UNIVERSITY OF MARYLAND
OFFICE OF THE SENIOR VICE PRESIDENT AND PROVOST

1119 Thomas V. Miller, Jr. Administration Building
College Park, Maryland 20742
301.405.5252 TEL 301.405.8195 FAX

June 13, 2025

MEMORANDUM

TO: Amitabh Varshney
Dean, College of Computer, Mathematical, and Natural Sciences

FROM: William Reed *Wm Reed*
Assistant Provost for Academic Planning

SUBJECT: Proposal to Establish a Master of Science in Artificial Intelligence (PCC Log No. 24072)

On June 13, 2025, the Board of Regents approved your proposal to establish a Master of Science in Artificial Intelligence. On June 10, 2025, the Maryland Higher Education Commission gave their approval. A copy of the approved proposal is attached.

The new program is effective Fall 2025. The Graduate Catalog entry for the program will be added by the Graduate School. Please ensure that the new program is fully described in all other relevant descriptive materials.

Please contact Linda Yokoi at lyokoi@umd.edu in the Office of the Registrar to establish a major code for the program. The new major code will be mapped to the following unit:

- 012030001300101 CMNS-College of Computer, Math & Natural Sciences

WLR/mdc

Enclosure

cc: Wendy Stickle, Chair, Senate PCC Committee
Shannon Gundy, Office of Enrollment Management
Veronica Marin, University Senate
Huifang Pan, Division of Information Technology
Pam Phillips, Institutional Research, Planning & Assessment
Natalie Trapuzzano, University Archives
Linda Yokoi, Office of the Registrar
Jason Farman, Graduate School
Leslie Pick, College of Computer, Mathematical, and Natural Sciences
Amy Chester, University of Maryland Science Academy

Maryland Higher Education Commission

Engage / Inform / Support

Governor
Wes Moore

Lt. Governor
Aruna Miller

Secretary
Sanjay Rai, Ph.D.

Commission Chair
Cassie Motz

Commission Vice Chair
Chike Aguh

Commissioners
Kathleen Bands, Ph.D.
Mickey L. Burnim, Ph.D.
Charlene Mickens Dukes, Ed.D.
Barbara Kerr Howe
Ray Serrano, Ph.D.
Rebecca Taber Staehelin
Sheila D. Thompson, Ph.D.
Craig A. Williams, Ph. D.
Janet E. Wormack, Ed.D.
Praise Alayode, Student Commissioner

Principal Counsel
Kimberly Smith Ward

June 10, 2025

Dr. Darryll Pines
President
University of Maryland College Park
1101 Thomas V. Miller Jr. Administration Building
College Park, MD 20742

Dear President Pines:

The Maryland Higher Education Commission has reviewed a request from University of Maryland College Park to offer a Master of Science (M.S.) in Artificial Intelligence as both an on-campus education program and a distance education program.

I am pleased to inform you that the program proposal is recommended for implementation in Fall 2025. This decision is based on an analysis of the program proposal in conjunction with the law and regulations governing academic program approval, in particular Code of Maryland Regulations (COMAR) 13B.02.03. As required by COMAR, the Commission circulated the proposal to the Maryland higher education community for comment and objection; no objections were received during the 30-day circulation period. The program meets COMAR's requirements and demonstrates potential for success, an essential factor in making this decision.

Additionally, the institution meets COMAR's requirements to provide distance education. An institution offering distance education must comply with the C-RAC guidelines in addition to other requirements outlined in COMAR, including 13B.02.03.22 and .29.

For the purposes of providing enrollment and degree data to the Commission, please use the following HEGIS and CIP codes:

Program Title	Award	Credits	HEGIS	CIP	Modality
Artificial Intelligence	M.S.	30	0799.04	11.0102	Dual

Should University of Maryland College Park desire to make a substantial modification to the program in the future, review by the Commission will be necessary. I wish you continued success.

Sincerely,

Sanjay Rai, PhD
Secretary

SR:EAAD:LS:BB:ae

C: Dr. Candace Caraco, Associate Vice Chancellor, Acad. Affairs, USM
Michael Colson, Senior Coordinator for Academic Programs, UMCP
Dr. Jennifer King Rice, Senior Vice President and Provost, UMCP

File: 25187

UNIVERSITY SENATE

LEGISLATION APPROVAL | #24-25-32

Approved by the Senate on April 24, 2025

PCC Proposal to Establish a Master of Science in Artificial Intelligence (Senate Document #24-25-32)

TO **Darryll J. Pines | President**

FROM **Jordan Sly | Chair, University Senate**

I am pleased to forward the accompanying legislation for your consideration and approval. Wendy Stickle, Chair of the Programs, Curricula & Courses (PCC) Committee, presented the PCC Proposal to Establish a Master of Science in Artificial Intelligence (Senate Document #24-25-32), which the University Senate approved at its meeting on April 24, 2025. Please inform the Senate of your decision and any administrative action related to your conclusion.

