UNIVERSITY OF MARYLAND
OFFICE OF THE PRESIDENT

1101 Thomas V. Miller, Jr. Administration Building
College Park, Maryland 20742
301.405.5803 TEL
301.314.9560 FAX

March 11, 2026

Dr. Sanjay Rai
Secretary
Maryland Higher Education Commission
217 East Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Secretary Rai:

I am writing to request approval for a new Bachelor of Science program in Artificial Intelligence: Computational Structures for AI Systems. The proposal for the new program is attached. I am also submitting this proposal to the University System of Maryland for approval.

The proposal was endorsed by the appropriate faculty and administrative committees. I also endorse this proposal and am pleased to submit it for your approval.

Sincerely,

Darryll J. Pines
President
Glenn L. Martin Professor of Aerospace Engineering

DJP/mdc

cc: Candace Caraco, Associate Vice Chancellor
Jennifer King Rice, Senior Vice President and Provost
Amitabh Varshney, Dean, College of Computer, Mathematical, and Natural Sciences

Office Use Only: PP#

Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	University of Maryland, College Park

Each action below requires a separate proposal and cover sheet.

- (●) New Academic Program
- ( ) New Area of Concentration
- ( ) New Degree Level Approval
- ( ) New Stand-Alone Certificate
- ( ) Off Campus Program
- ( ) Substantial Change to a Degree Program
- ( ) Substantial Change to an Area of Concentration
- ( ) Substantial Change to a Certificate Program
- ( ) Cooperative Degree Program
- ( ) Offer Program at Regional Higher Education Center

Payment Submitted: (●) Yes ( ) No Payment Type: (●) R*STARS # JJ620191 ( ) Check # Payment Amount: 850 Date Submitted: 1/15/20

Department Proposing Program	Department of Computer Science
Degree Level and Degree Type	Bachelor's; Bachelor of Science
Title of Proposed Program	Artificial Intelligence: Computational Structures for AI Systems
Total Number of Credits	120
Suggested Codes	HEGIS: 079906 CIP: 11.0102
Program Modality	(●) On-campus ( ) Distance Education (fully online) ( ) Both
Program Resources	(●) Using Existing Resources ( ) Requiring New Resources
Projected Implementation Date (must be 60 days from proposal submisison as per COMAR 13B.02.03.03)	(●) Fall ( ) Spring ( ) Summer Year: 2026
Provide Link to Most Recent Academic Catalog	URL: https://academiccatalog.umd.edu/
Preferred Contact for this Proposal	Name: Michael Colson Title: Senior Coordinator for Academic Programs Phone: 301-405-5626 Email: mcolson@umd.edu
President/Chief Executive	Type Name: Darryll J. Pines Signature: Darryll J. Pines Date: 03-11-2026
	Date of Approval/Endorsement by Governing Board:

Revised 4/2025

A. Centrality to the University's Mission and Planning Priorities

Description. Artificial Intelligence (AI) is the study of creating computer systems that learn from data and interactions to create systems that can reason, generate text and images, and interact in ways that resemble humans. The University of Maryland, College Park (UMD) proposes to establish a **Bachelor of Science in Artificial Intelligence: Computational Structures for AI Systems**, housed in the Department of Computer Science within the College of Computer, Mathematical, and Natural Sciences. The program will train students to build new AI systems and algorithms from the ground up, understand the training of models from both a data and systems perspective, and then use those techniques in interdisciplinary applications. The first two years of the program develop a strong technical foundation in programming and understanding the theory of statistical learning, symbolic reasoning, and optimization. The following two years focus on deploying those techniques in interdisciplinary applications enabling students to build state-of-the-art AI systems and also think critically about the effective and ethical application of AI.

Relation to Strategic Goals. The goal of the program is to train the next generation of innovators and builders of artificial intelligence technology to apply their expertise to help solve interdisciplinary problems in science and society. The program is strongly aligned with the University of Maryland's mission and strategic priorities, as it equips students to tackle complex global challenges through an interdisciplinary, applied, and inclusive curriculum. As called for in the UMD Strategic Plan 2022–2032, the major "places interdisciplinary grand challenges at the center" of undergraduate education. The program teaches students the technical foundation required to design, implement, and scale AI systems capable of addressing society's most complex problems. Students will apply this technical knowledge to critical domains such as urban infrastructure, healthcare systems, environmental monitoring, and digital accessibility. Moreover, the curriculum ensures that students not only develop the technical expertise, but also the ethical framework to assess broader impacts. Students will examine issues of bias, accountability, transparency, and safety in AI through required coursework in ethics, law, fairness, and interdisciplinary applications such as urban planning, public health, and accessibility.

The University of Maryland is intent on becoming a leader in AI education. In Spring 2024, UMD launched the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM), bringing together AI experts across campus to focus on responsible, ethical development, and use of the technology to advance public good in industry, government, and society. Given the rapid pace of AI development, a core part of AIM's mission is to reimagine learning in the face of these drastic changes through the introduction of new interdisciplinary programs, including this proposed Bachelor of Science program and a Bachelor of Arts degree in Human-Centered Artificial Intelligence, which will be proposed in a separate proposal.

Funding and Institutional Commitment. The program will utilize existing coursework for foundational and interdisciplinary applications and will develop new courses focused on the technical aspects of AI. The new major will be launched with a strategic reallocation of existing institutional resources, allowing for targeted new instructional and administrative hires without

requiring additional funding. The University of Maryland has prioritized this program as part of its broader investment in interdisciplinary education and responsible innovation, consistent with the goals of the *Fearlessly Forward* strategic plan. New instructional needs will be met through a combination of existing faculty capacity and planned hires within the Department of Computer Science and affiliated units, supported by internally reallocated funds. Similarly, administrative infrastructure, including an Assistant Program Director, academic advising staff, and technical support, will be added through strategic redeployment of resources. This funding model reflects the university's commitment to launching high-impact academic programs that advance institutional priorities while ensuring fiscal sustainability and cross-campus collaboration.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

Need. The program directly aligns with Governor Wes Moore's Executive Order 01.01.2024.02, titled "Catalyzing the Responsible and Productive Use of Artificial Intelligence in Maryland State Government." This order emphasizes the need for the State to "ensure the use of AI in Maryland state government is responsible, ethical, beneficial, and trustworthy" and acknowledges that "AI is transforming society and work in myriad ways, and the pace of that change will continue to accelerate." By developing a curriculum that emphasizes responsible AI development and ethical considerations, the program will prepare technical graduates to contribute to the State's commitment to "fairness and equity" in AI applications. The program's focus on innovation and human-centered design will support the State's goal to "explore ways AI can be leveraged to improve State services and resident outcomes"—one of the many interdisciplinary applications of AI possible with the program. Furthermore, by educating students on privacy, safety, security, and the importance of transparency in AI systems, the program will help build a workforce capable of upholding the principles outlined in the Executive Order, ensuring that AI technologies are implemented in ways that are "valid and reliable" and that "preserve individuals' privacy rights." In summary, the program will play a pivotal role in fulfilling the directives of the Executive Order by cultivating a skilled workforce dedicated to the responsible and innovative use of AI, thereby supporting Maryland's mission to "Leave No One Behind" in the rapidly evolving technological landscape.

