in Medicine, 63(2), pp. 91-106, February 2015.

G.J. Lim, M. Rungta, and M.R. Baharnemati, “Reliability Analysis of Evacuation Routes under Capacity Uncertainty of Road Links,” IIE Transactions, vol. 47, pp 50-63, January 2015. (Featured in IIE magazine)

G. LIM, GRANTS: 2015 - 2016

“Understanding Biological and Physical Factors Affecting Response to Proton Therapy to Improve its Clinical Effectiveness,” CPRIT, \$879,362, Role: Co-PI.

“Robust models and computational algorithms for a fully automated intensity modulated proton therapy treatment planning system,” Global Oncology One, Inc., Houston, TX, \$25,648, Role: PI.

“Optimization of intensity-modulated proton therapy incorporating physical and biological characteristics of protons,” U of Texas MD Anderson Cancer Center, \$90,000, Role: PI.

“Mathematical models and computational algorithms considering Relative Biological Effects for IMPT Treatment Planning,” U of Texas MD Anderson Cancer Center, \$29,136, Role: PI.

“Smart Channel Initiative: Interdisciplinary Approach to Sustainability and Resilience,” Hobby Center for Public Policy and the Division of Research, A seed grant, \$25,000, Role: Team leader.

“Risk Analysis and Efficient Logistics for Maritime Ports and Waterways” Qatar National Research Funds (NPRP 4-1249-2-492), \$898,697, Role: PI at UH.

“Robust Optimization considering Relative Biological Effects for Intensity-Modulated Proton Therapy Treatment Planning,” U of Texas MD Anderson Cancer Center, \$10,160, Role: PI.

“Center of Excellence for the Study of Natural Disasters, Coastal Infrastructure and Emergency Management,” Department of Homeland Security, \$6M Role: PI at UH.

“Optimization of intensity-modulated proton therapy incorporating physical and biological characteristics of protons,” U of Texas MD Anderson Cancer Center, \$136,567, Role: PI

“Development of computational techniques for intensity modulated proton therapy (IMPT),” Global Oncology One, Houston, TX, \$22,184, Role: PI

“Development of Flood Information Distribution Systems for the Houston TranStar Emergency Response Center,” City of Houston, \$400,700, Role: PI

“Four- and Five-Dimensional Robustness Quantification and Adaptive 4D Robust Optimization of Intensity-Modulated Proton Therapy for Lung Cancers,” U of Texas MD Anderson Cancer Center, \$55,958, Role: PI

WANG, YAPING  
PUBLICATIONS: 2016

Y.Wang, E. Moreno-Centeno, Y. Ding, “Matching misaligned two-resolution metrology data”, IEEE Transactions on Automation Science and Engineering, in press, 2016.

Dehghanian P., Y. Wang, G. Gurrala, E. Moreno-Centeno, M. Kezunovic, “Flexible implementation of power system corrective topology control”, Electric Power Systems Research, vol. 128, pp. 79-89, 2015

KHATOR, SURESH  
PUBLICATIONS: 2015 - 2016

Arab, A. Khodaei, S. K. Khator, K. Ding, V. Emesih, and Z. Han, “Stochastic Pre-hurricane Restoration Planning for Electric Power Systems Infrastructure,” IEEE Transactions on Smart Grid, Vol. 6, No 2, 1046-1054, 2015.

A. Arab, A. Khodaei, Z. Han, and S. K. Khator, “Proactive Recovery of Electric Power Assets for Resiliency Enhancement”, IEEE Access, Vol. 3, 99-109, 2015.

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S. KHATOR, GRANTS: 2014 - 2016

Proactive Recovery of Electric Power Assets for Resiliency Enhancement (PREPARE)”, National Science Foundation, CMMI-1434789, Funded, \$500,000, Co-PI (PI: Zhu Han), my share : \$250,000.



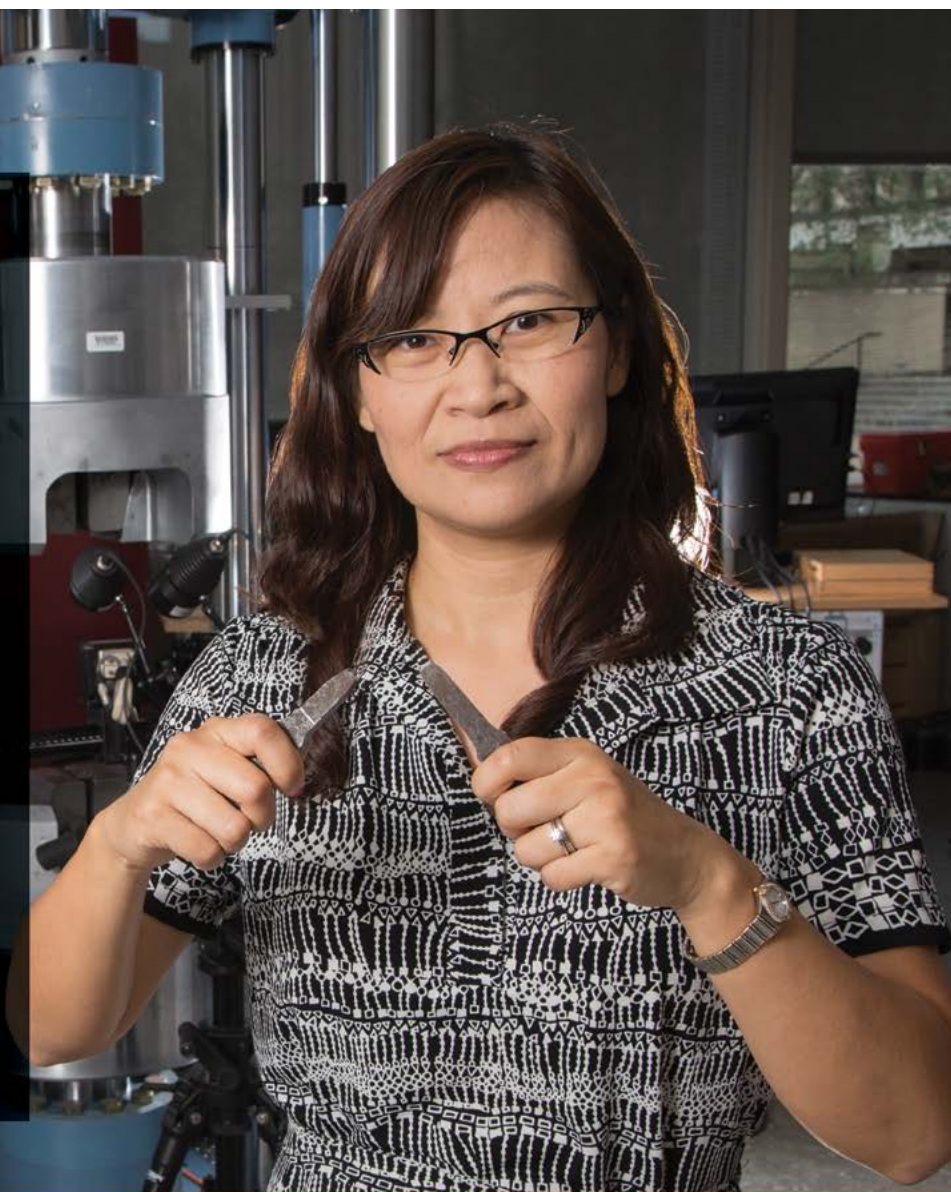
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