SPRING 2019

COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES

ODYSSEY

Be the future.

WELCOME TO THE BRENDAN IRIBE CENTER

ODYSSEY

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ON THE COVER

The Brendan Iribe Center for Computer Science and Engineering. Photo by Faye Levine.

Message from the Dean

Dear Science Terps,

I am incredibly excited that the Brendan Iribe Center for Computer Science and Engineering is now open! This new home for the Department of Computer Science and the University of Maryland Institute for Advanced Computer Studies is absolutely incredible.

Looking back at the remarkable journey that brought us here, it is hard to believe that this milestone was less than five years in the making—thanks to the state of Maryland and so many generous supporters. The ambition of our donors, inspired by the fearless vision of Brendan Iribe, has created a best-in-class space for innovation, collaboration and education.

When students entered the building for the first time in late January, they settled into spaces designed specifically to deliver a world-class, 21st-century education for tomorrow's technology leaders. People from all over campus are already finding themselves drawn into the Brendan Iribe Center as an inviting space to think and to imagine.

In this new building, research in areas such as cybersecurity, machine learning, data science, among many other specialties, will continue to solidify the University of Maryland's leadership in computer science.

I would be remiss if I didn't also mention the generous contributions of Michael Antonov, Bill Pugh and Lisa Orange, and Jagdeep and Roshni Singh, which made the Brendan Iribe Center's auditorium and makerspace possible.

The Brendan Iribe Center is not just a capital improvement project. It is the launching point for a new, energizing era in the history of computer science at Maryland. It exemplifies something we have always had: a diverse community of students, faculty and staff members, and alumni who are passionate about innovation and dedicated to collaboration and action.

While it is difficult in such a short editorial to do justice to the wonderful teaching and research that will occur in the building, the pages that follow will take you on a brief tour of some of the highlights.

I invite you to visit us in our new home and see how our vision for the future of computer science education and research is coming to life.

Join us on our journey to *"Be the Future."*

Amitabh Varshney
Dean
College of Computer, Mathematical, and Natural Sciences

Photo by John T. Consoli

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Photo by John T. Consoli

Welcome to the Brendan Iribe Center

Be the future.

BY KIMBRA CUTLIP

OPENING A DOOR TO TOMORROW

THE BRENDAN IRIBE CENTER FOR COMPUTER SCIENCE AND ENGINEERING PROJECTS THE UNIVERSITY'S FUTURE

With its curved glass exterior and six stories cantilevered over a large ground-floor plaza, the Brendan Iribe (ee-REEB') Center for Computer Science and Engineering projects an image of modernity on Baltimore Avenue. Unlike any other building on campus, it is truly a new face for the University of Maryland that boldly pronounces the institution's commitment to excelling as the technology hub for the region.

"This transformative building will take one of the nation's top computer and data science programs to even greater heights," said University of Maryland President Wallace D. Loh. "Our leadership in fields like artificial intelligence and virtual and augmented reality will grow, making our campus an even greater hub for innovation and economic development."

Located along Campus Drive at the northeast entrance to the university, the Brendan Iribe Center overlooks the stately lawns and neo-Georgian buildings of the university in one direction and the city of College Park's developing Discovery District in the other. A visual linchpin, the new building connects the university's deep traditions of excellence and innovation with the burgeoning technology corridor emerging around Washington, D.C.

When it opened to students this spring semester, the 215,600 square-foot Brendan Iribe Center quickly became the place to go on campus for inspiration and collaboration. Students gather in study groups in front of its expansive windows and meet with friends outside the Breakpoint Café. They lounge on the tiered amphitheater-style steps of the informal study area that overlooks the woodlands across Baltimore Avenue. Designed to promote conversation across disciplines, 20,000 square feet of community space attracts students from all across campus. The entire UMD community shares in the excitement of the latest drone research or robotics work visible in the high-bay labs adjacent to the ground floor lobby. As intended, it is an inspiring space that brings people together.

"One of the most important parts of the college experience is time spent building relationships and experimenting in whatever you're passionate about," said Brendan Iribe, a UMD alumnus who co-founded several successful technology startups and the virtual reality company Oculus with friends he met at UMD. Iribe's 2014 donation of $31 million for a new building and scholarships was the largest single gift ever given to the university at the time.

"I came out of Maryland with a business partnership and many personal relationships that have lasted my whole life," Iribe said. "I wanted this gift to support a place that inspires students to form friendships and teams that last a lifetime, where students have access to everything they need to build the next great company or breakthrough technology."

Senior Vice President and Provost Mary Ann Rankin said that Iribe's initial gift—and his continued support of the university through scholarships and diversity programs—is enabling the university to attract even more world-class faculty members and enrich the educational experience for its students.

"The advances our students will achieve are going to give rise to new tech companies, boosting not only the University of Maryland but helping fuel economic development in the state of Maryland," Rankin said.