State Plan. The proposed program aligns with Priority 5 in the 2022 *Maryland State Plan for Postsecondary Education*: "Maintain the commitment to high-quality postsecondary education in Maryland," specifically addressing the Action Item to "Identify innovative fields of study." Unlike traditional computer science programs that introduce artificial intelligence as an upper-level concentration, this program is designed from the ground up as a full undergraduate major focused on the computational foundations of AI. The curriculum provides early and sustained engagement with AI systems, including coursework in algorithms, systems optimization, machine learning, and programming languages, while also integrating interdisciplinary applications in linguistics, ethics, accessibility, and public policy. This structure reflects the State Plan's call for high-quality, innovative academic offerings that are responsive to workforce needs and grounded in emerging disciplines. By creating a technically rigorous and socially engaged degree in artificial intelligence, the program expands the educational landscape in Maryland and reinforces the state's leadership in next-generation STEM education.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

According to the US Bureau of Labor Statistics, Computer Systems Design and Related Services is projected to be the fastest growing area of employment with an increase of 19.5% from 2023 to 2033: "Heightened demand for workers in this industry is expected due to outsourcing of IT functions to specialized firms, increased cybersecurity needs, and continued adoption of advanced technologies, such as artificial intelligence (AI)."[1] The state of Maryland data also projects that Computer and Mathematical Occupations will have the greatest increase, with 14.32% from 2023 to 2033.[2]

The establishment of this program is economically justified by the increasing market demand for AI professionals, particularly in the Washington, D.C. metropolitan region. While computer science (CS) provides a broad foundation in computing principles, AI concentrates on creating intelligent systems capable of tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. This AI focus aligns with the distinct skill sets employers want in creating training data for models, evaluating AI models, and adapting existing AI models.

A white paper titled "From West to the Rest: AI Workforce Trends in the United States," authored by UMD scholars in the Robert H. Smith School of Business, provides critical insights into the rapidly expanding AI job market.[3] The report highlights that "Stripping out the effects of sheer size, AI Jobs Intensity (ratio of AI to all job postings) yields a different picture. Compared to the aggregated US-level AI Jobs Intensity of 0.56%, Washington DC ranks #1 at 1.75%, followed by VA at 1.36%, with MD not too far behind at 0.83%" (p. 5). This is attributed to the region's strong emphasis on defense, public sector applications, and private industries increasingly incorporating AI into their operations. Moreover, the paper notes that "Driving this growth is an all-out embrace of AI by various agencies of the U.S. federal government, including the Department of Defense. As a direct correlate, many of the major equipment, software, and services suppliers to federal agencies and DoD are based in the MD-DC-VA region. These include, among others, Northrop Grumman, Lockheed Martin, Huntington Ingalls, Booz Allen Hamilton, Accenture, and Deloitte. The region is also home to Amazon HQ2 and Capital One's corporate HQ" (p. 15).

By situating the program in this unique economic landscape, UMD can address a clear market need. The program will prepare graduates with the specialized skills—natural language processing, generative AI, and how to train and adapt models—positioning them to thrive in industries that are rapidly adopting AI technologies. This alignment with workforce demands

[1] US Bureau of Labor Statistics Career Outlook. The tastes growing industry sector, 2023-33: Professional, Scientific, and Technical Services. https://www.bls.gov/careeroutlook/2025/article/fastest-growing-industry-sector.htm
[2] Maryland Department of Labor. Maryland Occupational Projections: 2023-2033-Workforce Information and Performance. https://labor.maryland.gov/lmi/iandoproj/maryland.shtml
[3] Gupta, Anil and Norberg, Jon and Schnidman, Evan and Viswanathan, Siva and Zhang, Kunpeng and Shi, Hanwen, From West to the Rest: Growing Dispersion of AI Jobs in America (January 22, 2024). White Paper #1 January 2024, Available at SSRN: https://ssrn.com/abstract=4703193 or http://dx.doi.org/10.2139/ssrn.4703193

underscores the strategic importance of the program in supporting the D.C. region's leadership in AI innovation and implementation.

D. Reasonableness of Program Duplication

Four institutions in the state have artificial intelligence-oriented bachelor's level programs. Capitol Technology University has programs in Artificial Intelligence and Artificial Intelligence and Autonomous Systems. The University of Maryland Global Campus has a bachelor's program in Artificial Intelligence. The University of Baltimore has a program in Artificial Intelligence for IT Operations. Bowie State University has a program in Artificial Intelligence that was recently approved in Fall 2025. Each of these programs serves distinct institutional missions, student populations, and applied workforce needs.

Given the tremendous growth and prevalence of artificial intelligence in a variety of applications and fields today, having multiple programs at various institutions that meet future demand for AI majors is not only reasonable but vital for the state's economic outlook. As the state's flagship public research university and a nationally ranked institution in computer science and artificial intelligence, UMD is uniquely positioned to offer a technically rigorous, research-driven AI curriculum that integrates systems design, model optimization, and interdisciplinary study of ethics and societal impact. Moreover, demand for AI-related education continues to grow substantially, and UMD's existing computer science enrollment—approaching 4,000 majors, including approximately 500 students specializing in machine learning—demonstrates both strong student interest and institutional capacity. Given the scale of workforce demand and the distinct research-intensive focus of UMD's program, the proposed degree does not represent unreasonable duplication but rather an essential expansion of high-level AI education within Maryland.

E. Relevance to Historically Black Institutions (HBIs)

As noted above, Bowie State University, a Historically Black Institution, has recently received approval for a bachelor's program in Artificial Intelligence (Fall 2025). The proposed program at UMD is not intended to compete with or supplant programs at Maryland's HBIs, but rather to contribute to the overall capacity of the state to prepare students in high-demand AI fields. Demand for computing and AI-related education is large and growing. UMD's existing computer science program enrolls approximately 4,000 majors, including roughly 500 students specializing in machine learning, reflecting strong and sustained student interest in AI-related fields. Given the rapid growth of artificial intelligence across industry, government, and research sectors, expanding access to AI education across multiple institutional contexts is essential to meeting workforce and innovation needs in Maryland.

F. Relevance to the identity of Historically Black Institutions (HBIs)

The proposed program will not diminish or alter the unique missions and institutional identities of Maryland's Historically Black Institutions. The B.S. in Artificial Intelligence: Computational Structures for AI Systems reflects UMD's established identity as the state's flagship public

research university with deep strengths in computer science, computing systems, and artificial intelligence research, including its existing Master of Science in Artificial Intelligence and nationally recognized research programs. The program's emphasis on computational systems, advanced technical foundations, and integration with large-scale research infrastructure is consistent with UMD's research-intensive mission.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

Curricular Development. In the spring of 2024, UMD launched the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM), bringing together AI experts across campus to focus on responsible, ethical development and use of the technology to advance public good in industry, government, and society. Given the rapid pace of AI development, a core part of AIM's mission is to reimagine learning in the face of these drastic changes through the introduction of new interdisciplinary programs.

The proposed Bachelor of Science program is designed from the outset as an interdisciplinary program, drawing on faculty with joint appointments in AIM and participating departments to develop new cross-cutting courses. Through this structure, the program not only integrates technical AI foundations with ethics, policy, and societal considerations, but also supports AIM's broader goal of fostering interdisciplinary research, innovation, and collaboration across the university.

While the proposed program shares several courses with UMD's existing Computer Science (CS) degree, it differs in three important ways: it is explicitly interdisciplinary, it introduces AI concepts early in the curriculum, and it provides an additional pathway for students interested in computational fields. Unlike the Computer Science major, which does not require coursework in ethics or social dimensions of technology, the proposed program embeds these elements as core components, preparing students to understand AI's broader societal impact. Additionally, AI coursework in the CS major is typically restricted to upper-level courses after long prerequisite chains, whereas the proposed program integrates AI from the introductory seminar and programming sequence onward.

