



UMBC



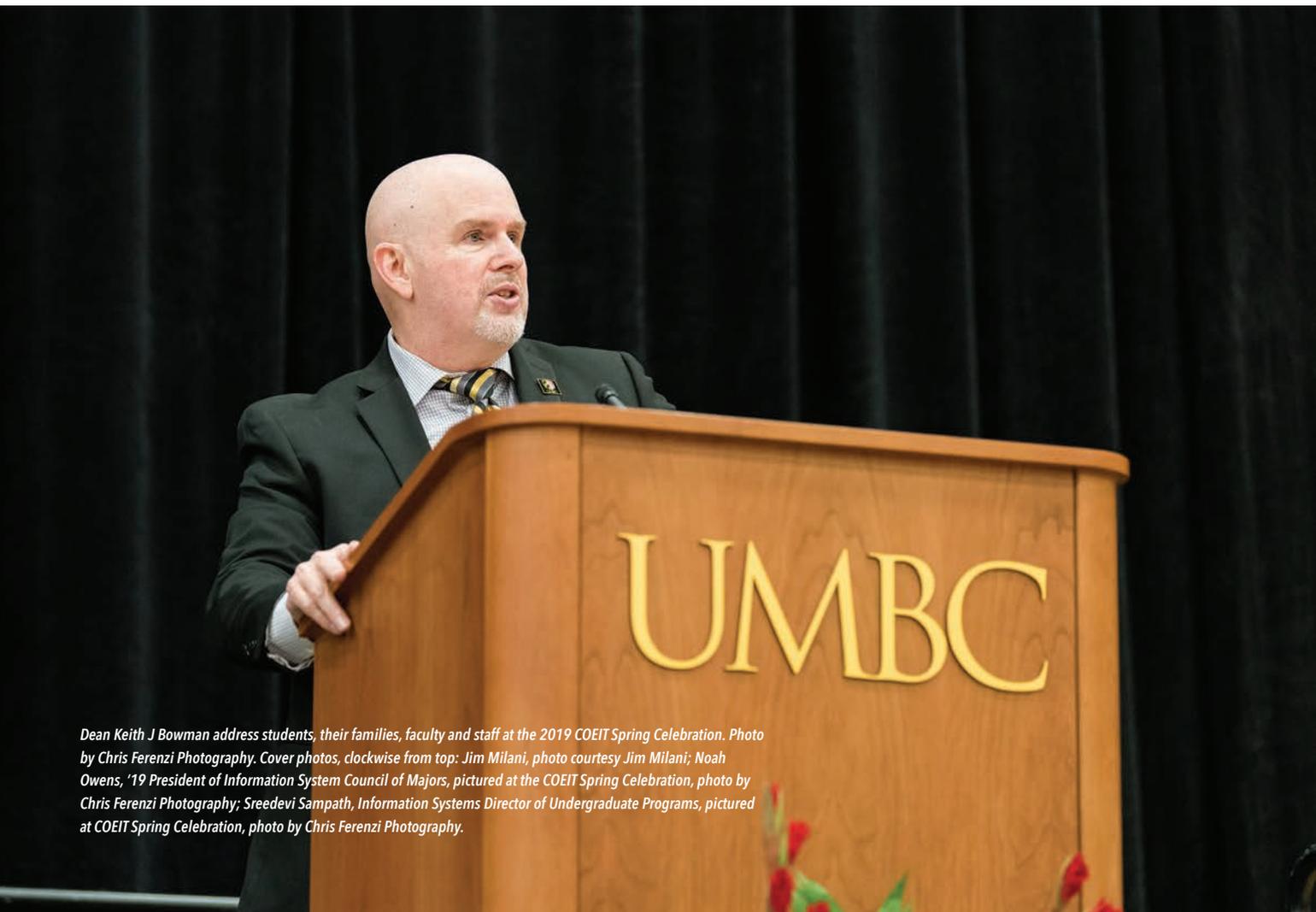
# 2019 ANNUAL REPORT

COLLEGE OF ENGINEERING  
& INFORMATION TECHNOLOGY

COEIT 2019 Spring Celebration held at UMBC's Retriever Activities Center, May 5, 2019. Photo by Chris Ferenzi Photography



*Incoming Students attend UMBC's Welcome Week Event, What's In Your Academic Toolkit program.  
Photo by Dean Keith J Bowman.*



*Dean Keith J Bowman address students, their families, faculty and staff at the 2019 COEIT Spring Celebration. Photo by Chris Ferenzi Photography. Cover photos, clockwise from top: Jim Milani, photo courtesy Jim Milani; Noah Owens, '19 President of Information System Council of Majors, pictured at the COEIT Spring Celebration, photo by Chris Ferenzi Photography; Sreedevi Sampath, Information Systems Director of Undergraduate Programs, pictured at COEIT Spring Celebration, photo by Chris Ferenzi Photography.*

# College Welcome

Inclusive excellence is at the core of UMBC, and here in the College of Engineering & Information Technology (COEIT) we are working to create an environment where there are many paths to success. The College has committed faculty and staff to support students in their academic journeys. The students and faculty in the College are highly entrepreneurial and collaborative, and we have numerous student organizations covering a broad range of interests and topics.

COEIT faculty currently lead a number of internationally recognized research centers, including the Center for Cybersecurity, and Center for Advanced Sensor Technology. These Centers capitalize on our renowned faculty, excellence in research, and collaborations across federal and academic institutions throughout the nation to create outstanding research and learning opportunities for undergraduate and graduate students.

There is a place for everyone in the College. We have a wide range of undergraduate and graduate level academic programs ready to accommodate any student with a passion for engineering or computing, from Business Technology Administration to Mechanical Engineering to Cybersecurity to

Environmental Engineering. Our academic programs and organizations strive for inclusion. The Center for Women in Technology (CWIT) and student organizations such as National Society of Black Engineers (NSBE) and the Society of Hispanic Professional Engineers (SHPE) are just a few examples that illustrate the College's commitment to fostering a welcoming environment.

Highlights:

- ◆ In the past two years, the College has launched several programs for its faculty, staff and students, including:
  - Student organization support funding;
  - College-level awards established to recognize our faculty and staff;
  - Research lab renewal/update program;
  - Partnering with Hanover Research to support faculty with grant proposal development.
- ◆ New faculty and staff advisory groups and undergraduate and graduate program committees were created.
- ◆ Over 1000 faculty, staff, students and family celebrated their accomplishments during the Spring celebrations of 2018 and 2019.

*There is a place for everyone in the College.*



# Contents

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**1** WELCOME FROM THE COLLEGE

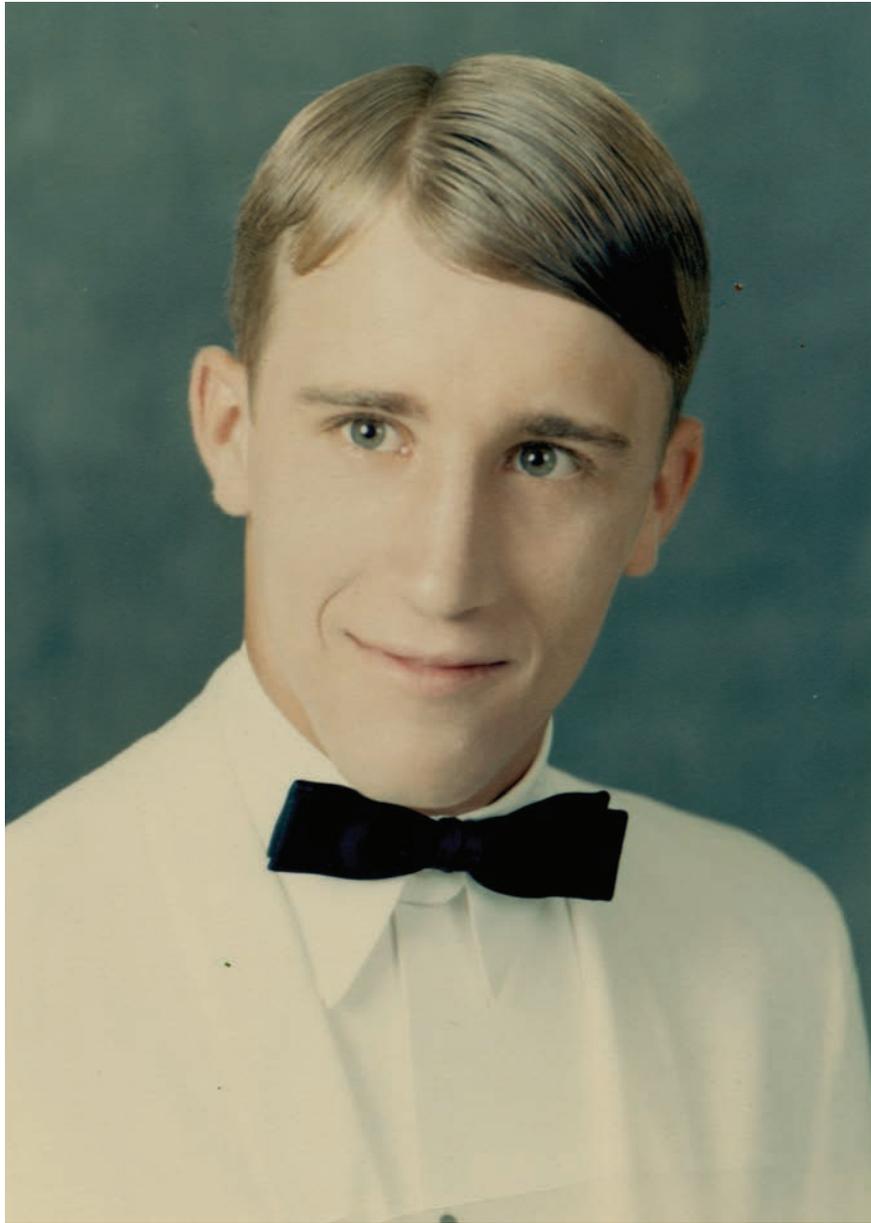
**5** REMEMBERING JIM MILANI

**8** BY THE NUMBERS

**11** STUDENT ORGANIZATION HIGHLIGHTS

**16** FACULTY AND RESEARCH ACCOMPLISHMENTS

*Previous, TOP (from left): Award recipients at the COEIT Spring Celebration on May 5, 2019, photo by Chris Ferenzi Photography; Alex Mercado '18, mechanical engineering. Photo courtesy of Mercado; Govind Rao, professor of chemical, biochemical, and environmental engineering, speaking during UMBC's 2019 Presidential Faculty and Staff Award event. Photo by Marlayna Demond '11 for UMBC. MIDDLE: Students participate in COEIT's 2019 Summer Research Program. Photo by Dr. Erin Lavik, professor of chemical, biochemical, and environmental engineering. BOTTOM (from left): Baja Racing Team testing the 2018 vehicle in Moab, UT. Photo courtesy of the UMBC Baha SAE Team; Greg Szeto, assistant professor of chemical, biochemical, and environmental engineering, right, and Shirin Parsa '20, biological sciences, conduct research in one of the new Interdisciplinary Life Science Building's open-concept labs. Photo by Marlayna Demond '11 for UMBC.*



*Jim Milani. Photo courtesy of the Milani family.*

# *Remembering Jim Milani*

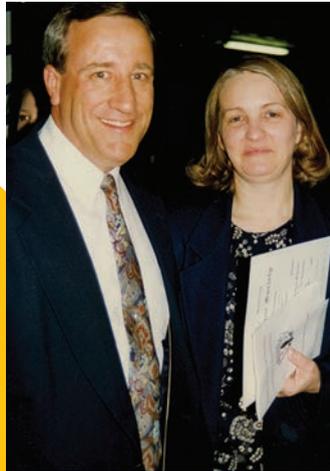
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*by Megan Hanks*

This year, UMBC mourned the loss of James R. Milani, Jr., assistant dean of administration and operations in the College of Engineering and Information Technology, who passed away on June 26, 2019. Throughout his 45-year career, Milani's calm, cheerful demeanor, positive personality, and dedication to UMBC were unparalleled.

Milani joined the UMBC family as a student in 1969. In 1973, he graduated with a degree in political science and began his professional career at UMBC. Throughout his time at UMBC, Milani held many positions of increasing responsibility across a range of disciplines and specializations. His diverse portfolio spanned from academic advising and counseling, to administrative affairs and finance. In each of these roles, he emphasized a passion for and support of student success and achievement.

## REMEMBERING JIM MILANI



"The UMBC community will always have great respect and love for our beloved colleague Jim, for his tireless commitment, and kind, open demeanor."

- President Freeman A Hrabowski, III



*Clockwise, from top left: Jim Milani and wife Liz Milani; Jim Milani as a student at UMBC; Jim Milani and UMBC President Freeman A Hrabowski, III. All photos courtesy of the Milani family.*



From left: Jim Milani coaching recreational sports; Jim Milani, former coworkers, and friends. Photos courtesy of the Milani family.



In 1987, Milani accepted the position of director of administration, where he helped in the development and growth of UMBC's College of Engineering. His role later expanded to include management of all administrative and business processes in the College. Milani was integral during the opening of UMBC's engineering building, supporting faculty and staff as they transitioned to the new space, and was a key contributor to campus laboratory safety guidelines, a significant accomplishment for UMBC.

"He had a tremendous impact on the College and across the university," says Dean Keith J Bowman. "There is no other person I have met in my personal or professional life who was more positive and optimistic. Like the very best coaches, he always made it clear that he wanted the best for everyone around him."

A committed member of the community, Milani was engaged in important campus initiatives over the years. He was a founding member of UMBC's Professional Staff Senate, where he served as a senator, vice president, and president. Milani also provided strong leadership to the development of the Employee of the Month award program. Most recently,

he served as a member of the implementation team and co-chair of the Faculty/Staff Advisory Committee of UMBC's Retriever Courage Initiative, created to address sexual violence/misconduct prevention and response.

A principal member of the Maryland Charity Campaign operating committee and a lead coordinator, he regularly contributed ideas to better support the campaign across campus. Milani's generous nature embodied the spirit of the campaign and was reflective of UMBC's culture of caring.

Milani received both a UMBC Presidential Distinguished Professional Staff Award and a USM Board of Regents' Award for his exceptional contributions to the University and the System.

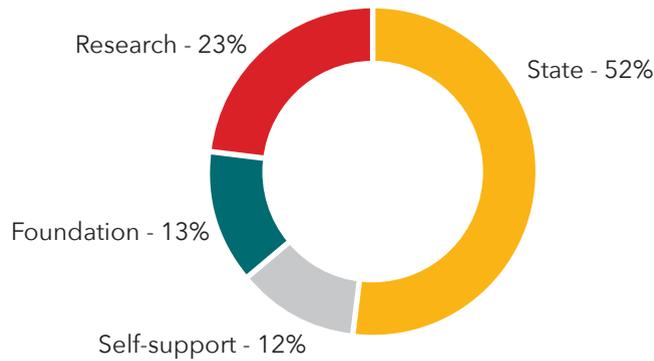
"The UMBC community will always have great respect and love for our beloved colleague Jim, for his tireless commitment, and kind, open demeanor," said President Freeman A Hrabowski, III. "He has dedicated himself to the accomplishment of UMBC's mission through his work with students, faculty, and staff – always putting the best interests of the university before himself." ♣

*Like the very best coaches, [Jim] always made it clear that he wanted the best for everyone around him.*

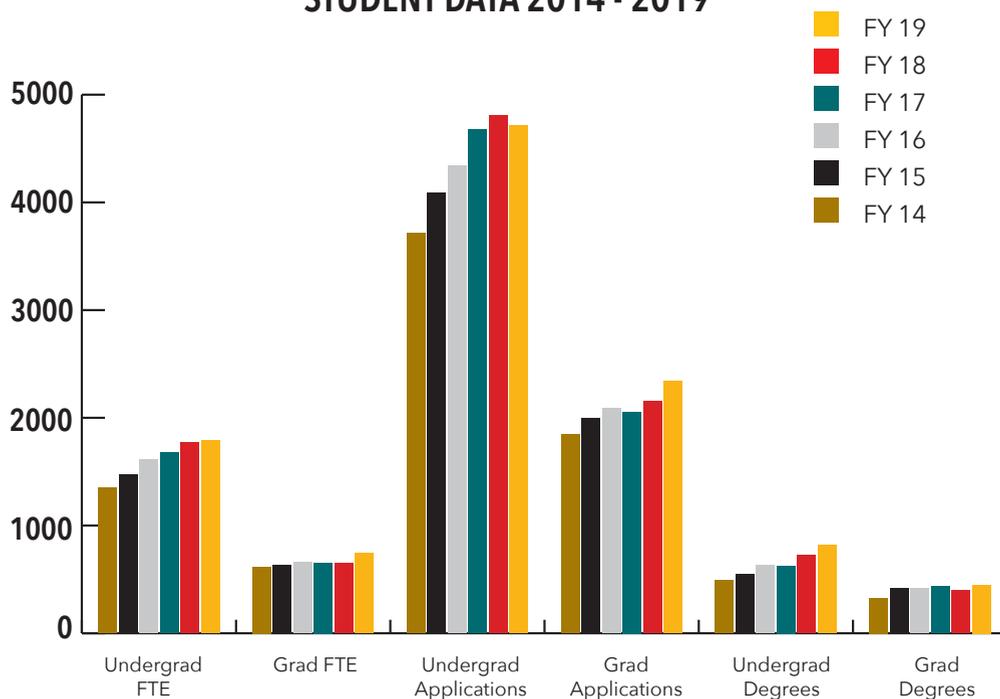
*– Dean Keith J Bowman*

# By the Numbers

## FY 19 FUNDING BY SOURCE



## STUDENT DATA 2014 - 2019



8%

GROWTH IN AVAILABLE FUNDS FY16 - FY 19

87%

COLLEGE FUNDS DEDICATED TO INSTRUCTION AND INSTRUCTIONAL SUPPORT COSTS

\$51 M

TOTAL FUNDS AVAILABLE IN FY19

1,271

DEGREES AWARDED IN 2019 (36% OF UMBC DEGREES AWARDED)

100%

GROWTH IN DEGREES AWARDED SINCE 2010

66%

GROWTH IN FULL-TIME EQUIVALENT STUDENTS SINCE 2010

\$13.5M

RESEARCH EXPENDITURES DURING FY19 (13% INCREASE SINCE FY14)

83%

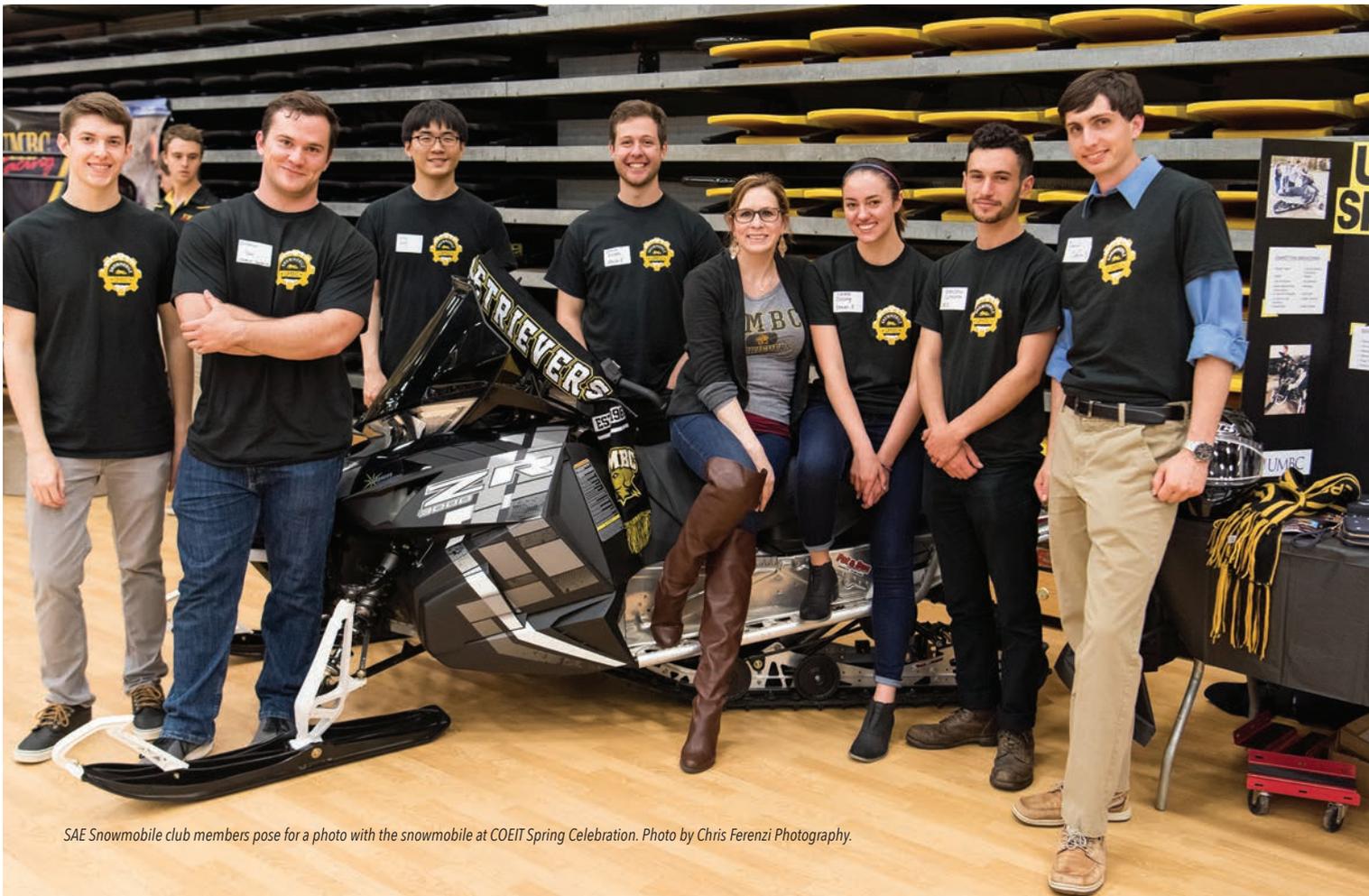
INCREASE IN SPONSORED AWARDS SINCE 2014 (\$13.6M IN FY19)

## **COEIT STUDENT ORGANIZATIONS**

American Institute of Chemical Engineers  
American Society of Mechanical Engineers  
Computer Science Education  
CWIT Student Council  
Cyber Defense Team  
Engineers Without Borders  
Game Developer's Club  
Grand Challenge Leaders of Tomorrow  
HackUMBC  
Information Systems Council of Majors  
Information Systems Security Association  
Institute of Electrical and Electronics Engineers  
Linux User's Group  
National Society of Black Engineers  
Retriever Robotics  
SAE Snowmobile Club  
Society of Asian Scientists and Engineers  
Society of Automotive Engineers  
Society of Hispanic Professional Engineers  
Society of Women Engineers  
SolarRetrievers  
Tau Beta Pi  
The American Institute of Aeronautics and Astronautics

Engineers Without Borders members pictured in Costa Rica. Photo courtesy of the EWB Organization.

# *Student Organization Highlights*



SAE Snowmobile club members pose for a photo with the snowmobile at COEIT Spring Celebration. Photo by Chris Ferenzi Photography.

## STUDENT ORGANIZATION HIGHLIGHTS

A group from Engineers Without Borders (top right, previous) traveled to San Rafael de Arencibia, Costa Rica, during Spring break of 2019 to define the community's priorities, collect data for design, and build the trust necessary for a successful partnership with the community.

The new UMBC chapter of SAE Snowmobile (bottom right, previous) was established. They plan to compete with their new vehicle in the national SAE Clean Snowmobile Challenge in March of 2020.

UMBC Retriever Robotics team-members at COEIT 2019 Spring Celebration. Photo by Chris Ferenzi Photography.



**UMBC** 2019 Baja Team (pictured top left, next page) from the student chapter of the Society of Automotive Engineers achieved the team's second best season in 30 years. The team placed 7th in the world out of more than a 100 teams that competed this year.

ASME held their annual "Let's Get Techy!" event where students from local elementary and middle schools participated in a day full of activities.

Linux Users Group held their bi-annual installment fest to help students install Linux on their computers.

UMBC's Computer Science Education Club organized an Hour of Code, and brought elementary school students from the Baltimore area to campus for the annual event that works to increase the participation of underrepresented groups in computing.

Retriever Robotics (pictured above) ranked fourth out of 48 teams in the VEX Robotics World Championship. 🏆



Clockwise, from top left: UMBC Baja SAE Car pictured in front of the Golden Gate Bridge. Photo courtesy of Baja SAE Team; NSBE Team-members pose for a photo after winning Collegiate Chapter Excellence Award. Photo courtesy of Warren Leggett, NSBE Member; Undergraduate researchers gather outside one of the labs in the ILSB. These spaces are designated as writing and meeting space for student researchers. Photo by Marlayna Demond '11 for UMBC; Julianna Posey '19, mechanical engineering, a Center for Women in Technology Scholar. Photo by Chris Ferenzi Photography; Neha Raikar, Jennie Leach, Amira Abukhdair, Mark Marten and Blair Hunt pose for a picture at COEIT 2019 Spring Celebration. Photo by Chris Ferenzi Photography; Narendra Goud Pandala, Devorah Cahn, Sydney Meinkeheim, Nuzhat Maisha, Joshua Leckron, and Grace Jones, students from Dr. Lavik's lab go bowling. Photo courtesy of Erin Lavik; Amrita Anam, Pooja Parameshwarappa and Prathamesh Walkikar pose after UMBC Hackathon. Photo courtesy of Amrita Anam.

*Below: Niara Richards, left, Josh Mpere, and Nithya Prakash. Photo by Marlayna Demond '11 for UMBC.  
Next page: Nithya Prakash, Swathi Krithivasan, and Josh Mpere being recognized at the award ceremony.  
Photo by Mike Lackner, computer science and informatics, and technology instructor at Loyola Blakefield High School.*



# UMBC STUDENTS WIN TOP PRIZE AT MARYLAND CYBER CHALLENGE

**BY MEGAN HANKS**

**B**usy teams of students clustered around laptops in a room overlooking Baltimore's Inner Harbor focused on solving as many challenges as possible during a "capture-the-flag" style competition. After hours of intense competition in cyberspace, UMBC's team emerged victorious, named champions of the college division of the 2018 Maryland Cyber Challenge.

Started in 2011, the competition is part of the annual CyberMaryland Conference. UMBC's team included Niara Richards '22, computer science; Nithya Prakash '22, information systems; Josh Mpere '19,

computer science; Seamus Burke '20 computer science; and Swathi Krithivasan '22, computer science. They worked together to test their skills in a series of real-world cybersecurity challenges over the course of two virtual qualifying rounds and then the final competition, beating talented teams from the U.S. Air Force Academy and University of Maryland, University College.

"It was my first time competing in the Maryland Cyber Challenge, although I have a pretty extensive competition background," said Burke. "I am especially proud of my freshman teammates who put

in a ton of effort, solved challenges, and didn't get discouraged when the challenges got more difficult."

Burke is a Center for Women in Technology (CWIT) Scholar and Mpere is a Cyber affiliate. Richards, Prakash, and Krithivasan all participate in UMBC's Cyber Scholars Program, which works to prepare the next generation of cybersecurity professionals.

All five members of the winning team will receive a monetary award and an offer to complete a summer internship to continue growing their experience and

skills. Additionally, the university will receive new technologies (including software) to support more UMBC students in developing their cybersecurity skills.

"The competition was a fantastic experience and gave me a lot of exposure into topics that I otherwise would not have gained, especially as a freshman," said Krithivasan. "We had a mix of both upper and underclassmen on our team, which really enabled us to learn and grow from working with each other." ▮

*"I am especially proud of my freshman teammates who put in a ton of effort, solved challenges, and didn't get discouraged when the challenges got more difficult."*

*– Seamus Burke '20*



*College Faculty &  
Research Highlights*

**"It's a great honor to be selected as an ACM fellow, since it is based on the recommendations of one's peers and recognizes contributions to the field of computing."**

**- Tim Finin**



# UMBC'S TIM FININ NAMED AN ACM FELLOW FOR ADVANCEMENTS IN ARTIFICIAL INTELLIGENCE AND SEMANTIC WEB TECHNOLOGY

BY MEGAN HANKS

**T**im Finin, professor of computer science and electrical engineering (CSEE), has been named a fellow of the Association for Computing Machinery (ACM), a distinctive honor granted to less than one percent of all ACM members. ACM fellows are selected based on their work to advance computing over the course of a career, in areas such as mobile networks, computer architecture, robotics, and security.

"It's a great honor to be selected as an ACM fellow, since it is based on the recommendations of one's peers and recognizes contributions to the field of computing," says Finin. "I am especially honored since ACM fellows include so many pioneers of the field whose work and contributions I have studied and used over the past 40 years."

"Dr. Finin has been a leader in our department ever since he came in as the chair in 1991," says Anupam Joshi, professor and chair of CSEE. "He is one of our most accomplished researchers, and in addition to

this fellowship, has been recognized both internally (as a Presidential Research Professor) and externally with numerous awards." Joshi continues, "Tim is a great teacher, and he has mentored a number of our mid-career and senior faculty, including me!"

Throughout his career, Finin has been involved with various aspects of ACM. As a graduate student at the University of Illinois Urbana-Champaign, Finin became a member of ACM's special interest group on artificial intelligence (SIGART), which is one of his primary areas of focus. In the years since then, he has collaborated with numerous many UMBC faculty, students, and alumni, in addition to colleagues in industry and at other institutions, to move this work forward.

In the 1990s, and with support from the Defense Advanced Research Projects Agency (DARPA), Finin worked with UMBC faculty to develop new software standards to support the then-new concept of intelligent multiagent systems. The software, called the Knowledge Query and Manipulation Language,

was used to develop intelligent applications and as the basis for faculty research and many Ph.D. dissertations.

The ACM's Conference for Information and Knowledge Management awarded Finin and his collaborators with the 2018 Test of Time Award for a 1994 paper about this research that has continued to have an important impact on the research community.

Finin and a group of collaborators also worked on projects related building the semantic web. "The idea was to enhance the new web technologies with a way to enclose structured data that machines could use into ordinary web pages," he explained. He adds that this

allowed computers to understand the information on the web page without having to understand natural language.

Starting in the 2000s, Finin and his collaborators focused much of their work on blogs and then social media, including Facebook and Twitter. They explored how to analyze the data collected on these sites, and also how to protect and improve security and privacy features.

"I've only been able to do this because of the environment at UMBC," Finin says, reflecting on the encouragement he has received to pursue new collaborations and areas of research.

"Based on my experience," he shares, "I hope to mentor more faculty in the middle of their careers," to help them access opportunities through organizations like ACM.

Finin currently oversees and mentors UMBC's student chapter of ACM, which includes both undergraduate and graduate students. The student organization sponsors weekly talks and other events for people in the UMBC community who are interested in computing and related topics.

Finin joins Roy Rada, professor emeritus of information systems, who is also an ACM fellow. ♣

*Tim Finin (right) with colleagues from the CSEE department. Photo by Marlayna Demond '11 for UMBC.*





## FACULTY AND RESEARCH HIGHLIGHTS

Cynthia Matuszek, assistant professor of computer science and electrical engineering (CSEE), was granted Strategic Awards for Research Transitions (START) funding to advance her work on robots that assist senior citizens in daily life and enable them to continue to live independently. She is collaborating with eldercare professionals to develop a library that will outline specific examples of how seniors can utilize assistive robots in daily life. Matuszek also received Summer Research Faculty Fellowship (SURFF) funding to develop a networking event at the Robotics: Science and Systems conference, to connect junior faculty and postdoctoral researchers with mentors in robotics.

Frank Ferraro, assistant professor of CSEE, used SURFF funding to advance his work in natural language processing. He studied how information extraction systems can help deconstruct and summarize highly complex documents. Over summer 2018, Ferraro developed, trained, and evaluated these systems to determine how they can be effectively used to help people understand themes within dense and complicated texts.

Haibin Zhang, assistant professor of CSEE, developed an efficient, secure and scalable system that helps prevent compromised sensors from shifting aggregated data results based on polluted data. The system that Zhang designed and put in place helps solve the problem by keeping individual sensor inputs private. ▮



*From top: Rick Forno, left, and Alan Sherman; Undergraduate researchers outside the TCARD<sup>2</sup> lab; Karla Negrete, right, working in the lab along with her mentors Aswani Poosapati and Deepa Madan. All photos by Marlayna Demond '11 for UMBC.*

# PORTA-NERDS: MEET THE TEAM CHANGING HOW PEOPLE THINK ABOUT WASTE THROUGH EPA-SUPPORTED RESEARCH

BY MEGAN HANKS



From top: Lee Blaney; Marc Zupan; Both photos by Marlayna Demond '11 for UMBC.

UMBC's Lee Blaney is known for his innovative research on water and soil contamination, working to keep people and the environment healthy. His latest project takes that focus in a new direction by developing an innovative system to recover nutrients from an unexpected source: human urine.

Blaney, associate professor of chemical, biochemical, and environmental engineering, received a phase one grant from the Environmental Protection Agency's People, Prosperity, and the Planet (P3) program to investigate the ability of his Nutrient Extraction and Recovery Device (NERD) technology to recover nutrients from human urine.

This project will advance knowledge about how sustainable resource recovery technologies can be implemented. "Human urine accounts for the majority of nutrients in municipal wastewater, but only a small fraction of the flow," explains Lee Blaney, associate professor of chemical, biochemical, and environmental engineering. "When urine gets diluted into the wastewater system, it makes it more difficult to treat and recover these nutrients. So, we wanted to go to the source—toilets."

Blaney worked with co-PI Marc Zupan, associate professor of mechanical engineering, and ten UMBC students to develop a system that can recover around 90% of the phosphorus, an ecologically

important nutrient, and some of the nitrogen and potassium from collected urine samples. These nutrients can impair water quality by causing the formation of dead zones in places like the Chesapeake Bay and Gulf of Mexico, so developing a low-cost way of removing them from urine could have a major impact.

Once removed, those nutrients can then be used in ways that are beneficial rather than harmful to human and environmental health. "The recovered nutrients can be used as a fertilizer," says Blaney. "By 'recycling' these nutrients, we also avoid the economical and energy costs associated with traditional fertilizers. It's a win-win for the environment and our wallets."

All P3 projects are required to include an educational component, to ensure researchers are sharing knowledge about the environment and sustainability. The student role in this particular project is significant.

Both undergraduate and graduate students have worked to develop and institute the NERD technology, which modified portable toilets to collect and process urine samples. In April, several students presented their work at the USA Science and Engineering Festival in Washington, D.C.

"I would say the biggest impact our work had at the USA Science and Engineering

Festival was getting people to think differently about 'waste' by raising their awareness of nutrient recovery," says Josh Benoit '18, chemical engineering. "Most people had never heard of the term 'nutrient recovery' and once they learned about it were excited about the potential of the Porta-NERDS system."

Charles Portner '18, chemical engineering, who worked with Blaney and Benoit, says that presenting their work in Washington D.C. allowed the group to explain the simplicity of the technology and how it can be implemented easily. "Folks could potentially have fixtures operating on this technology installed in their private homes or schools without having to wait for municipal adoption," Porter says, explaining that the system could decrease the burden on municipal

treatment systems and empower "aver-age folks who wanted to do their part."

In the future, Utsav Shashvatt Ph.D '19, environmental engineering, hopes this work will impact communities globally. "I am excited about the potential of bringing these cost-effective portable nutrient recovery technologies to communities around the world." And, as Sophia Lopresti '18, global studies, states "There are so many ways that human waste disposal affects our environment and our future health, yet urine continues to be a 'taboo' topic, but not to those who stopped at our table."

NSF recently produced a video about research being done in Blaney's lab. The full video can be viewed on the NSF website. 📺



*Students in Lee Blaney's lab presenting at USA Science and Engineering Festival in Washington, D.C. Photo courtesy of Lee Blaney.*



Spectators applaud at the 2019 COEIT Spring Celebration. Photo by of Chris Ferenzi Photography. Back cover photos, left to right: Carolyn Seaman, interim director of the Center for Women in Technology; Ronghui Ma, undergraduate program director, mechanical engineering; And don't forget a special appearance by the world's most photogenic service dog, Chief, who is a good boy. All pictured at COEIT Spring Celebration. Photos by Chris Ferenzi Photography.



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