> "I came out of Maryland with a business partnership and many personal relationships that have lasted my whole life."
>
> BRENDAN IRIBE

A MORE FITTING HOME

In April 2014, Iribe returned to campus to speak at the first Bitcamp student hackathon. He was struck by the contrast between the university's aspirations to foster leadership in technology and the staid atmosphere of the A.V. Williams building. The traditional windowless corridors and labs of the former home for computer science were out of sync with the inspiring work achieved there.

Despite the lackluster environment, the Department of Computer Science at UMD ranks 10th in the nation according to Computer Science Rankings (csrankings.org). It is also the largest undergraduate program at the university, educating over 4,000 students per year. These students, along with nearly 300 graduate students, enter the workforce ready to become industry leaders. While at UMD, they have opportunities to conduct research side-by-side with some of the brightest minds in the field, including faculty

Photos by John T. Consoli

COLLABORATIVE CLASSROOM

members in the University of Maryland Institute for Advanced Computer Studies (UMIACS). Hailing from 10 departments, UMIACS researchers apply some of the most advanced computing technology to collaborative research and innovations that are changing the world.

The Department of Computer Science and UMIACS needed a home that reflected their stature. Iribe's donation was quickly followed by a $4 million gift for the building and scholarships from his Oculus co-founder and freshman dormmate Michael Antonov (B.S. '03, computer science), and a $3 million donation for endowed faculty positions from Iribe's mother, Elizabeth Iribe.

Many others were inspired by the idea of a new home for computer science and UMIACS. In total, private donors—including many faculty and staff members—gave $38 million for the new building. With the addition of nearly $105 million in state funds and nearly $10 million from the university, the Brendan Iribe Center has become a beacon of UMD's strength and commitment to leading technology and innovation.

Faculty members and students have unprecedented opportunities to participate in groundbreaking research in 13 state-of-the-art research labs, including four high-bay laboratories designed for research and development of robotics, unmanned aerial vehicles, virtual and augmented reality, and more.

"This is one of the most innovative facilities at any university," said Amitabh Varshney, dean of UMD's College of Computer, Mathematical, and Natural Sciences and himself a leader in virtual and augmented reality. "What is so remarkable is not just the beautiful space and the advanced equipment, but the way the building was designed. It is truly a collaborative place where people will work together to experiment and invent technologies that will lead us into the future."

FAST FACTS

215,600 gross square feet

20,000 square feet of community space

5,300-square-foot makerspace

658 seats of instructional space

298-seat auditorium

100-seat auditorium

13 research labs

6 collaborative classrooms

2 seminar rooms

1 rooftop park

1 garden terrace

LOBBY/STUDY AREA

COLLABORATION AND INNOVATION

"I've been walking by this building every day, and I had to come see what it was," said freshman biological sciences major Noa Ferziger on a rainy day in February. Her companion, economics and psychology major Jacob Glassman, echoed her curiosity, craning his neck up to look around in awe.

Classroom photo by Faye Levine / Lobby photo by John T. Consoli

"It's a beautiful building," Glassman said. "There's nothing else like this on campus."

Expansive views to the outside and into glass-walled laboratories are the dominant features of the lounges that surround the central staircase on the ground and first floors. Natural light and commanding views characterize the dedicated informal study spaces on every floor.

Also surrounded by glass walls, the 5,300 square-foot Singh Sandbox is a makerspace that is sure to become a showplace of inspiring student creations. It was made possible by donations from Jagdeep Singh (B.S. '86, computer science and economics) and his wife, Roshni, and Professor Emeritus of Computer Science Bill Pugh and his wife, Lisa Orange. It is driven by students, and any student, regardless of major, has access to specialized tools and equipment to simply work out an idea.

The expectation among those involved in the design of the building is that members from the entire UMD community will be drawn to the collaborative spaces, and while there, they will be inspired by the cutting-edge work on display. The vision for the Brendan Iribe Center is that it will be a facility where formal and informal learning coexist; and students, faculty members, and entrepreneurs come together to create amazing new things and develop ideas that will change the world.

Even the classrooms were designed to foster teamwork and innovation, eschewing traditional rows of seating in favor of round tables and display screens on all four walls.

"The layout makes the classrooms feel more intimate and makes for a better learning experience," said computer science major Angela Lambert. "You're not all facing the same direction because you're in groups, but no matter where you're sitting you can see the screens, and the instructor is more central, so it makes it feel more interactive."

In addition to the classrooms, a 100-seat lecture hall and the 298-seat Antonov Auditorium feature shared tables and 180-degree swiveling chairs that enable students to alternate between lecture mode and collaborative teamwork.

Reisse Park, which features gardens and a fountain on the rooftop will likely become one of the most inspiring places on campus. Built in memory of Andrew Reisse (B.S. '01, computer science and mathematics), who was a co-founder and lead engineer of Oculus, the park is a serene space overlooking Paint Branch Creek and downtown College Park. The gardens and the view of the woods surrounding the creek reflect Reisse's passion for the outdoors. Next to the park, just inside the building, an art gallery displays Reisse's photographs of landscapes and waterfalls, offering another space for reflection.