Faculty Oversight. The proposed program will be administered by the Department of Computer Science in partnership with the Artificial Intelligence Interdisciplinary Institute at Maryland. A tenured faculty member in Computer Science with a joint appointment in AIM will serve as Academic Director and will be responsible for curricular coherence, faculty coordination, assessment oversight, and alignment with AIM's interdisciplinary mission. Faculty teaching in the program include tenured/tenure-track and professional-track faculty from Computer Science and participating departments, and program-level learning outcomes and effectiveness will be reviewed annually through existing departmental education and campus processes to ensure continuous improvement and alignment with evolving developments in artificial intelligence.

Educational Objectives and Learning Outcomes. The Bachelor of Science in Artificial Intelligence: Computational Structures for AI Systems is designed to prepare students to become technically

rigorous, systems-oriented, and ethically grounded AI practitioners. Graduates will develop strong foundations in computing systems, mathematics, algorithms, and machine learning, with particular emphasis on the computational structures that enable the design, optimization, and deployment of AI models at scale. Students will learn to build, evaluate, and implement AI systems across application domains while critically examining their societal, ethical, and policy implications. The program prepares graduates for careers in AI development, data science, systems engineering, and related computational fields, as well as for advanced study in graduate and professional programs.

The learning outcomes for the program are as follows:

1. Understand and apply core principles of modern and classic AI.
2. Design and build efficient, scalable, and effective algorithms and systems for real-world applications.
3. Configure, train and deploy existing models for real-world applications.
4. Critically assess AI tools and outputs to ensure reliability, efficiency, safety and alignment with intended goals.
5. Apply insights from ethics and social sciences to interdisciplinary applications of AI to address societal challenges and risks of AI such as bias, transparency, fairness and accountability.
6. Collaborate and communicate effectively in multidisciplinary teams to design AI solutions that address diverse perspectives and priorities.

Institutional assessment and documentation of learning outcomes. The curriculum will be evaluated using both direct and indirect measures, including assessment of student achievement of learning outcomes and long-term tracking of alumni career progress. Courses will be reviewed on a rotating basis, with a portion assessed each year and all courses evaluated within a four-year cycle, prioritizing those under the program's direct oversight while coordinating with other departments as needed. Student learning will be measured through exams, projects, or similar tools. Curriculum and course assessments will occur annually in the spring, and a comprehensive report summarizing findings and recommendations for improvement will be submitted each fall.

Course requirements. The curriculum provides a rigorous foundation in computing systems, mathematics, algorithms, and machine learning, with a distinctive emphasis on the computational structures that enable the efficient training, optimization, and deployment of AI systems. Students also take core courses in philosophy and ethics and designing fair systems. Students progress from this core coursework into specialized AI foundations and systems courses that connect theory to implementation. "Sampler" courses expose students to applications of AI across the curriculum, allowing them to explore new interests that might encourage them to explore new research paths or to help them pick a specialization. Upper-level specializations allow students to develop depth in areas such as generative AI, AI algorithms, AI and society, and accessibility, or develop their own pathway in a general specialization. The program culminates in a capstone experience that integrates technical, ethical, and interdisciplinary perspectives in the design of real-world AI systems.

Course Code	Course Title	Credits
CSAI101	**The Current AI Moment**	**1**
MATH140 or MATH340	**Calculus I or Multivariable Calculus, Linear Algebra and Differential Equations I (Honors)**	**4**
Introduction to Programming (one of the following):		**3-4**
CMSC141	Programming with Purpose I: Data-Centric Computing	
CMSC131	Object-Oriented Programming I	
INST326	Object-Oriented Programming for Information Science	
MATH141	**Calculus II**	**4**
Preferences and Rankings (one of the following):		**3**
CSAI220	Measuring Preferences and Rankings	
STAT400	Applied Probability and Statistics I	
PHIL211	**AI & Ethics**	**3**
INST204	**Designing Fair Systems**	**3**
Foundations of Artificial Intelligence Algorithms (one of the following):		**3-4**
CSAI221	Classical AI Algorithms	
CMSC421	Introduction to Artificial Intelligence	
Continuation of Programming (one of the following):		**4**
CMSC132	Object-Oriented Programming II	
CMSC142	Programming with Purpose II: Data Structures and Algorithms	
Sampler (one of the following):		**3**
CSAI102	Introduction to AI and the Law	
CSAI103	Introduction to AI and Food	
CSAI104	Introduction to AI and Creativity	
CMSC250 or DATA250	**Discrete Structures or Discrete Mathematics**	**4**
Linear Algebra (one of the following):		**3-4**
ENEE290	Introduction to Differential Equations and Linear Algebra for Engineers	
MATH240	Introduction to Linear Algebra	
MATH243	Introduction to Linear Algebra and Differential Equations	
MATH341	Multivariable Calculus, Linear Algebra, Differential Equations II (Honors)	
MATH461	Linear Algebra for Scientists and Engineers	
CMSC351	**Algorithms**	**3**
Classification/Data Science (one of the following):		**3**
INST414	Data Science Techniques	
CMSC320	Introduction to Data Science	
DATA320	Introduction to Data Science	
STAT426	Introduction to Data Science and Machine Learning	
CSAI216	**Efficient Systems for AI Applications**	**4**
Specialization (choose one of the following):		**18**
	General	

	Generative AI	
	AI, Society, and Decision Making	
	AI Algorithms	
	Accessibility	
Total Credits		**66-69**

See Appendix A for the Specialization course requirements. Appendix C provides a list of course descriptions. Please note that courses with the CSAI course prefix are new courses proposed for the program and have not yet been approved through the university's course review process and are therefore not listed in the university academic catalog.

General Education. All UMD students are required to complete General Education requirements in Fundamental Studies (Mathematics, Writing, and Analytic Reasoning) and Distributive Studies in the sciences, humanities, and social sciences. The Distributive Studies area includes a diversity requirement, two practice-based courses, and two "Big Question" courses that address societal grand challenges. Maryland community college students who complete the associate degree and are admitted to UMD are deemed to have completed their General Education requirements, except for Professional Writing (typically completed in the 3rd year of study). See Appendix D for how students in the program will fulfill their General Education requirements.

Accreditation or Certification Requirements. There are no specialized accreditation or certification requirements associated with this program.

Other Institutions or Organizations. The university is not planning to contract with another institution or non-collegiate organization for this program.

Student Support. Students enrolled in the Bachelor of Science in Artificial Intelligence: Computational Structures for AI Systems will receive clear, complete, and timely information regarding program requirements, course sequencing, specialization pathways, technology expectations, and available academic resources through the Undergraduate Catalog and program website. Dedicated advising will be provided through the Department of Computer Science advising office, supplemented by faculty mentorship from the Academic Director and affiliated faculty, particularly for research, capstone, and interdisciplinary experiences. Students will have access to university-wide academic support services including tutoring, writing assistance, career services, mental health resources, and financial aid counseling. Given the program's technical rigor, students will also receive guidance regarding required computing competencies and access to campus high-performance computing infrastructure and IT support.

Marketing and Admissions Information. The program will be clearly and accurately described in the university website and be marketed at university recruiting events. The University of Maryland's Office of Undergraduate Admissions markets nationally to a broad base of interested students who are admitted to the University as a whole. If the program is approved, it will be included among the more than 100 possible undergraduate majors available to students.

H. Adequacy of Articulation

The University of Maryland respectfully requests a waiver of the requirement to provide a formal transfer pathway agreement for the Bachelor of Science in Artificial Intelligence: Computational Structures for AI Systems, based on the unique nature of this program.

Foundational coursework in mathematics and computing will continue to articulate, and transfer students will remain eligible for admission under established university transfer standards. The University remains committed to ongoing collaboration with Maryland community colleges as artificial intelligence curricula continue to evolve statewide.

I. Adequacy of Faculty Resources

Program faculty. Appendix B contains a list of faculty members who will teach in the program. The Bachelor of Science in Artificial Intelligence: Computational Structures for AI Systems will be supported by a robust cohort of tenured/tenure-track and professional-track faculty primarily housed in the Department of Computer Science, with additional participation from affiliated departments. Many participating faculty members hold joint or affiliated appointments with the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM), ensuring both disciplinary depth and interdisciplinary integration. Faculty teaching in the program possess terminal degrees in relevant fields and demonstrated expertise in artificial intelligence, machine learning, computing systems, algorithms, ethics, and related areas. Existing faculty resources are sufficient to support the core and specialization courses, and the university anticipates strategic hiring in AI focus areas.

Faculty training. Faculty teaching in the program will use the university's learning management system along with its extensive electronic resources. They will have access to instructional development opportunities available across the College Park campus, including those offered as part of the Teaching and Learning Transformation Center, many of which are delivered in a virtual environment. Instructors will work with the learning design specialists on campus to incorporate best practices when teaching in the online environment.

J. Adequacy of Library Resources

The University of Maryland Libraries assessment concluded that the Libraries are able to meet, with current resources, the curricular and research needs of the program.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

The university is not anticipating overall enrollment growth as a result of this major (we expect a shift in major selection by matriculating students); therefore, no new tuition revenue is assumed in identifying resources. Some core coursework is already offered by academic units across campus. For new courses, reallocated resources will come from the redirection of tuition revenue at the campus level, redirection of instructional resources from the collaborating

departments, and from other reallocated resources within the university. As enrollments grow, additional instructional support—including faculty lines and teaching assistantships—will be aligned with demand through ongoing coordination with the college, AIM, and university administration. The university affirms that physical facilities, computing infrastructure, and instructional equipment are adequate to initiate the program.

The program will be delivered primarily in existing facilities within the Brendan Iribe Center for Computer Science and Engineering and the Computer Science Instructional Center (CSIC), both of which are fully equipped to support technically intensive undergraduate instruction. These facilities provide modern classrooms, collaborative learning spaces, faculty offices, and specialized computing environments appropriate for AI and systems-focused coursework.

The program will be supported by established advising and administrative infrastructure within the Department of Computer Science and the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM). Academic advising will be provided by a dedicated advising team under the leadership of the program's Academic Director to ensure coordinated degree planning and student success. A full-time Assistant Program Director will oversee program operations and student services. These resources are integrated within existing departmental and college structures and supported in coordination with the College of Computer, Mathematical, and Natural Sciences.

The proposed program will be in-person, but for the online components of the coursework, UMD maintains an Enterprise Learning Management System (ELMS). ELMS is a Web-based platform for sharing course content, tracking assignments and grades, and enabling virtual collaboration and interaction. All students and faculty have access to UMD's electronic mailing system.

L. Adequacy of Financial Resources

The budget tables reflect the reallocation of internal UMD resources to operate the program. Currently, UMD has approximately 4000 computer science majors. We expect that some of those students (between 500-700) will ultimately enroll in the proposed program. Several courses in the proposed program are already offered. In that regard, the budget reflects a redistribution of students into the new program without increasing the overall UMD enrollment. There will also be new courses taught for the program and this reallocation will come from funding reserved by the university specifically for new AI programs.

Resources (see Table 1):
This table assumes an enrollment of approximately 500 full-time students and 30 part-time students per year with increases over time. The reallocated resources reflect that some funds will be shifted from within the Department of Computer Science and collaborating departments and the remaining funds will be set aside by UMD leadership for developing AI programs.

1. Line 1 reflects the reallocated resources anticipated to support the program.
2. We assume no additional tuition revenue will be generated by this new major since we do not anticipate a significant change in the overall undergraduate population.

3. Our model assumes that most students will be full-time undergraduates enrolled at UMD.
4. A portion of the reallocation reflects the redistribution of existing students and courses from existing majors to the new program.
5. No external sources of funding are assumed.
6. No other sources of funding are assumed.

Expenditures (see Table 2):
Most faculty and staff are already in place to operate this program. Some new courses, alongside additional staff, advising, and GA support will be required for the major.

1. Line 1 reflects the faculty who will teach the new courses in the program as well as the faculty who will continue their course instruction within the Department of Computer Science and collaborating academic units.
2. Line 2 reflects the administrative support.
3. Line 3 reflects the staff support.
4. Line 4 reflects graduate student positions.
5. The additional equipment, library, and operational expenses will mainly be reserved for informational resource and technology related purchases.

M. Adequacy of Program Evaluation

Formal program review is carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (http://www.president.umd.edu/policies/2014-i-600a.html). Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment (https://irpa.umd.edu/Assessment/loa_overview.html). Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html). Since 2005, the University has used an online survey instrument that standardizes student course feedback across campus. The survey has standard, university-wide questions and allows for supplemental, specialized questions from the academic unit offering the course.

N. Consistency with Minority Student Achievement goals

The program is committed to fostering a welcoming environment by integrating and expanding upon existing initiatives within the University of Maryland's computing and information sciences communities. Building upon successful Computer Science recruiting programs, the new major will actively participate in and promote activities such as the Mentoring Program, Conference Scholarships, and the Tech + Research initiative (many of the projects there are already AI-centered). These programs have a proven track record of supporting underrepresented students in computing fields by providing mentorship, professional development opportunities, and research experiences. By aligning with these initiatives, the program aims to create a supportive network that encourages the recruitment and retention of a well-rounded and representational student body.

Furthermore, the program will collaborate with university recruiting efforts to ensure that the program's culture reflects a commitment to accessibility and the democratization of information. This collaboration includes participating in outreach programs targeting K-12 students, such as the TRAILS AI Summer Academy, which introduces high school students to artificial intelligence concepts and applications. By engaging with these outreach efforts, the program seeks to inspire a thriving pipeline of future students who are well-prepared and motivated to pursue studies in artificial intelligence.

The program will create an environment that not only attracts a group of students from varied backgrounds but also provides the necessary support and resources to ensure their success throughout their academic journey.

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

This program is not intended for distance education.

