2022 ANNUAL REPORT

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY

UMBC

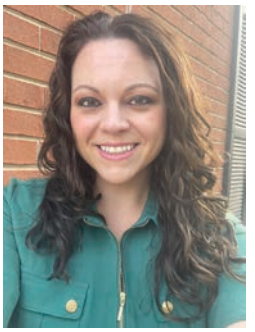
CELEBRATING 30 YEARS

Cover photos: foreground, Courtesy Keith J Bowman, dean of COEIT; background, Christopher Burns on Unsplash.














COLLEGE WELCOME

Thirty years ago, when what would become the College of Engineering & Information Technology (COEIT) was launched as the new College of Engineering at UMBC, it was a different era. The movie *Groundhog Day* had just opened while UMBC was recovering from challenging economic times, including budget cuts that required difficult decisions. And not everyone on campus understood the value of computing and engineering fields, with a column in The Retriever suggesting we might be training "robotized…tech-heads." Since then, I believe we have developed a stronger appreciation for diversity, including those who are neurodiverse. Still, our university was beginning to embark on a rapid period of growth, with one *Baltimore Sun* headline declaring that UMBC was a distinctive university "Where Vision Matches Achievement."

As we celebrate COEIT's 30th anniversary, we're reminded of that important moment of transition, as well as how much our programs and the university have grown, and the impact that our faculty, staff, students, and alumni have had.

In 1993, our college's first building reached full occupancy and programs that comprise today's College of Engineering & Information Technology produced 375 bachelor's degrees, 75 master's degrees, and 12 doctorates. Last year, our college produced a record 45 doctorates, well beyond the previous record. And this year we should triple the number of bachelor's and produce nearly seven times the number of master's degrees, compared to thirty years ago.

We have now reached milestones we wouldn't have thought possible thirty years ago.

- Applications for COEIT undergraduate and graduate programs are at record levels.
- Our research enterprise is the most successful it has ever been as part of UMBC's ascendance to Carnegie R1 status.
- Support for UMBC's growth in workforce development, healthcare engineering, computing education, and cybersecurity has resulted in at least $6M in added support from the state to UMBC. Over $4M is an addition to UMBC's recurrent annual budget.

We continue to grow at a rapid rate.

- Over one-third of COEIT's full-time faculty members have been hired since 2017, and our students, staff, and faculty are the most diverse in UMBC's history.
- Research awards for grants and contracts processed in the college were nearly $23M in the 2021-2022 fiscal year, which is more than double any year before 2018.

There is a lot to celebrate and also a lot to plan for as we seek to continue advancing the college and UMBC in our fourth decade.

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UMBC OPENS NEW ACADEMIC YEAR WITH NEW PRESIDENT, LARGEST-EVER INCOMING CLASS

BY KAIT McCAFFREY

President Sheares Ashby eagerly welcomes UMBC's new students. Photo by Marlayna Demond '11/UMBC.

As UMBC President Valerie Sheares Ashby looked out at the crowd of eager first-year students during the fall 2022 Convocation ceremony to open the academic year, she reinforced the importance of marking this formative chapter. And with well over 2,100 new first-year students, and record numbers of graduate and international students, this is a new chapter for UMBC's largest incoming class yet.

"In an increasingly competitive college admissions landscape characterized by a declining pool of high school graduates and increasing costs of attendance, UMBC's ability to continue to attract a strong and talented first-year class speaks to, among many things, our reputation as an institution that offers an exceptional collegiate experience that is affordable," says Yvette Mozie-Ross '88, UMBC's vice provost for enrollment management and planning. This includes in-demand programs at both UMBC's main campus and the Universities at Shady Grove in Montgomery County.

In addition to a record number of new first-year students, UMBC enrolled over 3,300 graduate students for fall 2022, marking an impressive 500-plus increase over last year's fall enrollment.

WELCOMING THE INCOMING CLASS

Veronica Goonan, an incoming first-year student, knew once she visited campus that she had found her place. "I had an incredible opportunity to tour campus with the [mock trial] team in the fall of my senior year, and that's when I began to know that my place was here," she said. "I could feel the innovation and excellence that UMBC boasts."

One of the biggest goals in the first few weeks of the new academic year is to ensure students have opportunities to get to know the campus and begin learning about the possibilities available to them throughout their academic career.

FEATURE STORY

"THIS IS A TIME WHEN YOU BEGIN TO DEFINE WHAT YOU LOVE, WHAT REALLY MATTERS TO YOU, WHO YOU WANT TO BE IN THIS WORLD, AND WHAT DIFFERENCE YOU WANT TO MAKE IN THE LIVES OF OTHERS."

Valerie Sheares Ashby

UMBC President

"In the Division of Student Affairs, we take the role of welcoming and holding space for our students seriously. Those first few days and weeks are about making sure that we are doing all we can to help them carve out their own path while they are here," says Jen Dress, associate director of campus life.

A robust Welcome Week full of fun and engaging events is an important part of this experience. When new students moved in last Saturday, they were treated to some of UMBC's favorite traditions. Once the boxes were unpacked, the beds were made, and the posters of (insert cool band here) were hung, students and their families made their way to Erickson Field.

If new Retrievers didn't know the school colors before, they certainly did now. Swag

President Sheares Ashby greets new students on the first day of classes, fall 2022. Photo by Marlayna Demond '11/UMBC.

Veronica Goonan addresses the audience during Fall Opening Meeting. Photo by Marlayna Demond '11/UMBC.

tables, information tables, and goodie tables lined the field, all decked out in UMBC's signature black and gold. Even the animals in the petting zoo got the memo.

