

**BOARD OF HIGHER EDUCATION  
REQUEST FOR BOARD ACTION**

**BHE** BHE 23-31

**BOARD DATE:** March 28, 2023

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**APPROVAL OF LETTER OF INTENT OF THE UNIVERSITY OF MASSACHUSETTS  
AMHERST TO AWARD THE BACHELOR OF ARTS IN COMPUTATIONAL  
LINGUISTICS 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 **Bachelor of Arts in Computational Linguistics** 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 and advanced to the full Board for approval by the Executive Committee 3/20/2023; and adopted by the BHE 3/28/2023.

**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  
March 2023  
University of Massachusetts Amherst  
Letter of Intent  
Bachelor of Arts in Computational Linguistics**

**DEGREE TITLE ABSTRACT ON INTENT AND MISSION OF PROGRAM**

The University of Massachusetts Amherst (UMA) intends that the proposed Bachelor of Arts in Computational Linguistics (BA/CL) will provide an opportunity for students to enter a rapidly growing STEM field. UMA reports that the BA/CL major is planned to combine coursework, research and internship opportunities from Linguistics and Computer Science that prepare students to enter the workforce in language technology, or to pursue graduate study in either discipline. UMA reports evidence from workplace surveys of the need for the program and attest that students who have completed UMA's Computational Linguistics courses have succeeded at finding employment, as well as being admitted to graduate programs. UMA's mission includes a commitment to diversity, equity and inclusion. Because Linguistics has a high proportion of female students, UMA expects that the proposed program will increase the number of women in the STEM pipeline and intends that this will significantly contribute to realizing this aspect of its mission.

The proposed Bachelor of Arts in Computational Linguistics was approved by the University of Massachusetts' Governing Authority on October 5, 2017. The LOI was circulated on December 20, 2022. 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 Massachusetts Department of Higher Education (DHE) 2014 Technology Talent Initiative Workforce Plan<sup>1</sup> provided statewide statistics indicating that almost 10 years ago, several underrepresented groups of students were conspicuously absent in the population of computer science and information technology majors. “...*These statistics indicate both a social justice mandate and an economic development imperative. As public educators, we must ensure that all of our young people have the opportunity to pursue and excel in our most lucrative and fastest growing fields.*” UMA further cites that currently, BIPOC students represent only 4%-7% of computer science or IT majors across public institutions in MA. UMA finds that Computational Linguistics is in a unique position as a bridge between broad computational disciplines and linguistics, which as previously mentioned, is cited as having a much higher proportion of women in undergraduate programs<sup>2</sup>.

#### *Program or Department Supports to Ensure Student Retention and Completion*

It is expected that the time from admission to graduation from the proposed program will be 4 years. This projection is based on the time to complete the degree for Linguistics majors, 72% of whom reportedly finished their degree in 4 years, for the last three incoming classes, 2014, 2015 and 2016. A dedicated linguistics faculty member is planned to serve as the computational linguistics advisor, who will be required to meet with each student at least once per semester. It is also planned that students will have year-round access to the UMA Academic Advising and Career Advising Offices operated by the College of Humanities and Fine Arts. It is further anticipated that the Center for the Study of African American Language will have a significant role in reaching out to traditionally underrepresented students in recruitment and with retention strategies for the proposed program.

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<sup>1</sup> Massachusetts Department of Higher Education (2014, Spring). Technology Talent Initiative Workforce Plan. Retrieved from <http://www.mass.edu/strategic/documents/2014-05-05DHETechnologyWorkforcePlan.pdf>

<sup>2</sup> Dickerson, Bethany, Durvasula, Karthik, and Adam Liter. (2019, October 9). Bias in linguistics. Career stages: student ratios (Source: NSF/NCES) Retrieved from <https://biasinlinguistics.org/projects/career-stages/#nsf-and-nces-data>

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

The First Year Admissions Office at UMA has indicated interest in working with faculty, staff and potential students in the proposed program. Once the program has been fully approved, Computational Linguistics will be included on the Common Application and in printed materials. In outreach to prospective students, the admissions office will identify to the program staff, those students who express interests in Computational Linguistics. Direct outreach reach through e-mails and spotlighting the program on the UMA admissions webpage and social media channels are also planned. Informational events for high school students and counselors, hosted each Fall, highlight new majors, and will include the Computational Linguistics major. Additionally, UMA First-Year Admissions has a database of counselor, teacher, and prospective student contacts at every high school in Massachusetts, with a particular focus on racially diverse school districts and high schools. UMA Admissions also maintains a database of community-based organizations in Massachusetts, which work with racially diverse students. Admissions and the Linguistics Department expect to collaborate on a communication campaign to counselors, teachers, and prospective students in schools across the Commonwealth. Marketing and communication efforts are planned to include mailing, e-mailing, and hosting in-person and virtual events with segments of traditionally underrepresented populations.

In terms of community college transfer opportunities, it is anticipated that the Linguistics department will work with the Director of Transfer Admissions and rely on existing relationships and agreements to include the proposed major as a transfer option. UMA expects to provide tailored course recommendations for the agreements specific to the proposed major. Together, Transfer Admissions and Linguistics will also highlight the program in special Zoom events with community college transfer counselors and advisors.

It is anticipated that industry partnerships will be an integral part of the proposed program. A memorandum of understanding (MOU) between the Department of Linguistics and the Manning College of Information & Computer Sciences (CICS) indicates that the College is already prepared to support the Computational Linguistics major by making the CICS Careers internship resources available in order to identify and set up industry practicums. Existing industry partners currently include Amazon, Liberty Mutual, Google, Adobe, IBM, MathWorks, among others. An additional pathway to industry/employers planned for the proposed Computational Linguistics majors is through the College of Humanities and Fine Arts (HFA) Career Center. Computational Linguistics major will take the Junior Year Writing course offered by the Department of Linguistics. As part of this course curriculum, the director of the HFA Career Center comes to speak with the students in class and connects them to career opportunities.

#### *Relationship to MassHire Regional Blueprints*

UMA expects that the introduction of a Computational Linguistics major will contribute to filling industry needs as well as prepare students to pursue graduate studies for more advanced positions. MassHire Regional Blueprints 2020 update for Greater Boston [https://usc-word-edit.officeapps.live.com/we/wordeditorframe.aspx?ui=en-us&rs=en-US&wopisrc=https://umass.sharepoint.com/sites/ProvostsDirectReports/\\_vti\\_bin/wopi.ashx/files/9b0f6bb9c6de453abe7a4a8ed605c17b&wdenableroaming=1&wdf=1&mssc=1&hid=434e3bfc-5c8d-4643-b32f-2bd01e22b7b4.0&uih=teams&uiembed=1&wdlcid=en-us&jsapi=1&jsapiver=v2&corrid=468614d3-dca1-4107-9909-005491b65109&usid=468614d3-dca1-4107-9909-005491b65109&newsession=1&sftc=1&uihit=UnifiedUiHostTeams&muv=v1&acclloop=1&sdr=6&scnd=1&sat=1&rat=1&sams=1&mtf=1&sfp=1&halh=1&hch=1&hmh=1&hsh=1&hwfh=1&hsth=1&sih=1&unh=1&onw=1&dchat=1&sc={\"pmo\": \"https://www.office.com\", \"pmshare\": true}&ctp=LeastProtected&rct=Medium&wdorigin=TEAMS-ELECTRON.teamsSdk.openFilePreview&wdhostclicktime=1669921382405&instantedit=1&wopicomplete=1&wdredirectionreason=Unified\\_SingleFlush](https://usc-word-edit.officeapps.live.com/we/wordeditorframe.aspx?ui=en-us&rs=en-US&wopisrc=https://umass.sharepoint.com/sites/ProvostsDirectReports/_vti_bin/wopi.ashx/files/9b0f6bb9c6de453abe7a4a8ed605c17b&wdenableroaming=1&wdf=1&mssc=1&hid=434e3bfc-5c8d-4643-b32f-2bd01e22b7b4.0&uih=teams&uiembed=1&wdlcid=en-us&jsapi=1&jsapiver=v2&corrid=468614d3-dca1-4107-9909-005491b65109&usid=468614d3-dca1-4107-9909-005491b65109&newsession=1&sftc=1&uihit=UnifiedUiHostTeams&muv=v1&acclloop=1&sdr=6&scnd=1&sat=1&rat=1&sams=1&mtf=1&sfp=1&halh=1&hch=1&hmh=1&hsh=1&hwfh=1&hsth=1&sih=1&unh=1&onw=1&dchat=1&sc={\) was cited as listing Professional

and Technical Services as the second largest industry<sup>3</sup>. Computer and Information Analysts and Software Developers and Programmers were found to also be in the top 5 priority occupations. This supported UMA's observation that there is a growing segment of jobs available for linguists with computational backgrounds. UMA further found that data from the Bureau of Labor Statistics (BLS) shows solid growth in jobs available for linguists with computational backgrounds<sup>4</sup>. Computational Linguist does not yet have its own classification; however, jobs often fall into two broader categories, software developers and computer and information research scientists. In both categories job-growth forecasts are strong with growth rates projected at 8%-22%. It is also reported that BA Linguistic graduates from UMA have found positions as data scientists and software engineers for the Amazon Alexa division, Facebook, Intelligent Machines Labs, and Lexalytics.

### *Duplication*

UMA reports that there are no undergraduate computational linguistics programs in the Northeast region, and very few in the United States. Brandeis University, Georgetown University, and Stony Brook University have masters' programs in computational linguistics.

### *Innovative Approaches to Teaching and Learning*

The program itself is planned as an innovation that will integrate two disciplines of study and expand the STEM pipeline to include more women and traditionally under-served students in technology. The proposed program is designed to provide student with experiences in learning competencies in both computational thinking and linguistic analysis and integrating the two areas. Capstone courses will integrate perspectives from linguistics and computer science to approach an understanding of language that enables students to statistically analyze text data sets. An experiential option for one of

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<sup>3</sup> MassHire Department of Career Services. (2020, September 25). Greater Boston 2020 Regional Planning report. Retrieved from <https://www.mass.gov/doc/greater-boston-2020-regional-planning-report>

<sup>4</sup> Bureau of Labor Statistics, U.S. Department of Labor. (2021, September 8). Employment by detailed occupation. Retrieved from <https://www.bls.gov/emp/tables/emp-by-detailed-occupation.htm>

the electives is completing a semester-long industry practicum. Other innovative approaches include team-based learning in courses, where students design, execute, and analyze experiments in teams.

## **B. ALIGNMENT WITH CAMPUS STRATEGIC PLAN AND MISSION**

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

The proposed BA/CL underscores its alignment with the UMA mission priorities, articulated in 2018-2023 Campus Strategic Plan. One of the plans goals is to establish UMA as a destination of choice by offering (among others) a wide range of high-demand degree programs and career pathways. UMA expects that the proposed BA/CL will fit into this goal because of recent advances in language technologies creating new employment demands. A second goal of the UMA plan is to establish UMA as a partner of choice with industries and employers. The proposed BA/CL program alignment to technological fields and growth in Massachusetts is a case-in-point for helping to meet this goal. Within the University, the proposed program is expected to integrate linguistics and computer science, especially in the areas of artificial intelligence and machine learning. It is designed that this will further alignment with the strategic plan by fostering opportunities for interdisciplinary and multidisciplinary research and graduate training that span the humanities, social sciences, natural sciences, and engineering. UMA's third strategic goal is to be a community of choice for students, by building a more diverse and inclusive community. The proposed major is expected to serve this purpose through diversifying the STEM pipeline on campus as previously noted. UMA reports that it is already recruiting women into National Science Foundation (NSF) research experiences for undergraduate programs in the Linguistics Department.

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

UMA's overall goal is to provide majors with the foundations to approach computation with language in a linguistically sophisticated way. It is expected that this will break down into learning objectives that include the ability to reason analytically about language; develop competence in quantitative/computational language research; develop an understanding of linguistic theories and their relationship to language diversity and linguistic discrimination; develop the ability to communicate about language; and to work as an effective member of a team. In alignment to campus-wide goals regarding gender diversity in STEM and Language technology majors, UMA aims to have 50% women in the proposed program. The Linguistics Department and CICS have set targets for increasing racial diversity as well, with plans to focus on recruiting and admitting diverse cohorts of students.

### **C. ALIGNMENT WITH OPERATIONAL AND FINANCIAL OBJECTIVES OF INSTITUTION**

It is planned that the proposed program will be offered using existing resources in faculty, advising and course offerings in the Department of Linguistics and the Colleges of Humanities and Fine Arts and of Computer and Information Sciences.

#### *Enrollment Projections (Form C Appendices)*

It is projected that after Year 1, 10 new students will be added to the major each year. It is also anticipated that the introduction of the new program will likely result in a small drop in enrollment in the Linguistics major. The proposed program and the Linguistics program are both located in the same department.

#### *Resources and Financial Statement of Estimated Net Impact on Institution (Form D Appendices)*

All required courses for the proposed program presently exist and it is planned that they will be taught by current faculty in both Linguistics and Computer Science. No additional space, equipment, or on-line infrastructure will be needed. Currently, around 30

students enroll in Introduction to Computational Linguistics and most of these students are linguistics majors with an expressed interest in Computation. It is expected that enrollment will increase to approximately 50 students over several years. It is also expected that the Computational Linguistics major will start out small as the curriculum will expand to include more computer science and a greater technical focus. In anticipation that many students may not have prior computational learning experiences.

#### **STAFF REVIEW AND VALIDATION**

Staff thoroughly reviewed the **LOI** proposing full degree granting authority for the **Bachelor of Arts in Computational Linguistics** 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**

BA Computational Linguistics

<b>Required (Core) Courses in the Major (Total # courses required = 14)</b>		
<i>Course Number</i>	<i>Course Title</i>	<i>Credit Hours</i>
LINGUIST 201	How Language Works: Introduction to Linguistic Theory	4
LINGUIST 305	Writing for Linguists	3
LINGUIST 394BI/ LINGUIST 412	Language and Cognition/ Language Processing & the Brain (CHOOSE ONE)	3
LINGUIST 401	Introduction to Syntax	3
LINGUIST 402/ LINGUIST 414	Speech Sounds and Structure OR Introduction to Phonetics for Linguists	3/ 4
LINGUIST 510	Intro to Semantics	4
LINGUIST 409	Introduction to Computational Linguistics	3
LINGUIST 429	Computational Linguistics: Use and Meaning	3
CICS 110	Foundations of Programming	4
CICS 160	Object Oriented Programming	4
CICS 220	Data Structures	4
COMPSCI 490A	Introduction to Natural Language Processing	3
MATH 131	Calculus I	3
MATH 132	Calculus II	3
	<b><i>Sub Total Required Credits</i></b>	47-48
<b>Elective Courses (Total # courses required = 2) (attach list of choices if needed)</b>		
Various	COMPSCI 200+	3-4
Various	COMPSCI 200+ / LINGUIST 400+ / Industry Practicum	3-4
	<b><i>Sub Total Elective Credits</i></b>	6-8
<b>Open Elective Courses (Total # courses required = 11-18)</b>		
	<i>Any UMass course</i>	
	<b><i>Sub Total Open Elective Credits</i></b>	43-52
<b><i>Distribution of General Education Requirements</i></b> Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Gen Ed Credits
Arts and Humanities, including Literature and Foreign Languages		11

1) 1 AL/AT Gen Ed, 4 cr (2 Gen Ed in combination with DU or DG designation) 2) 1 HS Gen Ed, 4 cr (2 Gen Ed in combination with DU or DG designation) 3) ENGLWRIT 112, 3 cr (unless waived, Gen Ed CW) 11	
Mathematics and the Natural and Physical Sciences 4) MATH 104 or MATH 101/102 or waiver with minimum score of 20 on part A of math placement exam- Pre-calculus, 3-4 cr (Gen Ed R1) 5) CICS 110, MATH 131, or LING 201 3-4 cr (Gen Ed R2) (already core courses for major, no extra credits or courses needed for this)	0-6
Social Sciences 6) 1 SB Gen Ed (2 Gen Ed in combination with DU or DG designation)	4
<b><i>Sub Total General Education Credits</i></b>	15-21
<b><i>Curriculum Summary</i></b>	
Total number of courses required for the degree	31-38
Total credit hours required for degree	120
<b><i>Prerequisite, Concentration or Other Requirements: None</i></b>	

**Form B: LOI Goals and Objectives:**

Goal	Measurable Objective	Strategy for Achievement	Timetable
Meet student recruitment target	10 new students in each of the first four years	Advertise to local K-12 schools, active recruitment from exploratory track (ET) placement across campus, recruit transfers from community colleges, establish a presence in open house events on campus. Since this is a joint major with CS, we plan to utilize outreach efforts in both HFA and CICS.	25 – 2023 25 – 2024 25 – 2025 25 - 2026
Change Academics Requirement Report (ARR) to reflect existence of new major	“Computational linguistics” will be available as a major to select in students’ program plan	Contact registrar’s office	Contact registrar’s office once major approved
Update brochures/website info to reflect new major	Brochures/websites updated by the end of Spring 2023	Undergraduate program director and computational linguistics advisor meet to implement changes	Complete updates by the end of Spring 2023
Train advisors on new curriculum	Conduct training session by end of Spring 2023	Undergraduate program director and computational linguistics advisor lead a briefing session with undergraduate advisors	Conduct training session by end of Spring 2023
Successful career placement for students	Job placement rates	Use HFA and CICS career services, industrial affiliates program, and HFA and CICS-hosted career fairs. Use existing university-level services for internships and Co-ops.	Start the process in Fall 2023 –

**Form C: LOI Program Enrollment**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
New Full-Time	0	10	10	10	10
Continuing Full-Time	21	14	17	20	30
New Part-Time					
Continuing Part-Time					
<b>Totals</b>	<b>21</b>	<b>24</b>	<b>27</b>	<b>30</b>	<b>40</b>

**Form D: LOI Program Budget**

<i>One Time/ Start Up Costs</i>	<i>Cost Categories</i>	<i>Annual Expenses</i>				
		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
	Full Time Faculty <i>(Salary &amp; Fringe)</i>	101,662	104,204	106,809	109,479	112,216
	Part Time/Adjunct Faculty <i>(Salary &amp; Fringe)</i>	-	-	-	-	-
	Staff	4,051	4,152	4,256	4,362	4,472
	General Administrative Costs	0	0	0	0	0
	Instructional Materials, Library Acquisitions	0	0	0	0	0
	Facilities/Space/Equipmen					
	Field & Clinical Resources					
	Marketing	0	0	0	0	0
	Student Assistance	0	0	0	0	0
	Other (Specify)					
	<b>TOTALS</b>	105,713	108,356	111,065	113,841	116,687

<i>One Time/Start- Up Support</i>	<i>Revenue Sources</i>	<i>Annual Income</i>				
		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
	Grants	0	0	0	0	0
	Tuition	435,624	513,038	594,051	678,793	927,684
	Fees	0	0	0	0	0
	Departmental	105,713	108,356	111,065	113,841	116,687
	Reallocated Funds	0	0	0	0	0
	Other (specify)	0	0	0	0	0