Strategic Plan

Manning College of Information and Computer Sciences

UMass Amherst

Manning College of Information
& Computer Sciences

Table of Contents

University of Massachusetts Amherst Strategic Plan 2018-2023

Be Revolutionary: A Vision for the Future

Mission

The mission of the University of Massachusetts Amherst is to create positive impact on the commonwealth and the broader society we serve through education and advancing knowledge. As the flagship public university in Massachusetts, we cherish and add to the commonwealth's long tradition of intellectual and educational leadership.

Our institution is rooted in the idea that any qualified individual, regardless of wealth or social status, should have access to high-quality higher education. We draw from and support diverse experiences and perspectives as an essential strength of this learning community and accept for ourselves and instill in our students an ongoing commitment to create a better, more just world.

Vision

Our vision is to dramatically improve every aspect of the University of Massachusetts Amherst so as to ascend into the ranks of the top 20 public universities in America, as measured by nationally and internationally recognized criteria. We intend to deliver, for the people of Massachusetts and beyond, a public university that shares the same qualities of excellence, impact, and outcomes as the best public universities in the nation and the world.

Values

- Excellence. In whatever we choose to do, we strive for excellence.
- Diversity, Equity, and Inclusiveness. We are committed to the success and well-being of every individual in our community regardless of group identity.
- Openness. As a university, we are committed to free and open intellectual inquiry and expression.
- Integrity and Stewardship. As a community, we set high standards for personal responsibility and institutional integrity, and hold ourselves accountable in managing institutional resources and for advancing sustainability of our planet.
- Innovation. We stimulate, recognize, and reward innovation and creativity.

UMassAmherst

Manning College of Information
& Computer Sciences

- Impact. We aim to create far-reaching impact on society by welcoming students and faculty from around the world and assisting them to contribute to the welfare of people both locally and globally.

Goals

The plan for the next five years will propel the campus on the pathway to the Top 20 among public research universities by fulfilling the following strategic goals:

1. Establish UMass Amherst as a destination of choice where academically accomplished, socially responsible seekers of a world-class education succeed in a research-rich, inclusive learning community.
2. Establish UMass Amherst as a partner of choice in advancing and applying knowledge and innovation for the betterment of society.
3. Establish UMass Amherst as a community of choice for students, staff, and faculty that exemplifies the power of diverse perspectives and mutual respect.

In support of these goals we follow two overarching principles:

1. Mobilize all our resources to achieve a sustainable financial strategy; and
2. Instill a culture of evidence at all levels that applies the best possible information and analysis to decisions.

Manning College of Information and Computer Sciences

Mission
The mission of the Manning College of Information and Computer Sciences is to deliver on the promise of computing by
- Developing secure, fair, trustworthy, easy-to-use, and helpful technologies that advance science, improve our quality of life, and contribute to the progress of society; and
- Educating a diverse community of responsible innovators who are prepared to solve problems across industries, leveraging computational thinking and technology to do good in a rapidly changing world.

Vision
As a college, we are dedicated to a vision we call "Computing for the Common Good". We envision a world where our computing research and the knowledge instilled in our graduates enhances the well-being of our citizenry.

Values
We support the University's values, and are proud to be part of this land-grant institution. In particular, we value:

Excellence and Integrity in all our activities.
- Innovative research that contributes to a better world
- A high-quality education, delivered by top faculty using the most effective pedagogical techniques
- Leadership within the university, our professional communities, the Commonwealth and the nation
- High standards for ethics and personal responsibility
- Continual innovation and improvement in all aspects of our college, leveraging data to drive our efforts

Open and Inclusive Collaboration in our research, teaching, and professional lives, within our college, across the university, and with external academic institutes and industry.
- Consensus-seeking governance processes in which all people have a voice, and all are treated fairly and equally
- Commitment to free and open communications

- Embracing diverse ideas, perspectives and contributions, vital to developing future leaders and serving the common good
- Special effort to invite the participation of people historically minoritized in computing
- Commitment to the success of all members of our community

Impact We value research, education and service that lead to positive change in our world.

Strategic Scan

Process
In Fall 2021, the college's Executive Committee kicked off an iterative process to refresh our strategic plan. The committee formed three working groups: education, research, and diversity, and each group conducted a strategic scan for their designated area. The teams brainstormed, collected and analyzed data, spoke to faculty and staff throughout the college, refined assumptions and eventually developed strategic action plans for the next 3-5 years. These findings and plans were presented and discussed with the Executive Committee as well as all faculty, staff and our external advisory board. Feedback was incorporated into a draft strategic plan that was again shared and refined before finalizing.

College Overview
The Manning College of Information and Computer Sciences (CICS) is a highly respected program, consistently ranked #20 in the nation, with strengths in machine learning, information retrieval and networking, among others. Our faculty have been pioneers of the computing field, bequeathing us a strong reputation that has allowed us to hire outstanding faculty in promising research areas and to attract brilliant students.

Information and computer sciences cover a broad spectrum of rapidly evolving fields and are among the fastest growing professions in the global economy. Computing plays a central role in universities, government, industry and society in general. CICS has been a visionary leader in developing interdisciplinary research, teaching and outreach that engage faculty and students. The need for computer scientists is skyrocketing globally, creating demand for our students and making recruiting and retaining faculty difficult.

Fortunately, CICS continues to attract academically accomplished students at all degree levels. Applications to our majors are increasing from both direct admissions and from major changes on campus. In addition, our Computing for the Common Good mission helps us attract socially responsible students. Student headcount has increased 80% over the last five years and with strong demand for computer scientists continuing, we anticipate that applications and enrollments will continue to increase. In 2021, Computer Science graduated the largest number of undergraduate students in a single degree program (the BS in Computer Science), the largest number of MS students, and the largest number of PhD students among all departments at UMass Amherst.

To support the increasing numbers of students, CICS has grown dramatically over the past five years. We have increased our faculty size by 52%, while maintaining our outstanding reputation for high quality research. Even with this increase in faculty size, increases in student enrollment have outpaced faculty hiring, leading to large class sizes, inability to

enroll in popular courses, and students having difficulty finding research opportunities with faculty. We have been exploring ways to manage the student/faculty ratio more effectively going forward. We also desperately need more physical space for faculty and students to interact. We recently secured funding to build a new, state-of-the-art facility that will help continue to attract the best and the brightest students and faculty to our college.

As we recruit new faculty, students and staff, we are also putting more resources and attention towards improving the representation of people historically minoritized in computing in our community, in alignment with our mission, vision and values. We are providing more pre-college educational support, increased scholarships, and new programs that focus on student retention and community building. We have also redoubled our efforts to hire more diverse faculty, including women. We have more than doubled our female faculty in the past five years and recently added our first Black faculty member, but there is more to do.

The financial health of the college has been strong, mainly due to our decision to grow our professional master's program. We have also been able to secure a few large gifts that fund faculty lines, student programs, scholarships, and collaborative research. Increased philanthropy will be important for continued support of our educational and research programs; this is challenging with a relatively young and small alumni base, however new programs are appealing to corporate and alumni donors to fund.

Student Success
Historically, CICS has been a research-rich environment with few undergraduate and master's students. Maintaining the quality of education despite significant increases in enrollment has been difficult. Undergraduate and master's students have experienced large class sizes, problems enrolling in courses, and difficulties getting involved with faculty research. We have offered more undergraduate courses during summer and winter breaks, hired professional advisors for both undergraduate and master's students, and invested in software to make communicating with students and grading assignments more efficient.

As the number of students continues to increase, CICS has committed to building a culture with a greater emphasis on teaching and teaching development. We are continually searching for high quality faculty to provide instruction. We are providing more teaching assistants and undergraduate course assistants, and have developed new courses to train them, investing in a new position to ensure they have the mentoring and monitoring they need to support students. We are also exploring mechanisms to build a more welcoming community to attract and retain students historically marginalized in computing and have

recently raised funds to support a number of new initiatives in this area, as detailed in the Diverse and Inclusive Community section below.

We are now in the first phases of a major project to review and refresh our curriculum to better prepare, support and retain students of all backgrounds. We are currently revising our introductory sequence to better support the range of experience of incoming students, providing a supportive and inclusive experience for all students, whether or not they have had prior exposure to computing. We plan to extend this review to refresh the rest of the curriculum over the next few years. As part of this project we will explore ways we can engage undergraduate and master's students in faculty research projects, encouraging those who are interested to continue their studies and providing experience for those who choose to enter the job market.

During this time of rapid growth, we also underwent a major shift from faculty advising for all undergraduate and masters students to creating a professional advising center that can support the whole student. Our team of professional academic advisors provides students with many important supports throughout their academic career and our successful career center, CICS Careers, helps students find the right career path for their interests and filling the talent pipeline, especially in MA. We have seen increased interest in co-op and credit-bearing internship programs and are exploring those experiential learning opportunities with multiple employers.

Research and Graduate Education
Our research strength is fundamental to our reputation, research funding from all sources, ability to attract top faculty and students (especially, but not limited to, graduate students), and ability to influence the industry and the field. Hence maintaining and building this strength is critical.

Our esteemed faculty lead many highly respected research groups such as the Center for Data Science, the Cybersecurity Institute, the Center for Intelligent Information Retrieval, the Computational Social Science Institute, the Center for Smart and Connected Society, the Public Interest Technology initiative, and the Center for Personalized Health Medicine, among many others. They have received many prestigious honors and awards, and their research is highly cited and well-funded. Faculty have held prominent positions at NSF and DARPA, and are active in important professional organizations such as the ACM, AAAI, NAE, CRA, and the American Academy.

More recently, we have added faculty in a wide range of new research areas such as human computer interaction, health informatics, information visualization, mobile and sensor systems, and quantum computing. Cross disciplinary groups include formal groups

such as the Computational Social Science Institute, and more informal ones such as EQUATE, an initiative of CICS faculty who are engaged in research and education related to equitable algorithms and systems. Our synergistic network of faculty provides unique learning opportunities and collaborations as the computing field and research interests evolve. Going forward, we will expand and showcase our initiatives surrounding the social impacts of computing and public interest technology, as these are particularly well-aligned with our mission.

To maintain our international reputation in long-standing research areas while growing in new areas requires robust and consistent faculty hiring. The demand for faculty is extremely high and we are competing for talent not only with other institutions of higher education, but with companies such as Google, Facebook and Amazon. We lost several faculty to more prestigious institutions and industry and we are continually looking to fill vacant positions. Our rural location often makes it difficult for partners of faculty to find employment, despite our vigorous efforts to find them positions on-campus. We hope this will improve as more companies offer remote positions and hiring picks up.

During this time of rapid growth, we have grown our grant funding and expenditures proportionally to our size—a remarkable accomplishment given that many senior faculty retired or took government positions, and our large base of assistant professors are still working to establish their research labs. We expect funding to grow even more substantially in the coming years as our junior faculty expand their research programs. Our funding sources remain diverse, primarily federal programs (NSF, DARPA, NIH, among others), industry, state programs, and foundations.

We anticipate that significant federal funding will become available under the Biden Administration, and we look to capitalize on these opportunities. CICS is providing mentoring and investigating other means to help faculty submit more impactful proposals and strengthen our ability to compete for large center-scale grants. We are also developing mechanisms to strengthen relationships among faculty to support fruitful collaborations and long-term success. On a similar note, building strong relationships with foundations and corporations will become increasingly important in funding new proposals and collaborative research.

An essential component of our continued research success is our ability to attract smart, curious, and diverse PhD students. The CICS PhD program continues to hold a high ranking among our peers and graduate students are attracted to the innovative research our faculty are pursuing. Our program requirements are some of the most flexible in the country and our graduates have a history of getting the jobs they want in academia and industry. The rural location of UMass Amherst, lack of diversity among domestic students

and limited availability of affordable housing are challenges to graduate student (and faculty) recruitment and retention. Average time to complete our program has been creeping up, with significant numbers of students taking more than seven years to get their degree. We would like to decrease the average time to obtain a PhD, focusing on two major milestones, candidacy and degree. We are instituting more regular reviews of candidate progress, and investigating other interventions towards this goal.

Diverse and Inclusive Community
The field of computer science lacks racial and gender diversity and CICS aspires to improve the representation of people historically minoritized in computing across our faculty, staff and student populations. We aim to deliver on the promise of computing while employing a diverse faculty that can inspire and mentor students from all backgrounds, races, genders and cultures to succeed. We want to ensure that our curriculum is aligned at appropriate levels of academic preparation so that success is attainable by all students. We also want all students to have equal opportunity to engage in research with faculty, participate in experiential learning and lead student organizations.

While CICS has made progress in building a more diverse and inclusive community (as of this year, our MS program is over 50% female-identifying students, for example), there are opportunities to improve. We established a faculty diversity committee many years ago and more recently hired three dedicated staff to create and lead diversity and inclusion programming in the college (STRIDE training, book groups, undergraduate peer mentoring programs, visible affinity groups, etc.). These new staff members have also challenged our thinking in student recruiting, provided much needed training in inclusive education, and facilitated many community conversations to improve our climate. In Summer 2020 the entire college community of interested faculty, students and staff joined together to form CARE (Committee Against Racism and for Equity) which branched out into many initiatives that explored ways to improve equity within the college. Changing organizational culture is one of the most difficult leadership challenges and we seek to continually make systematic changes in our college structures and hold leaders accountable for implementing and maintaining these changes.

The lack of racial and gender diversity among our faculty is disappointing and recruiting and retaining diverse faculty is difficult. Most tenure track women hired before 2019 have left or retired, resulting in a lack of active senior women faculty to hold leadership positions and serve as mentors. Intersectional analyses from the 2020 UMass ADVANCE survey reveal that women of color, foreign-born women, LGBT?Q women, women at the Associate Professor level, and caregiving women in STEM face barriers to being fully included on campus and heard in department meetings compared to their male counterparts. CICS is committed to building a healthy and inclusive community, promoting faculty connections

to enhance collaborations, and sponsoring specialized mentoring and support programs to increase the retention of diverse faculty members. At the same time, we are continuously searching for faculty with diverse backgrounds and perspectives, which is difficult given that few computer science PhDs graduate each year and there is fierce competition for this talent from academia and industry.

The peer-to-peer student climate in CICS has been described by some undergraduate students in small-group discussions as 'hostile,' 'toxic,' and 'hyper competitive'. While hardly unique to CICS (similar concerns are reported in other CS programs across the country), we definitely aspire to improve the culture in our college. CICS has thus been taking measures to educate faculty to address this culture, as much of this competitiveness occurs in the classroom. The CICS Office of Diversity and Inclusive Community Development and our strong teaching faculty have engaged students (both undergrad and graduate), faculty and staff to find and implement solutions.

Recruiting new, diverse graduate students is an area where we are putting more energy and resources. One of our CARE groups explored ways to improve the equity in PhD admissions and we have implemented many of their recommendations. We have also been in discussions with the Undergraduate Admissions Office to increase the diversity of our admitted students. We have received large gifts to support a summer institute, an undergraduate cohort program, hackathons and numerous scholarships for students underrepresented in CICS. Some students suffer from financial hardships, and scholarship opportunities make college accessible to those trapped by economic circumstances. We also know that first-gen students often don't have the cultural competencies to excel and we want to increase our communications, ramp-on and support programs to decrease student melt and prepare them for success. Our Diversity office also developed a Broadening Participation in Computing statement that accompanies every NSF proposal and allows faculty to easily plug into and further support the college's diversity initiatives and/or supplement these activities with their own.

Strategic Action Plans

GOAL 1: Establish UMass Amherst as a destination of choice where academically accomplished, socially responsible seekers of a world-class education succeed in a research-rich, inclusive learning community.

CICS Strategic Focus Area: Refresh curriculum to better support and retain students of all backgrounds
- Redesign introductory course sequence with a focus on retaining students in the major and preparing them to succeed in later courses
- Make research more available within the educational program for undergraduate students
- Expand and institutionalize our co-op style internship program, leveraging the Mt. Ida campus

CICS Strategic Focus Area: Build a college culture with a greater emphasis on teaching & teaching development
- Launch programs to provide support for skills development and evaluation
- Empower the Teaching Development committee to support such programs, for example, peer feedback on teaching, best practices for evaluation in the context of reappointment, promotion, and tenure.

CICS Strategic Focus Area: Attract and retain a broader diversity of students at all levels from undergraduate to PhD
- Increase the representation of women and historically marginalized students in the undergraduate program
- Increase the representation of domestic students (and among them, of women and historically marginalized students) in our masters and doctoral programs
- Expand our online and professional programs, reaching new groups of students

CICS Strategic Focus Area: Maintain quality of education while continuing to grow to support the interest of students and needs of the university and Commonwealth
- Complement our new professional advising model with faculty mentoring and interactions
- Offer more seats in courses and streamline the course override process to meet student demand
- Strategically limit sideways entry to the computer science major through major changes as needed to improve the educational experience
- Provide a longer and more targeted onboarding program to prepare foreign students' for the transition into and through our program

GOAL 2: Establish UMass Amherst as a partner of choice in advancing and applying knowledge and innovation to the betterment of society.

CICS Strategic Focus Area: Strengthen our ability to do and lead strong and impactful research
- Rebuild and enhance our strength in core areas of CS
- Strengthen our ability to compete for large center-scale grants
- Help faculty submit more impactful proposals beyond their direct intellectual merit
- Expand and showcase initiatives surrounding the social impacts of computing

CICS Strategic Focus Area: Strengthen our highly collaborative research environment
- Increase faculty awareness and knowledge of research activities and interests within the college and university
- Catalyze collaborative projects among CICS and broader UMass Amherst faculty
- Better inform faculty about how to develop, propose and conduct collaborative, interdisciplinary research

CICS Strategic Focus Area: Maintain and improve the CICS PhD program in terms of quality, productivity and overall student success
- Improve faculty training and mentoring on how to be good PhD advisors and mentors
- Provide more uniform training and guidance to students on how to become independent researchers early in the program
- Strengthen our efforts to recruit strong students and increase the number of underrepresented students that succeed in our program.

GOAL 3: Establish UMass Amherst as a community of choice for students, staff and faculty that exemplifies the power of diverse perspectives and mutual respect.

CICS Strategic Focus Area: Align academic programs to support varying levels of preparation
- Design academic programs that provide students with academic success and the social capital to make connections to next steps (graduate school or industry)
- Strengthen the sense of community that we build around the classroom to increase belonging and sustain motivation
- Engage faculty and course staff in developmental activities on inclusive teaching
- Improve learning outcomes for students historically marginalized in our college
- Assess and address barriers to retention and success

UMassAmherst

Manning College of Information
& Computer Sciences

CICS Strategic Focus Area: Improve peer to peer climate

- Engage students (graduate and undergraduate) in collaborative, social, developmental and non-competitive activities that encourage mutual respect
- Provide numerous, connected support systems and experiences for all students to increase their feelings of success and sense of community
- Make cultural knowledge and expectations explicit, and provide faculty and staff with resources to facilitate demystifying "hidden" curriculum in our classrooms and research labs (reducing the cultural divide between those that have prior exposure/experience and those that are new to college, graduate school or the U.S.)
- Reward faculty and staff who complete cultural competency training or graduate advising/mentoring training

CICS Strategic Focus Area: Recruit and retain diverse faculty

- Increase the recruitment of diverse faculty, particularly faculty who identify with groups historically minoritized in computing
- Improve and expand faculty on-boarding programs to ensure that new, diverse faculty are welcomed into a collegial, collaborative environment
- Examine, evaluate and update existing onboarding, evaluation, mentoring and promotion practices according to established DEI principles
- Improve faculty retention at all levels and enhance our collegial environment through public recognition of accomplishments, equitable access to resources, and ensuring equitable service and teaching loads

CICS Strategic Focus Area: Enhance student recruitment strategies that increase diversity

- Develop effective, well-mapped, cohesive and sustainable recruitment plans to increase diverse student enrollment at the undergraduate, master's and PhD levels
- Partner with programs, conferences and influencing groups that identify and locate target audiences with aptitude (e.g., Digital Ready, historically Black colleges and universities, Grace Hopper Celebration, etc.)
- Create summer communications and pre-enrollment programs that decrease student melt and prepare students for success

UMassAmherst

Manning College of Information
& Computer Sciences