UNIVERSITY OF MARYLAND CENTER FOR ECONOMIC AND ENTREPRENEURSHIP DEVELOPMENT (UMCEED)

FY 2025 REPORT

FY25 report on University of Maryland Center for Economic and Entrepreneurship Development (UMCEED) progress at University of Maryland, College Park (UMD)

Introduction

In higher education, launching new or expanding existing academic programs typically takes several years. In addition to developing the curriculum and obtaining the required approvals, instructors must be hired, laboratories and classrooms must be equipped, and students must be recruited to the new programs and make progress toward their degree. It is also important to note that academic programs are very distinct from entrepreneurship and economic development activities related to IP and startup companies. In FY25, UMCEED funds have been utilized to support economic development through faculty recruitment, degree programs, and other infrastructure initiatives, furthering the campus's mission of economic development in the sectors identified in the bill. Significant progress has been made in recent years toward our UMCEED goals, and we are pleased to provide this FY25 report.

Progress on degree production in current UMCEED-related programs and certificates

- **Immersive Media Design Major**

In Fall 2021 the University launched the new major in Immersive Media Design, through a collaboration between the Colleges of Arts and Humanities (ARHU) and Computer, Mathematical and Natural Sciences (CMNS). This major represents a substantive collaboration between STEM fields and the Arts, and prepares students to be leaders in the production of Augmented Reality, Virtual Reality, Projection, games, interactive installations, and related Immersive Media Design disciplines. The program offers two undergraduate degrees, a Bachelor of Arts through the Studio Art department, and a Bachelor of Science through the Computer Science Department. Students in both majors take computing and arts courses, as well as a core of collaborative courses in which they design and build substantial digital arts works. The program increased from a handful of majors when launched in Fall 2021 to 135 declared majors in Fall 2024. In spring 2024 the program graduated 27 majors (BA and BS), in spring 2025 42 majors, and is on track to graduate about 55 in spring 2026. Students have taken positions at game companies, the National Gallery of Art imaging unit, XR engineering units, defense and general software contractors, design firms, and graduate programs including Carnegie Mellon.

- **College of Information Studies programs**

There has been an extraordinary amount of growth in the College of Information (INFO) over the past few years, spurred by the tremendous success of new undergraduate majors and specializations. INFO continues to grow its programs and graduates. The B.S. in Information Science, launched in 2016, due in part, to prior funding from previous Governor Larry Hogan's Workforce Development Initiative (WDI). The undergraduate major in Information Science, launched in 2016, now has nearly 1909 majors as of Fall 2025 (1847 as of Fall 2024) on the College Park campus as well as 119 (110 in Fall 2024) enrolled students in our transfer program

at the Universities at Shady Grove campus location. The undergraduate major in Technology and Information Design, launched in 2021, now has 142 majors as of Fall 2025 (107 as of Fall 2024).

In 2022, INFO also launched a new undergraduate major, the B.S. in Social Data Science, in collaboration with the College of Behavioral and Social Sciences and School of Public Health. The program has increased from an initial enrollment of 27 students in Fall 2022 to 118 in Fall 2024. In recent years, INFO has focused on building connections with other units on campus–these include a joint Master of Library and Information Science/M.A. in History; a joint Master of Information Management/Master of Community Planning; and, among others, an undergraduate minor, Science, Technology, Ethics, and Policy, which is jointly managed by INFO, PLCY, and ENGR as well as a minor in Information Risk Management, Ethics, and Privacy.

- **Computer and Data Science**

Even with the implementation of a limited enrollment program in computer science, the number of majors in the field continues to grow. The number of degrees granted also continues to increase, with 955 bachelor's degrees in FY24. UMCEED funds have been allocated towards additional faculty and teaching assistants to support the substantial enrollments. In FY22, a minor in Data Science was added through a collaboration between the departments of Mathematics and Computer Science. A Data Science major has been designed but has not yet been moved forward for approval, pending identification of resources.