"This is where the next generation of startups and technological innovations are being nurtured."

MICHAEL ANTONOV

ANTONOV AUDITORIUM

Photos by John T. Consoli

(CLOCKWISE FROM ABOVE) ALUMNUS ANDREW REISSE; THE BRENDAN IRIBE CENTER'S ROOFTOP PARK THAT HONORS THE MEMORY OF REISSE, WHO WAS AN AVID PHOTOGRAPHER AND INSPIRING MENTOR; THE BRENDAN IRIBE CENTER LOBBY.

BUILT FOR THE FUTURE

Creating a space intended to serve as a hub for innovation carried the challenge of designing for a future that hasn't yet been imagined. Answering that challenge meant building flexible spaces with removable walls so labs can be reconfigured, as well as open ceilings with spacious cable trays for easy installation of new equipment.

"No one knows the future, but we do know that it will involve people and technology," said Brian Kowalchuk, global director of design for the architectural firm HDR and lead architect for the Brendan Iribe Center. "We've gone to great lengths to create a building that can be flexible as needs change and technology advances."

For Kowalchuk, building for the future also meant projecting an image of technological advancement on a campus deeply rooted in classical neo-Georgian architectural tradition. His vision was to deconstruct the classic design, removing the Maryland brick façade that characterizes the other buildings on campus and leaving the highly ordered structural grid beneath. He said it was almost like peeling the skin off the building to reveal the buzz of activity inside. The Maryland brick is brought back as an anchor, grounding the building as the main exterior feature of the Antonov Auditorium. The brick ties in the very modern building with the historic brick knee walls fronting the road and the brick archways of the founders' gate at the entrance to campus.

The effect makes a bold statement.

"It's a remarkable building that demonstrates the University of Maryland is at the leading edge of computer science," Antonov said. "This is where the next generation of startups and technological innovations are being nurtured. Students and faculty have world-class resources and facilities that enable them to achieve the seemingly impossible."

Brendan Iribe Center photos by John T. Consoli
Andrew Reisse photo courtesy of Robert and Dana Reisse

TURNING IDEAS **INTO REALITY**

JAGDEEP SINGH FAMILY MAKERSPACE OFFERS HANDS-ON EXPERIENCES BEYOND THE CLASSROOM

Teaching entrepreneurship means giving students the skills they need to turn an idea into a reality, according to Bill Pugh, professor emeritus of computer science at the University of Maryland.

"You have to figure out if building your idea is feasible and what technology you should use," Pugh said. "You bounce it off other people. Maybe you start implementing it and find it isn't going to work, or maybe the technology works but it just isn't compelling, so you pivot. And you keep pivoting until you eventually come up with something that is either useful to you or wows your friends and family. Those are the skills you need to become an entrepreneur."

An opportunity to foster that process inspired Pugh to lead the initiative for the new 5,300-square-foot Jagdeep Singh Family makerspace in the Brendan Iribe Center. Over the years, Pugh has been a strong supporter of innovation in computer science education at UMD, donating nearly $1.5 million along with his wife, Lisa Orange. The couple's most recent gift provided $500,000 to staff and operate the new makerspace and $250,000 to coordinate makerspaces across campus.

A $1 million gift from Jagdeep Singh (B.S. '86, computer science and economics) and his wife, Roshni, provided building funds to support the makerspace, which is affectionately called the Singh Sandbox. The name is a nod to the first Sandbox, a makerspace that opened in 2016 in the Computer Science Instructional Center.

"It's so important for students to gain experience beyond the traditional computer science curriculum that is often focused on software," Jagdeep Singh said. "Makerspaces are a wonderful way for students to work with tangible hardware and apply real-life problem-solving skills to create something in the real world."

The Singh Sandbox will be guided by the interests of students from any major who can make something, even if it's unrelated to research or a class.

Consisting of six workshop spaces and a large communal work area on the first floor, Sandbox provides access to specialized equipment. The facilities include two laser cutters, a fully equipped wood shop, a large-format printer, a vinyl cutter, a metal milling machine, two types of 3D printers, an advanced electronics fabrication and analysis shop, sewing machines, hot glue guns, a button maker, and more.

"The Iribe Center was designed to encourage students to be inventive, to think about what they can do with technology and to partner with people outside their disciplines," Pugh said. "They'll come here, see research with drones and robots, as well as art projects infused with technology—all done by students—and they'll be excited to get involved."