Table 1: Resources

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds	$1,500,000	$1,500,000	$1,600,000	$1,600,000	$1,650,000
2. Tuition/Fee Revenue (c+g below)	$0	$0	$0	$0	$0
a. #FT Students	500	550	605	665	732
b. Annual Tuition/Fee Rate	$23,994	$24,714	$25,456	$26,219	$27,006
c. Annual FT Revenue (a x b)	$11,997,000	$13,592,828	$15,400,674	$17,448,963	$19,769,675
d. # PT Students	30	33	36	40	44
e. Credit Hour Rate	$933.40	$961.40	$990.24	$1,019.95	$1,050.55
f. Annual Credit Hours	12	12	12	12	12
g. Total Part Time Revenue (d x e x f)	$336,024	$380,715	$431,350	$488,720	$553,720
3. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	**$1,500,000**	**$1,500,000**	**$1,600,000**	**$1,600,000**	**$1,650,000**

Table 2: Expenditures

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	$997,500	$1,027,425	$1,058,248	$1,089,995	$1,122,695
a. #FTE	5	5	5	5	5
b. Total Salary	$750,000	$772,500	$795,675	$819,545	$844,132
c. Total Benefits	$247,500	$254,925	$262,573	$270,450	$278,563
2. Admin. Staff (b+c below)	$133,000	$136,990	$141,100	$145,333	$149,693
a. #FTE	1	1	1	1	1
b. Total Salary	$100,000	$103,000	$106,090	$109,273	$112,551
c. Total Benefits	$33,000	$33,990	$35,010	$36,060	$37,142
3. Total Support Staff (b+c below)	$79,800	$82,194	$84,660	$87,200	$89,816
a. #FTE	1	1	1	1	1
b. Total Salary	$60,000	$61,800	$63,654	$65,564	$67,531
c. Total Benefits	$19,800	$20,394	$21,006	$21,636	$22,285
4. Graduate Assistants (b+c)	$162,420	$167,293	$172,311	$177,481	$182,805
a. #FTE	3	3	3	3	3
b. Stipend	$108,000	$111,240	$114,577	$118,015	$121,555
c. Tuition Remission	$18,780	$19,343	$19,924	$20,521	$21,137
d. Benefits	$35,640	$36,709	$37,810	$38,945	$40,113
5. Equipment	$20,000	$20,000	$20,000	$20,000	$20,000
6. Library	$5,000	$5,000	$5,000	$5,000	$5,000
7. New or Renovated Space	$0	$0	$0	$0	$0
8. Other Expenses: Operational Expenses	$50,000	$50,000	$50,000	$50,000	$50,000
TOTAL (Add 1 - 8)	**$1,447,720**	**$1,488,902**	**$1,531,319**	**$1,575,008**	**$1,620,008**

Appendix A Specialization Curricula

Each specialization is 18 credits.

General Specialization
The General specialization allows students to pursue a flexible pathway through advanced artificial intelligence coursework. Students have one required course, CSAI473 Capstone in Artificial Intelligence (3 credits), and then select 15 upper-level electives across technical and interdisciplinary domains.

Generative AI Specialization
The Generative AI Specialization prepares students to design, train, evaluate, and deploy systems that generate text, images, and multimodal content, combining advanced coursework in language, representation, and model architectures with interdisciplinary study of human language, creativity, and evaluation. Students have four required courses:

- CSAI370 Multilingual Text Processing and Evaluation (3 credits)
- LING200 Introductory Linguistics (3 credits)
- LING240 Language and Mind (3 credits)
- CSAI424 Multimodal Generation (3 credits)

Students also take 6 credits of electives that deepen expertise in generative modeling through advanced technical courses.

AI Algorithms Specialization
The AI Algorithms Specialization focuses on the theoretical and methodological foundations of artificial intelligence, preparing students to design, analyze, and optimize advanced AI models across domains and modalities. Students have four required courses:

- CMSC422 Introduction to Machine Learning (3 credits)
- CMSC472 Introduction to Deep Learning (3 credits)
- CSAI427 Reinforcement Learning (3 credits)
- CSAI461 Multiagent Systems (3 credits)

Students also take 6 credits of electives that expand technical depth in areas such as computer vision, natural language processing, robotics, computational game theory, and advanced AI systems.

AI, Society, and Decision-Making Specialization
The AI, Society, and Decision-Making Specialization prepares students to apply AI methods within social, civic, and policy contexts while critically examining the ethical, legal, and societal implications of intelligent systems. Students have four required courses:

- CMSC401 Algorithms for Geospatial Computing (3 credits)
- CSAI460 AI and the Life of Great Cities (3 credits)
- GEOG398E Special Topics in Geography: Introduction to Spatial Artificial Intelligence (3 credits)
- INST366 Privacy, Security and Ethics for Big Data (3 credits)

Students also take 6 credits of electives that explore topics such as AI governance, public policy, sociology of technology, equity, trust, and the social dimensions of digital systems.

Accessibility Specialization

The Accessibility Specialization prepares students to design and implement AI-enabled systems that promote equity, usability, and inclusive technology for individuals with diverse abilities and needs. Students have three required courses:

- CMSC434 Introduction to Human-Computer Interaction (3 credits)
- INST401 Design and Human Disability and Aging (3 credits)
- WGSS105 Introduction to Disability Studies (3 credits)

Students also take 9 credits of electives that emphasize user-centered design, assistive technologies, visualization, mobile systems, and the social and ethical dimensions of accessibility in AI systems.

Appendix B: Faculty Involved in Major

The chart below lists faculty members projected to regularly teach in the program. Some courses will be taught by graduate assistants, who are not listed here. All faculty are full-time unless otherwise indicated.

P/T indicates part-time status.

Name	Highest Degree Earned, Institution and Program	UMD Title	Courses
Neel Ahuja	Ph.D., University of San Diego; Cultural Studies	Professor	WGSS105
Tonia Bleam	Ph.D., University of Delaware; Linguistics	Senior Lecturer	LING200; LING240
Patrick Brosnan	Ph.D., University of Chicago; Mathematics	Professor	MATH141
Cody Buntain	Ph.D., University of Maryland, College Park; Computer Science	Assistant Professor	CSAI220; INST414
Nora Burkhauser	M.Ed., Lehigh University; Secondary Mathematics	Lecturer	CMSC141
Marine Carpuat	Ph.D., Hong Kong University of Science and Technology; Computer Science and Engineering	Assistant Professor	CSAI370
James Conway	Ph.D., Georgia Institute of Technology; Mathematics	Lecturer	MATH340; MATH341
Wojciech Czaja	Ph.D., Washington University in Saint Louis; Mathematics	Professor	DATA250
Susan Dwyer	Ph.D., Massachusetts Institute of Technology; Philosophy	Associate Professor	PHIL211
Roger Eastman	Ph.D., University of Maryland, College Park; Computer Science	Professor of the Practice	CMSC250; CSAI104
Anna Evtushenko	Ph.D., Cornell University; Information Science	Lecturer	DATA320
Jonathan Fernandes	Ph.D., University of Maryland, College Park; Mathematics	Senior Lecturer	MATH140; STAT426
Leila De Floriani	Ph.D., Università degli Studi di Genova; Mathematics	Professor	CMSC401
Vanessa Frias-Martinez	Ph.D., Columbia University; Computer Science	Professor	CSAI103; CSAI460
Amin Gholampour	Ph.D., University of British Columbia; Mathematics	Professor	STAT400; MATH461
Jen Golbeck	Ph.D., University of Maryland; Computer Science	Professor	INST326; INST366

Evan Golub	Ph.D., University of Maryland, College Park; Computer Science	Principal Lecturer	CMSC131
Daniel Greene	Ph.D., University of Maryland, College Park; Information Science	Associate Professor	INST204
Ritwik Gupta	Ph.D., University of California, Berkeley; Artificial Intelligence	Assistant Professor	CSAI216
Furong Huang	Ph.D., University of California, Irvine; Electrical and Computer Engineering	Associate Professor	CSAI461
Heng Huang	Ph.D., Dartmouth College; Computer Science	Professor	CMSC422
Jia-Bin Huang	Ph.D., University of Illinois, Urbana-Champaign; Electrical and Computer Engineering	Associate Professor	CSAI424
Sujeong Kim	Ph.D., University of North Carolina at Chapel Hill; Computer Science	Lecturer	CSAI221
Clyde Kruskal	Ph.D., New York University; Computer Science	Associate Professor	CMSC351
Jonathan Lazar	Ph.D., University of Maryland, Baltimore County; Information Systems	Professor	INST401
Terence Long	Ph.D., University of Maryland, College Park; Mathematics	Senior Lecturer	MATH240; MATH243
Anwar Mamat	Ph.D., University of Nebraska, Lincoln; Computer Science	Senior Lecturer	CMSC132
Kevin McGarry	J.D., St. Thomas University	Clinical Professor	CSAI102
Nuno Miguel Martins	Ph.D., University of California, Berkeley; Electrical Engineering and Computer Sciences	Professor	ENEE290
Maksym Morawski	M.S., University of Maryland, Baltimore County; Computer Science	Lecturer	CMSC320
Jun Nishida	Ph.D., University of Tsukuba, Japan; Human Informatics	Assistant Professor	CMSC434
William Regli	Ph.D., University of Maryland; Computer Science	Professor	CMSC421
Abhinav Shrivastava	Ph.D., Carnegie Mellon University; Robotics and Artificial Intelligence	Associate Professor	CMSC472
Pratap Tokekar	Ph.D., University of Minnesota; Computer Science	Assistant Professor	CSAI101; CSAI427
David Van Horn	Ph.D., Brandeis University; Computer Science	Associate Professor	CMSC142
Yiqun Xie	Ph.D., University of Minnesota; Computer Science	Assistant Professor	GEOG398E

Appendix C Course Descriptions

CSAI Courses

CSAI101 The Current AI Moment 1 Credit
This course introduces students to the current moment of artificial intelligence. It examines historical technological transformations—such as mechanized agriculture, assembly lines, and information technologies—and compares them to the present AI revolution. Students explore major AI developments of the past century and engage with societal, ethical, economic, and technical questions shaping today's AI landscape. The course also introduces students to the effective and responsible use of contemporary AI tools.

CSAI102 Introduction to AI and the Law 3 Credits
This course examines artificial intelligence law and regulation from the perspective of U.S. law and industry self-regulation, with discussion of select international frameworks such as the EU AI Act and relevant ISO, UN, and OECD guidance. Topics may include administrative law for AI regulation, constitutional implications of AI, intellectual property (copyright, trademark, patent, trade secret), negligence and product liability, privacy law, contract law, and industry self-regulation. Students analyze how legal systems respond to emerging AI technologies and how governance structures shape AI development and deployment.

CSAI103 Introduction to AI and Food 3 Credits
This course examines the role of artificial intelligence in food systems across production, distribution, and consumption. Topics include AI-driven chemical synthesis for fertilizers and crop protection, computer vision for monitoring livestock, robotic harvesting systems, supply chain optimization, commodities markets, and AI-assisted food preparation and marketing. Students explore how AI tools influence agricultural productivity, sustainability, trade, and nutritional decision-making, while considering ethical and societal implications.

CSAI104 Introduction to AI and Creativity 3 Credits
This course explores the role of artificial intelligence in creative domains, particularly visual media. Students learn how to generate and edit images and videos using AI tools, examine the limitations and biases of these systems, and explore methods for incorporating new concepts into generative models. The course also addresses detection of AI-generated content and broader ethical implications. The final project involves the creation of a portfolio of artwork assisted by AI tools.

CSAI216 Efficient Systems for AI Applications 4 Credits
This course introduces students to the computer systems fundamentals that underpin artificial intelligence systems. Students learn how memory and parameters are organized in low-level systems and the programming techniques necessary to efficiently update those parameters on large datasets. The course also covers how the mathematical foundations of AI algorithms are translated into learned parameters and how modern algorithms optimize those parameters efficiently at scale. Topics include memory hierarchy and latency, allocation and deallocation of

memory, numerical representations and floating point operations, computation graphs, automatic differentiation, tensor layouts in memory, and efficient matrix multiplication on GPUs. Linear algebra is required but may be taken concurrently.

CSAI220 Measuring Preferences and Rankings 3 Credits
A key component of modern AI systems is determining when one AI system—or its output—is better than another. Many of the mathematical tools used to make these decisions originate in psychology and statistics. This course introduces the mathematical foundations underlying preference modeling and ranking systems, teaches students how to fit these models to data, and explains how they are used in AI evaluation and decision-making systems.

CSAI221 Classical AI Algorithms 4 Credits
This course introduces the foundational theory and practice of artificial intelligence. Students learn how to search over structured representations to find optimal solutions to planning problems, represent real-world problems using graph structures and game trees, and solve AI problems using first-order logic. The course provides a lower-division introduction to core AI methods and emphasizes conceptual understanding and problem-solving.

CSAI370 Multilingual Text Processing and Evaluation 3 Credits
This course covers the representation and manipulation of linguistic data on computers. Students examine byte-level representations of text, how different languages are encoded and processed, and the distinction between types and tokens in word usage. The course explores challenges of tokenization across languages, particularly in cases of implicit or ambiguous segmentation. Students apply large language models and related resources to novel tasks, learning how to adapt existing models to new domains, evaluate performance, and efficiently fine-tune systems.

CSAI424 Multimodal Generation 3 Credits
This course introduces the algorithms and models that enable the generation of images, audio, video, and other modalities from textual or structured inputs. Students study joint representation learning that bridges descriptive language and target media, iterative refinement techniques for generation, and methods for training and fine-tuning generative models to improve expressiveness and generalization. The course also addresses dataset curation, evaluation methodologies, detection of generated content, and broader social impacts of multimodal AI systems.

CSAI427 Reinforcement Learning 3 Credits
This course surveys the theory and practice of reinforcement learning, focusing on how agents learn to make decisions through interaction with an environment. Students study reward formulation, policy estimation, value function approximation, and foundational algorithms such as dynamic programming and Q-learning. Advanced topics include imitation learning, opponent modeling, and deep reinforcement learning. The course emphasizes both mathematical foundations and practical implementation of reinforcement learning systems.

CSAI460 AI and the Life of Great Cities 3 Credits

This course explores the transformative role of artificial intelligence and data science in urban environments. Students develop and apply AI algorithms and data science pipelines to challenges in mobility, sustainability, governance, infrastructure, and public services. Through case studies and hands-on projects, the course examines ethical, social, and equity implications of AI in cities, equipping students with technical and analytical skills to design data-driven urban solutions.

CSAI461 Multiagent Systems 3 Credits
This course examines the theory and practice of AI agents interacting in complex environments. Topics include coordination and communication protocols, consensus formation, security considerations, strategic behavior, and mechanisms for cooperation and competition among agents. Students explore models of distributed decision-making and analyze how multiagent systems operate in real-world settings. The course combines theoretical foundations with applied case studies.

CSAI473 Capstone in Artificial Intelligence 3 Credits
Students complete a semester-long project under the supervision of a faculty advisor or, where appropriate, an industry mentor. The capstone requires students to identify, design, and implement a substantial artificial intelligence project that integrates technical depth with applied or interdisciplinary impact. Projects may result in a research paper, software tool, prototype system, or applied solution, and students are encouraged to pursue work suitable for academic publication or real-world deployment.

CMSC Courses

CMSC131 Object-Oriented Programming I 4 Credits
Introduction to programming and computer science. Emphasizes understanding and implementation of applications using object-oriented techniques. Develops skills such as program design and testing as well as implementation of programs using a graphical IDE. Programming done in Java.

CMSC132 Object-Oriented Programming II 4 Credits
Introduction to use of computers to solve problems using software engineering principles. Design, build, test, and debug medium-size software systems and learn to use relevant tools. Use object-oriented methods to create effective and efficient problem solutions. Use and implement application programming interfaces (APIs). Programming done in Java.

CMSC141 Programming with Purpose I: Data-Centric Computing 4 Credits
This course is an introduction to computing and programming through the lens of data. It aims to give you ways of thinking about solving problems using computation. Students will learn to write programs to process both tabular and structured data, to assess programs both experimentally and theoretically, to apply basic data science concepts, and to discuss big ideas around the communication, use, and social impacts of digital information.

CMSC142 Programming with Purpose II: Data Structures and Algorithms 4 Credits

This course explains the concepts and techniques required to write programs that can handle large amounts of data efficiently. Project-oriented and classroom-tested, it presents a number of important algorithms—supported by motivating examples—that bring meaning to the problems faced by computer programmers. The idea of computational complexity is introduced, demonstrating what can and cannot be computed efficiently at scale, helping programmers make informed choices about the algorithms they use.

CMSC250 Discrete Structures 4 Credits
Fundamental mathematical concepts related to computer science, including finite and infinite sets, relations, functions, and propositional logic. Introduction to other techniques, modeling and solving problems in computer science. Introduction to permutations, combinations, graphs, and trees with selected applications.

CMSC320 Introduction to Data Science 3 Credits
An introduction to the data science pipeline, i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of several topics including statistical data analysis, basic data mining and machine learning algorithms, large-scale data management, cloud computing, and information visualization.

CMSC351 Algorithms 3 Credits
A systematic study of the complexity of some elementary algorithms related to sorting, graphs and trees, and combinatorics. Algorithms are analyzed using mathematical techniques to solve recurrences and summations.

CMSC401 Algorithms for Geospatial Computing 3 Credits
An introduction to fundamental geospatial objects and geometric algorithms for spatio-temporal data processing and analysis. Point data representation and analysis: spatial data models and data structures, algorithms for spatial queries, point clustering algorithms. Surface and scalar field modeling, such as terrains: raster and triangle-based models (TINs), algorithms for building and querying TINs. Algorithms for natural and urban terrain analysis: morphology computation and visibility analysis. Applications to processing and analysis of LiDAR (Light Detection and Ranging) data in the context of terrain reconstruction, urban modeling, forest management and bathymetry reconstruction for coastal data management. Road network computation and analysis: algorithms for route computation in road networks, and for road network reconstruction from GPS and satellite data.

CMSC421 Introduction to Artificial Intelligence 3 Credits
Introduces a range of ideas and methods in AI, varying semester to semester but chosen largely from: automated heuristic search, planning, games, knowledge representation, logical and statistical inference, learning, natural language processing, vision, robotics, cognitive modeling, and intelligent agents. Programming projects will help students obtain a hands-on feel for various topics.

CMSC422 Introduction to Machine Learning 3 Credits

Machine Learning studies representations and algorithms that allow machines to improve their performance on a task from experience. This is a broad overview of existing methods for machine learning and an introduction to adaptive systems in general. Emphasis is given to practical aspects of machine learning and data mining.

CMSC434 Introduction to Human-Computer Interaction 3 Credits
Assess usability by quantitative and qualitative methods. Conduct task analyses, usability tests, expert reviews, and continuing assessments of working products by interviews, surveys, and logging. Apply design processes and guidelines to develop professional quality user interfaces. Build low-fidelity paper mockups, and a high-fidelity prototype using contemporary tools such as graphic editors and a graphical programming environment (e.g., Visual Basic, Java).

CMSC472 Introduction to Deep Learning 3 Credits
An introduction to deep learning, a machine learning technique, as well as its applications to a variety of domains. Provides a broad overview of deep learning concepts including neural networks, convolutional neural networks, recurrent neural networks, generative models, and deep reinforcement learning, and an intuitive introduction to basics of machine learning such as simple models, learning paradigms, optimization, overfitting, importance of data, and training caveats.

MATH Courses

MATH140 Calculus I 4 Credits
Introduction to calculus, including functions, limits, continuity, derivatives and applications of the derivative, sketching of graphs of functions, definite and indefinite integrals, and calculation of area. The course is especially recommended for science, engineering and mathematics majors.

MATH141 Calculus II 4 Credits
Continuation of MATH140, including techniques of integration, improper integrals, applications of integration (such as volumes, work, arc length, moments), inverse functions, exponential and logarithmic functions, sequences and series.

MATH240 Introduction to Linear Algebra 4 Credits
Basic concepts of linear algebra: vector spaces, applications to line and plane geometry, linear equations and matrices, similar matrices, linear transformations, eigenvalues, determinants and quadratic forms.

MATH243 Introduction to Linear Algebra and Differential Equations 4 Credits
The basics of linear algebra and differential equations, with an emphasis on general physical and engineering applications. Aimed at students who need the material for future coursework but do not need as much depth and rigor as provided by MATH240 and MATH246.

MATH340 Multivariable Calculus, Linear Algebra and Differential Equations I (Honors) 4 Credits

First semester of the MATH340-341 sequence which gives a unified and enriched treatment of multivariable calculus, linear algebra and ordinary differential equations, with supplementary material from subjects such as differential geometry, Fourier series and calculus of variations. Students completing MATH340-341 will have covered the material of MATH240, MATH241, and MATH246, and may not also receive credit for MATH240, MATH241 or MATH246.

MATH341 Multivariable Calculus, Linear Algebra, Differential Equations II (Honors) 4 Credits
A continuation of MATH340.

MATH461 Linear Algebra for Scientists and Engineers 3 Credits
Basic concepts of linear algebra. This course is similar to MATH240, but with more extensive coverage of the topics needed in applied linear algebra: change of basis, complex eigenvalues, diagonalization, the Jordan canonical form.

INST Courses

INST204 Designing Fair Systems 3 Credits
Reviews how specific values are built into different automated decision-making systems as an inevitable result of constructing mechanisms meant to produce specific outcomes. These values create differential outcomes for the different people enmeshed in these systems, but both these values and these systems can be changed to support different values and different outcomes. The class serves as an introduction to the emerging field of algorithmic bias that bridges the disciplines of information science, computer science, law, policy, philosophy, sociology, urban planning, and others.

INST326 Object-Oriented Programming for Information Science 3 Credits
An introduction to programming, emphasizing understanding and implementation of applications using object-oriented techniques. Topics to be covered include program design and testing as well as implementation of programs.

INST366 Privacy, Security and Ethics for Big Data 3 Credits
Evaluates major privacy and security questions raised by big data, Internet of Things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other AI-driven systems. Covers history of research ethics and considers how ethical frameworks can and should be applied to digital data.

INST401 Design and Human Disability and Aging 3 Credits
Focuses on the design of consumer products and information systems to enable their use by persons with a wider range of physical, sensory, and cognitive abilities. Overviews aging and major types of impairment as they relate to resulting problems using consumer products and information systems. Focuses on principles of design of mass market products.

INST414 Data Science Techniques 3 Credits
An exploration of how to extract insights from large-scale datasets. The course will cover the complete analytical funnel from data extraction and cleaning to data analysis and insights

interpretation and visualization. The data analysis component will focus on techniques in both supervised and unsupervised learning to extract information from datasets. Topics will include clustering, classification, and regression techniques. Through homework assignments, a project, exams and in-class activities, students will practice working with these techniques and tools to extract relevant information from structured and unstructured data.

DATA Courses

DATA250 Discrete Mathematics 4 Credits
Introduction to basic discrete mathematical and linear algebraic structures and use of these mathematical structures to solve programming problems. Logic, set theory, formal proof methodology, functions, combinatorics, advanced counting techniques, and elements of linear algebra.

DATA320 Introduction to Data Science 3 Credits
An introduction to data science i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of several topics including statistical data analysis, basic data mining and machine learning algorithms, large-scale data management, cloud computing, and information visualization.

STAT Courses

STAT400 Applied Probability and Statistics I 3 Credits
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.

STAT426 Introduction to Data Science and Machine Learning 3 Credits
An introductory course to the recent developments in the fields of data science and machine learning. Emphasis will be given to mathematical and statistical understanding of commonly used methods and processes.

ENEE Course

ENEE290 Introduction to Differential Equations and Linear Algebra for Engineers 4 Credits
First-order differential equations, matrices and systems of linear equations, finite-dimensional vector spaces, inner product spaces, eigenvalues and eigenvectors, linear differential equations of higher order, and systems of differential equations. This course covers important topics in mathematics for Electrical and Computer Engineers. Specifically, several topics are covered, including first-order differential equations, matrices and systems of linear equations, finite-dimensional vector spaces, inner product spaces, eigenvalues and eigenvectors, linear differential equations of higher order, and systems of differential equations. Theoretical topics presented in the lectures will be reinforced by laboratory exercises.

GEOG Course

GEOG398E Special Topics in Geography; Introduction to Spatial Artificial Intelligence 3 Credits
An introductory course to spatial artificial intelligence (AI), providing a broad overview of spatial AI applications such as Google Maps, Uber/Lyft, Earth observation, smart cities, and autonomous vehicles. The course covers foundational AI concepts and identifies challenges that arise when applying AI techniques to spatial data and applications. Topics include spatial data models and knowledge representation, pattern mining, machine learning, perception, planning, and spatial-aware AI methods. Students are expected to develop conceptual understanding of spatial AI, gain intuition about AI techniques in spatial contexts, and complete hands-on Python-based exercises.

LING Courses

LING200 Introductory Linguistics 3 Credits
An exploration of the nature of human language. Introduction to the basic concepts and methodology of modern linguistic analysis (sound systems, word formation, sentence structure). Examination of the factors that contribute to dialect differences and the social implications of language variation. Additional topics may include: semantics, pragmatics, language change, writing systems, typology, language universals, comparison with other communication systems.

LING240 Language and Mind 3 Credits
The study of language as a cognitive phenomenon. Ways of representing people's knowledge of their native language, ways in which that knowledge is attained naturally by children, and how it is used in speaking and listening. Additional topics may include: animal communication, language and the brain, language and thought.

PHIL Courses

PHIL211 AI & Ethics 3 Credits
An introduction to a major subfield of contemporary Philosophy, namely applied ethics, and the experience of using some major tools in the practice of philosophy more generally, namely, the construction and formal evaluation of arguments, conceptual analysis, the use of thought experiments, and clear, direct and persuasive writing. Learning how to execute the latter will involve an intense iterative process. The substantive focus of the course will be the ethical evaluation of Artificial Intelligence (AI) in some of its current and potentially future incarnations. We'll examine algorithmic opacity, algorithmic bias and decision-making, autonomous weapons systems, human-robot interaction, and artificial moral agents, in order to uncover what, if any, ethical issues they give rise to.

WGSS Course

WGSS105 Introduction to Disability Studies 3 Credits
Explores theories of disability justice as they intersect with feminist and antiracist struggles. Analyzing how disability has been an important aspect of institutions and social experience in the United States and beyond, the course considers how disability activists have responded to

ableism by developing art, political strategies, and subcultures that promote a more just society built for a wider variety of human bodies.

Appendix D: B.S. in Artificial Intelligence: Computational Structures for AI Systems (with General Education code)

Year 1	Fall		Spring	
	Course	Credit	Course	Credit
	CMSC141 or CMSC131	4	MATH141	4
	MATH140 (MA & AR)	4	CMSC142 or CMSC132	4
	ENGL101 (AW)	3	Humanities (HU, UP)	3
	PHIL211 (SP)	3	INST204 (HS, IS)	3
	CSAI101	1	CSAI102, 103, or 104	3
	Total	**15**	**Total**	**17**
Year 2	Fall		Spring	
	Course	Credit	Course	Credit
	CSAI216	4	Natural Science Lab (NL)	4
	DATA250	4	CMSC351	3
	CSAI220	3	CSAI221	4
	Oral Communication (OC)	3	Elective	3
	Total	**14**	**Total**	**14**
Year 3	Fall		Spring	
	Course	Credit	Course	Credit
	CMSC320	3	Specialization	3
	Specialization Course	3	Specialization	3
	Specialization Course	3	Scholarship in Practice (SP)	3
	Professional Writing (PW)	3	Natural Science (NS)	3
	History/Social Sciences (HS, CC)	3	Humanities (HU, IS)	3
	Total	**15**	**Total**	**15**
Year 4	Fall		Spring	
	Course	Credit	Course	Credit
	Specialization	3	Capstone/Research (SP)	3
	Specialization	3	Specialization	3
	Elective	3	Elective	3
	Elective	3	Elective	3
	Elective	3	Elective	3
	Total	**15**	**Total**	**15**
			Total Credits	**120**

University of Maryland General Education Requirements Overview		
Fundamental Studies: 15 Credits		
Fundamental Studies Academic Writing	3	AW
Fundamental Studies Professional Writing	3	PW
Fundamental Studies Oral Communication	3	OC
Fundamental Studies Mathematics	3	MA
Fundamental Studies Analytic Reasoning[1]	3	AR
[1] If a student passes an Analytic Reasoning course that requires a Fundamental Studies Math course as a prerequisite, then the Fundamental Studies Math course is considered to be fulfilled (e.g., students who place into and pass a calculus course, which counts for FS-AR, do not need to take a less advanced Math course to fulfill the FS-MA requirement).		
Distributive Studies: 25 Credits		
Distributive Studies Natural Sciences	3	NS
Distributive Studies Natural Science Lab Course[2]	4	NL
Distributive Studies History and Social Sciences	6	HS
Distributive Studies Humanities	6	HU
Distributive Studies Scholarship in Practice[3]	6	SP
[2] A second DS-NL course can fulfill the DS-NS course requirement.		
[3] Students learn and practice skills of critical evaluation and participate in the process of applying knowledge in the pursuit of a tangible goal. At least one course must be outside of the major.		
Big Question Courses: 6 Credits [4]		
The signature courses of the UMD General Education program, Big Question courses investigate a significant issue in depth and demonstrate how particular disciplines and fields of study address problems.		
Big Question Course	6	IS
[4] Big Question credits may be double-counted with courses taken for the Distributive Studies requirement.		
Diversity: 4-6 Credits[5]		
Diversity Understanding Plural Societies[6] Courses examine how diverse cultural and ethnic groups co-exist.	3-6	UP
Diversity Cultural Competence Courses help students develop skills to succeed in a diverse world.	0-3	CC
[5] These credits may be double-counted with courses taken for the Distributive Studies requirement.		
[6] Students may take either two DV-UP courses or one DV-UP course and one DV-CC course.		