Additionally, the CS major was modified to include a Quantum Information track to complement the existing specialty areas of Data Science, Machine Learning, Cybersecurity, and CS education. The first degrees in the Quantum Information track were conferred in FY23. Also notable is that the number of master's degrees conferred has increased by over 50% since FY19, with 1140 in FY24. New master's programs in Machine Learning and in Data Science and Analytics comprise over 60 degrees of the total. The newest Master's program, the MS in Artificial Intelligence was approved in June 2025 has an initial class enrolled in Fall 2025.

While this report focuses on degree production, UMD is among the leaders in providing non-credit training on cybersecurity through its Massive Open Online Course (MOOC) sequence in Cybersecurity, offered through Coursera. UMD's free Cybersecurity for Everyone course was Coursera's #1 offering in August 2024, finishing ahead of nearly 300 other courses worldwide, including Google's top offering on this topic. To date, the course has enrolled over 350,000 learners from 200 countries, with nearly 19,000 completers.

- **Neuroscience**

Our recently established undergraduate major in Neuroscience successfully launched in Fall 2020, despite the emergency conditions of the pandemic. The Neuroscience major provides rigorous training in the interdisciplinary study of the brain and behavior, preparing students for a broad range of career paths, including scientific research, medicine, clinical psychology, allied health professions, and science-related employment in government, nonprofit, and private sectors. In the Fall of 2020, there were 97

majors, of which 51 were direct admit new freshmen. As of Fall 2025, there are 460 current majors and 319 alumni. The number of bachelor's degrees has continued to increase from 34 in FY22 to 108 in FY24. The major is now projected to grow over the next two years to a steady state of approximately 500-plus students. The new neuroscience major will continue to encourage more academically talented Maryland residents to stay in-state for undergraduate training at their flagship institution, thereby increasing the likelihood that they will contribute to the local scientific, medical, and allied health professions workforce later, rather than pursuing out-of-state college and graduate training.

Recently approved academic programs

Multiple graduate programs related to the strategic areas of UMCEED were launched in FY25.

- **Master of Science in Biostatistics**

The Department of Epidemiology and Biostatistics within the university's School of Public Health established a Master of Science in Biostatistics. This program focuses on the analytical methods for collecting, analyzing, and interpreting scientific data collected in public health and medical research. This program addresses the growing demand for biostatisticians that has resulted from the massive increase of health data and the need for experts who can analyze this data to inform public health decisions.

- **Ph.D. in Biostatistics**

The Department of Epidemiology and Biostatistics also established a Ph.D. in Biostatistics. This program emphasizes biostatistical methodologies and their application in public health, equipping students with skills to analyze big health data, apply machine learning, and develop applied biostatistical methods for medical and epidemiological studies. The program aims to produce future scholars and leaders in public health and biomedical data science, addressing a workforce shortage in these fields.

- **Master of Science in Artificial Intelligence**

The College of Computer, Mathematical, and Natural Sciences established a Master of Science in Artificial Intelligence. The curriculum emphasizes technical proficiency in machine learning, deep learning, and AI decision-making, while also addressing human-centered design, ethics, and the societal impact of AI. The program prepares graduates to develop AI solutions that are fair, safe, and impactful across industries such as healthcare, finance, public policy, and engineering. Core coursework includes subjects such as probability and statistics, data science, machine learning, computing systems for AI, human-centered approaches, AI and society, and safe and trustworthy AI. Electives allow students to explore specialized topics such as natural language processing, robotics, AI for cybersecurity, AI for healthcare, generative AI, and AI policy.

Research, Patents, IP, and Economic Development related to the UMCEED sectors

Inventive, patenting, and licensing activity for FY24 is listed below

Overall USM and UMCP were recognized for ranking in the top 10 nationally and top 25 globally in calendar year 2024 (which includes the first half of FY25) for turning research into patents by the National Academy of Inventors. https://today.umd.edu/usm-climbs-in-list-of-nations-top-10-patent-producing-universities

While it is very unlikely to be able to make a direct correlation to an academic degree program and patents and licensing by faculty and students, the table below identifies new invention disclosures, patent applications, patents issued, and agreements executed across the six UMCEED areas of focus.