> **"It's so important for students to gain experience beyond the traditional computer science curriculum that is often focused on software."**
>
> JAGDEEP SINGH

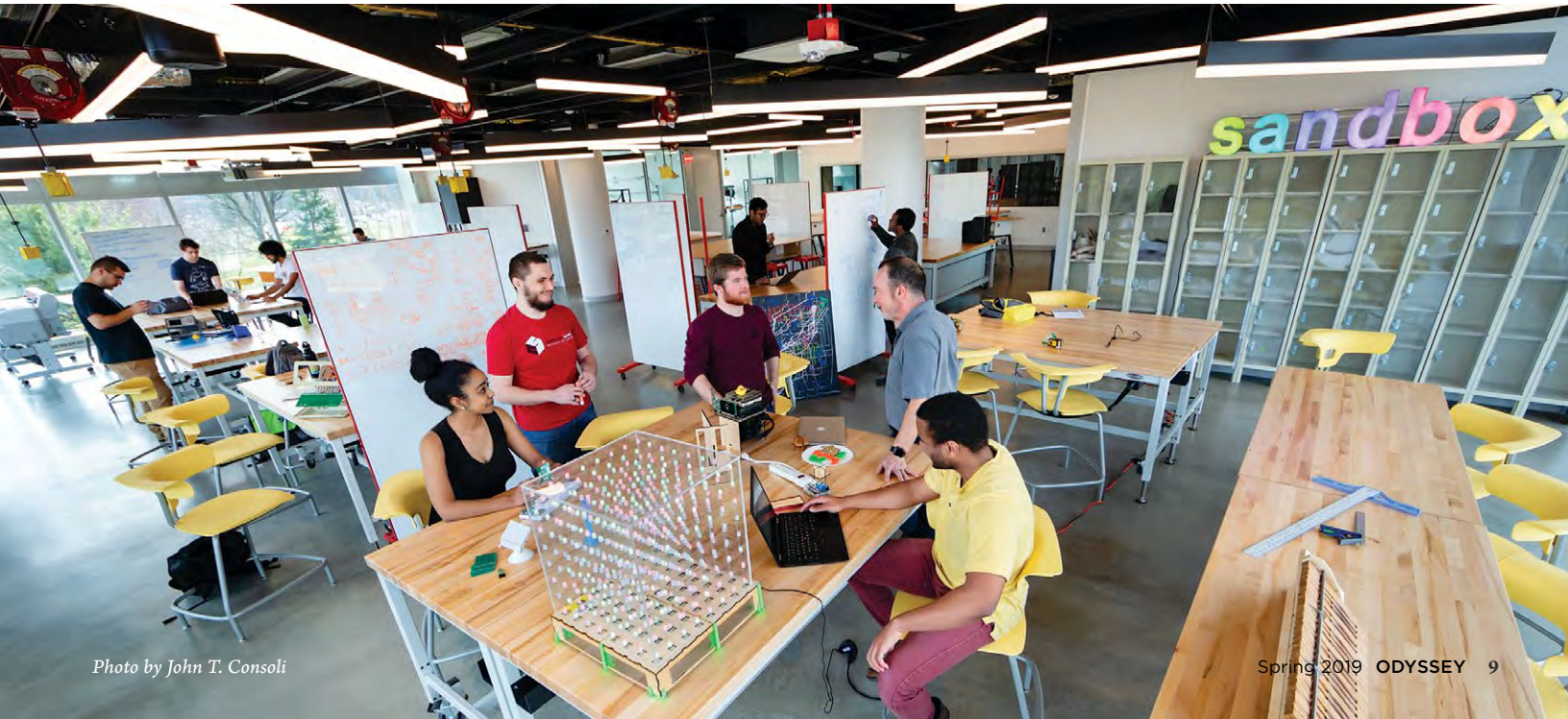


Photo by John T. Consoli

COMPUTER SCIENCE MAJOR UTSA SANTHOSH (CENTER) MENTORS STUDENTS AT A MARYLAND CENTER FOR WOMEN IN COMPUTING EVENT. HER LOVE OF COMPUTING WAS INSPIRED BY SIMILAR EVENTS AND BEGAN WHEN SANTOSH WAS IN MIDDLE SCHOOL (INSET) ATTENDING A UMD SUMMER CAMP FOR GIRLS IN COMPUTING.

CREATING A SENSE OF **COMMUNITY**

NEW INITIATIVE EXPANDS INCLUSION AND DIVERSITY IN COMPUTER SCIENCE AT UMD

University of Maryland freshman computer science major Utsa Santhosh feels like she and the Brendan Iribe Center have grown up together. Santhosh had just finished her third year in UMD's CompSciConnect summer camp for middle school students when Brendan Iribe made his lead gift for the new building.

Throughout high school, Santhosh returned to UMD as a teaching assistant for the summer camp, which encourages young girls to explore computer science.

"Every year, I would come back and see the building progress. It's like the center was growing up as I did," Santhosh said.

As the Department of Computer Science's new home took shape, so did the community of computing women and girls around Santhosh.

"In high school, I made friends with a lot of the college students," Santhosh said. "Hearing their experiences really made me excited, not only to come to Maryland but also to major in comp sci. Now, finally I'm a freshman, and it's really exciting to be one of the first students in the new building. I'm so inspired by all the collaborative work spaces and the innovative initiatives going on here."