Once families said their goodbyes and maybe a few students and parents teared up got something in their eye, celebrations continued with Playfair and the annual fireworks display. New Retrievers played "getting to know you" games to break the ice and capped off the night with a spectacular fireworks show.

A PLACE FOR EVERYONE

Incoming transfer student Luther Daigle, mechanical engineering, summed up the feeling hearing about UMBC versus coming to UMBC by saying, "It wasn't until I toured the campus and I felt an overwhelming sense of belonging that I knew I wanted to continue my academic career at UMBC." And that feeling has carried through the start of his first semester.

This sense of belonging extends to UMBC's rapidly growing population of international students. As of the end of August, over 2,200 international students were enrolled for the 2022 – 2023 academic year.

"As UMBC's international reputation continues to grow, more students from around the world choose to join our campus community," says David Di Maria, associate vice provost for international education. "We are very pleased to welcome the largest number of international students in UMBC's history."

Jok Thon, an incoming graduate student studying entrepreneurship, innovation, and leadership, is the first student from South Sudan to enroll at UMBC and he was buoyed by the diversity represented in the community he'd be joining.

Addressing his peers at the annual Fall Opening Meeting, Thon said, "We have an incredibly diverse and creative campus community. We have such an opportunity to learn from this global village…maybe we should even think of it as our responsibility as global citizens to learn from each other during our time at UMBC."

During Convocation, 2022 Presidential Teaching Award recipient Tamra Mendelson echoed the importance of this saying, "Inclusive to me means that we not only value, we require a diversity of backgrounds to make the world a better place. It's the only way we will achieve a more accurately educated, environmentally conscious civil society."

STUDENTS AT THE CENTER

While students may think faculty and staff are the backbone of their educational career, their educators and advisors would argue it's the opposite—students themselves are at the core of UMBC.

"If there was an equation to describe UMBC, our students would be the

Luther Daigle addresses the crowd at Fall Opening Meeting. Photo by Marlayna Demond '11/UMBC.

essential term. We are committed to providing each of our outstanding students with a first-class education and the support needed to achieve success, whether that means meeting with the CNMS success coach, participating in programs at The Learning Collaboratory, or working one-on-one with a faculty mentor," said William R. LaCourse, dean of the College of Natural and Mathematical Sciences (CNMS). "Inclusive excellence is more than just words—it is our mission."

LaCourse himself knows the importance of connecting with students on a foundational level. In the spring, you can find him co-teaching CHEM 100: The Chemical World to non-chemistry majors.

Keith J Bowman, dean of the College of Engineering and Information Technology (COEIT), points to the essential role that student leaders play in reaching out to and connecting with new students, and helping them feel welcome and connected.

"All summer I have been hearing from student org leaders from our college," says Bowman. "Their enthusiasm to engage with current and new members is very exciting."

Among the new students Dean Kimberly Moffitt welcomed to UMBC's College of Arts, Humanities, and Social Sciences (CAHSS) this year are several Shriver Peaceworker Fellows, who gathered on campus on August 1 to kick off their fellowship. These Returned Peace Corps Volunteers pursue

A Retriever family stops to pose with President Sheares Ashby (in gold). They include (l-r): Myra Sydnor, Camryn Sydnor, and Maryland State Senator Charles Sydnor. Photo by Marlayna Demond '11/UMBC.

"ALL SUMMER I HAVE BEEN HEARING FROM STUDENT ORG LEADERS FROM OUR COLLEGE. THEIR ENTHUSIASM TO ENGAGE WITH CURRENT AND NEW MEMBERS IS VERY EXCITING."

Keith J Bowman

COEIT Dean

graduate degrees in a range of fields (such as teaching and applied sociology) while also working with community partner organizations to address diverse social needs, and actively reflecting on their learning and engagement experiences.

This multifaceted approach exemplifies how work in the classroom, hands-on learning, community engagement, and service connect to form the unique UMBC student experience.

LESSONS LEARNED AND LOOKING FORWARD

As new members of the UMBC family look forward to the coming year, many are also looking back at the people and moments that led them to UMBC. Formally addressing the UMBC campus for the first time at Fall Opening Meeting, Sheares Ashby shared the lessons of her own mentors that she's carried through life.

Just your normal campus petting zoo. Photo by Marlayna Demond '11/UMBC.

"I learned from their wonderful examples—that taking the time to encourage, empower and promote others can change lives, that true excellence can never be achieved without diversity, that leadership requires courage to sometimes make hard decisions, and that treating people with decency and kindness will never be outdated or obsolete," she said.

Fall Opening Meeting also shined a spotlight on faculty and staff members who have called UMBC home for years and, in some instances, decades, serving as mentors and helping to grow the UMBC community.

David Hoffman, Ph.D. '13, language, literacy, and culture (LLC), director of the Center for Democracy and Civic Life, reflected on his 19 years at UMBC saying, "UMBC is beautifully unfinished. There is room to contribute: to grow and create together. And every day, I get to work with students, faculty, and staff members who teach, challenge, and nurture me."

NEW BEGINNINGS

The academic year officially kicked off on August 31 and the excitement on Hilltop Circle was palpable. Students found their way through the sea of black and gold to reunite with friends and every welcome tent was staffed with someone offering

Fireworks lighting up the UMBC night sky. Photo by Marlayna Demond '11/UMBC.

"IT WASN'T UNTIL I TOURED THE CAMPUS AND I FELT AN OVERWHELMING SENSE OF BELONGING THAT I KNEW I WANTED TO CONTINUE MY ACADEMIC CAREER AT UMBC."

Luther Daigle, mechanical engineering

directions, encouragement, and, of course, snacks.

Throughout the day, the UMBC community answered the question, "What are you most excited about for this year?" on Instagram. The answers ran the gamut from making straight A's to meeting new people and attending sporting events, with comments that spoke to the vibrancy and humor of the UMBC community.