Approved: Darryll J. Pines **Date:** **04-25-2025**

Darryll J. Pines
President

Copies of this approval and the accompanying legislation will be forwarded to:

Jennifer King Rice, Senior Vice President and Provost
Veronica Marin, Executive Secretary and Director, University Senate
Jay Rosselló, Vice President of Legal Affairs and General Counsel
Dylan Baker, Associate Vice President for Finance and Personnel
John Bertot, Associate Provost for Faculty Affairs
Elizabeth Beise, Associate Provost for Academic Planning & Programs
Rhonda Smith, Director, Division of Academic Affairs
Jeff Waters, Director, Graduate Operations
Amitabh Varshney, Dean, College of Computer, Mathematical, and Natural Sciences
Amy Chester, Assistant Dean, College of Computer, Mathematical, and Natural Sciences
David Jacobs, Professor, Computer Science

UNIVERSITY SENATE | TRANSMITTAL | #24-25-32

Senate Programs, Curricula, & Courses Committee

PCC Proposal to Establish a Master of Science in Artificial Intelligence (Senate Document #24-25-32)

PRESENTED BY	**Wendy Stickle, Chair, Senate Programs, Curricula, and Courses Committee**
REVIEW DATES	**SEC – April 9, 2025 | SENATE – April 24, 2025**
VOTING METHOD	**In a single vote**
RELEVANT POLICY/DOCUMENT	
NECESSARY APPROVALS	**Senate, President, USM Board of Regents, and the Maryland Higher Education Commission**

ISSUE

The College of Computer, Mathematical, and Natural Sciences proposes to establish a Master of Science in Artificial Intelligence (AI). This 30-credit, non-thesis program is designed for professionals seeking advanced training in AI technologies. The curriculum emphasizes technical proficiency in machine learning, deep learning, and AI decision-making, while also addressing human-centered design, ethics, and the societal impact of AI. The program prepares graduates to develop AI solutions that are fair, safe, and impactful across industries such as healthcare, finance, public policy, and engineering.

This program includes 21 credits of required core courses and 9 elective credits. Core coursework includes subjects such as probability and statistics, data science, machine learning, computing systems for AI, human-centered approaches, AI and society, and safe and trustworthy AI. Electives allow students to explore specialized topics such as natural language processing, robotics, AI for cybersecurity, AI for healthcare, generative AI, and AI policy. There will be both an in-person and online version of the program.

The program is designed to meet the growing demand for professionals trained in both the technical and social dimensions of AI. According to labor market data and projections from the U.S. Bureau of Labor Statistics, the job market for AI-related roles is expected to grow significantly, both nationally (26% growth) and in Maryland (21% growth).

The MS in AI will be self-supported and funded entirely through tuition revenue. No state funds or additional university resources are required to support the program. The program will be offered through the college's Science Academy, which currently offers self-supported MS programs in Data Science, Bioinformatics and Computational Biology, Quantum Computing, and Applied Machine Learning.

The proposal was approved by the Graduate School PCC committee on March 26, 2025, and the Senate Programs, Curricula, and Courses committee on April 4, 2025.

RECOMMENDATION(S)

The Senate Committee on Programs, Curricula, and Courses recommends that the Senate approve this new academic program.

COMMITTEE WORK

The committee considered this proposal at its meeting on April 4, 2025. David Jacobs, Hal Daume, and Amy Chester, from the College of Computer, Mathematical, and Natural Sciences, presented the proposal and answered questions from the committee. The committee approved the proposal.

ALTERNATIVES

The Senate could decline to approve this new academic program.

RISKS

If the Senate does not approve this new program, the university will miss an opportunity to establish a timely and strategically aligned program that supports workforce needs in Maryland and the surrounding region.

FINANCIAL IMPLICATIONS

There are no significant financial implications. The program will be entirely self-supported through tuition revenue and will not require additional university or state resources.

1007: ARTIFICIAL INTELLIGENCE

In Workflow

1. CMNS PCC Chair (jpresson@umd.edu; lpick@umd.edu)
2. CMNS Dean (rinfanti@umd.edu)
3. Academic Affairs Curriculum Manager (mcolson@umd.edu)
4. Graduate School Curriculum Manager (jfarman@umd.edu; rlong12@umd.edu)
5. Graduate PCC Chair (jfarman@umd.edu; rlong12@umd.edu)
6. Dean of the Graduate School (jfarman@umd.edu; sroth1@umd.edu)
7. Senate PCC Chair (mcolson@umd.edu; wstickle@umd.edu)
8. University Senate Chair (mcolson@umd.edu)
9. President (mcolson@umd.edu)
10. Board of Regents (mcolson@umd.edu)
11. MHEC (mcolson@umd.edu)
12. Provost Office (mcolson@umd.edu)
13. Graduate Catalog Manager (bhernand@umd.edu; fantsao@umd.edu)

Approval Path

1. Sun, 02 Mar 2025 19:56:56 GMT
   John Fourkas (fourkas): Approved for CMNS PCC Chair
2. Mon, 03 Mar 2025 13:09:19 GMT
   Robert Infantino (rinfanti): Approved for CMNS Dean
3. Thu, 20 Mar 2025 21:30:58 GMT
   Michael Colson (mcolson): