BOARD OF HIGHER EDUCATION

REQUEST FOR BOARD ACTION

NO: BHE 20-28

BOARD DATE: June 23, 2020

APPROVAL OF LETTER OF INTENT OF THE UNIVERSITY OF MASSACHUSETTS AMHERST TO AWARD THE MASTER OF SCIENCE IN DATA ANALYTICS AND COMPUTATIONAL SOCIAL SCIENCE AND AUTHORIZATION FOR FAST TRACK REVIEW

MOVED: The Board of Higher Education (BHE) has evaluated the Letter of Intent of the **University of Massachusetts Amherst** to award **the Master of Science in Data Analytics and Computational Social Science** and has determined that the proposal aligns with BHE criteria. Accordingly, the BHE authorizes the Commissioner to review the program and to make a final determination on degree granting authority pursuant to the Fast Track review protocol.

VOTED: Motion adopted by BHE 6/23/2020.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b); AAC 18-40.

Contact: Winifred M. Hagan, Ed.D., Senior Associate Commissioner for Strategic Planning and Public Program Approval

BOARD OF HIGHER EDUCATION
June 2020
University of Massachusetts Amherst
Letter of Intent
Master of Science in Data Analytics and Computational Social Science

DEGREE TITLE ABSTRACT ON INTENT AND MISSION OF PROGRAM

The proposed Master's in Data Analytics and Computational Social Science (MS/DACSS) is an interdisciplinary degree program designed to train students to be employed in roles that require data analysis and computational social science training, and/or which require consistent and regular interaction with computer scientists and other data science professionals. The University of Massachusetts Amherst (UMA) reports that Computational Social Science is a data science field with a strong record of attracting female and traditionally underserved students. A primary mission of the program is to increase the diversity of students pursuing STEM careers at UMA.

After review by the Chief Academic Officer (CAO) at UMA, the proposed program has obtained all necessary governance approvals and was approved by the University of Massachusetts' Board of Trustees on February 18, 2020. The LOI was circulated on April 14, 2020. No comments were received.

A. ALIGNMENT WITH MASSACHUSETTS GOALS FOR HIGHER EDUCATION

Address Gaps in Opportunity and Achievement in Alignment with Campus-Wide Goals

The proposed MS/DACSS program is planned to expand inclusivity and student diversity in the fields of data analytics and computational social science. UMA reports that there is a well-documented shortage of women and traditionally underserved students in most STEM fields and that computational social science (CSS) is an exception. Women make up half or more of the students in CSS related courses and in a related undergraduate letter of specialization at UMA. It is further anticipated that women and underrepresented scholars will make up over half of the program faculty in the proposed MS/DACSS program (including a female Director). The program will be housed in the College of Social and Behavioral Sciences, which serves the highest proportion of traditionally underserved students at UMA, who will be eligible for preferential admission.

UMA plans that MS/DACSS will contribute to supporting student success and expanding students' career opportunities. This is Goal 1 in UMA's 2018-2023 Strategic Plan. It is also planned that career development events and activities with alumni and external affiliates will provide students with access and opportunities to integrate internships into the curriculum, extending and developing networks for career opportunities. As the program grows, it is

anticipated that advanced research methods courses will support student success and enrich the range of options available to graduate students in the College of Social and Behavioral Sciences.

Program or Department Supports to Ensure Student Retention and Completion

MS DACSS has been designed to provide students with a deep immersion into the world of data analytics and computational analysis. UMA expects that students will complete the program in approximately10 months. In addition to standard advising on requirements and degree completion, during an extended orientation UMA will also assign each student a dedicated faculty advisor based on student interests and desired career path. Faculty advisors will be expected to meet with students regularly to monitor progress and connect coursework to student career interests. The extended 3-weeek orientation period that will be integrated with the initial summer session course, will include career events, outside speakers, and breakout groups with faculty and other students. The extended orientation, smaller class sizes and regular program events throughout the term are expected to provide students with a strong support system.

Students with financial stress or an early job offer may struggle to complete the degree, but we have put UMA has further designed for three different measures that are expected to provide students with maximum flexibility for completion. These include course designs for working students during the final Summer II semester; appropriation of two faculty-supervised data-analytics internships; and extensive on-line certificate offerings taught by other UMass campuses, which can stack into the degree providing for completion attainment when students relocate due to jobs or financial stressors.

Alliances and Partnerships with PK-12, Other IHE's, Community Employers

UMA will cultivate an industry advisory board to provide input on expectations for what data analytics professionals should know and be able to do, curriculum content, and potential client projects. It is anticipated that members of such an advisory will attend student research presentations, network with students and graduates, and provide career guidance. UMA plans to work with an advisory to develop internships and client projects that are financed by external sponsors. Creating and maintaining an active network of alumni to participate in program events and provide feedback and networking opportunities is also part of the UMA plan. An annual alumni survey and tracking graduates will be part of this effort.

Relationship to MassHire Regional Blueprints

UMA reports that data analytics and computational social science skills are in high demand in the job market, particularly in jobs where data is used to make informed decisions. In 2014, UMA's Joint Task Force on Strategic Oversight, Subcommittee on Research and Graduate

Education identified Data Science, Computing and Analytics, and Computational Social Science as one of seven areas where UMA strengths are well-aligned with state, regional, or national priorities. In 2016, UMA commissioned a report by EAB[1] assess employer demand for data analytics graduates in Massachusetts and throughout the Northeast. UMA notes that the report finds a substantial and growing market for master's level programs in data analytics, particularly one that trains students to communicate about data and interpret results to inform decision-making and communication in the public and private sectors. According to UMA, the EAB report indicated that over the past three years, occupations requiring education in data analytics grew by an estimated 143%. Over 8,000 new job postings were listed for graduates with data analytics education and training in the Northeast region during the second half of 2016.

UMA also found that there is no specific mention of data analytics professionals in the MassHire Regional Blueprints. However, two of the regions' blueprints (Central and Northeast) indicate "professional and technical services" (including STEM fields) as areas of concern in terms of projected future employee shortages, while the Pioneer Valley report includes "cross-industry occupations" (including IT-related, professional services, and logistical supports) as being amid those in highest demand. In the Greater Boston area, professional and technical services comprise the second largest industry in terms of employment opportunities and are near the top in terms of growth from 2001 to 2016. More specifically, computer- and mathematics-related occupations were among the top in terms of projected employee shortages, with management and business jobs projected to be among the highest in demand. UMA holds that the proposed DACSS program will prepare students for these mixed-skill careers.

A 2017 report[2] by Burning Glass was also cited by UMA. This study measured demand by identifying skill requirements from posted job advertisements and identified almost 30,000 job postings requiring data science skills in the Boston Metropolitan Statistical Area (MSA) alone over a 12-month period. Boston was amongst the top 10 cities overall in terms of both total and per capita demand for data analytics professionals. Areas around Boston house firms in finance, health, and technology that rely heavily on data-driven strategies. According to the Burning Glass report, overall, Massachusetts is tied with California and Washington for the state with the highest relative demand for data analytics professionals. Despite the recent growth in data science graduate programs, companies are still finding it difficult to fill positions requiring data analytics skills, with job ads for data science positions remaining open for 5 days longer than average.

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[1] Education, Technology, Services and Research (EAB) serving higher education presidents, boards, cabinets, and chiefs of staff with a focus on setting future strategy, organizational design, campus innovations and agility. EAB is headquartered in Washington, D.C. Vista Equity Partners Fund VI acquired EAB from The Advisory Board Company in November 2017. Retrieved 5/13/2020 eab.com) (Graduate Data Analytics Programs for Social and Natural Sciences Professionals: Analysis of Program Design and Northeastern Employer Demand. The Advisory Board Company, 2016.)

[2] Markow,W.; Braganza,S.; Taska,B. Quant Crunch: How the Demand for Data Science Skills is Disrupting the Job Market. Burning Glass Technologies. (2017.).

Duplication

In the process of developing the MS/DACSS program, UMA commissioned the previously noted marketing report by EAB to assess competitor programs. The report noted that both Northeastern University and Bay Path University offer similar Applied Data Science degrees that may attract some of the same students. UMA notes that the proposed program is distinctive. Additionally, while not included in the EAB report of 2017, Boston University (MS Analytics, Business Intelligence -MS in Computer Information Systems), Brandeis University (MS Strategic Analytics), Tufts University (MS Data Analytics) and Worcester Polytechnical Institute (MS Data Science) offer similar graduate degree programs. As well, UMass Boston and UMass Lowell offer an MS in Business Analytics, and UMass Dartmouth offers an MS in Data Science.

Innovative Approaches to Teaching and Learning

The proposed curriculum has been designed to prepare students for the workforce and to reflect current industry standards for data science professionals. Advanced technical courses are planned to ensure graduates are trained in one or more social science research methods such as survey research, network analysis or computational text analysis. Students will be required to take seven methods courses designed to provide hands-on experiences in designing and conducting research, using career-specific specialized software (e.g., R, ArcGIS, Qualtrics), and in writing and visualizing data. In addition, students will participate in internships and work on research projects with the mentorship of experienced faculty. One feature planned for the program is that students will have the opportunity to present a poster session each term to the campus community and industry representatives.

B. ALIGNMENT WITH CAMPUS STRATEGIC PLAN AND MISSION

Priority Rationale and Support of Strategic Plan and Overall Mission of Institution

The MS/DACSS program is designed to contribute positively to almost every major goal listed in UMA's 2018-2023 Strategic Plan. It is expected to increase student diversity in STEM programs, improve student career outcomes, contribute to improvements in graduate education, and expand supports and impacts of research. As previously noted, MS/DACSS will be one of the only STEM programs on campus where UMA projects that women will comprise half or more of enrolled students. UMA is home to the Computational Social Science Institute, and it is expected that the proposed program will contribute significantly to the institution's research mission. It is planned that resources generated by the program will be reinvested primarily into research and teaching related to data analytics and computational social science, to improve graduate student training and enhance faculty productivity and retention. UMA anticipates that the program's industrial advisory board will serve as a bridge to research partnerships.

Overall Goals, Learning Objectives, Outcomes Evaluation (see Form B Appendices)

Graduates of the MS/DACSS program are expected to be equipped to design research which will support evidence-based decision-making, work with large datasets using a range of analysis methods, and communicate their results to general audiences, both visually and in writing. Through interdisciplinary coursework, students in the program will learn to identify sources of evidence to use in decision-making; work with large datasets; develop reliable and ethical data management practices; interpret and visualize results of analyses; and effectively communicate data and research to a general audience.

C. ALIGNMENT WITH OPERATIONAL AND FINANCIAL OBJECTIVES OF INSTITUTION

Enrollment Projections (see Form C Appendices)

UMA indicates that the program is expected to be competitive based on related applications. For example, the MS in Computer Science program at UMA, is reported to attract over 1000 applications each year, and has expanded rapidly with 30 degrees awarded in 2016-2017 and over 100 degrees awarded over the past two years. Similarly, the new M.S. in Business Analytics at Isenberg School of Management launched in 2017 with 28 students, enrolled twice that many the following year. UMA finds that the MS/DACSS offers an alternative to the more traditional Computer Science and Business Analytics or Data Science degrees that are offered at UMA and other UMass campuses, and expects to be able to attract and recruit a distinct population of students.

Resources and Financial Statement of Estimated Net Impact on Institution (see FORM D Appendices)

It is estimated that half of the revenue generated by the MS/DACSS program will be used to underwrite general costs of operation. It is further planned that the remaining new revenue returned to the program will completely underwrite the enrollment-contingent fixed costs of program administration and teaching through a combination of direct faculty and staff hires and an innovative departmental revenue sharing program.

No additional tenure-track faculty lines are planned during the initial years of program operation, as no new courses will be taught on load by tenure-track faculty. Instead, students in the DACSS program will be incorporated into existing courses, and faculty and departments will receive a portion of program revenue to fund teaching support and teaching replacement costs. The departmental revenue-sharing program developed by participating departments ensures that faculty will receive research and teaching support to offset the workload increase associated with increasing the sizes of their existing courses.

If course selection and seat availability are deemed insufficient to support program enrollment targets, additional faculty will be hired using excess program revenue. At least two fixed term

post-doctoral research and teaching positions will be needed to allow the program to expand as indicated.

The Department of Political Science has been supporting the developing MS/DACSS program by providing a faculty home for any MS/DACSS-related hires as well as general administrative support and overhead. The department agreed to continue these arrangements until the end of the 2022-2023 academic year, at which time the issue of a departmental home for the MS/DACSS program will be revisited. General administrative support provided by Political Science includes financial management or other non-program specific activities, and overhead expenses such as office space, computing and office supplies, temporary loans, etc. The MS/DACSS program will compensate the department for this support.

A dedicated DACSS Program Manager was recently hired to help plan the program launch, and additional staff positions will be added when they become financially self-sustaining. UMA plans to hire at least two additional positions to ensure high quality administrative support, including coordination of student marketing, recruitment and admissions; enrollment management and strategic planning; internal coordination of faculty and governance board activity; direct support for student success, including student advising and coordination of orientation, internship, and professionalization programs; and coordination with external audiences.

The attached budget demonstrates the feasibility and sustainability of the program and its cost-contingent budgetary model as the program grows. UMA estimates the mature program of 45 to 50 students will generate a surplus. Some of the projected excess revenue will likely go towards currently unallocated or unanticipated program costs, including additional faculty hires should course provision under the departmental revenue sharing arrangements prove inadequate to meet program needs.

STAFF REVIEW AND VALIDATION

Staff thoroughly reviewed the **LOI** proposing full degree granting authority for the **Master of Science in Data Analytics and Computational Social Sciences** submitted by the **University of Massachusetts Amherst.** Staff validate that the LOI includes all data required by the Massachusetts Board of Higher Education. Staff recommendation is for BHE authorization for the Commissioner to review the program pursuant to the Fast Track review protocol.

Form A: Curriculum

MS/DACSS Curriculum Outline

Major Required (Core) Courses (Total courses required** = 4**)		
Course Number	Course Title	Credit Hours
POLISCI 601	Fundamentals of Data Science	3
POLISCI 750	Research Design	3
JOURNAL 604	Advanced Data-Driven Storytelling	3
POLISCI 755 RES-ECON 701	Introduction to Quantitative Analysis OR Quantitative Methods	3 3
	SubTotal # Core Credits Required	12
Advanced Technical Course Choices (Total courses required = 3 or more)		
ANTHRO 681	Advanced Quantitative Methods in Anthropology	3
COMM 621	Quantitative Methods in Research	3
COMM 623	Survey of Digital Behavioral Data	3
COMM 794A	Content Analysis	3
ECON 652	Econometrics	3
ECON 751	Mathematical Methods for Economics	3
JOURNAL 641	Web Design for Journalists	3
REGIONPL 625	Intro to Geographic Information Systems	3
REGIONPL 673	Spatial Analysis and Regional Development	3
POLISCI 652	Experiments	3
POLISCI 753	Network Analysis	3
POLISCI 758	Text as Data	3
POLISCI 791EA	Text Analysis	3
POLISCI 797BA	Bayesian Statistics	3
POLISCI 797SR	Survey Design	3
RES-ECON 702	Econometric Methods	3
RES-ECON 703	Econometrics III	3
RES-ECON 740	Experimental Economics	3
RES-ECON 797A	ST - Time Series & Forecasting	3
RES-ECON 797D	ST – Panel Data Econometrics	3
SOCIOL 712	Social Statistics II	3

SOCIOL 714	Survey Research	3
SOCIOL 794N	Social Networks	3
SOCIOL 797NE	Networks & Health	3
SOCIOL 795E	S – Modeling Emergence	3
STAT 501	Methods Applied Statistics	3
STAT 515	Statistics I	3
STAT 516	Statistics II	3
STAT 526	Design of Experiments	3
STAT 535	Statistical Computing	3
STAT 598C	Statistical Consulting Practicum	3
STAT 610	Bayesian Statistics	3
STAT 625	Regression Modeling	3
CS course	Courses TBD in seat exchange agreement	3
	SubTotal # Concentration Credits Required	9
Other/Elective Course Choices (Total courses required = up to 3) **(***attach list as needed)*		
COMM 626	Social Media in Everyday Life	3
COMM 627	Communications, Tech. and Work	3
ECON 503	Advanced Microeconomic Theory	3
ECON 504	Advanced Macroeconomic Theory	3
ECON 568	The Practice of Development Policy and Intl. Cooperation	3
JOURNAL 646	Media, Technology, and Culture	3
JOURNAL 647	International Journalism	3
REGIONPL 642	Economic Development Issues in Planning	3
POLISCI 608	Public Opinion	3
POLISCI 609	Media and Politics	3
POLISCI 688	Corporate Lobbying	3
POLISCI 791B	American Political Behavior Proseminar	3
POLISCI 791T	American Political Institutions Proseminar	3
POLISCI 792MP	Money & Power	3
RES-ECON 711	Applied Micro	3
RES-ECON 712	Applied Macro	3
RES-ECON 720	Env & Nat Resource Econ	3
RES-ECON 732	Topic: Industrial Organization	3
SOCIOL 793D	Organizational Theory	3

SPP 597GP	Internet Governance & Information Policy	3
SPP 651	Social Inequalities, Technology and Public Policy	3
	Any Advanced Technical Elective (above list)	
SBS Course >500	with Faculty consent and Program Director Approval	
	SubTotal # Elective Credits Required	9

Curriculum Summary	
Total number of courses required for the	10
Total credit hours required for degree	30

Prerequisite or Other Additional Requirements:

Form B: LOI Goals and Objectives

Goal	Measurable Objective	Strategy for Achievement	Timetable
Regular, high quality training in data analytics for all UMass Amherst students	Increased consistency and availability of courses in data analytics and CSS; graduate student satisfaction with methods coursework	Coordinate methods course scheduling across SBS; admit qualified M.S. students; prepare M.S. students for advanced coursework	Annual, starting Winter 2020
Become financially self-sustaining without subsidies	Reach enrollment target of 15-20 students	Market and recruit students domestically and through international partners	Fall 2021
Increase funding for DACSS research and teaching	Reach enrollment target of 40-45 students; hire 2 postdoctoral teaching fellows; provide funds for teaching support, class research projects, conference travel, HPC access, etc.	Effectively market program and recruit prospective students; Ensure funding of research and teaching programs through MOUs and annual program budget	Fall 2024
Successful career placement for program graduates	Job placement rates	Track student placement through surveys and utilize the Office of Career and Professional Development	Annual Alumni Survey starts Fall 2022
Encourage student-faculty research, faculty research productivity, and faculty retention	Faculty research productivity; funding available for faculty-student research; CSSI-affiliate faculty retention	Provide faculty with opportunity to teach advanced methods courses, encourage faculty to engage in student partnerships by offering additional research funding and well-trained research assistance	Annual Faculty Survey starts Summer 2020 Annual Report, first published Fall 2021

Form C: LOI Program Enrollment

	Year 1	Year 2	Year 3	Year 4	Year 5
New Full-Time	15	30	45	50	50
Continuing Full-Time	n/a	n/a	n/a	n/a	n/a
New Part-Time	n/a	n/a	n/a	n/a	n/a
Continuing Part-Time	n/a	n/a	n/a	n/a	n/a
Totals	15	30	45	50	50

Form D: LOI Program Budget

One Time/ Startup Costs						
		Annual Enrollment				
	Cost Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
$25,000	Full Time Faculty *(Salary & Fringe)*	$152,500	$354,285	$464,571	$492,662	$496,115
	Part Time/Adjunct Faculty *(Salary & Fringe)*					
$67,131	Staff	$77,534	$158,346	$249,068	$220,816	$254,049
	General Administrative Costs	$15,000	$30,000	$45,000	$25,000	$25,000
	Instructional Materials, Library Acquisitions					
$10,000	Facilities/Space/Equipment	$23,000	$40,000	$45,000	$45,000	$45,000
	Field & Clinical Resources					
$4,800	Marketing	$22,396	$33,021	$51,771	$61,146	$52,251
	Scholarships (Other)	$117,121	$120,635	$124,254	0	0
One Time/Start-Up Support			***Annual Income***			
	Revenue Sources	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
$2,000	Grants					
	Tuition	$580,512	$1,099,501	$1,698,730	$1,858,917	$1,909,107
	Fees					
$37,300	Departmental	(37,300)				
$70,000	Reallocated Funds	143,814	193,541	151,308	0	0
	Admin Revenue Share	($275,743)	($522,263)	($806,897)	($882,985)	($906,825)
$2,369	**TOTALS**	**$3,732**	**$34,492**	**$63,477**	**$153,074**	**$129,867**