"This time of year on a college campus is nothing short of magical. The energy, excitement, and hope in the air are the things that make the work all worth it," says Dress.

•

Five of UMBC's 2022 Fulbright student scholars (l-r): Maryam Elhabashy, Kaitlyn Szekerczes, Kaitlyn Keaton, Adrianna-Marie Urbina-Ruiz, and Chemutai Wangui Nganga. Photo by Marlayna Demond '11/UMBC.

Kaitlyn Keaton. Photo by Marlayna Demond '11/UMBC.

UMBC'S 2022 FULBRIGHT STUDENT SCHOLARS WILL TRAVEL THE WORLD TO EXPLORE DIFFICULT QUESTIONS

BY CATALINA SOFIA DANSBERGER DUQUE

EIGHT RECENT UMBC

graduates and alumni will soon travel to countries across three continents as 2022 Fulbright U.S. Student scholars. They include emerging leaders in education, astrophysics, cybersecurity, human rights, and more, and they are excited to explore difficult questions through fresh perspectives.

The Fulbright Program is the U.S. government's flagship international exchange program. UMBC was named a Fulbright Top Producing Institution in 2019 – 2020. In the last decade, UMBC has received over 60 Fulbright U.S. Student Program awards for research and teaching placements in Africa, Asia and the Pacific, the Middle East, South America, and Europe.

CREATING NEW PATHS

This year marks UMBC's first Fulbright awards to the UK. Kaitlyn Keaton '22, computer engineering, a Cyber Scholar in the Center for Women In Technology, will head to Newcastle University (NU) in North East England to complete a master's in cybersecurity. NU is recognized jointly by the UK's National Cyber Security Center and the Engineering and Physical Sciences Research Council as an Academic Centre of Excellence in cyber security research.

Keaton has focused on making the most of her college education by pursuing a wide range of learning experiences. She has held competitive software engineering internships at General Dynamics Mission and Systems and Northrop Grumman Mission Systems, and has participated in Capture the Flags cybersecurity competitions, but this will be her first learning experience abroad.

As a Cyber Scholar and Tau Beta Pi Engineering Honors Society member, Keaton is determined to further develop the skills necessary to be on the cutting edge of cybersecurity research. She is also committed to creating new pathways for more women and girls to be leaders in engineering.

"I want to inspire and encourage even more girls and young women to join the cybersecurity world," says Keaton. "There is a critical need to get girls interested at younger ages to show them they can do it too." ●

"I WANT TO INSPIRE AND ENCOURAGE EVEN MORE GIRLS AND YOUNG WOMEN TO JOIN THE CYBERSECURITY WORLD."

Kaitlyn Keaton

Nadja Franklin in front of the MDOT building. Photo by Marlayna Demond '11/UMBC.

"THE STATE OF MARYLAND HAS REALIZED TREMENDOUS VALUE FROM THE PARTNERSHIP WITH UMBC THROUGH THE TECHNOLOGY INTERNSHIP PROGRAM. BEYOND THE CONTRIBUTION OF THE STUDENTS DURING THEIR INTERNSHIP, MANY HAVE GONE ON TO BECOME PERMANENT MEMBERS OF THE TEAM. THIS PROGRAM HELPS TO FILL THE WORKFORCE PIPELINE WITH QUALIFIED AND TALENTED WORKERS, LESSENING THE IMPACT CAUSED BY THE SHORTAGE OF TECHNOLOGY AND CYBERSECURITY WORKERS."

Chip Stewart,

Maryland's State Chief Information Security Officer

UMBC STUDENTS, EDUCATORS, AND RESEARCHERS ADVANCE MARYLAND THROUGH INNOVATIVE COMPUTING PARTNERSHIP

BY MEGAN HANKS MASTROLA

IN EARLY 2022, NADJA FRANKLIN '23 WAS exploring summer opportunities through the UMBC Career Center when she heard about a chance to connect with tech internships at Maryland's state agencies. As a business technology administration major, her interest was piqued. She arrived at the on-campus internship event with résumé in hand, ready to discuss her skills, and her preparation and enthusiasm paid off.

The hiring event was hosted by the Maryland Institute for Innovative Computing (MIIC) to help state agencies expand their technical talent pipeline through intern recruitment. The MIIC is a collaboration between the University System of Maryland and partners in the public and private sectors, launched in 2021. Administered by UMBC, the MIIC addresses workforce challenges related to computing and analytics in state agencies. Students at colleges and universities across Maryland are eligible to apply for internships through the MIIC, connecting skilled students with state employers seeking fresh tech talent.

TALENT MEETS OPPORTUNITY

The MIIC is continuously growing the pipeline of tech talent ready to support state agencies in the longer term, helping them run securely and efficiently. So far, in 2022, they've connected nearly 40 interns with opportunities at state agencies across Maryland, including the Department of Labor, Department of Information Technology, Department of Health, Department of Transportation and the Chief Data Office within the Governor's Office.

"The MIIC reflects Maryland's dedication to ensuring our state agencies have the technical staffing and internal infrastructure they need," explains Annie Weinschenk, program director of workforce initiatives in the UMBC Career Center.

"With cyber crime on the rise, including attacks on government agencies, MIIC is helping to build a skilled workforce dedicated to service within the state of Maryland," Weinschenk says. "MIIC internship areas range from data

"WE WORK TO MAKE SURE [STUDENTS] PUT THEIR BEST FOOT FORWARD, SO THEY CAN ACCESS THESE UNIQUE HANDS-ON LEARNING OPPORTUNITIES."