The initiative closest to her heart may be the Iribe Initiative for Inclusion and Diversity in Computing. Supported by a new $1 million gift from Iribe, the initiative will build on the success of the Maryland Center for Women in Computing (MCWIC) by creating programs to encourage students from all genders, backgrounds and under-represented populations. In addition to after-school programs and summer camps for elementary through high school students, the initiative will cultivate and retain a diverse community of computer science majors through tutoring, computing-related student organizations, a computer science inclusion speaker seminar series, and funding for students to attend computing conferences.

"Increasing diversity in computer science is so important for many reasons," said Jandelyn Plane, the new initiative's director and a principal lecturer in the Department of Computer Science. "A critical step in building diversity is creating a sense of community. I think it makes a big difference for underrepresented groups to see college students and professionals like themselves succeeding in the field."

Plane founded MCWIC in 2014 as an outgrowth of CompSciConnect, which has expanded since Santhosh joined as a sixth grader in 2011. Today, MCWIC hosts a variety of camps, conferences, workshops, research opportunities and partnerships. Over the last five years, MCWIC's programming has helped to double the number of female undergraduates in the department. With 650 women majoring in computer science, UMD is home to one of the largest populations of women computer scientists in the country.

"Without a doubt, I am a UMD computer science student because of CompSciConnect and MCWIC," Santhosh said. "I know firsthand how successful these efforts are. In high school, I was the only girl in my comp sci class, but I knew that there were people like me out there and they had made it through and were doing a lot of cool things."

Like MCWIC, the new Iribe Initiative will serve as a pipeline to bring young people into computer science and support them through their college careers. MCWIC will continue to operate as a home for women in computing, but the new initiative will serve as an umbrella entity with an expanded mission to support students from all backgrounds.

"Computers are needed for nearly everything we do, so it's really important for people with different mindsets to come together and collaborate," Santhosh said, adding that she can't wait to see the next crop of summer campers donning virtual reality headsets. "It's amazing to watch them doing things with technology that didn't even exist a few years ago and most people still don't even have access to."

Utsa Santhosh with middle school students photo by Justin Derato
2011 photo of Utsa Santhosh courtesy of the Maryland Center for Women in Computing

CULTIVATING **LEADERSHIP**

ANDREW REISSE ENDOWED TEACHING AWARD SUPPORTS UNDERGRADUATES EDUCATING PEERS

University of Maryland computer science major Galen Stetsyuk and alumnus Mikhail Sorokin (B.S. '18, computer science) aspire to be leaders in the field of virtual reality (VR), and they're well on their way. As founders of the company MPLEX VR, they are developing a set of best practices for VR and sharing their experiences with classmates through the university's XR Club for VR and augmented reality. This spring, they put that experience into practice by developing and teaching the course CMSC388G: "Special Topics in Computer Science: Virtual Reality Game Development."

Their course is part of a campus program called Student Initiated Courses (STICs), where students design and teach courses to their peers. Stetsyuk and Sorokin were able to turn their expertise into a formal class with help from the inaugural Andrew Reisse Endowed Teaching Award, which supports undergraduates teaching STICs in the sciences.

"The field of VR is so new that we're sort of developing these best practices as we go," Stetsyuk said, adding that this is the beauty of the STICs program. "Student-taught courses explore a lot more at the edge of our knowledge than traditional courses. We're teaching things that we know and also encouraging students to try new things and see how they work. That approach lets students know that not everything is known yet. I think that's very beneficial for students who are looking to invent new technologies."

The course addresses some of VR's biggest challenges, such as techniques to reduce simulation-induced motion sickness and render certain materials like smoke or fire in VR.

"Just because certain materials look cool in a regular game doesn't mean they will work in VR," Sorokin said. "You have to balance what you think will look cool with what actually works."

Improving the VR experience is the focus of their company, as well as the class. If successful, they believe VR will quickly become mainstream.

"With improvements to the immersive experience, VR could fundamentally change the landscape of all of entertainment, and our goal is to be among the leaders in that," Stetsyuk said.

Their entrepreneurial spirit and conviction echo the life of the man for whom their teaching award was named. The award was created by Robert Reisse (M.S. '70 and Ph.D. '76, physics) and his wife, Dana (M.L.S. '73, library and information services), in memory of their son, Andrew Reisse (B.S. '01, computer science and mathematics). Co-founder and lead engineer of Oculus, Andrew Reisse launched his first startup as a 19-year-old college student with his friends Michael Antonov and Brendan Iribe. Tragically, in 2013, Reisse was killed in a hit-and-run accident. A passionate hiker and landscape photographer, as well as a natural mentor who inspired others around him, Andrew Reisse's legacy will live on in the gifts that carry his name. They include the rooftop garden and art gallery in the Brendan Iribe Center, the Andrew Reisse Memorial Scholarship in Computer Science, and the endowment for student-led classes.

"I've been so impressed with the students we met who were teaching through the STICs program," said Dana Reisse. "I think it's very important to support students who are willing to take the time and effort to teach a class to their peers."