Area	Invention Disclosures	Patent applications filed	Patents issued	Agreements Executed
VR/AR	0	0	0	0
Neuroscience	2	1	0	0
Biomedical Devices	12	24	9	3
Data Analytics	39	23	6	3
Cybersecurity	0	0	0	0
Quantum	22	18	14	2

- **Brain and Behavior/Neuroscience Initiative**

The Brain and Behavior Institute (BBI) was launched in January 2021 to elevate and expand neuroscience research efforts across our campus and with UMB. The focus of the BBI is to solve challenges in global health and wellness related to nervous system function in development, aging and disease, and is establishing the University of Maryland and the State of Maryland as a nexus for excellence in research and education in the field of neuroscience. The BBI advances Maryland neuroscience through the recruitment of a cohort of world-class scientists, the development of cutting-edge tools, the facilitation of collaborations with diverse partner disciplines, and the promotion of the translation of basic science.

Since 2016, UMD has invested in the Brain and Behavior Institute (née Initiative), including $3.75 million in the form of seed grants that have been successfully translated into $28.5 million in new research funding. Resources to support the institute are drawn from UMCEED, The Clark Family Foundation gift, E-Nnovate funds and contributions from the Provost, Vice President for Research, and the Deans of participating colleges. Four new BBI faculty hires have opened their research labs as of Fall 2025. The BBI has also facilitated recruitment of affiliate faculty in computer science, psychology, and philosophy to College Park. To expand campus research in molecular and behavioral science, the BBI has procured and staffed new state-of-the-art equipment cores, including the BBI-Advanced Genomic Technologies Core

(BBI-AGTC) and the BBI-Small Animal MR Imaging facility (SAMRI). The BBI-AGTC, which opened in April 2021, offers the latest approaches to molecular biology and bioinformatics. Following a successful international search for a nuclear physicist to direct the core, imaging is underway at the BBI-SAMRI, where UMD undergraduates in mechanical and bioengineering are also gaining hands-on experience by completing keystone projects to streamline the acquisition and analysis of scanning data. Additionally, the BBI has ordered equipment to expand campus's focused ion beam scanning electron microscopy capabilities to allow for 3D reconstruction of biological ultrastructure, including the nervous system, for the first time. The BBI hopes to open this third core, a cryo-FIB-SEM facility, in the coming years.

The BBI also made a major contribution to the upgrade to the campus MR facility, which facilitated the success of BBI investigators in garnering research grants from the NIH HEALthy Brain and Child Development ($7.5 million over five years) and the NSF Learning the Rules of Neuronal Learning ($3 million over five years). The BBI's grants development office actively promotes the formation of interdisciplinary research teams to compete for large extramural awards, and strategic partnerships forged by the BBI continue to promote the expansion of basic science. In June 2021, the BBI secured funding from MPower to participate in the UMB Institute for Clinical and Translational Research, and UMD faculty, postdocs, and graduate students have competed for multiple awards through this UMB CTSA. In 2023, the BBI development office contributed to the successful funding of UMD faculty in the KL2 and ATIP programs and of two Neuroscience and Cognitive Science graduate students in the ICTR's TL1 program.

BBI will be administratively housed, beginning in fall 2025, in the College of Behavioral and Social Sciences (BSOS), which houses the Neuroscience & Cognitive Science (NACS) program. The longstanding connection between NACS and BBI will now be formalized as they are administratively joined and co-located in new, central convening office space in the Biomolecular Sciences Building. This acknowledges the BBI's overlapping mission with NACS and reinforces our joint commitment to advancing neuroscience research and education. We believe that more closely aligning graduate student training in neuroscience with the BBI's mission will bring mutual benefits to both NACS and the BBI.

Strengthening the brain and behavior community will continue the success of UMD and UMB in recruiting talented faculty to perform cutting-edge, interdisciplinary research. Synergy with the emerging MPower initiatives focused on neurobiology, aging and global health will afford support and collaboration opportunities for existing and new faculty in brain research, amplifying clinical trial capabilities at UMD while elevating and extending our competitiveness to acquire external funding from leading federal agencies.

- **Virtual and Augmented Reality**

The Center for Medical Innovations in Extended Reality (MIXR), launched in 2022 with $5M in funding from the National Science Foundation and industry partners, is a pre-competitive consortium dedicated to accelerating the responsible integration of XR into health care. Now part of the University of Maryland Institute for Health Computing (IHC) in Montgomery County, Maryland, MIXR brings together industry leaders, academic researchers and regulatory experts to drive progress through collaborative research, shared standards and open communication across sectors. MIXR is a joint effort between computer science and visualization experts at the University of Maryland, College Park, and the medical schools at the University of Maryland, Baltimore, the University of Michigan, and the University of

Illinois, Urbana-Champaign. Current industry and government Advisory Board members include the U.S. Food and Drug Administration, Sony, MediView, Cook Advanced Technologies, the Air Force Research Laboratory, Cleveland Clinic, and Microsoft.

MIXR has given a significant boost to the local ecosystem in virtual and augmented reality through events such as the recent open house hosted by the FDA that included representatives from the MIXR Advisory Board Members and GE Healthcare, US Pharmacopeia, NIH, NIST, NSF, and other companies and agencies in this area. MIXR program outcomes are laying the groundwork for regulatory requirements and decisions regarding XR devices, with a focus on current gaps and evaluation challenges across a range of clinical specialties and various XR hardware and software platforms. Current projects include quantifying cybersickness in XR, developing a collaborative simulation platform, standardizing XR integration into healthcare facilities, and optimizing XR for medical training.

A key tool deployed by MIXR is the HoloCamera Studio, a world-unique volumetric capture facility featuring 300 frame-synchronized cameras and a ready pipeline for rendering holographic avatars. Using the HoloCamera in collaboration with the Physicians Assistant program at the University of Maryland, Baltimore, MIXR has created a novel immersive training module depicting a stroke, used in classrooms for the first time in January 2025. The HoloCamera has also been a point of interest for many government and industry leaders during their visits to the College Park campus; recent guests include Maryland Lt. Governor Aruna Miller, Maryland Secretary of Higher Education Sanjay Ray, Maryland Deputy Secretary of Labor Jason Perkins-Cohen, along with several representatives from Nvidia.

- **Quantum Technology - Establishing the Capital of Quantum**

Building on UMD's decades of leadership in advancing quantum information science and technology, UMD has been leading regional efforts to build a globally-connected quantum innovation ecosystem since 2019. UMD's global leadership role was demonstrated by Prof. Yanne Chembo helping to create the United Nations' "International Year of Quantum" in 2025, then UMD organizing a variety of aligned events, including a regional celebration of World Quantum Day on April 14. It is therefore fitting that 2025 marked an inflection point in transitioning quantum to be a driver of economic development for the region and a public commitment to reinvigorating UMD's academic capabilities with the launch of a strategic cluster hire.

Regional Collaboration: Launched in 2020, the Mid-Atlantic Quantum Alliance (MQA) is led by UMD to enable collaboration between its regional partners from government, industry, academia and non-profits to grow a vibrant regional ecosystem. The MQA added 10 more members this year to reach 52, accelerating the rapid growth from its 14 founding members. Through the MQA's collaboration with Connected DMV, UMD has helped to grow and served as the lead academic sponsor for the Quantum World Congress (QWC) since it launched in November 2022; QWC 2025 was the largest one yet and helped to crystalize international opinion that Maryland truly is one of the main US hubs for quantum. QWC 2025 also provided an international stage for showcasing UMD's Quantum and Arts initiative which teams technologists with artists to foster creativity and improve public understanding of and engagement with these emerging technologies. The MQA also led the second attempt at pursuing an NSF Regional Innovation Engine, which proved unsuccessful but established new ties between the

quantum and life-sciences sectors and helped to mobilize support for the state's prioritization of quantum.

Economic Impact: While the Quantum Startup Foundry (QSF) has supported dozens of companies over the last four years (see next section), UMD's economic development impact experienced a quantum leap this year. In January, Gov. Moore announced the $1 billion Capital of Quantum Initiative, a public-private partnership between the state, UMD and IonQ. This includes IonQ building a new, expanded headquarters in College Park to support its rapid growth and aggressive acquisition strategy. In April, the Applied Research Laboratory for Intelligence and Security (ARLIS) launched the new Maryland Institute for Quantum Applications (MIQA). MIQA serves as a critical asset for the federal test and evaluation of quantum technologies, and is a foundational element of the subsequently announced Capital Quantum Benchmarking Hub. This Hub is a partnership between DARPA and the state to support the delivery of practical quantum computing by 2033 through DARPA's Quantum Benchmarking Initiative (QBI). At QWC 2025, Microsoft announced it was the first QBI company to move into the Discovery District with a new Quantum Partners Integration Center.

Global Leadership: Key leadership changes further demonstrate this inflection point. Last summer, Dr. Saikat Guha joined UMD's ECE Department, where he continues to serve as the Co-Director of the Center for Quantum Networks (CQN), the NSF's only quantum-focused Engineering Research Center. CQN is currently seeking its renewal, which will include making UMD the primary institution. This July, Dr. Gretchen Campbell became the inaugural Vice President for Quantum Research and Education. Dr. Campbell had been part of the Joint Quantum Institute for 15 years, serving most recently as the NIST Co-Director. Dr. Campbell was the Director of the National Quantum Coordination Office (NQCO) in the White House for the last three years. In September, she was joined by Dr. Corey Stambaugh to serve as the Director of the Capital of Quantum Initiative through the Discovery District Management Corporation, where he will guide and implement the state's investment strategy. Dr. Stambaugh helped to set up the NQCO as a national industry liaison, then served as the Chief of Staff of NIST's Physical Measurement Laboratory. Concurrently, Dr. Norbert Linke returned to Maryland to become the new Director of the National Quantum Laboratory (QLab), UMD's global user facility putting qubits into the hands of users. The QLab, launched as a close partnership with IonQ in 2021, expanded in 2025 to include collaborations with Xanadu and growing its quantum networking capabilities in partnership with the CQN. In addition, UMD is part of two of the NSF's four inaugural National Quantum Virtual Laboratories (NQVLs) that are improving the accessibility of the critical infrastructure for enabling accelerated quantum research and development.

Workforce Development: UMD significantly accelerated its preparation of the workforce in 2025, with a particular emphasis on experiential learning and engaging with quantum employers. UMD accepted its first cohort into the newly launched interdisciplinary Quantum Science and Engineering Minor in Spring 2025. The QSF and one of its companies, QC82, used state Build Our Future grants to launch the AQCESS Lab in the Rabin TAP Building to serve as a testbed for startups that simultaneously provides students with hands-on experience with cutting-edge technologies. This summer, the QLab enabled IonQ to launch a graduate student internship program; this has already yielded a 100% success rate with

four full-time hire offers. Enabling further expansion of our educational efforts, UMD launched a strategic cluster hire in quantum in 2025, supported in part by $1M in UMCEED funding towards new tenure track faculty hires in Computer Science and in Engineering. These accomplishments build on prior quantum workforce development efforts, which include launching or expanding

- A quantum information specialization in Computer Science,
- Professional Development trainings for local K-12 teachers to integrate quantum education into their classrooms,
- Summer programs for high school and middle school students,
- Interdisciplinary bootcamps and workshops to build community between quantum computing and domain experts,
- Quantum hackathons,
- The Quantum Machine Learning stream in the First-Year Innovation & Research Experience (FIRE) program since 2022, and
- The QLab Collaboration Space that has supported educational programs and research projects in high-energy physics, materials science, image processing, cybersecurity and computational fluid dynamics since 2023.

Discovery Fund & Quantum Startup Foundry

The Discovery Fund and the Quantum Startup Foundry are critical parts of the strategy to accelerate the quantum innovation ecosystem to achieve the vision of making Maryland the Capital of Quantum

The Discovery Fund is UMD's first ever venture fund. Its investments aim to spur growth of startups in high technology areas like quantum in the Discovery District and Prince George's County, and it is supported by $1 million annually from UMCEED. Highlights from the Discovery Fund in FY2025:

- In FY2025, the Discovery Fund made 6 funding commitments totaling $840,000 in several promising startups and strategic programs including RelAI, QC82, Reversal Therapeutics, Medcura, The Coding School, and Causify.ai:
    - Relai.ai is an early-stage SaaS company that offers enterprises an all-in-one artificial intelligence ("AI') framework specializing in reliability inspection and mitigation.
    - QC82 is the developer of room-temperature photonic chips with on-chip photon number resolving detectors to conquer fault tolerance.
    - Reversal Therapeutics is a preclinical stage biopharmaceutical company pioneering the development of proprietary molecules designed to neutralize and remove a wide range of agents from the body through a revolutionary sequestration mode of action.
    - Medcura's advanced wound treatment platform provides rapid and reliable bleeding management while creating an antibacterial healing environment, all at a small fraction of the costs of the market leading products.
    - The Coding School's Qubit x Qubit platform brings high-quality quantum education and workforce development training to College Park and Prince Georges County at large.
    - Causify has developed a real-time reasoning engine and suite of data intelligence tools that use Causal AI to uncover why things happen, not just what will happen, so businesses can make better decisions and drive better outcomes.

- Since inception (2022), the Discovery Fund has committed to invest ~$2.64 M in promising technology startups and strategic projects.

The Quantum Startup Foundry (QSF) at the University of Maryland creates a vibrant quantum commercialization ecosystem with everything quantum entrepreneurs and startups need to be successful. That includes access to UMD's research and education strengths, and UMD's talent and infrastructure. QSF also brings in investors and other funders, critical services like legal and IP support, and business expertise and mentoring like the NSF Mid-Atlantic I-Corps Hub innovation training program. QSF is supported by $500,000 annually from UMCEED. Highlights from the QSF in FY2025:

Quantum Startups in MD

- In 2021, UMD launched one of the world's first startup incubators dedicated exclusively to quantum, Quantum Startup Foundry. UMD partnered with the Mid-Atlantic Quantum Alliance (MQA) to develop QSF to provide the resources and support needed for startups to advance global innovations in quantum. Located just steps away from IonQ and the Q-Lab, QSF provides critical access to UMD's quantum research and education strengths, and UMD's quantum talent and infrastructure, including offices at WeWork and a dedicated quantum lab in the TAP incubator. Supported by $1 million annually from state economic development legislation, QSF also brings in investors and other funders, critical services like legal and IP support, and business expertise and mentoring.
- In three years, QSF accelerated over 30 new quantum startups, including one non-profit called Qubit by Qubit (The Coding School), whose mission is to inspire and expose youth from diverse and often underserved populations to the basics of quantum computing. QSF's current members include the following companies: Error Corporation, QC82, RadBio-Q, QRC America (Quantum Resistant Cryptography), BEIT, NanoQT, Qubit by Qubit, Patero, Singularity Quantum, and CertnKey (Data-Warehouse GmbH). Recent highlights include:
    - QC82, Error Corp., and Nanofiber Quantum Technologies all were awarded MIPS grants to collaborate with UMD researchers
    - QC82 was awarded a MD Build Our Future grant for its AQCESS project to equip a dual use commercial-educational research space that would be beneficial to startups as well as students from MD and the region
    - Six QSF-affiliated startups have collaborated with IonQ through the Q-Lab
    - Qapital Qnnections (Q2) connects quantum startups with quantum investors, including the Discovery Fund. Q2 program's flagship event is an invitation-only Quantum Investment Summit (QIS).
- QSF has established strong relationships with US and global quantum hubs: Chicago Duality, Chattanooga Quantum Collaborative, The South Carolina Quantum Association, Quantum Delta Netherlands, Québec Quantique to name a few. QSF is a regular speaker, exhibitor, and chair at quantum conferences like Quantum-2-Business, Quantum World Congress, and TechConnect. QSF is an active member of MQA and QED-C (QSF was the inaugural host of the QED-C Quantum Marketplace Webinar). QSF has also collaborated with a team in X-Prize Quantum. Key QSF partners include: MD Department of Commerce, Prince George's County Economic Development Corporation, Montgomery County Economic Development Corporation, Carter Deluca IP Law Firm, EY, IonQ, and McKinsey.

The number of University of Maryland graduates who are employed in Maryland based businesses.

39% (1502 students) based upon the 2022 Graduation survey report.
40% (1539 students) based upon the 2023 Graduation survey report.
47% (1558 students) based upon the 2024 Graduation survey report.

* “Employed” includes students who are ***employed FT, employed PT***, volunteering or in a service program, serving in the military, or starting a business.