Annie Weinschenk,
Program Director of Workforce Initiatives
UMBC Career Center

science, cybersecurity, and artificial intelligence, to geographic information systems at seven agencies across Maryland."

PREPARED TO SUCCEED

Franklin is a T-SITE Scholar in UMBC's Center for Women in Technology who transferred to UMBC from the Community College of Baltimore County. At the MIIC event, she connected with the Maryland Department of Transportation (MDOT) about projects that would draw on her interests and experience, and she realized the opportunity could be a great match.

Afterward, she quickly completed her application for a project management internship in MDOT's information technology department. She also accessed other Career Center resources to help her stand out as a top candidate, including interview prep with Weinschenk and Career Center Director Christine Routzahn.

"Students come to their internship experiences with a variety of backgrounds, levels of experience, and majors," says Weinschenk. "We work to make sure they put their best foot forward, so they can access these unique hands-on learning opportunities."

MEANINGFUL CONNECTIONS

Franklin's primary project with MDOT involves radio frequency identification (RFID), tagging IT and non-IT assets for use in various projects across the agency. But she has particularly enjoyed the chance to meet with MDOT's chief information officer and deputy chief information officer. She's also had a chance to learn about the broad range of projects across MDOT, and how project management works, through supporting directors' meetings.

Franklin also drew on her writing skills and creativity to help develop scripts for MDOT training videos, and she enjoyed a unique chance to participate in the video filming and production process.

Beyond learning new skills, her favorite aspect of the internship has been MDOT's inclusive, welcoming environment.

K-12 AND HIGHER ED PARTNERSHIPS

While Franklin came to UMBC interested in a career in tech, that's not the case for many students who have the talent and skills to succeed in tech fields. With this in mind, the MIIC has also focused on expanding K-12 initiatives, to help prepare students earlier on for these high-demand careers, particularly in cybersecurity.

Earlier this year, Governor Larry Hogan announced the launch of the Maryland Cyber Range for Elevating Workforce and Education, operated by the MIIC. This $1.2 million initiative will expand cybersecurity education and training through collaboration with the Maryland Center for Computing Education (MCCE), Virginia Tech U.S. Cyber Range, and the nonprofit Teach Cyber.

This partnership will include initiatives at all educational levels, from K-12 through higher education and workforce training. The U.S. Cyber Range will provide access to a high quality simulated environment for teachers and students to learn cybersecurity.

Overall, this collaborative effort will enable Maryland to continue to grow and strengthen the state's cybersecurity education infrastructure, explains Jack Suess, UMBC's vice president of information technology and chief technology officer.

INNOVATING CYBERSECURITY EDUCATION

A leader in cybersecurity education, UMBC is also advancing the field in other ways, complementing the work of the MIIC. For example, Alan T. Sherman, professor of computer science, recently received more than $260,000 of a $500,000 grant from the National Science Foundation (NSF) to study and improve how cybersecurity is taught at the U.S. Naval Academy and U.S. Military Academy.

The project, Examining Pedagogy in Cybersecurity (EPIC), is collaborative with the University of Illinois Urbana-Champaign and University of Minnesota Duluth, and is funded through NSF's Secure and Trustworthy Computing (SaTC) program. Because the academies teach cybersecurity to all first-year students, EPIC offers a large-scale opportunity to investigate how simulation-based teaching and learning affects different student populations.

In the first phase of the research, Sherman and his collaborators—including computer science Ph.D. student Andew Slack and Linda Oliva, assistant professor of education—will study how instructors at the academies structure and teach their cybersecurity courses. In the second phase, they will introduce active simulation-based learning exercises and pedagogies and assess their effectiveness.

UMBC's championship-winning Cyberdawgs cyberdefense team will help adapt and improve learning materials. As one quantitative measure of the new pedagogy's effectiveness, EPIC will assess students' conceptual understanding using the Cybersecurity Concept Inventory (CCI), developed by Sherman and his team.

BENEFITS FOR MARYLAND

MIIC initiatives continue to expand in new directions. In research, The Hilltop Institute at UMBC is receiving funding to bring together health data related to opioid addiction from different state sources to more accurately identify patients' risks for relapse. Like the MIIC's educational initiatives, this work demonstrates how innovations in computing can benefit Maryland and its residents. •

FRANKLIN'S PRIMARY PROJECT WITH MDOT INVOLVES RADIO FREQUENCY IDENTIFICATION (RFID), TAGGING IT AND NON-IT ASSETS FOR USE IN VARIOUS PROJECTS ACROSS THE AGENCY. BUT SHE HAS PARTICULARLY ENJOYED THE CHANCE TO MEET WITH MDOT'S CHIEF INFORMATION OFFICER AND DEPUTY CHIEF INFORMATION OFFICER.

COEIT BY THE NUMBERS

1580 DEGREES AWARDED IN FY22

27%

increase in degree production since FY18 (compared to FY22)

6233 TOTAL STUDENTS IN FALL 2022

30%

increase in headcount since fall 2017

2740 FTES IN FY22

13%

increase in FTEs since FY18

44% OF TOTAL UMBC HEADCOUNT

64% OF UMBC GRAD HEADCOUNT

38% OF UNDERGRAD HEADCOUNT

$14.3M IN RESEARCH EXPENDITURES IN FY22

50%

increase in $ research expenditures (FY22 vs. FY18)
*excludes Centers

$22.8M IN NEW RESEARCH AWARDS IN FY22

57%

increase in research funding awarded (FY22 vs. FY18)

125 FTF IN FALL 2022

21 NTT; 85 T/TT FALL 2017
40 NTT; 85 T/TT FALL 2022

18%

increase in FTF since fall 2017

74% 6-YEAR GRADUATION RATE FOR 1ST TIME FRESHMEN

10%

improvement over the last five years

Faculty in the Deparement of Information Systems pose for a photo. [Names needed?] Photo by Marlayna Demond '11/UMBC.

Left: Anupam Joshi presents UMBC's economic impact metrics and workforce data to Maryland state leaders; Right: Anupam Joshi. Photos by Marlayna Demond '11/UMBC.

UMBC'S ANUPAM JOSHI, CYBERSECURITY INNOVATOR, TO EXPAND LEADERSHIP IMPACT AS 2022–23 ACE FELLOW

BY DINAH WINNICK

ANUPAM JOSHI, A PROFESSOR focused on both high-impact computing research and expanding access to computer science and cybersecurity education, has been named a 2022–23 American Council on Education (ACE) Fellow.

Joshi is the Oros Family Professor and chair of computer science and electrical engineering at UMBC and director of UMBC's Center for Cybersecurity. He will spend the coming academic year with University System of Maryland (USM) leaders, shadowing both USM Chancellor Jay A. Perman and Bruce Jarrell, president of the University of Maryland, Baltimore (UMB).

UMBC has a strong history of leaders participating in the ACE Fellows program, an intensive mentorship program that has prepared faculty, staff, and administrators for senior positions in college and university leadership since it began in 1965. More than 80 percent of the program's 2,500 past Fellows have gone on to serve as chief executive officers, chief academic officers, other cabinet-level positions, or deans following their fellowship.

"The ACE Fellows program embodies ACE's goal of enriching the capacity of agile leaders to problem-solve and innovate, and it fuels the expansion of a talented and diverse higher education leadership pipeline," said ACE President Ted Mitchell. "Fellows continue to excel in prominent leadership roles, and the potential of this new cohort to bring strong leadership to institutions across America greatly excites me."

FOCUS ON INNOVATING INSTITUTIONS

Following a rigorous application process, ACE selected 46 Fellows this year from colleges and universities across the United States. Throughout the year, these Fellows will observe and work with senior leaders at their host institution, attend decision-making meetings, and focus on issues of interest. They will also conduct projects of pressing concern for their home institutions, with the goal of returning after their fellowship year prepared to guide positive change.

"I am thrilled and honored to be mentored by two stalwarts of higher education in Chancellor Perman and President Jarrell," Joshi says. "I look forward to learning from these leaders and working together to make a difference for the students in USM universities. I thank President Emeritus Hrabowski, President Sheares Ashby, and Provost Rous at UMBC for nominating me for this opportunity and their support."

Anupam Joshi celebrates with colleagues at an event for UMBC faculty named fellows of professional societies. Photo by Marlayna Demond '11/UMBC.

LEADERSHIP TRAJECTORY

Joshi obtained a B.Tech degree from the Indian Institute of Technology (IIT) Delhi in 1989, and a master's and Ph.D. from Purdue University in 1991 and 1993, respectively. He has published more than 275 technical papers, has been granted nine patents and obtained research support from a variety of federal and industrial sources. In 2014 he was named a Fellow of the Institute of Electrical and Electronics Engineers, or IEEE.

As chair, Joshi leads one of UMBC's largest departments. There he has overseen a near doubling of student enrollment at the graduate level and a 50% growth rate at the undergraduate level, accompanied by an increase in student body diversity.

He has worked with partners in the UMBC Office of Institutional Advancement to raise funds supporting research from such industry partners as Northrop Grumman, GE, and Cisco. As a result of these efforts and collaboration with Jack Suess, UMBC's chief information officer and vice president of information technology, the state recently announced the creation of a Maryland Institute for Innovative Computing at UMBC.

Joshi directs the Center for Cybersecurity, which brings together scholarship and research in cybersecurity from computer science, information systems, social sciences, humanities, public policy, and natural sciences. In this role, he serves on the Maryland Cybersecurity Council.

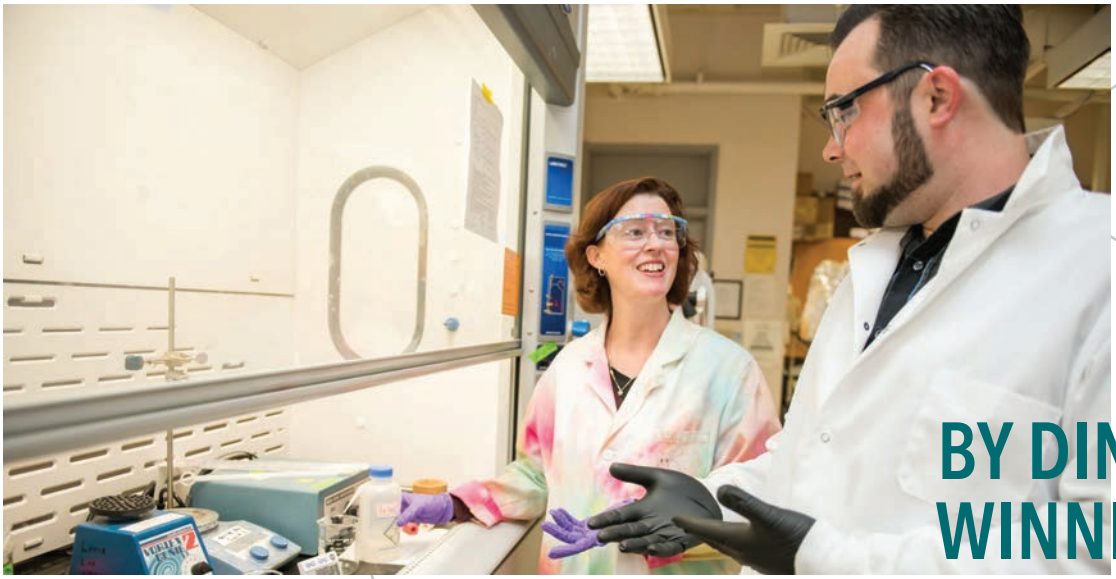
Additionally, Joshi directs UMBC's Cyber Scholars Program, a joint effort between the Center for Cybersecurity and UMBC's Center for Women in Technology. This program is focused on supporting a diverse next generation of leaders in cybersecurity and computing.

At the conclusion of the fellowship year, Joshi will return to these leadership roles with new knowledge and skills to expand UMBC's work in innovative ways, supported by a network of emerging and longstanding university leaders across the nation.

"I LOOK FORWARD TO LEARNING FROM THESE LEADERS AND WORKING TOGETHER TO MAKE A DIFFERENCE FOR THE STUDENTS IN USM UNIVERSITIES."

Anupam Joshi

Erin Lavik (left) works with then-graduate student Adam Day (right) in her lab, 2018. Photo by Marlayna Demond '11/UMBC.



BY DINAH WINNICK

UMBC'S NEW AAAS SCIENCE & TECHNOLOGY POLICY FELLOWS FOCUS ON STEM WORKFORCE INCLUSION, YOUTH JUSTICE

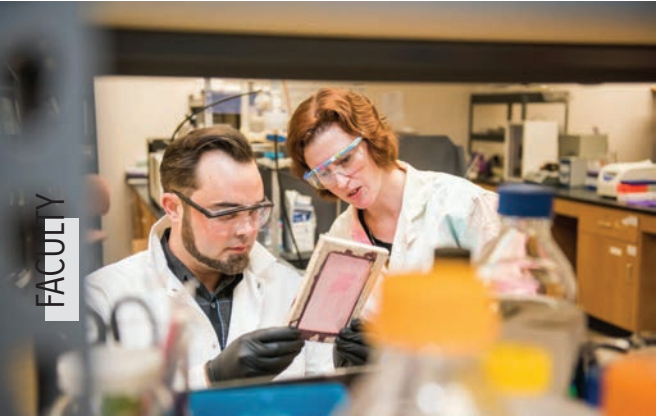
ERIN LAVIK, PROFESSOR OF chemical, biochemical, and environmental engineering at UMBC, is an innovator in developing nanoparticles to stop internal bleeding. She's also hard at work on a very different challenge: building STEM workforce development programs that are more inclusive and equitable.

Lavik and Erika Fountain, assistant professor of psychology, will serve as 2022-23 Science & Technology Policy Fellows (STPF) with the American Association for the Advancement of Science (AAAS), in the prestigious program's 50th class.

"AAAS policy fellows have been demonstrating excellence in science policy for the past half-century—defining what it means to be a scientist and engineer in the policymaking realm," said STPF Director Rashada Alexander.

The 300 fellows chosen for the 2022-23 class will serve in a range of government offices, working to inform actionable, science-based policies. Lavik will be based in the Advanced Manufacturing Office of the National Institute of Standards and Technology, known as Manufacturing USA. Fountain will be hosted by the American Psychological Association (APA), serving as a Congressional Fellow.

The 2022-23 fellowship class is supported by variety of bodies including the U.S. Government, AAAS, partner societies, and the Gordon and Betty Moore Foundation, with an eye on both the value of this experience for



Erin Lavik (right) works in her lab with then-graduate student Adam Day (left) in 2018. Lavik's lab works to develop new therapies through polymer synthesis and processing, drug delivery, and stem cell biology. Photo by Marlayna Demond '11/UMBC.

participating fellows and the impact fellows will have throughout their careers.

INCLUSIVE HIGH-TECH WORKFORCE

"With the CHIPS Act passing, I'll be focusing on building workforce development programs that are equitable, inclusive, diverse, and accessible," says Lavik.

"CHIPS" stands for Creating Helpful Incentives to Produce Semiconductors—legislation that will provide nearly $53 billion to support semiconductor production in the U.S., supporting both research and high-tech jobs. The goal of CHIPS, the White House notes, is "to sustain U.S. leadership in the sciences and engineering as the engine for American innovation."

Lavik, who is also associate dean for research and faculty development in UMBC's College of Engineering and Information Technology (COEIT), will play an important role at NIST in shaping the programs that will generate these high-tech jobs, maximizing their benefit. At the same time, she will learn about federal policymaking and implementation first-hand.

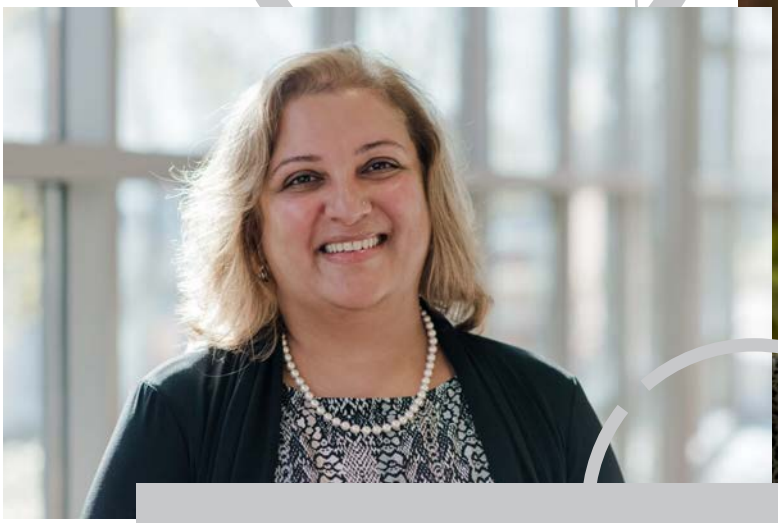
"Dr. Lavik has worked as both a researcher and as an associate dean elevating research and advancing faculty development. This combination has given her a broad insight into product development," says COEIT Dean Keith J Bowman. "I am certain that expertise will serve her well in supporting advancement of our nation's manufacturing enterprises. I know from direct experience that Manufacturing USA has changed how we think about and carry out manufacturing, and Dr. Lavik's strategic and innovative mindset is a great match for this opportunity. •

"DR. LAVIK HAS WORKED AS BOTH A RESEARCHER AND AS AN ASSOCIATE DEAN ELEVATING RESEARCH AND ADVANCING FACULTY DEVELOPMENT."

Keith J Bowman

COEIT Dean

Vandana Janeja (left) and Christine Mallison. Photos by Marlayna Demond '11/UMBC.



CAN YOU CATCH A DEEPFAKE? UMBC RESEARCHERS RECEIVE NSF AWARD TO HELP PEOPLE IDENTIFY AUDIO DEEPFAKES

BY MEGAN HANKS MASTROLA

VANDANA JANEJA AND Christine Mallinson have received a two-year, $300,000 grant from the National Science Foundation (NSF) to study deepfakes, focusing on audio clips. Deepfakes are images, videos, and sounds that are developed using artificial intelligence (AI) technology, but that are designed to appear as authentic, real-life recordings. They can be highly deceiving for audiences, impacting public opinion and behavior.

Through their NSF Early-Concept Grant for Exploratory Research (EAGER) award, Janeja and Mallinson will study and evaluate listener perceptions of audio deepfakes that have been created with varying degrees of linguistic complexity. This study will include training sessions to help listeners discern audio deepfakes. Informed by training and linguistic labels, this project will develop data science algorithms that can help people discern audio deepfakes. More broadly, their project will establish a new pathway for collaborative public-impact research across the social sciences and computing.

UMBC was engaging in multi-disciplinary work between computing and the social sciences when NSF started this initiative. "We can't solve big societal issues with an AI algorithm alone," explains Janeja, professor and chair of information systems. She notes that collaboration between researchers in computing and sociolinguistics is essential to

address complex, real-world problems that involve both technology and communication.

EVALUATING LISTENER PERCEPTIONS

Deepfakes can contribute to the rapid spread of misinformation. The threat of deepfakes on social media has received some visibility, but they can appear in other contexts as well.

Janeja highlights an example, recently covered in *The New York Times*, of a situation when an employee at a well-known investment banking company flagged that a person on the other end of a call sounded like their voice was being digitally altered. After the call, the company found that the person on the call was a leader from a media company posing as a different leader at another firm.

With this type of scenario in mind, the research team will develop training sessions to help listeners improve their ability to recognize audio deepfakes with varying degrees of linguistic complexity, says Janeja, principal investigator (PI) on the grant. They will then evaluate the efficacy of those training sessions to help the listeners protect themselves against deception by audio deepfakes. Using linguistic features, the research team will also create data science algorithms to augment the information that a listener is presented with.

The resulting tools will empower listeners to evaluate the accuracy and authenticity of information they see online, explains Mallinson, professor of language, literacy, and culture (LLC), and director of UMBC's Center for Social Science Scholarship, who is also co-PI on the award. Participants will receive sociolinguistic training to help them develop a more finely-tuned ear for distinguishing linguistic details, and they will draw upon that information as they evaluate deepfakes.

OPEN-ACCESS TOOLS

Mallinson's work focuses on language as a socially and culturally embedded phenomenon. She explains that the linguistic complexity of audio deepfakes makes it challenging for listeners to distinguish them from natural speech and identify them as inauthentic misinformation. At the same time, linguistic training and tools can help address these challenges. By working together, experts in computing and linguistics can disentangle this complexity.

The EAGER grant is "high risk, high reward," she says. It involves approaching a challenging phenomenon in an entirely new way, and building bridges across disciplines. Students studying both data science and the social sciences will develop the skills to identify audio deepfakes, which is uncommon, Mallinson explains. Success would mean helping people protect themselves against deception by deepfakes and increasing the equitability of AI technology.

Janeja and Mallinson's project team will include UMBC data science scholars as well as Sara Khanjani, Ph.D. '24, information systems, and Lavon Davis, incoming LLC Ph.D. student. Khanjani also completed initial research informing the grant, along with Gabrielle Watson '21, information systems. That work explored college students' audio deepfake perceptions.

Khanjani looks forward to creating tutorials that can better prepare people to spot deepfakes. The team's series of online educational modules will be openly accessible to the public, to help them improve their critical listening and discernment skills.

Ultimately, Mallinson says, this interdisciplinary research in sociolinguistics and data science will better prepare people to navigate emerging communication issues in today's technologically complex world.

Mallinson and Janeja hope that in establishing an innovative pathway for collaborative research that fully integrates sociolinguistics, human-centered analytics, and data science, the study will also lay the groundwork for future analyses of deepfakes in ways that are broadly relevant to all of these fields. •

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BY MEGAN HANKS MASTROLA

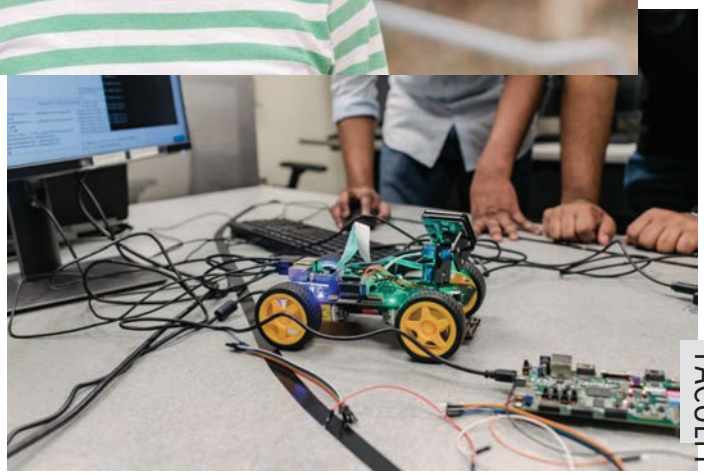
UMBC'S RIADUL ISLAM RECEIVES NSF FUNDING TO SECURE CARS AGAINST COMMUNICATION SYSTEM ATTACKS

AS VEHICLES BECOME MORE

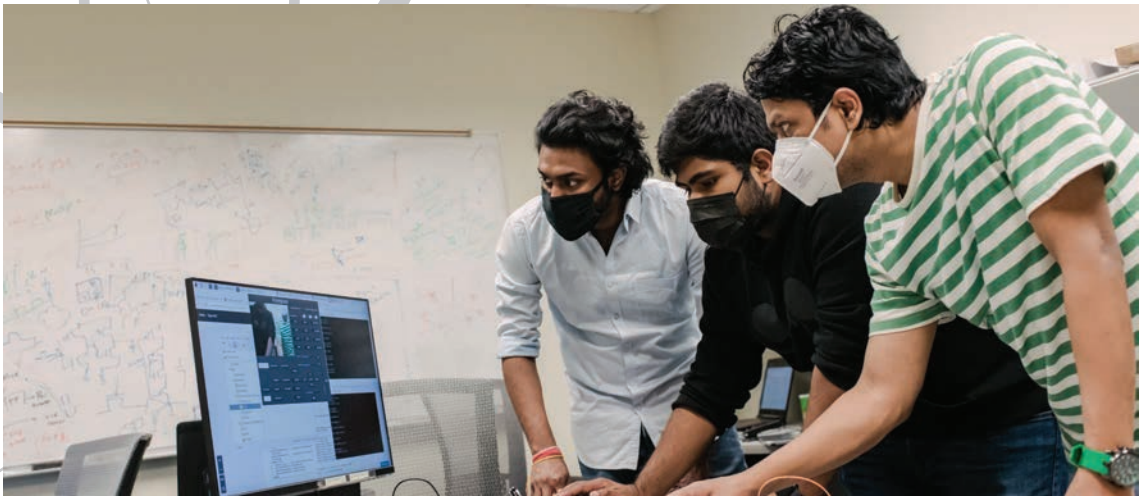
advanced, opportunities increase for hackers to remotely attack their embedded systems, creating significant safety concerns for drivers and passengers. Riadul Islam, assistant professor of computer science and electrical engineering at UMBC, received a $200,000 grant from the National Science Foundation to study how to better detect and protect against these cyber attacks.

Today's cars include complex electronic systems that interact and communicate with each other in order to operate properly. For example, steering and braking systems rely on internal communications and must also effectively communicate with other systems and networks in the vehicle to function properly.

Issues arise when communications between systems are interrupted, or when external players intentionally hack into these systems. "Remote attacks can jam the communication systems," Islam explains, which can pose dangers.



From top: Dr. Riadul Islam. A model vehicle that Islam and his team are using in their research. Photos by Marlayna Demond '11/UMBC.



Riadul Islam, right, in the lab with students. Photo by Marlayna Demond '11 for UMBC.

IMPROVING SAFETY

To detect potential issues that can put people at risk, Islam and his team are developing data graphs that chart out messages and signals among a vehicle's systems. They will next build an attacker detection algorithm based on that analysis.

This approach to detecting attacks will fundamentally change how people can analyze the enormous amount of data that modern vehicles generate. And it's essential that people become more aware of this data and start to manage it, says Islam. He explains that vehicles with advanced driver-assistance systems, more common today than ever before, are more vulnerable to being hacked. "Anyone can take over a car remotely," he says. "It's a huge safety concern."

BOOSTING PUBLIC CONFIDENCE IN AUTONOMOUS CARS

Dhandeep Challagundla '22, computer engineering, and Sri Ranga Sai Krishna Tummala, M.S '25, computer science, are working alongside Islam on this research. Challagundla is primarily working on energy-efficient computing, while Tummala is building a testbed for collecting sensor data from vehicular networks.

"Vehicular security is the primary key to maintaining the integrity of the automated driving systems, which can significantly boost public confidence in future autonomous cars," explains Tummala.

This research will also integrate novel neural architectures to manage humongous data generated by vehicle electronic control units and provide real-time training and inference platform to tackle unknown issues, says Islam.

DETECTING AND CLASSIFYING IMAGES

In addition to the funding from NSF, Islam received funding through the Maryland Innovation Initiative (MII), and from the Maryland Industrial Partnership (MIPS). He is collaborating with Ryan Robucci, associate professor of computer science and electrical engineering, and industrial partner Oculi on a project funded by the MIPS.

Their work will focus on developing algorithms that allow cameras to more accurately detect and classify images. Through this work, Islam and Robucci are working to create a software platform to support the design of an energy-efficient spiking neural network that can be implemented in conventional vision sensors.

"Both the MII and MIPS research will directly impact Maryland's economy," explains Islam. "The MII research will also improve the security of our transportation systems, and MIPS will concentrate on energy-efficient imaging considering public safety and privacy." ●

"ANYONE CAN TAKE OVER A CAR REMOTELY. IT'S A HUGE SAFETY CONCERN."

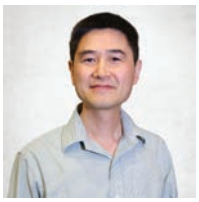
Riadul Islam











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