(L–R) COMPUTER SCIENCE MAJORS SOPHIYA CHHETRI, GALEN STETSYUK, KEVIN FENG; ALUMNUS MIKHAIL SOROKIN.

Photo by John T. Consoli

"I've been so impressed with the students we met who were teaching through the STICs program. I think it's very important to support students who are willing to take the time and effort to teach a class to their peers."

DANA REISSE

Building a Hub for TECH LEADERS

The University of Maryland's commitment to elevating computer science and driving fearless innovation has attracted the support of donors in the form of eight new endowed faculty positions in the Department of Computer Science. These positions have aided in the recruitment of world-class researchers to fill the new Brendan Iribe Center.

Three positions endowed by Brendan Iribe's mother, Elizabeth Iribe, have already been filled. Her $3 million donation received $2.15 million in matching funds from the state's Maryland E-Nnovation Initiative (MEI). These combined donations led to the creation of a position in her name and two others: one in honor of her brother, Paul Chrisman Iribe, for his leadership of the family, and another that honors Brendan's high school computer science teacher, Reginald Allan **Hahne**.

Soon, the department will fill five more endowed faculty positions. A $2.1 million gift from Capital One that was matched by the MEI will support an endowed chair and two professorships in machine learning, data science, and cybersecurity. Two endowed professorships in theoretical computer science will be supported by a $1 million donation from the Brin family, which includes Samuel Brin (B.S. '09, computer science); his brother and Google co-founder, Sergey (B.S. '93, mathematics and computer science); their father, Michael, a UMD professor emeritus in mathematics; and their mother, Eugenia, a former analyst at NASA's Goddard Space Flight Center. The Brin family gift was also matched by the MEI.

"THERE IS JUST SO MUCH POSSIBILITY TO DO THINGS REALLY DIFFERENTLY AND CREATIVELY IN THE NEW CLASSROOMS. PART OF WHAT EXCITED ME TO COME HERE IS THAT THE UNIVERSITY IS BECOMING A HUB FOR AN EMERGING TECHNOLOGY CORRIDOR. ANY TECH COMPANY, IF THEY ARE THINKING FAR AHEAD, SHOULD WANT TO HAVE A PRESENCE IN THE GREATER WASHINGTON AREA."

Ming Lin, Elizabeth Stevinson Iribe E-Nnovate Chair for Computer Science

"THE IRIBE CENTER IS, IN MY OPINION, ONE OF THE MOST FANTASTIC AND STATE-OF-THE-ART COMPUTER SCIENCE BUILDINGS IN THE COUNTRY, IF NOT THE WORLD. THE IRIBE CENTER IS GOING TO ENABLE SOME AMAZING NEW FUNDAMENTAL AND EXPERIMENTAL RESEARCH IN VIRTUAL AND AUGMENTED REALITY, ROBOTICS, AND OTHER INTERDISCIPLINARY AREAS. MOREOVER, IT'S GOING TO BE A BIG FACTOR IN ATTRACTING GREAT PEOPLE AND TOP TECHNOLOGY COMPANIES TO THE AREA."

Dinesh Manocha, Paul Chrisman Iribe Endowed E-Nnovate Professor

"THE IRIBE CENTER IS A MUCH MORE WELCOMING SPACE TO COLLABORATE. IT'S ACTUALLY A 'PLACE TO BE.' THE NEW FACILITY AND FACULTY MEMBERS COMING IN SHOW THAT THE DEPARTMENT IS COMMITTED TO INNOVATION, AND I THINK THAT'S VERY ATTRACTIVE TO NEW UNDERGRADS, GRADUATE STUDENTS, AND FACULTY."

Matthias Zwicker, Reginald Allan Hahne Endowed E-Nnovate Professor

Ming Lin photo by John T. Consoli / Dinesh Manocha photo by Brandi Adams
Matthias Zwicker photo courtesy of same

DRIVING **RESEARCH** *ADVANCES*

STUDENTS AND FACULTY MEMBERS TACKLE GLOBAL-SCALE PROBLEMS AND CHALLENGES OF EVERYDAY LIFE

As computers are becoming integrated into nearly every facet of society, computer scientists are being thrust to the forefront of important global issues. Their research crosses disciplines and spans economic sectors.

The Brendan Iribe Center was designed to encourage talented researchers to work together on innovative discoveries that can improve the world. Advanced laboratories and numerous collaborative spaces will help amplify the university's computational resources, which are among the most powerful on the East Coast.

The building will house over 500 graduate students, faculty members, and staff members from the Department of Computer Science and the University of Maryland Institute for Advanced Computer Studies (UMIACS). UMIACS includes campus researchers from six colleges, including the A. James Clark School of Engineering.

Researchers in the Brendan Iribe Center will cultivate collaborations with other academic institutions, federal agencies and companies to address issues ranging from the global-scale problems facing humanity to the challenges of everyday life.

"We look forward to new opportunities in research, innovation and education that the Brendan Iribe Center will afford," said Mihai Pop, professor of computer science and director of UMIACS. "Our interdisciplinary teams of faculty members and students will benefit immensely from the design of the building, which is focused on collaboration and connectivity."

Read on for examples of how UMD researchers are driving advances in computing that positively impact science and society.

ADVANCING COMPUTER VISION

Experts in computer vision and artificial intelligence are developing autonomous robotic systems able to navigate complex environments unassisted. Their small drones rely on systems modeled after bees to "see" their way through tight, completely unfamiliar spaces using just a single camera and onboard processing system without human guidance.

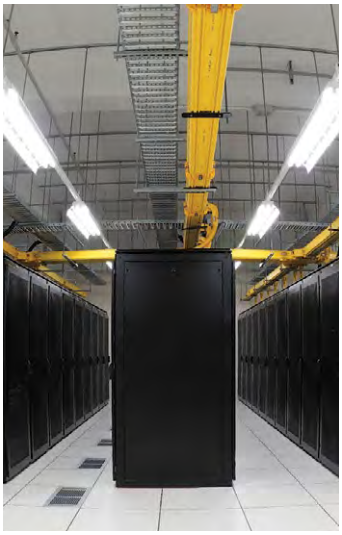
TRANSFORMING MEDICAL CARE WITH AUGMENTED AND VIRTUAL REALITY

Virtual and augmented reality experts at UMD are partnering with the R Adams Cowley Shock Trauma Center and the University of Maryland School of Medicine to transform medical diagnostics and training. An augmented reality prototype allows physicians to see an ultrasound image overlaid onto their patient so they can continue working without looking away from the patient. Virtual reality teaching modules are also being developed to train surgical residents in lifesaving emergency procedures.

Drone photo courtesy of UMD Perception and Robotics Group
Augmented reality ultrasound image courtesy of Maryland Blended Reality Center

DESIGNING EARLY INTERVENTION TOOLS FOR LEARNING DISABILITIES

Using machine learning, computational linguists and hearing and speech scientists at UMD are working with cognitive scientists from Rutgers University to develop tools that predict which language interventions are most effective for Developmental Language Disorder. This is one of the most common childhood learning disabilities, affecting approximately 7 to 8 percent of kindergarteners.



SAFEGUARDING CLOUD DATA

Cloud computing has undoubtedly become a key enabler for processing and analyzing massive amounts of information. But with much more personal data now residing in the cloud, people are worried about their privacy. UMD cybersecurity experts are designing new frameworks and protocols that provide security, availability, and privacy to common classes of cloud applications like Dropbox, Gmail search, and Google Maps.

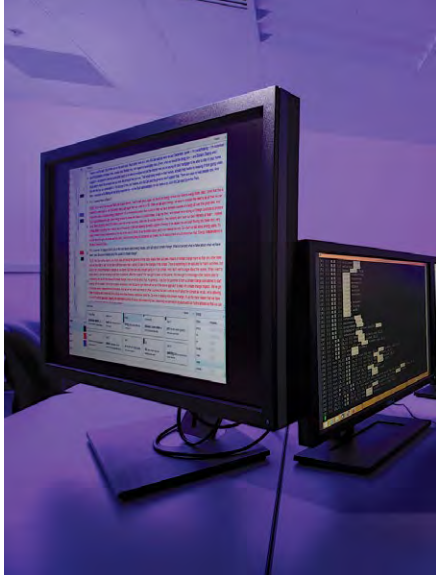
(Clockwise) Child photo by Shutterstock / Cryptocurrency photo by Aaron J. Olson–Pixabay / Language system photo by John T. Consoli / Opera photo by Geoff Sheil / Data center photo by Bob West

SECURING CRYPTOCURRENCY

Cryptocurrencies such as bitcoin, and the underlying blockchain technology they rely on, hold significant promise to change the future of financial transactions, but many compelling challenges remain. Cybersecurity experts at UMD are working with companies and other universities to develop new technologies and blockchain protocols that will protect financial transactions involving cryptocurrencies.

MANAGING PAIN WITH ART, NOT OPIOIDS

The opioid crisis has physicians scrambling for better ways to manage their patients' pain. One drug-free option under investigation is the use of immersive experiences to distract the brain. UMD virtual reality experts have partnered with the Maryland Opera Studio and the R Adams Cowley Shock Trauma Center in Baltimore to study the potential of opera experienced in virtual reality to decrease the use of opioids for selected intensive care unit patients.

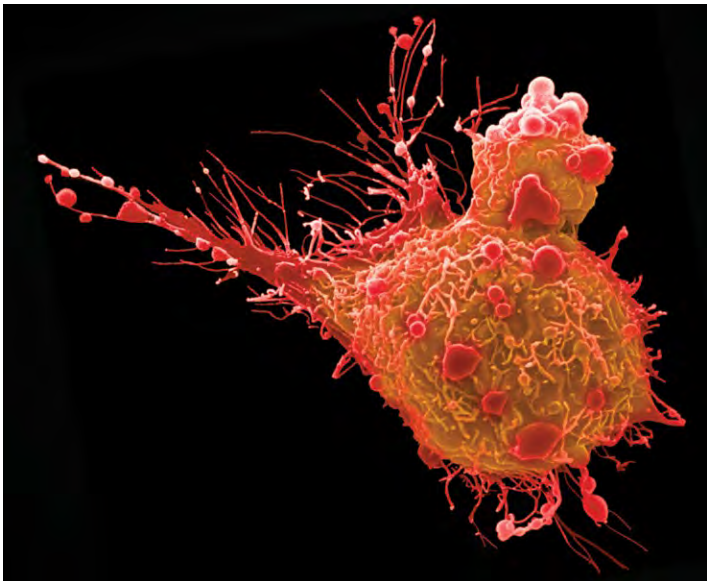


BUILDING A UNIVERSAL LANGUAGE SYSTEM

The thousands of human languages spoken around the world pose challenges to an increasingly global society. That's why computational linguists and information retrieval experts at UMD are collaborating with colleagues at Columbia University, Yale University, the University of Cambridge, and the University of Edinburgh to build a universal language system able to translate and summarize data from any language. Leveraging deep-learning neural networks, their system will find and analyze commonalities in syntax and semantics to teach itself languages, even those with limited online presence.

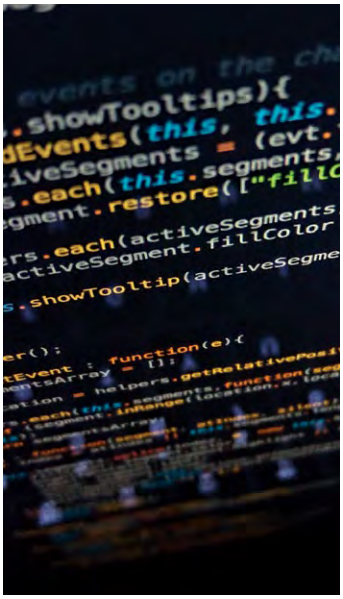
IMPROVING ORGAN DONOR MATCHES

Roughly 100,000 people with terminal kidney failure are waiting for a matching donor. The process of finding one can take years, and the vast majority of potential matches do not result in donations. UMD researchers have shown that artificial intelligence can help to nearly double success rates of matches in nationwide kidney exchanges.



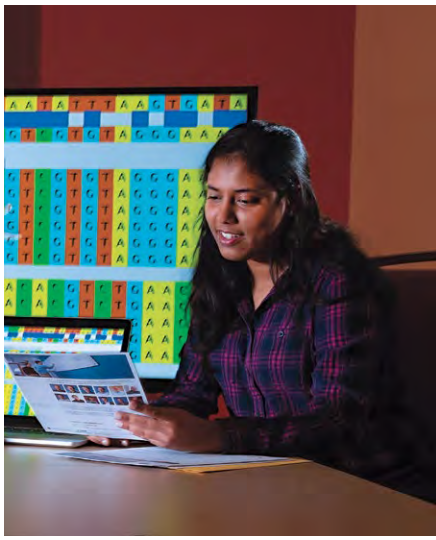
TARGETING CANCER THERAPIES WITH MACHINE LEARNING

Immunotherapies that employ a patient's own immune system to fight cancer have proven revolutionary, sometimes even curing previously fatal disease, but their success rates remain very low. In collaboration with medical experts and researchers at Microsoft, a computational biology researcher at UMD is using machine learning to identify patterns in clinical trial data that can help identify which patients will benefit from treatment.



PREVENTING ZERO-DAY ATTACKS

Engineering faculty members in the Maryland Cybersecurity Center are on the front lines in the battle against "zero-day" cyberattacks, which exploit vulnerabilities not disclosed to the public and allow cyber thieves to roam freely on hacked websites. By conducting empirical studies of major attacks on Fortune 500 companies and others, UMD researchers can offer best practices to protect against these types of attacks in the future.



SCREENING DNA FOR BIOLOGICAL THREATS

The use of DNA synthesis technology has increased significantly during the past decade, promising revolutionary advances in medicine, agriculture and materials science. But DNA-altering technology may also be exploited for harmful purposes, such as resurrecting eradicated deadly plagues. Computational biologists at UMD are working with the Fraunhofer Center for Experimental Software Engineering and others to develop new tools to quickly screen synthetic DNA strands and identify those that might accidentally—or intentionally—be altered to become a biological threat.

(Clockwise) Organ photo by iStock / DNA screening photo by John T. Consoli / Code image by Irvan Smith–Unsplash / Bladder cancer cell image by Steve G. Schmeissner–Science Source

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Join 100+ alumni, corporate leaders, faculty and staff members, and friends by making a gift to the Brendan Iribe Center today.

There are opportunities to support students, research, faculty, infrastructure and more.

For information, contact Stacey Locke at 301.405.4344 or slocke@umd.edu.

FEARLESS IDEAS THE CAMPAIGN FOR MARYLAND

Photo by John T. Consoli