



THE UNIVERSITY OF TENNESSEE  
**CHATTANOOGA**  
COLLEGE OF ENGINEERING  
AND COMPUTER SCIENCE

2017-2018 | **year in review**

# message from the dean

Greetings from the Beautiful Campus of the University of Tennessee at Chattanooga



In 1947, under the leadership of President Lockmiller, the University of Chattanooga, as it was called before its merging with the UT System in 1969, began offering professional degrees on campus to meet the needs of industry in Chattanooga, including a major in general engineering. It was not until 1977 that the College of Engineering and Computer Science was formed. Today, the college offers eight undergraduate, three master's and one PhD program to more than 1,600 students.

In this annual review, you will read about how the college is continuing to grow in enrollment and expand student success opportunities, applied research activities and community engagement. Student enrollment has increased by more than a third since 2012, including a 15 percent increase in graduate student enrollment during the last academic year. The number of internship, co-op and undergraduate research opportunities for our students increased measurably, funding for applied research grew to more than \$4 million last year, and student, staff and faculty engagement with the Chattanooga community is vibrant and active.

Students gained valuable technical and life experiences through a variety of leadership, job

shadowing, team competition, internship, co-op, research, entrepreneurial and community service programs, which you will read about in this review. You will also read about the college welcoming eight new faculty members in mechanical engineering, engineering management, computer science, and chemical engineering programs. Our new faculty members include a department head for engineering management and technology and a program director for chemical engineering. In addition to new faculty, six new staff members joined the college, strengthening the capacity of college to outreach, support classroom and laboratory technologies and coordinate college events.

Two new academic programs started this fall, both created in response to the workforce needs of the region and approved by the Tennessee Higher Education Council: Bachelor of Applied Science in Mechatronics Engineering Technology and Bachelor of Science in Computer Engineering. The mechatronics engineering degree program is one of six in the nation and the only one in the Southeast. The computer engineering degree program was a concentration under the general engineering degree but is now a full-fledged independent program offered by the computer science and engineering department. A joint Master of Science

in Data Analytics program with the Gary W. Rollins College of Business is in the works to be the next degree program the college will offer, expected to start in fall of 2019.

As you will see in this review, the college has accomplished much during the past academic year and is ready to accelerate its efforts to reach new heights in the coming year. We are proud of our students, staff and faculty for their accomplishments and are grateful for the support we received from the alumni, friends of the college and leaders in our community. The progress we have made from our humble beginnings in 1947 would not have been possible without the valuable partnerships we have had with industry, community organizations, local, state and federal governments and academic institutions. We continue our path to learn, discover, grow and engage. I invite you to join us on this amazing journey.

Gratefully,

Dean



## Employers Recruit Students on Campus

Ready that elevator speech. Last fall and spring, more than 50 employers from across the Chattanooga region participated in the College of Engineering and Computer Science Networking Career Fairs. Students learned about co-op and internship opportunities as well as full-time employment, following graduation. CECS alumni also were invited to participate as both employers and potential employees.

The events took place at the engineering building, making it easy for students to attend in the same building in which they attend class and allowing faculty and staff to hear directly from employers about their workforce needs. Prior to the event, students had the opportunity to attend a workshop in partnership with University Career Services covering resumes and interview tips.

Led by the college's Student Success Center Director, Julie David, the Career Fair is one component of commitment to students success in the classrooms, laboratories and beyond the walls of CECS. In addition to career opportunities, the center coordinates tutoring, student advisement, a professional development speaker series and programs promoting community service and leadership development.

## College of Engineering and Computer Science 2017-2018 Advisory Board



Advisory Board Meeting, August 2018

**Chairman:** Joe Ferguson, *Chairman, Electric Power Board*

### Steering Committee:

Joe Brown	<i>Vice President, Engineering and Quality Education, Miller Industries</i>
Nick Coussoule Sr.	<i>Senior Vice President and CIO, BlueCross BlueShield</i>
Steven Douglas	<i>Vice President, Nuclear Oversight, Tennessee Valley Authority</i>
Patsy Hazelwood	<i>Member, TN House of Representatives District 27</i>
Jimmy Lail	<i>Vice President, Raines Brothers Inc.</i>
Mack McCarley	<i>President, PDM Associates</i>
Daniel Pack	<i>Dean, College of Engineering and Computer Science, The University of Tennessee at Chattanooga</i>
Bill Raines	<i>President and CEO, The Raines Group</i>
Elaine Swafford	<i>Director, Chattanooga Girls Leadership Academy</i>
Roger Tuder	<i>Past President and CEO, Associated General Contractors</i>
J. David Wade	<i>President and CEO, Electric Power Board</i>

### General Membership

Rowena Belcher	<i>Retired TVA Executive, Community Volunteer Chattanooga Women's Leadership Institute</i>
Larry Buie	<i>Regional Director Chattanooga Gas and Chairman, Chattanooga Chamber of Commerce</i>
Jeff Cornet	<i>Industrial and Economic Development, Oak Ridge National Laboratory</i>
Todd Gardenhire	<i>Alumnus, Member of TN Legislature representing TN's 10th District</i>
Tom Griscom	<i>Alumnus, Former Exec. Editor and Publisher of the Chattanooga Times Free Press, and White House Communications Chief, Founder and Chief Strategist Q Strategies</i>
Hon. Jon Kinsey	<i>Former Chattanooga Mayor, President of Kinsey Probasco Hays</i>
Tom Kline	<i>Alumnus, Retired Exec. with Pfizer Pharma, President of the Kline Health Group</i>
Mike McGauley	<i>Chairman, Fidelity Trust Company</i>
John McNeely	<i>Alumnus, Founder and CEO, Sword and Shield Cybersecurity and Data Assurance Company</i>
Bill Stacy	<i>Chancellor Emeritus, UT Chattanooga</i>
Jim Vaughn	<i>East TN Regional President, SunTrust Bank</i>
Albert Woodard	<i>Alumnus, Founder and Chairman, KaZee, Inc. Healthcare Software and Technology Firm</i>

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# internship

Keeping  
Tech  
Cool

**Reed** Boeger was sitting in his 8 a.m. Controls Systems class when an email popped up on his screen, telling him he was chosen for a competitive summer internship program.

“I had entirely forgotten I had applied,” Boeger says.

Boeger was one of 30 students nationally named a Society of Chemical Industry (SCI) Scholar last year. The prestigious program places chemistry and chemical engineering undergraduates in 10-week industrial internships across the country.

Part of the application process asks applicants to list their top three “dream” companies for an internship, if they are chosen for the program. Boeger was placed with a company that made his list, Air Liquide USA. Internationally operated, Air Liquide is “the largest industrial gas supplier in the world,” Boeger said.

Boeger originally learned about the Scholars program through an email from a professional organization he joined last year, the American Chemical Society.

He spent two months in Lehi, Utah, 40 minutes south of Salt Lake City, working in a cryogenic gas plant. It sounds like something out of science fiction and, though he isn’t putting people

in a deep, cold sleep, his work is still pretty cool.

The cryogenic gas plant sits on the site of a microchip fabrication facility managed by Intel and Micron and runs 24/7 with several thousand employees. The microchips being made are super-sensitive, Boeger says, and the facility requires a constant supply of high-purity hydrogen, nitrogen and oxygen, among other gases, for the delicate microchip production.

“Our gas plant runs around the clock, taking air out of the atmosphere, purifying it and splitting it into nitrogen, oxygen, etc., to be sent down a pipeline to the facility,” Boeger said.

Gaining real-world experience before he graduates is one of his top goals, Boeger said. Through the internship, he’s getting a crash course in the professional world of chemical engineering, rounding out his previous work in undergraduate research and traditional lab experience.

“My passion is in the innovation that comes out of this field, from cancer and disease research to nanotech to alternative fuels or even to inventing new ways of brewing coffee. I love the science of it all, and chemical engineers are major players in these areas.”

## Student Simar Singh Received 2nd Place Award

Ever wonder about the efficacy of fuzzy electronics in space? As a junior, Simar Singh, electrical engineering and university honors student, won second place for his submission to the 52nd Annual Conference of the National Collegiate Honors Council (NCHC) held in Atlanta. The topic of Simar’s presentation and poster in the Business, Engineering and Computer Science category was, “Efficacy of Fuzzy Electronics in Space.” Founded in 1966, NCHC is an educational organization designed to support and promote undergraduate honors education with resources, training opportunities and collaborative events. Simar’s advisor and university honors thesis director is Daniel Loveless, assistant professor of electrical engineering.



# student spotlight

Katie Rouse



**An** engineering graduate student as of fall 2018, Kathryn “Katie” Rouse already has achieved a lot of undergraduate success. Rouse transferred to CECS from the University of Virginia and was a student leader from her first semester at UTC. Her work with Student Success Director Julie David in assisting students reflects her commitment to helping others and provided an opportunity for Katie to further her leadership skills.

Rouse was an active member of the Girls in Computer Science Chapter as well as the COMP UTC student organization. She served as a member of the Dean’s Student Advisory Council and was the volunteer coordinator of the College’s peer-to-peer tutoring program. As the tutoring program Coordinator, Rouse recruited and scheduled volunteers from each of the college’s programs to tutor students in mathematics, computer science and engineering courses.

A true “renaissance woman,” Rouse also

made time to work in the University’s Aquatics and Recreation Center (ARC) as a trip leader for UTC Outdoors. During spring break 2017, she led a group of her fellow students on a backpacking trip to Arizona, with sites including the Grand Canyon.

A computer science major, Rouse was involved in research with Hong Qin, associate professor of computer science and engineering. In 2017, she shared her research at the regional conference of the National Institute for Mathematical and Biological Synthesis (NIMBioS), held in Knoxville, Tennessee. The ninth annual undergraduate research conference provided a platform for innovative undergraduate students to showcase work in areas combining computer science and statistical modeling with biological principles. Rouse’s research with Qin addressed the effects of dietary restrictions on lifespan and genotype-dependent models.

# student experience

## The Rocket Mocs BLAST onto the Scene



In the inaugural “launch” of the CECS Rocket Team – the Rocket Mocs – placed third in the nation in the University Student Rocketry Challenge, a competition hosted by the world’s only independent, fully student-run nonprofit organization for space advocacy, Students for the Exploration and Development of Space (SEDS). The Rocket Mocs were mentored by Assistant Professor of Mechanical Engineering Trevor Elliott. Forty teams from

across the nation competed, with scoring of each multi-stage rocket conducted by a panel of aerospace professionals from companies such as United Launch Alliances, SpaceX and Sierra Nevada Corp.

“I couldn’t be happier for them,” Elliott said. “They represented UTC and the College very well against well-established competitors and aerospace programs.”

First place in the competition went to the University of Missouri and second place was Arizona State University. One judge noted that the top three contenders were clearly set apart from the other teams and final placement came down to a very small point margin.

The UTC rocket was built in conjunction with a senior-level design course in which the team developed models, performed simulations, constructed prototypes, completed test launches and analyzed post flight data.

“The idea of studying rocket propulsion for a class project started out as an intimidating feat for our team,” says design team leader William Reynolds. “As inexperienced undergraduate students, we learned that we have been given the tools to study interdisciplinary engineering applications and came out of this experience with a deep understanding of the field of aeronautics and a passion to continue such work post-graduation.”

Kevin Braziel, the team’s launch control and recovery systems designer, says the competition “opened up new opportunities to learn about rockets, space exploration and developments currently taking place, and even specific companies who combine all these and more into inspiring careers. “I personally hope that this incredible experience might eventually lead me on a path to a career in the aerospace industry.”

## Elliott and Grad-School-Bound Seniors Win Solid ‘Rockets Best Paper’

A technical paper presented by Assistant Professor Trevor Elliott and graduating seniors Dillon Sluss and Wes Gibson received international recognition. “Biglobal Stability of the Swirling Majdalani-Fist Mean Flowfield in Solid Rocket Motors” was presented in a Solid Rockets Technical Session at the American Institute of Aeronautics and Astronautics (AIAA) Propulsion and Energy Forum. Out of all submissions, the paper was chosen as the 2017 Solid Rockets Best Paper. Elliott traveled to Cincinnati, Ohio, to accept the award in July 2018.

Now UTC alums, Sluss is at Virginia Tech pursuing a Ph.D. in aerospace engineering and Gibson is a master’s student in aerospace engineering at Purdue University.

# awards dinner

Hon. William Raines delivered the keynote address



The annual Spring Awards Dinner in April was attended by students, faculty, scholarship donors and community leaders. More than 125 awards and scholarships were presented, honoring research accomplishments, academic performance, service to the community and outstanding teaching.

“The Harder You Work, the Luckier You Become” was the title of the keynote address delivered by college advisory board member and retired U.S. Army Maj. Gen. William Raines. “I hope students took away that they have the potential to succeed by putting preparation and opportunity together,” Raines said.

Nominees and recipients of university-level awards also were recognized. Joseph Kizza, professor

and department head of computer science and engineering, received the Lifetime Research and Creative Achievement award and Don Reising, assistant professor of electrical engineering, received the Outstanding University Service award.



## Outstanding Student-Athletes

Student-athletes in the College of Engineering and Computer Science were named to the All-Southern Conference Academic Team:

- **Rashun Freeman**, football, engineering management
- **Brianna Nelson**, cross country, environmental engineering
- **John Payne**, cross country, chemical engineering
- **Monica San Juan**, golf, engineering
- **Nathan Watson**, cross country, chemical engineering

Each semester, the conference honors individual students for excelling in the classroom as well as in athletic competition. To be eligible for the academic all-conference team, student-athletes must have at least a 3.3 cumulative GPA and are required to compete in at least half of their teams’ competitions. Student-athletes also must have successfully completed at least three semesters at their respective institutions.

See more online at [utc.edu/CECS-Awards](http://utc.edu/CECS-Awards)



# student experience

## National Competitions

College of Engineering and Computer Science students learn beyond the classroom and engage with the community and other universities through participation in 14 student organizations. Newer organizations at UTC include GiCS (Girls in Computer Science) and Rocket Mocs. Students often compete nationally, showcasing research and team projects.

## Top Finishes at Concrete Canoe Race

Student members of the American Society of Civil Engineers took two top 10 finishes in the concrete canoe sprint at competition hosted at the University of Florida in March. Under the guidance of UC Foundation Professor Ignatius Fomunung, the UTC men's team finished fifth and the women's team finished ninth. The three-day event involved 26 universities and more than 1,200 students participating in multiple competitive events. In addition to the sprint races, students participated in a steel bridge competition, professional paper competition and creative civil engineering design challenges.

## Students Compete at National Chemical Engineering Conference

In fall 2017, students represented UTC at the annual meeting of the American Institute of Chemical Engineers in Minneapolis.

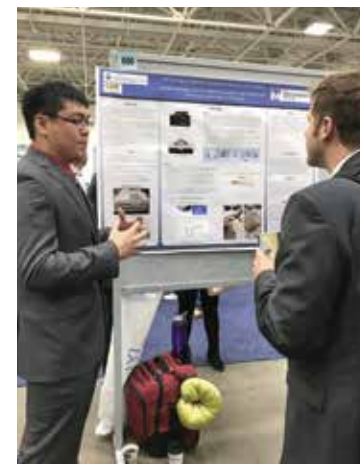
Mentored by Assistant Professor of Chemical Engineering Bradley Harris, students participated in conference presentations and competed in Chem-E Car, designing and fabricating a car powered and stopped by chemical reactions. The seven-member Mocs Chem-E Car team finished 14th in a field of 42 teams.

Mechanical engineering honors student Hiroshi "Chantz" Yanagida placed third in the materials science division for his research, "3D Printing an Optically Transparent Part for Use in Sensors." Yanagida's research was conducted in summer 2017 as part of a National Science Foundation Research Experience for Undergraduates in partnership with Tennessee Tech University. Also at the Minneapolis conference, chemical engineering student Olivia George was invited to make a poster presentation on her research, "Targeting and Killing Melanoma Cancer Using Photoactivated Nanoparticles."

UTC chapter president and chemical engineering student Cooper Thome praised the four-day opportunity for career networking, social events and competitions.

"I think this was a really great experience for everyone. There are so many different opportunities at these conferences, and I think every student that went benefited in some fashion. Also, it's just really fun to explore new places with friends from UTC."

## Hiroshi "Chantz" Yanagida Robotics Team Places Fifth at SouthEastCon



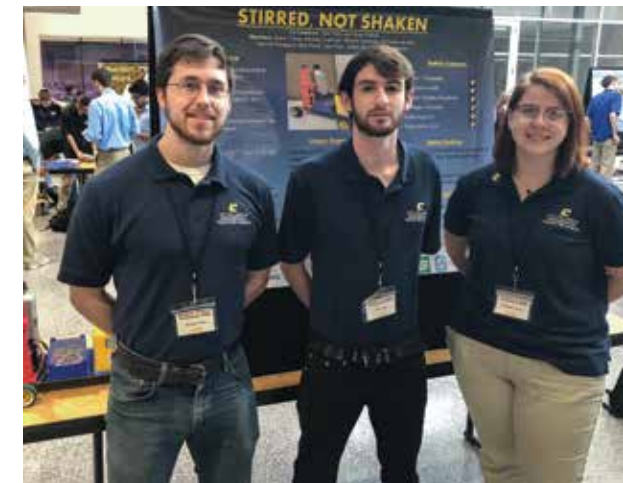
The UTC IEEE (Institute of Electrical and Electronics Engineers) Robotics Team won fifth place in the robotics hardware competition at the IEEE SouthEastCon in St. Petersburg, Florida, in April. The annual conference offered tutorial and technical sessions and exhibits.

UTC students visited with industry representatives, stopped by an on-site career fair and got to know fellow engineering students from other universities.



## First Place at Engineering Education Conference in Florida

UTC students won the freshman/sophomore design team competition by taking first place at the American Society for Engineering Education annual conference at Embry-Riddle Aeronautical University in Florida. Students also participated in technical and poster sessions and workshops. Themed "Educating the Engineer of the Future," the conference promoted discussion and sharing best practices in engineering education.



## Third Place at Chem-E-Car Regional Competition

At the 2018 Southern Regional Conference of the American Institute of Chemical Engineers, the Mocs Chem-E Car team took third place in competition to use chemical reactions to propel a model car to a finish line without overshooting it. Assistant Professor Bradley Harris advises and mentors the team, whose competition car came within 37 centimeters of the finish line. Hosted at Louisiana State University, the conference offered a variety of social, educational and competitive activities.



## Racing Mocs SAE Baja Team Compete Nationally

The Racing Mocs compete nationally at events hosted by the Society of Automotive Engineers. In Baja SAE, engineering students are tasked with designing and building a single-seat, all-terrain sporting vehicle that is to be a prototype for a reliable, maintainable, ergonomic, and economic production vehicle that serves a recreational user market.

# faculty profile

**Jim Hiestand**  
Always Looking to Serve



**“A**re you still looking?”

It was 1972 and James “Jim” Hiestand was a recent Cornell University grad eager to start his teaching career. He remembers the specific July evening the call came in because it was the night of the Major League Baseball All-Star game. Three weeks later, Hiestand had an interview at UTC on a Friday morning and was offered the job that afternoon. The next day, he went apartment-hunting for his family and, the following weekend, they drove to Chattanooga. By Tuesday, he was advising students.

Hiestand was the first in his family to go to college. His father worked in a factory for 49 years, and his parents instilled in him the values of education and hard work.

“It was assumed that I would attend college,” Hiestand said. He studied aerospace engineering at Rensselaer Polytechnic Institute in Troy, New York, before graduate education at Cornell in Ithaca, New York. Hiestand completed both master’s and a doctoral degrees at Cornell. He says he wanted to be an educator from the start of college.

He was one of just seven engineering faculty members at UTC in 1972. The college was small, and enrollment was lower than expected his first year.

“They had to let somebody go,” Hiestand said, and he was the somebody.

He stayed in Chattanooga and accepted a full-time position with Combustion Engineering but continued teaching as an adjunct faculty member at UTC. Twelve years later, a full-time professorship became available, and Hiestand went after it.

“I was in my 40s and didn’t want to turn 60 wishing I had gone back to teaching earlier,” he said. “I didn’t realize it when moving to the private sector, but those years made me a better teacher.”

For more than 30 years, Hiestand has taught at UTC full-time. His favorite part of teaching? That moment when the proverbial light bulb comes on for students.

“I spend plenty of time preparing for class. I don’t ever want a student to ask me a question I don’t know the answer to,” Hiestand said. Answering questions from students is another favorite part of the job. He encourages students to visit his office by keeping the door open – literally, unless he’s preparing a test.

A course Hiestand teaches once required two textbooks, but “Books are so expensive for students,” he said. “I kept waiting for the books to be combined.”

While waiting, Hiestand worked on another solution: writing the book himself. In 2009, he published a textbook for the course and recently submitted a proposal for a variation with Louie Elliott, UTC assistant professor in mechanical engineering.

He tells his students to gain as much varied experience as they can.

“Tools change, but the fundamentals generally don’t,” he said. “Students might join a small company or start-up in Chattanooga and be one of a few engineers getting to work on a broad range of projects.” Hiestand prepares students by encouraging collaboration and using an interactive lecture style.

He stayed at UTC because of the University’s commitment to student success and teaching. “UTC values teaching,” Hiestand said. “Smaller class sizes allow me to make sure every student gets it.”

Hiestand earned the UTC Outstanding Faculty Teaching Award—given to one professor each year—three times.

In addition to teaching, Hiestand is committed to faculty service, working across the University to promote shared governance and collaboration. He currently serves as the chair of the Engineering and Computer Science Scholarship Committee. Hiestand served many years on the Faculty Senate, including several terms as parliamentarian. While not serving on the Senate, he was asked to be parliamentarian. He agreed on one condition: that he be allowed to speak at meetings. Senate leadership gladly agreed.

Never a hobbyist, Hiestand spent his spare time and energy focused on family and teaching. Recently, however, he and his wife Fran have taken to traveling.

“Now whenever people see me they ask, ‘Where are you going next?’ ”

He and Fran recently traveled to Patagonia, Italy and Switzerland. They

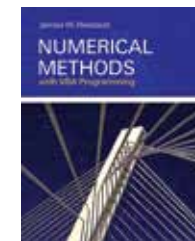
**Hiestand and his wife Fran have been married for more than 50 years and plan their trips around a love of the mountains and birding.**



have been married for more than 50 years and plan their trips around a love of the mountains and birding (for Fran). The Hiestands have two grown children, a daughter and a son. Every other year, they vacation with their son’s family, including two grandchildren and all four grandparents.

Fast forward from that first question more than 45 years ago, “Are you still looking?” and for Hiestand, the answer is still “Yes.”

Looking for ways to serve students, looking to contribute to campus life and, most recently, looking for new areas of the globe to explore.



*Numerical Methods with VBA Programming is an introductory text that unifies Visual Basic Application (VBA) programming and numerical analysis. The book includes real-world scenarios to help students understand and retain key concepts.*

**MORE ON THE WEB**  
[utc.edu/Hiestand-book](http://utc.edu/Hiestand-book)



excellence in teaching

New Academic Programs Launch Fall 2018, Another In Development

**The** College of Engineering and Computer Science launched two new degree programs in fall 2018, the bachelor of applied science in mechatronics engineering technology and the bachelor of science in computer engineering. Both programs were developed in response to changing industry needs and current workforce demands. The college is now working in partnership with the UTC Gary W. Rollins College of Business to develop a master's degree program in data analytics.

**BAS, Mechatronics**

The mechatronics engineering technology program at UTC will prepare students for jobs designing and enhancing robotics and automated systems. The program is a direct response to the growth of high-tech manufacturing in the Chattanooga region, which has expanded the need for engineering technologists to manage, maintain and operate sophisticated equipment and processes beyond the capabilities of a technician.

Developed in partnership with Chattanooga State Community College and Cleveland State Community College, the program will provide a clear pathway for students with engineering technology associate degrees to then complete bachelor's degrees in a high-growth field in Chattanooga. UTC is working with other community colleges that offer associate's degrees in mechatronics technology to develop similar pathways to a UTC bachelor's degree. UTC is the only institution in the Southeast offering a bachelor of applied science in mechatronics engineering technology.

Regional business and industry partners reported a strong need for mechatronics technologists to fill critical positions and, according to the Center for Automotive Research, mechatronics will dominate future employment needs in automobile manufacturing. Graduates of the program have acquired knowledge in the major concepts, principles and techniques to pursue managerial-level positions in the field.

**BS, Computer Engineering**

Is your smartphone within arm's reach? The rise of embedded computing and proliferation of computing systems in everyday life has led to an increase in the demand for computer engineers. Computer engineers design and create systems that encompass both hardware and software, with the two working together to accomplish a desired function or produce a marketable product.

UTC's new bachelor of science in computer engineering is based on an academic program that has existed within the college for nearly 20 years: Computer engineering as a concentration within an engineering program. Over the last two decades, computer engineering has evolved to combine knowledge and skills from the fields of computer science, electrical engineering and other engineering disciplines. In recent years, even industries not obviously computing-related have seen an increase in demand for computer engineers due to the rise of embedded computing (computing incorporated in larger systems such as in automobiles and appliances).

The computer engineering program is unique in its emphasis on embedded systems and the integration of computer hardware and software, with a lesser focus on semiconductors and microelectronics. Courses explore the interaction of hardware and software at the machine level with student projects frequently focusing on this integration. The College is committed to continuously adapting the program's focus to emphasize skills and knowledge demanded by employers.

**MS, Data Analytics**

In response to the growth of big data and workforce demands, the College of Engineering and Computer Science and the Gary W. Rollins College of Business are partnering to develop a master's degree program in data analytics. UTC's collaborative approach involving both business and computer science will differentiate the graduate program from those at other universities.

The College of Business already offers a certificate program in data analytics, and the proposed new program will align existing graduate courses—offered for the certificate program in data analytics and computer science courses related to data analytics—with new courses to serve as the core curriculum.

Two courses are to be developed by the College of Business and three by the College of Engineering and Computer Science. Students will choose additional coursework for either a business or computer science concentration. The program is expected to launch in fall 2019, pending approvals from UT System Administration and the Tennessee Higher Education Commission.



**Highly qualified engineering technologists will be essential to manufacturers and the energy sector as the education and skill gap widens between the expertise of a technician and the needs of businesses and industry.**

**Online Master's Degree in Engineering Management Earns National Top 10 Ranking**

A master's degree program in the College of Engineering and Computer Science has been named one of the top 10 in the country.

The online master's degree in engineering management is at No. 7 in rankings from *Best College Reviews*, an online higher-education review journal.

Best College Reviews chose the UTC program for "the university's overall outstanding reputation, as well as the engineering program's comprehensive core curriculum, for its faculty's excellence and the commitment to providing non-traditional students with all of the tools that they need to achieve their educational and career goals."

"I'm so glad that we were recognized and ranked No. 7 in the nation, which is a great honor for our college and university," said Neslihan Alp, past associate dean of the College of Engineering and Computer Science. "This ranking will help us to move forward and bring much more attention not just to our program but to our institution, as well."

The master's in engineering management began in 2000 "when there were not many online programs at UTC, even in Tennessee and in the world," Alp said. "It's hard work and dedication of faculty to make it possible, and I'm really proud of our accomplishment."

"In the last 10 years, we were trying to make our program different and better than other online engineering management master's programs in the nation. We have students from all over the globe and in many states in the U.S. The reason why these students choose our program is because of its reputation and quality."



# teaching

## Ahad Nasab is New Head of Engineering Management and Technology

Ahad Nasab joined the College of Engineering and Computer Science in August as head of the engineering management and technology department, and professor and Burkett Miller Chair. Nasab was at Middle Tennessee State University for more than 20 years and an adjunct professor at Vanderbilt University since 2008.

In 2013, Nasab founded the mechatronics engineering program at MTSU, where he was the program director. He advised the more than 300 students in the mechatronics program, mentored faculty, secured NSF scholarship grants for freshmen and matched graduates with jobs in the automation industry. As head of the engineering management and technology department at UTC, Nasab will lead the new mechatronics program.

Nasab earned a doctoral degree in mechanical engineering at Georgia Tech in 1987, and he was a research scientist from 1987 to 1991 at the UT Space Institute in Tullahoma. His nearly 10 years of industry experience includes serving as vice president of technology at Middle Tennessee Technologies.

Nasab's research activities are focused on engineering education and the use of lasers. He has worked on numerous NSF projects to engage students in lifelong learning and to encourage their enthusiasm for engineering and technology studies and careers.

## Eight New Faculty Members

**The** College of Engineering and Computer Science takes pride in bringing exceptional new faculty to UTC. New faculty members this year include a department head and a program director, as well as a visiting professor and a lecturer.

### Chemical Engineering Adds a Program Director

A new program director was hired to support the continued growth of chemical engineering program. Michael Danquah joins UTC with an extensive industry and academic experience. Most recently, he was a lead senior process innovation engineer at Agricen Sciences, an Agro-Biotech company in Dallas, Texas, leading

science from the University of Nebraska, Lincoln and joined UTC in 1989 as an assistant professor. In his nine years as department head, Kizza led the growth of the department in program offering, enrollment and research activities. The department leads the college in research productivity and currently offers BS and MS degrees in computer science, a BS degree in computer engineering, and a Ph.D degree in computational science.

In 1990, Kizza initiated the cyber security program at UTC with the establishment of the UTC InfoSec Center, which subsequently received National Security Agency Recognition and was certified as a



Spring 2018 Faculty Award's Dinner; Joseph Kizza pictured third from left.

the development of novel biostimulants in the U.S. He was also a full professor, associate dean and leader of the bio-process technologies research cluster at Curtin University in Australia and Malaysia.

### New Associate Dean

Joseph Kizza, former computer science and engineering department head, was appointed as associate dean of the College of Engineering and Computer Science. Kizza received a Ph.D in computer

National Center of Excellence in Information Security Education. The designation of the center led to the establishment of information security programs (BS and MS concentrations), which have been recognized as the most outstanding programs of their classification in Tennessee. He has published extensively on cryptography, computer ethics, computer networks, and information security, including ten books. In spring 2018, he received the UTC Lifetime Research and Creative Achievement Award.

# new faculty



**Michael Danquah**  
Chemical Engineering Professor and Program Director; *Ph.D from Monash University*



**Hamdy Ibrahim**  
Mechanical Engineering Assistant Professor, *Ph.D from University of Toledo*



**Seong Dae Kim**  
Engineering Management & Technology Associate Professor, *Ph.D from Texas A&M University*



**Mohamad Mahtabi**  
Mechanical Engineering Assistant Professor, *Ph.D from Mississippi State University*



**Deborah Mudali**  
Computer Science and Engineering Visiting Professor, *Ph.D from University of Groningen*



**Ahad Nasab**  
Engineering Management and Technology Department Head, Professor and Burkett Miller Chair; *Ph.D from Georgia Institute of Technology*



**Alexandr Sokolov**  
Engineering Management and Technology Visiting Lecturer, *Ph.D candidate at UT Knoxville*



**Mengjun Xie**  
Computer Science and Engineering Associate Professor, *Ph.D from College of William and Mary*

# new staff



**Philip Bonfiglio**  
Development



**Amber Burdsall**  
Dean's Office



**Maryam Ghorashi**  
Dean's Office



**Alanna Hunnicutt**  
Student Success Center



**Sara Jackson**  
Student Success Center



**Jason McDowell**  
IT and Laboratories



## 2017 Solar Eclipse Sets Stage for Record-Setting Balloon Launch

To capture images of the 2017 solar eclipse in southeast Tennessee from a unique perspective, Daniel Loveless and his team launched MOC3, a high-altitude balloon equipped with aerial photography and video systems.

Loveless, UC Foundation assistant professor of electrical engineering and his student team, had help from graduate students Matt Joplin and Ryan Boggs and UTC alumnus Colin Smith for the four-hour balloon flight originating from Soddy Daisy, Tennessee. In addition to the balloon's imaging capabilities, a power supply fought colder-than-usual temperatures due to the eclipse.

"The goals of MOC3 were to capture the totality of the solar eclipse from a unique vantage point and ascend to 110,000 feet, setting a new record for UTChatSat's high-altitude balloon program," Loveless said. "New systems for maintaining power to the electronics and capturing aerial photography and video were developed and implemented for the first time."

The new record was achieved with an "open-air payload rig to cut the mass of the system down to approximately 2.2 pounds. This allowed the flight to achieve higher altitudes with less helium," Loveless said.

The solar eclipse created a unique learning experience for the UTChatSat program. The mission encountered temperatures as low as minus 70 degrees Celsius—or minus 94 degrees Fahrenheit.

"This is significant because typical commercial electronics systems and virtually no battery technologies are

designed for these temperatures and are generally only rated to minus 40 degrees Celsius, at best. Our main computer shut down temporarily during this period but regained functionality when warmed back up by the sun," Loveless said.

"The custom camera and power system survived the entire ascent, were able to capture the eclipse (looking at the Earth) and maintained functionality throughout the flight. I am very proud of the students' accomplishments given a difficult set of constraints. The images and the massive data set gathered will keep everyone busy for quite some time and were well worth the challenge."

The electronics system and cameras aboard the flight were designed by students. The design was funded in part by the High Impact Practices Development Grant program at UTC, which promotes active learning for improving student success in learning and engagement.

Students involved in the MOC3 mission included:

Joplin, a second-year graduate student who completed a 10-month internship at SpaceX. He has been involved with the UTChatSat high-altitude balloon program since it began and has conducted research on space and radiation effects in electronics under Loveless' direction since attending UTC as an undergraduate.

Boggs, a first-year graduate student, studies the effects of space and radiation effects in photonic (optical and electrical) circuits and systems. While an undergraduate, he helped design the electronics systems on MOC3, along with undergraduates in the electrical engineering and computer science departments.

Smith is a UTC alum and research assistant to UTC Professor Henry Spratt. He is interested in studying space applications of micro- and molecular biology.



## UTC Partners with U.S. Air Force on \$9.8-Million Research Project

UTC is among several university partners in a \$9.8-million project with the U.S. Air Force Research Laboratory. The research is on development of materials and structures for reusable hypersonic vehicles to travel at speeds greater than five times the speed of sound.

UTC researchers are collaborating with counterparts at the University of Tennessee Space Institute, the University of Tennessee, Knoxville, Purdue University and the University of Dayton Research Institute.

UTC experts and other team members will perform both numerical simulations and experiments to guide materials and structure design performed by the University of Dayton Research Institute. UT researchers also will conduct aerodynamic and thermal analysis of the vehicle and environment.

Five times the speed of sound is about 3,800 miles per hour and, at such extreme velocity, intense heat is generated by the vehicle. Understanding how that heat is transferred to the vehicle by the aerodynamic environment is critical to the vehicle design, according to John Schmisser, professor of mechanical, aerospace and biomedical engineering at the UT Space Institute.

"Understanding the origin and transmission of the intense thermal loads generated on a hypersonic vehicle

requires identification of regions of significant local heating that are often the greatest source of risk to the vehicle surface," Schmisser said. "Fortunately, within the UT system we have outstanding capabilities for just such a complex analysis."

Schmisser, lead investigator for UT's role in the project, will head a team of 15 faculty researchers from UTC, UT Knoxville and UTSI, where Schmisser serves as the H.H. Arnold Chair in the Department of Mechanical, Aerospace and Biomedical Engineering.

"When we consider the integrated technical capabilities of the three UT campuses involved in this project, we have a lot of intellectual firepower to bring to bear on this challenging problem," Schmisser said.

The Tennessee Department of Economic and Community Development has recognized aerospace and defense as a significant contributor to Tennessee's economy, and this hypersonics project is intended to foster development of UT system-wide partnerships to enhance research and innovation in support of the sector, according to Schmisser.

"We are grateful for the critical support of Sen. Lamar Alexander, Rep. Chuck Fleischmann, and Rep. Scott DesJarlais in enabling this hypersonics partnership with the University of Dayton Research Institute and

Purdue University that facilitates collaboration across our UT campuses for the benefit of Tennessee and its aerospace and defense industries," Schmisser said. "The federal funding making resources available for this project is a strategic investment in national security and the advancement of research in Tennessee."

Alexander voiced his support for the project and what it will mean for U.S. aerospace research.

"Congratulations to the University of Tennessee for being one of three universities selected to receive federal funding to research and develop hypersonic technology," Alexander said. "This project, spearheaded by the UT Space Institute, will increase our nation's defense capabilities. Tennessee has played a key role in scientific research for many decades and, with UT's brainpower, our state will continue to play a key role in the development of our nation's defense capabilities."

**"The federal funding making resources available for this project is a strategic investment in national security and the advancement of research in Tennessee."**

## Pioneering Smart City Technology: Seeing Underground



Dalei Wu

**B**uilding up means digging down—literally. Documentation for underground infrastructure can be out-of-date or inaccurate, making construction around existing pipes, conduits or other utilities a timely and dangerous proposition. A project at UTC in partnership with University of Vermont provides a unique solution, one that earned the project recognition among the 50 best Smart City projects in the country.

The Underground Infrastructure Sensing project, headed by Dalei Wu, assistant professor of computer science in partnership with Dryer Huston, mechanical engineering professor at the University of Vermont, uses equipment such as radar and magnetic sensors to document the location and condition of underground water and sewer pipes, electrical conduits, fiber-optic lines and other infrastructure. The data is fed into high-speed computers at the UTC SimCenter and turned into spreadsheets, graphics and other easy-to-use documents.

City engineers, planners and construction companies can use the data gathered by the sensing project to locate pipes, conduits and other utilities before digging begins. The technology reduces the danger of damaging critical equipment and eliminates the need to excavate entire areas.

The project was chosen by Smart Cities Connect Media and Research for the Smart 50 Awards. The awards annually recognize global Smart Cities projects, honoring the most innovative and influential work with current or future municipal-scale impact and application.

“We are thrilled to know that our project was recognized by this award,” Wu said. “Success with this research will enable cities to manage, maintain and grow their underground infrastructure in manners that improve service, sustainability and resilience, while reducing costs, energy consumption and wasted resources.”

## UTC Chosen as Site for New Center for Urban Informatics and Progress

The Center for Urban Informatics and Progress (CUIP) is a new nexus of research and innovation at the University of Tennessee at Chattanooga that will engage experts from across the statewide UT system in cross-disciplinary research into solutions to urban and regional challenges. The vision for CUIP centers on research initiatives related to energy, mobility, healthcare, public safety, and utility that will directly or indirectly benefit local citizens while developing methods and models for use around the world. CUIP is housed at UTC as an independent research entity, underscoring Chattanooga’s emergence as an innovation hub.

The center will be led by Mina Sartipi, an accomplished researcher with a distinguished record of scholarship and who is a nationally recognized leader in smart cities research. Sartipi is a UC Foundation professor in the computer science and engineering department and has led numerous interdisciplinary research initiatives as program leader for Urban Science and Technology and in her direction of the Smart Communications and Analysis Lab.

Partnerships are critical to the capacity and efficacy of faculty and student research projects. They include collaborations with a number of renowned research institutions and labs regionally and nationally, such as the University of Tennessee, Knoxville; Oak Ridge National Laboratory, US Ignite, MetroLab Network, Vanderbilt University and Georgia Tech Research Institute. In addition, through hosting workshops like the Chattanooga 2018 Deep Learning Conference and visiting scholars and thought leaders, CUIP continues to grow partners across disciplines that serve to elevate and broaden the research capabilities at UTC and within the greater Chattanooga community.



Mina Sartipi

## Another Chattanooga Project Wins Smart Cities Award

CARTA, Chattanooga’s mass transit system, also was a Smart City award winner for a separate project that involved solar-assisted charging for electric vehicles. The CARTA project was done in collaboration with Green Commuter Chattanooga, which supplies electric vehicles to rent.

The project utilized the creation of about 20 electric-vehicle charging pods across the city that use solar power as part of their energy-storing technology. A fleet of 20 all-electric cars also were provided as a public car-share system. The project was integrated with CARTA, the city’s electric shuttle, bicycle lanes and public parking and, in the end, logged more than 55,000 vehicle miles using clean energy and reducing emission reductions.

David Wade, president and CEO of EPB, which owns the fiber-optic network critical to both projects, says UTC’s research capabilities are “one of several efforts in which UTC professors are leading research that engages local officials and our community’s outstanding infrastructure assets in pioneering new ‘Smart City’ technologies.”

Cooperation among UTC, EPB and other organizations in Chattanooga is setting the stage for even more growth in the city’s technology sector, said Christy Gillenwater, president and CEO of the Chattanooga Area Chamber of Commerce. “Working together we can continue to position our community as a test bed for next-generation technologies,” she said.





**Flying Drones:  
It's All In Your Head**

In the future, it may be possible to control multiple drones by thought.

UTC electrical engineering students, graduate researchers and faculty already are at work on what has been dubbed the Unmanned Systems Lab to develop technology to control all aspects of drone operation simply through brainwaves. Visualization in the brain would control the drone.

The project aims to detect patterns in brainwaves to give abstract commands to multiple drones. In the current setup, brainwaves are detected by electrodes attached to a user's head. The brainwaves are fed into a laptop computer, which sends a Wi-Fi signal to a second computer that, in turn, emits a wireless signal to the drone. In the second computer is software that actually controls the drone. Alongside this research, a separate study of the use of infrared light to control a swarm of drones is taking place.



**Computer Science and Mechanical Engineering Collaborate on Project Funded by Engility Corp.**

A new research project leverages high-performance computing expertise across the college and the UC Foundation's investment in cutting-edge equipment at the UTC SimCenter.

Four faculty in two academic departments have been awarded a more than \$440,000 grant from Engility Corp. for researching "Heterogeneous High-Performance Computing for High-Order Stabilized Finite-elements on Moving and Deforming Domains."

Effective fall 2017 and encompassing a two-year period, the funding is to investigate the relationships between evolving computer hardware capabilities and increasingly sophisticated and powerful software.

Computer Science Assistant Professor Craig Tanis is collaborating with Robert Webster and Kidambi Sreenivas, both associate professors of mechanical engineering, and with James Newman, professor and head of mechanical engineering. Their research focus is of interest to both the U.S. Department of Defense and NASA researchers. The project will involve research, conference and journal publications to share findings, and practical application recommendations for Engility Corp.

Engility Corporation is a provider of integrated services to the U.S. government, including the Department of Defense, intelligence community, space communities, and federal civilian agencies, and international customers.

**Partnering with Local High Schools Toward Eradicating Malaria**

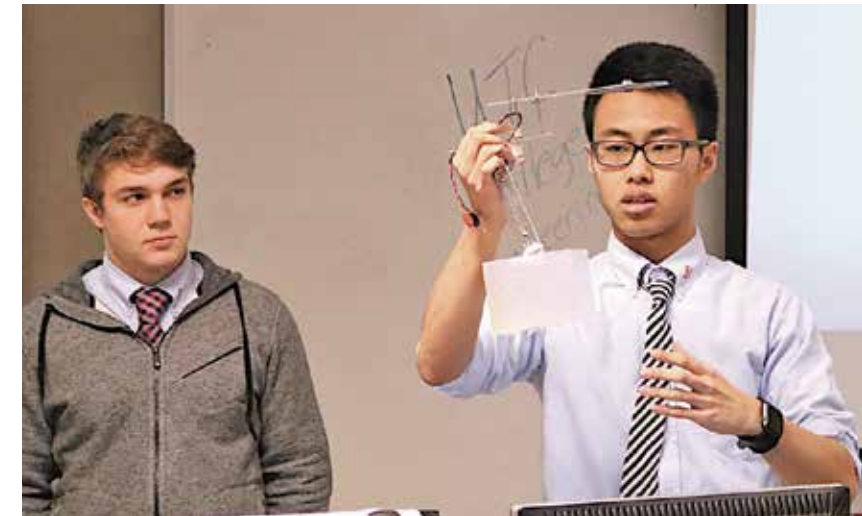
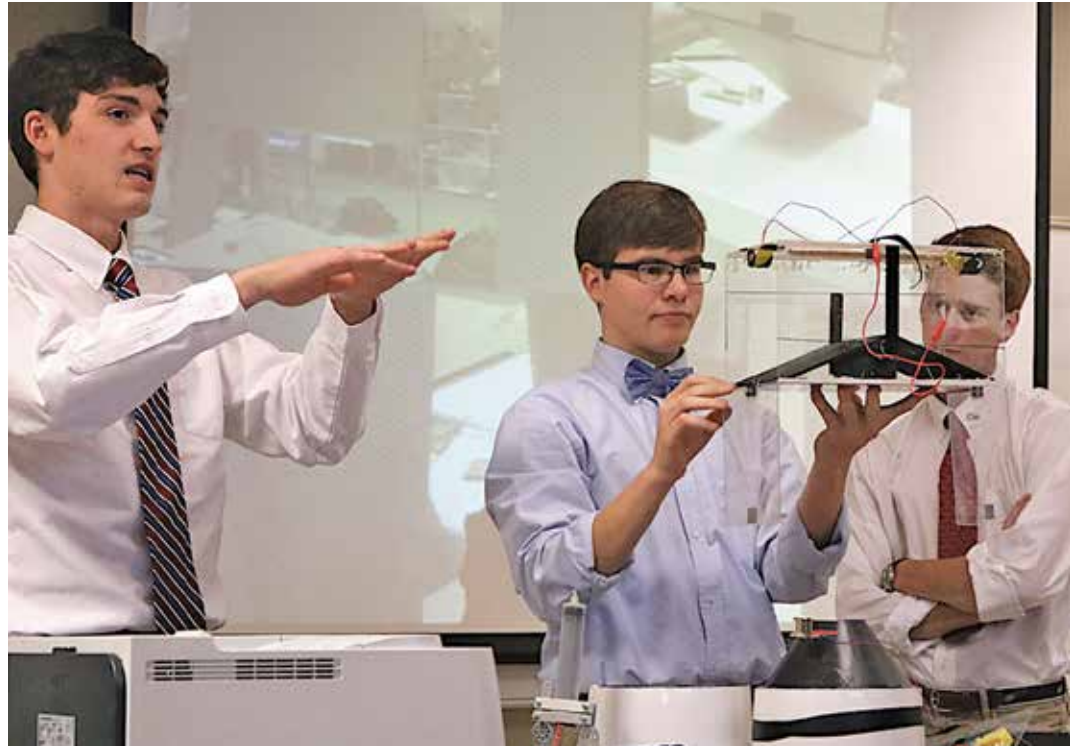
The College of Engineering and Computer Science is on the cutting edge of applied research to combat malaria, exploring—among other innovations—the use of drones to test water samples for the larvae of mosquitos, which carry malaria, and to distribute chemicals to kill the larvae.

UC Foundation Assistant Professor Daniel Loveless and post-doctoral researcher Zach Ruble partnered with local high school students to investigate ways to mitigate the devastation that malaria wreaks on Africa. Last fall, Baylor School students, led by Mary Loveless, director of the school's IdeaLab, built prototypes of devices that would attach to drones to carry out specific tasks. The students came to the college to present seven prototypes they constructed.

"We simply provided them with desired specifications and operating constraints," Loveless said. "The students had the freedom to tackle the problems using any approach they saw fit."

"All seven prototypes were demonstrated and functional. This is remarkable, especially given the short timeframe the students had to work. They were clearly prepared and put in their best effort."

The applied research collaboration with the Baylor School using drone technology to combat malaria will be used as a model for the college in seeking to expand partnerships with area schools.



**Stormwater Management: Challenge Accepted**

In response to the U.S. Environmental Protection Agency's EPA Campus RainWorks Challenge, a team of interdisciplinary undergraduates developed a campus-wide stormwater management master plan. The plan primarily focused on retrofitting gray infrastructure with green infrastructure to help mitigate pressing stormwater issues on campus. In alignment with Chattanooga's pollution control efforts and UTC's sustainability initiatives, the project demonstrated a successful retrofitting approach for effective stormwater management in a fully developed urban environment.

Under the direction of Jejal Bathi, assistant professor in the civil and chemical engineering department, students collaborated with city engineers, the Tennessee Department of Environment and Conservation and the UTC Facilities Planning Department to gather relevant data through field surveys from public domains.

The student research team, Green MOCS, included students in civil and chemical engineering along with some from business management, environmental science and interior architecture.

# community service



## Challenging Children and Parents at the Chattanooga Public Library

Concrete can, in fact, float.

That was demonstrated to children and their parents at a workshop hosted at the Chattanooga Public Library by students in the College of Engineering and Computer Science's chapter of the American Society of Civil Engineers (ASCE). Students worked with the college's concrete canoe team to host the hands-on opportunity for participants to work on a variety of projects.

Students challenged the participants' traditional thinking about construction materials while helping them explore math skills as a key to solving problems in the real world. According to ASCE chapter president Andy Lewis, "It was hard to tell who was having the most fun, the children or their parents. It was a great chance for us to pique their curiosity and have some fun at the same time."

## Improving the Lives of Neighbors in Need

With grant funding provided by the Tennessee Board of Architectural and Engineering Examiners, engineering management students and faculty partnered with the UTC interior design program

and the UT Knoxville College of Architecture to establish a community design studio at the First Baptist Church of Bozontown in Chattanooga. Students invested sweat equity in cleaning, painting and refurbishing church spaces to create a studio to assist the community with residential design challenges.

Students worked on a project in partnership with Widow's Harvest Ministries, a local organization providing home repairs to widowed women. Past Associate Dean Neslihan Alp and UTC Interior Design Program Director Dana Moody described the partnership with Widow's Harvest as a great way for students to see how their education equips them to help their community.

## Tau Beta Pi Sponsors Science Fair Workshop

Members of Tau Beta Pi Chapter spent a Saturday morning in spring 2018 assisting area high school students with science projects. The Tau Beta Pi students provided hands-on help in a variety of areas, including research, display, construction, and presentation. The university annually hosts the Chattanooga Regional Science Fair, where projects that have earned prizes in local fairs are displayed in the University Center.

Tau Beta Pi officers Cooper Thome and Natalie Burdine coordinated the volunteer effort. "We can remember working to develop projects for entry in our high school science fairs," said Thome. "It would have been great to have some input from college students about how to get started on a project and how to bring a hypothesis to a reality."

Tau Beta Pi is the national academic honor society for engineering students. In addition to excellence in academics, the society encourages community outreach and service initiatives.

## Society of Black Engineers Marks Ninth Year for ACT Workshop

Preparing to take the ACT admissions test can be stressful for high school students. Members of the campus chapter of the National Association of Black Engineers make it their mission to help lower those anxiety levels by offering day-long ACT prep courses each fall and spring, complete with a pizza lunch and mixer. The group has hosted the workshops for the past nine years.

Open to high school juniors and seniors across the region, the workshop takes place at the College of Engineering and Computer Science and includes instruction in test content and test-taking strategies. High school students are welcomed by Dean Daniel Pack and given information about the college from Julie David, director of student success.

## Students Help the Girls Leadership Academy Dream Big

What do eighth grade girls dream about? At the Chattanooga Girls Leadership Academy (CGLA), eighth graders dream big about excelling in science, technology, engineering and math. Faculty and students helped inspire those dreams by providing activities in fall 2017 to introduce young women to STEM fields as college majors and professional careers.

Seventy CGLA students in four classes learned about possibilities for study and discovery in STEM, and how the college can foster their interest and dreams of making a difference in the world as engineers, technologists and computer scientists of the future. CGLA students visited the college to learn about programs of study and to tour the building. Executive Director of CGLA Elaine Stafford thanked UTC and the College "for supporting our school mission to inspire hope in each girl, positively changing the trajectory of her life and empowering her infinite choices in the future."

The College continues to strengthen and expand its partnership with CGLA through planned classroom visits by members of the student chapter of the Society of Women Engineers and other outreach activities.

## Open House Offers Career Choices to High School Students

Weston Braddock looks around the everyday world and sees something missing.

Robots.

"About the only thing we have is Roombas," he said, referencing the Wi-Fi-controlled machine that thumps and bumps around the house, sweeping floors and vacuuming carpets.

"That, and garage doors."

An interest in designing and working with robots brought Braddock, a sophomore at Ivy Academy in Soddy Daisy, to UTC spring 2018 to attend the open house in the College of Engineering and Computer Science. He was one of about 60 high school students from around Chattanooga who attended the day-long event in the Engineering, Math and Computer Science building and the SimCenter.

During the open house, students witnessed demonstrations of the student designed Chem-E Car, which rolled a little more than 30 feet on fuel made from the reaction of several chemicals. They tried to control flying drones using cellphones and computers—the cellphone-driven ones skittered across the floor or slammed into netting like big mosquitoes, while the computer-driven ones flew up and around the room with little problem.

They also took part in workshops for video game computer coding, bridge building and examining the student-made, off-road Baja car.

Physically demonstrating how engineering or computer science can change the world tends to be a more effective way of getting students excited about the fields than merely talking to them, said Daniel Pack, dean of the College of Engineering and



Computer Science.

"This is a way to allow them to discover things on their own," he said. "It helps them appreciate it more."

Sara Sosebee, a junior at Ringgold High School, said she hopes to be an architect, so she came to the open house for a demonstration on civil engineering.

"I really like seeing how everything fits together," she said.

Daniel Locke, a senior at Soddy Daisy High School, is interested in industrial engineering because, "It's optimizing processes, and I really like when things are really efficient and streamlined."

Braddock says he was turned on to robotics after attending a camp last summer at the Volkswagen plant in Chattanooga and watching its robots at work.

"Just controlling one of those big beasts was like, 'Wow!'" he said.

The college hosts a high school open house annually. The event includes lab tours, hands-on project demonstrations and information about scholarships.

# speaker series



Above: Christopher Kilmartin

## Second Year for Speaker Series Brings 14 Professionals to Campus

**The** College of Engineering and Computer Science Speaker Series provides opportunities for sharing cutting-edge information from noted researchers and sharing experiences, expertise and advice from community leaders. As part of the College's commitment to outreach opportunities for students and faculty, events are open to the public, free to attend and hosted on campus.

Assistant Dean Li Yang led the effort to launch the series in 2016 and partnered with Julie David, director of student success, to plan the 2017-2018 series. The 14 events included topics ranging from additive manufacturing to cybersecurity, from crypto-currency to characteristics of successful business leaders.

The 2018-2019 series will be led by Yang, David and the college's director of development Philip Bonfiglio.

"The Distinguished Speaker Series allowed us to host business professionals alongside the best researchers from top research institutions, national labs and federal government," said Yang. "This initiative expands the horizons of our students and faculty, promotes career readiness, brings collaboration opportunities and inspires innovation at UTC and in Chattanooga, which are important in building our research capacity."

## 2017-2018 Speaker Series

### Indoor Positioning Advances Exploiting GPS and WLAN Infrastructures

David Akopian, professor, electrical and computer engineering, University of Texas at San Antonio

### Energy, Water and Climate: Challenges and Opportunities in Africa

Vahid Alavian, water and hydropower advisor (former), Africa region at The World Bank

### For Engineers, Does Career Advancement Come from Hard Skills or Soft Skills?

Ryan M. Brewer, associate professor of finance, Indiana University

### Crypto-currency Status and Future Perspectives

Richard Brooks, professor of electrical and computer engineering, Clemson University

### Information Security Careers: Pathfinding on the Digital Battlefield

Shayne Champion, cybersecurity professional

### Oak Ridge National Lab Capabilities

Jeffrey B. Cornett, manager, industrial and economic development, Oak Ridge National Laboratory

### The Science of Additive Manufacturing and What the Future Holds

Amy M. Elliott, associate research staff, Oak Ridge National Laboratory Manufacturing Demonstration Facility

### Security Challenges for the Internet of Things: A Semantics-Based View

Csilla Farkas, professor, Department of Computer Science and Engineering, University of South Carolina

### The Implicit Bias and Microaggressions that Are Often Targeted at Women in the STEM Fields and What We Can Do About It

Christopher Kilmartin, emeritus professor of psychology, the University of Mary Washington

### The Future of Deep Space Human Exploration

Paul McConaughy, associate director, technical, Office of the Center Director NASA Marshall Space Flight Center

### From Classroom to Corporation: Adventures of a Tech CEO

John P. McNeely, President/CEO, principal and co-founder of Sword and Shield Enterprise Security, Inc., and principal and co-founder of Affenix, LLC

### Why Do Some People Advance in Their Career Faster Than Others?

Scott C. Pierce, executive vice president and chief operating officer, BlueCross BlueShield of Tennessee

### Petal: Rejuvenation of MPI Applications Ariadne: Static Analysis Meets Model Checking

Peter Pirkelbauer, assistant professor, computer science, University of Alabama at Birmingham

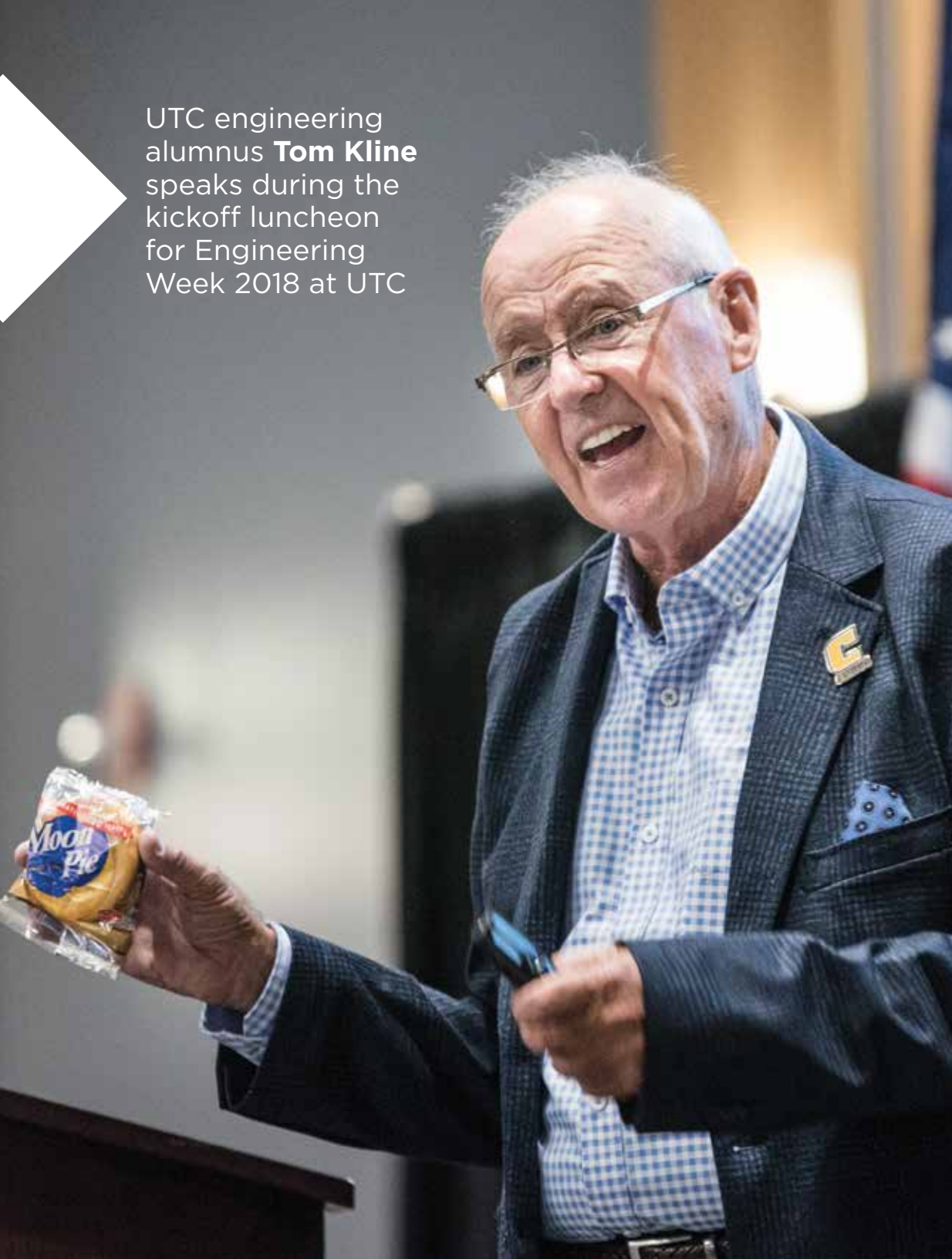
### Security of Additive Manufacturing: Threats and Research Opportunities

Mark Yampolskiy, assistant professor, School of Computing, University of South Alabama



Clockwise top left: Jeff Cornett, John McNeely, Paul McConaughy, Peter Pirkelbauer, Amy Elliott, Shayne Champion and David Akopian

UTC engineering alumnus **Tom Kline** speaks during the kickoff luncheon for Engineering Week 2018 at UTC



## UTC Hosts National Engineers Week Kickoff

Can one Chattanooga engineer make a difference? The Chattanooga Engineers Week (E-Week) kickoff took place in the UTC. Engineers from UTC and organizations across the region gathered for a week of events to celebrate the work of engineers and computer scientists and to educate potential students about the field.

At the event, conversations centered on how engineers can make a difference. UTC alumnus and Principal of Kline Health Group Tom Kline emphasized the great potential for engineers to change lives through their work, and that even one seed planted with an engineer from Chattanooga could make a world of a difference.

“My basic view of life is that engineering has given me the technical capability to make changes in the way our lives are lived. It’s also given me the confidence that engineers, and me as one person, can do it,” Kline said. “That we can make changes one small step at a time.”

Also at the kickoff event, area organizations, including the Society of Women Engineers, Chattanooga Engineers Club and American Society of Civil Engineers, presented scholarships to students.



Rob Gagliano with BASE, left, stands with Lyn Potter, accepting scholarship money for Chattanooga State Community College, center, and Daniel Pack, accepts scholarship money for the UTC during the Engineering Week kickoff luncheon.

## Outreach and Engagement on Display at National Engineers Week

**A**ttention: Students searching for career ideas, unable to decide exactly what to do with your lives—National Engineers Week is for you, and it happens each year in spring.

“It allows us to recognize and promote the engineering field to students who, in the future, may become engineers,” said Dean Daniel Pack. “It’s a venue for us to be able to reach prospects in high school, middle school and others.”

The 2018 event was packed with activities to connect with potential students and to recognize the work of engineers and computer scientists that impacts quality of life.

It’s about teaching people, “What we do in society that has to do with solving problems and creating products that enhance and benefit people’s lives,” Pack said.

“We’re doing a lot more engagement in the community and applied research. We bring in problems of the real world into our research and programs as well.”

The college is working with the city of Chattanooga, its utility company EPB (Electric Power Board), TVA, Volkswagen, Erlanger and Memorial health care systems and other area businesses and institutions to promote applied research, improve efficiency in programs, and develop manufacturing ideas.

For example, UTC is working with the city of Chattanooga and its Enterprise Center on the Smart



Daniel Pack, dean of the College of Engineering and Computer Science, far right, looks on while chemical engineering students work in a college lab.

City project, which is researching the possibility of driverless cars and other tools toward efficient traffic flow.

With TVA, the University is partnering to test ways of checking the ‘health’ of electrical transformers and, if work is needed, conduct it on-site, a process that could save millions of dollars.

At VW, the College of Engineering and Computer Science is developing tools through virtual reality simulation to help train assembly line workers.

The number of research awards won by the College of Engineering and Computer Science has increased 56 percent over the past five years, while the number of faculty and other researchers in the College awarded grant money has grown by 60 percent, “which tells you how much applied research activity is going up, led by faculty members,” Pack said. “The more, the better.”

## Partnering with Erlanger Health System to Improve Patient Care and Accessibility

A new partnership between the College of Engineering and Computer Science and Erlanger Health System focuses on applied research involving students and surgeons leading to improvements in patient care and accessibility. It is increasingly essential that experts develop healthcare systems that are secure and meet user information needs. The partnership incorporates new research methods in the areas of usability engineering, data-driven computer innovations and multidisciplinary project design.

Under the direction of of Jed Mescon, Erlanger vice president of public relations, marketing and development; Li Yang, assistant dean of the college; and Julie David, student success center director, the partnership includes early morning brainstorming sessions between Erlanger surgeons and UTC engineering and computer science students and faculty.

Students have the opportunity to job shadow surgeons to observe processes, procedures, workflow and other key areas of healthcare delivery and patient access. Initial projects resulting from the collaboration ranged from development of a comprehensive highway signage plan for the Chattanooga- and Hamilton County-area hospitals, to a study of patient release procedures with a focus on efficiency, workflow and communication, to an engineering review of improving kidney surgery procedures to ensure organ viability and improved patient recovery times.

In commenting on his initial efforts with Erlanger and the Tennessee Department of Transportation on the highway signage project, senior civil engineering major and U.S. Navy Veteran Hospital Corpsman Damon Jarrod Magourik said, “This is a networking opportunity like no other. We are pursuing our degrees not only for the knowledge and skills acquisition, but also for future employment. This opportunity gives us the chance to work directly with potential employers on real-world problems.”



## Cybersecurity Leader Credits UTC for Success

**When** John McNeely arrived in Chattanooga in August 1986, he had no idea that his interest in computers would take him on a professional adventure that would put his company in all 50 states and land him at the helm of a \$60-million annual revenue cybersecurity firm.

This wide-eyed cross-country and track star from the Tri-Cities area of Upper East Tennessee — one mile from the famous Bristol Motor Speedway, to be specific — experienced a very different Chattanooga than we know today. Back then, McNeely recalled, downtown wasn't nearly as vibrant and practically turned into a ghost town when the American National Bank closed each afternoon at 4 p.m.

As a member of UTC's cross-country and track squad, McNeely quickly became familiar with the streets of Chattanooga, and was a first-hand witness to the city's burgeoning renaissance. "I ran all over downtown and saw the beginning of the big transformation," said McNeely.

Even during those uncertain times when Chattanooga seemed stagnant, the UTC College of Engineering and Computer Science was home to cutting-edge innovation.

"Going to UTC offered a lot of opportunity for students curious about computers and programming. We had great professors who offered one-on-one instruction, which helped me to better hone my skills," said McNeely, whose love of technological development was born his senior year in high school when a math teacher introduced him to the Apple II computer.

Like UTC's computer science programs, Chattanooga's vast TVA complex was an oasis of innovation and offered McNeely a professional outlet while he finished his junior and senior years at the University. He was able to work 20 hours a week as a computer programmer while taking a full course load. With a busy work schedule and several challenging semesters of studies, McNeely still found time to earn the M. Rex Jones Memorial Award for most outstanding computer science student in his senior year.



Following graduation in 1990, McNeely did a two-year stint with Southwest Research Institute in Texas, where he worked on "state-of-the-art" projects including the Tomahawk Missile System.

Cutting-edge work in Texas was exciting for McNeely and his bride, the former Sheila Summers of Signal Mountain, Tennessee, but they missed the green hills of home and relocated to Knoxville to get closer to family and old friends.

There, McNeely went to work in Oak Ridge, Tennessee for Martin Marietta Energy Systems, a leading contractor with the U.S. Department of Energy. McNeely's expertise was farmed out to other governmental agencies including the FBI and the Federal Aviation Administration.

After five years working on various government projects, McNeely got a unique opportunity to partner with James Goldston. In July 1997, these two entrepreneurs converted garage space in Goldston's home to offices, and Sword and Shield Enterprise Security, Inc. was born. A year later, the duo brought in Will Henderson, who McNeely said "was instrumental to the success of the start-up."

Twenty-one years later, Sword and Shield is an international cybersecurity provider with clients in Europe, Asia and the Middle East. As CEO and principal, McNeely has assembled a skilled team of 65 certified security professionals with

**Balance between technical knowledge and core business values has proven fruitful for McNeely's company.**

offices in Portland, Nashville, Atlanta and Knoxville.

For McNeely, brand knowledge is as essential to success as business values. "We want our people to have a thirst for learning, a need to stay relevant in a fast-moving field," he said. "Training and education are key, but character is just as important. We value integrity, teamwork, collaborations and, above all, customer service."

Balance between technical knowledge and core business values has proven fruitful for McNeely's company. Its dynamic growth was nationally recognized by *Inc.* 500/5000 for posting a nearly 30 percent annual growth rate every year since 2007. Sword and Shield received the 2011 Knoxville Chamber of Commerce Pinnacle Award for Small Business Excellence and has been included on Cybersecurity Ventures' "Cybersecurity 500" list of "the world's hottest and most innovative cybersecurity companies." In addition, Sword and Shield is the only Tennessee-based company to be recognized in the Managed Security 100, an annual list recognizing providers with cutting-edge approaches to managed services.

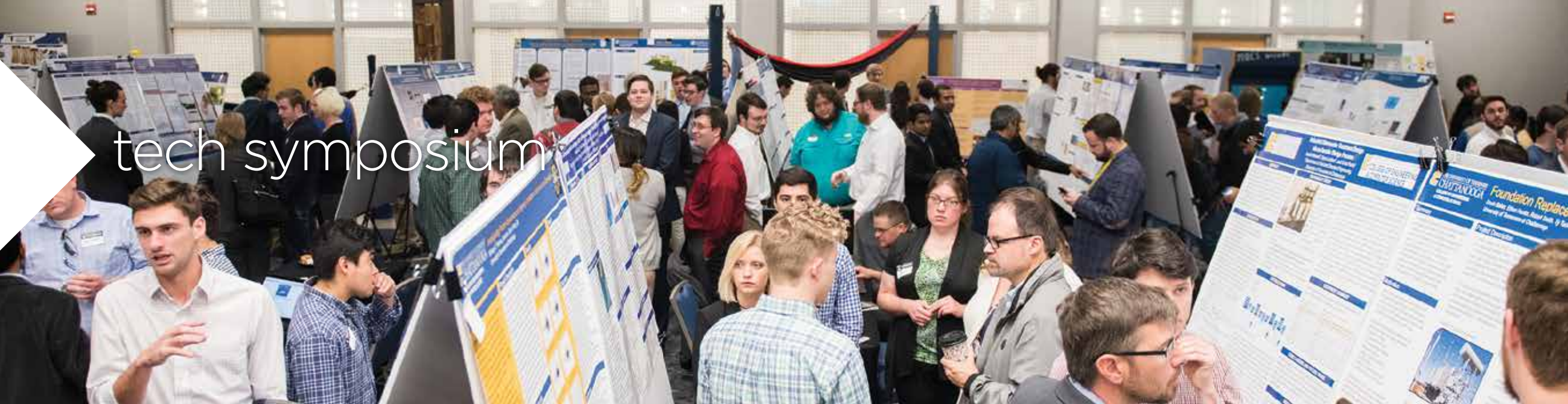
But this CEO of a fast-growing, high-performing international business can't forget his educational roots in Chattanooga.

"UTC gave me a great opportunity to learn and grow," McNeely said.

"I had a number of excellent instructors and professors who I still think of to this day and the impact they had on me during my time at UTC. I was inspired and challenged by my professors to have big goals, to work hard at achieving them, and to always persevere."

The education he received and the lessons he learned while at UTC taught him not only to persevere, but how to achieve. That's no surprise considering the University's motto: "Faciemus." We Shall Achieve.

"I am grateful for the experiences I had at UTC," McNeely said. "They prepared me for where I am today."



# tech symposium

Could an app tell you when someone is lying?

How about the ability to detect fraudulent ads on the internet?

Would you like to know the best ways to start your own microbrewery?

Maybe you'd like to know how to help people with disabilities learn to ride horses or to paint.

Students and faculty presented all of these ideas, and more, at the inaugural College of Engineering and Computer Science Technology Symposium, an innovation event open to the public.

Among the projects and their presenter summaries were:

**Lie to Me: The App** "Trying to master all methods of lie detecting is a daunting task for anyone, the team created an application for training people in becoming better at detecting lies. In short, the app takes in user input and returns a percentage opinion on whether the subject is lying or not. The app is meant to act as training wheels for the user to train them in detecting lies so, in future events, they can detect a lie on the fly."

**Using Smartphones and Watches to Detect Falls and Get Help for the Elderly** "Develop an application which can accurately detect and assess when the user falls, using machine learning techniques. If the application running on the cell phone detects a fall, the application will make a call to a predetermined telephone number and send a text message displaying the location of the user via a Google maps hyperlink."

**Beethoven's Fountain** "Provide an interactive water fountain display that allows the user to plug in a music device and have the fountain 'play' a unique display based on the song. Currently, there are no water fountains on the market that are in an affordable price range that will provide a visual display of music being played in real time."

**UTC Hammock Garden Hanger** "Create a hammock garden where students can hang their hammocks and study or socialize."

The Student Government Association is considering the space between Crossroads and Chamberlain Pavilion south of Brock Hall for the garden. They are looking for a few hanging solutions and garden layouts to present to the UTC administration to initiate the construction of the garden."

**Freedom Brewing: Preliminary Design of a Microbrewery** "Design a brewery with a production size of less than 15,000 barrels (465,000 gallons) of beer per year. End goal was to provide a feasible, preliminary design complete with a process flow diagram and batch scheduling chart, an equipment list and design basis and a cost estimate."

**Mocs Arcade Retro Video Game** "Objective was to reinvent a classic arcade game. 'Twotris,' short for 'Two-player Tetris' ... aims to shatter the classic image of 'Tetris,' take these shards and put them together in a whole new way."

**Horseback Sensory Trail** "Rainbow Riders, a program at the Tri-State Therapeutic Riding Center, is a therapeutic riding program that teaches individuals with disabilities how to ride. ... TSTRC would like a collection of horseback-accessible sensory activities that children can see, hear, touch and engage with along a trail outside of the main rink that will help them practice balance and use their core muscles."



A panel of external experts judged the research projects, with awards presented in various categories. Students at all educational levels, educators, business and industry representatives, entrepreneurs and the general public attended.

Peter Fuhr kicked off the symposium with a keynote address. Fuhr is a distinguished scientist at Oak Ridge National Laboratory serving in the capacity as the technology director for the Unmanned Aerial Systems (UAS) Research Laboratory and director of grid security.

The Symposium concluded with an awards presentation for outstanding research and entrepreneurship. The winners were:

### Undergraduate Research

Taylor Dearman, Beau Simmons and Timothy Stewart, "*Rubens Tube: Demonstration of Acoustic Standing Waves*"

### Graduate Research

Hana Karrar, "*Girls to Engineers Network (GEN)*"

### Freshman Design

Stephen Burton, Grant Gronemeier, Lexi Johnson and Andrew Mays, "*The Accessible Picnic Table for Open Arms Care*"

Ali Aldrwish, Zuhair Alelq, Grey Drewery, Amanda George and Kenneth Pruett, "*The Karate Assistant*"

### Senior Design

Jessica McCaw, Tejashkumar Patel, Joshua Smith and Matthew Totton, "*Implementing a Full Automation with Performance Improvement of a Tire Recycling Machine*"

Austin O'Byrne, Ben Meyer, Alay Patel and Derek Snyder, "*Using Smart Phones and Watches to Detect Falls and Get Help for the Elderly*"

Russ Bazemore, Jason Cobb, Daniel Witt and Brandon Whitley, "*Upgrading a Locomotive Telemetry Device (LTD)*"

### Student Tech Entrepreneurship Award

Sponsored by CO.LAB, a nonprofit startup accelerator. An award for the research project that best represents the potential for commercialization. The winning team receives acceptance into one of CO.LAB's programs, access to its CO.LAB network and access to free mentorship through CO.LAB.  
Mina Sartipi, Jose Stovall, Rebekah Thompson and Daniel Velasquez, "*All-in-One Urban Mobility Mapping*" (Graduate Research)

## 2019 Technology Symposium

Building on the success of the inaugural symposium, the college is looking to make the 2019 event more integrated with the community by moving it to the Chattanooga Public Library downtown. The event will feature 100+ research projects and guest speakers. The college plans to invite local middle and high school students to learn about research and technology at the undergraduate and graduate levels. Moving the symposium to the heart of innovation district will be a great opportunity for engineering and computer science students to showcase their talent and mix with industry partners.





# alumni profile

Jerry Bear

Gushing waterfalls, leftovers from a day of rain, cascade down the rocky sides of the Ocoee River Gorge overwhelm all other sounds.

**It's** a familiar melody to Jerry Bear, who has worked at the Tennessee Valley Authority's (TVA) Ocoee Powerhouse No. 3 for the past five years. Along with generating electricity through its enormous turbine system, the powerhouse is responsible for the water flow of about 20 miles of the Ocoee River, including sections ridden by thousands of whitewater rafters every summer.

"It really makes the rapids for rafters and kayakers, as long as there's water flowing, but I wouldn't want to be out in the middle of it when the water stops," says Bear, who graduated from UT Chattanooga in 1993 with a bachelor's degree in engineering.

And Bear, who grew up in the Ocoee area and has a lifelong love of its deep woods and rocky ridges, has a key role to play in each year's whitewater season.

In November, part of the 100-year-old wooden flume, which runs alongside the Ocoee, collapsed. That flume diverted excess water away from the river and sent it downstream to other powerhouses. Until the flume was repaired, all excess water flowed straight

down the river, so its rapids were in rare form.

At the powerhouse, Bear is responsible for making sure all the safety mechanisms work properly, from the ones that protect the equipment in case of catastrophic failure to the steps taken to protect technicians when repairs and general maintenance are performed on the equipment.

On this day, the fire-containment system needs maintenance, so he's tagging several valves that control the water that sprays into a device if a fire breaks out. The red tags are a sign that the valves are turned off and it's safe to go inside the machine.

After graduating from UTC, Bear worked at a power plant in Tennega, Georgia, and an iron foundry in Etowah, Tennessee. He joined TVA in 2008, spending five years at Watts Bar, before coming to the Ocoee River basin.

What he learned at UTC comes up frequently in his job, especially concepts about electricity, water flow and other engineering subjects. In his daily work, he sees those concepts in real-world applications.

*Jerry Bear tags valves that have been turned off.*





## College Hosts Teacher Externship Days for Future Ready Institutes of Hamilton County

It's the age-old question asked by students, "Will I really use this in my future?" Future Ready Institutes aims to answer this question by giving teachers working knowledge of the skills needed for career success, so they can develop a curriculum to better prepare students.

The College of Engineering and Computer Science hosted a two-day externship for educators of the Institute of Computer Sciences and Engineering at Red Bank High School. The externship featured hands-on exercises led by faculty and site visits to Komatsu and UTC's SimCenter.

Julie David, director of student success, kicked off the event with an overview of the college and programs offered for students.

"The teachers and principal who attended the externship had extremely positive feedback after day one," David said. "We discussed the opportunity to bring high school students on campus next month for a similar 'open house' style visit."

"We are proud to partner with Future Ready Institutes of Hamilton County to support the Computer Science and Engineering Institute at Red Bank High School," said Dean Daniel Pack. "It is a unique opportunity for high school students and we look forward to supporting the program for years to come."



DENSO donated \$50,000 to fund the UTC Society of Automotive Engineers Baja Capstone Design project.

## Students and Faculty Tour VW Robotics Lab

Volkswagen Group of America has been part of American culture since the first Beetle rolled off an assembly line more than six decades ago. With the 2008 announcement of the Chattanooga manufacturing plant and production of vehicles in 2011, VW has opened its doors to UTC engineering and computer science students and faculty. As the world's first and only Platinum LEED-Certified auto manufacturing facility and the employer of a workforce of 3,000, the Chattanooga plant is of particular interest to engineering and computer science students as

they consider internship and post-graduation employment options. The College also has partnerships with area suppliers to VW, including Gestamp and Yangfeng.

Two CECS student groups have visited the VW facility to take the 90-minute tour of the robotics labs and line-production areas. Organized by Aldo McLean, assistant professor of engineering technology management, and junior chemical engineering major Reed Boeger, the CECS students touring the plant learned about innovations in the manufacturing of the VW Atlas SUV and Passat sedan.

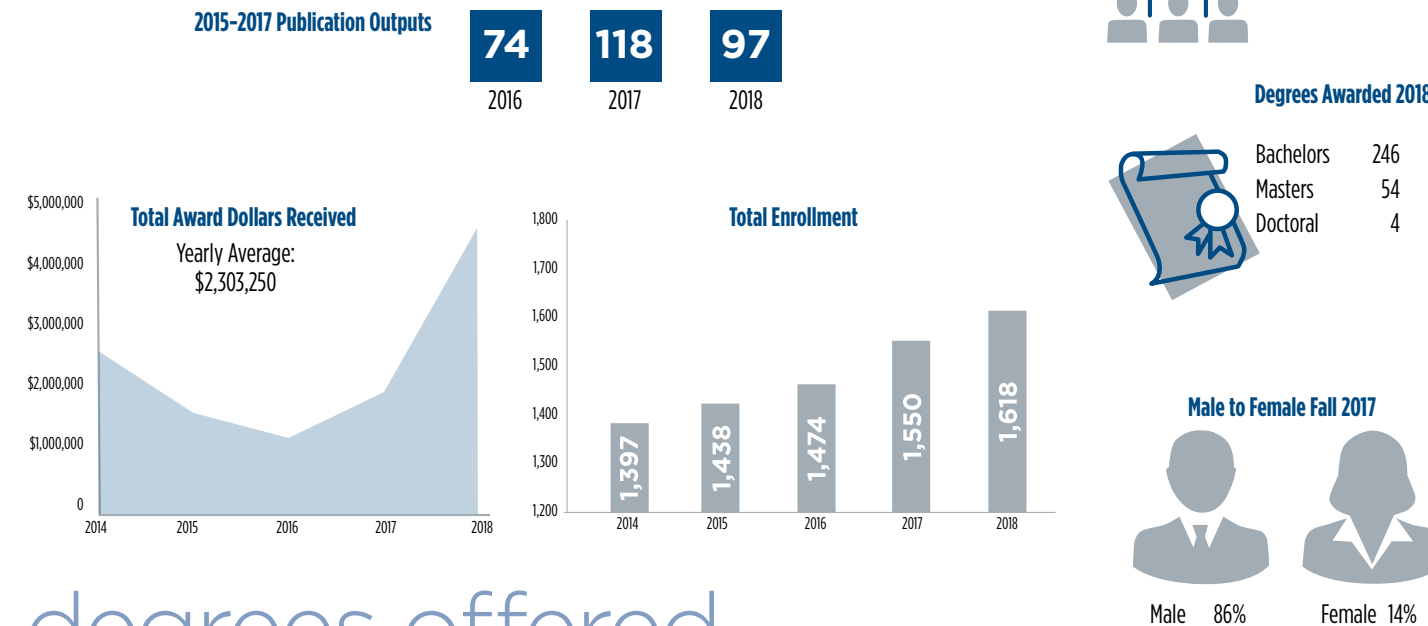
## Dedication of New Labs

The College of Engineering and Computer Science dedicated two laboratories to chemical engineering faculty, who were instrumental in expanding research components of the program. At ribbon-cutting ceremonies in fall 2017, the former lab 120 became the Jim Henry Chemical Engineering and Control System Laboratory, named in honor of Professor Emeritus Jim Henry. The former lab 119 became the Francis "Frank" J. Jones Chemical Engineering Laboratory, named in memory of the late UC Foundation Professor Frank Jones.



Among speakers at the Jones Laboratory dedication were two of Jones' brothers, Brian and Russ Jones, and UTC alumna Stephanie Fraley, who was mentored by Jones. In 2006, Fraley received a bachelor's degree in chemical engineering. She has since earned a doctoral degree in chemical engineering and biomolecular engineering at Johns Hopkins University in Baltimore, Maryland.

## by the numbers



## degrees offered

### ENGINEERING

- Bachelor of Science**
- Chemical Engineering (B.S.Ch.E.)
  - Chemical Engineering: Environmental (B.S.Ch.E.)
  - Civil Engineering (B.S.C.E.)
  - Civil Engineering: Environmental (B.S.C.E.)
  - Electrical Engineering (B.S.E.E.)
  - Mechanical Engineering (B.S.M.E.)

### Master of Science (M.S.)

- Engineering: Automotive Systems
- Engineering: Chemical
- Engineering: Civil
- Engineering: Electrical
- Engineering: Mechanical

### Ph.D. Programs

- Computational Science with concentrations in
  - Computational and Applied Mathematics
  - Computational Engineering
  - Computer Science

### COMPUTER SCIENCE AND ENGINEERING

- Bachelor of Science**
- Computer Science (B.S.), with concentrations in
    - Computer Engineering
    - Cyber Security
    - Data Science
    - Software Systems
    - STEM Education
  - Computer Engineering (B.S.)

### Minor

- Computer Science

### Undergraduate Certificates

- Advanced Information Systems Security
- Information Systems Security

### Master of Science (M.S.)

- Computer Science with concentrations in
  - Computer Science
  - Data Science
  - Information Security and Assurance

### ENGINEERING MANAGEMENT AND TECHNOLOGY

- Bachelor of Science**
- Engineering Technology Management (B.S.), with concentrations in
    - Construction Management
    - Engineering Management
  - Mechatronics Engineering (B.A.S.)

### Minor

- Construction Management
- Engineering Management

### Master of Science (M.S.)

- Engineering Management with concentrations in
  - Construction Management
  - Engineering Management

### POST-BACCALAUREATE CERTIFICATE PROGRAMS

- Post-Baccalaureate Certificates**
- Computer Science:
    - Biomedical Informatics
  - Engineering:
    - Power System Protection
    - Smart Grid
    - Smart Power Distribution
    - Sustainable Electric Energy
  - Engineering Management:
    - Construction Management
    - Fundamentals of Engineering Management
    - Leadership and Ethics
    - Logistics and Supply Chain Management
    - Power Systems Management
    - Project and Technology Management
    - Quality Management



THE UNIVERSITY OF TENNESSEE  
**CHATTANOOGA**  
COLLEGE OF ENGINEERING  
AND COMPUTER SCIENCE

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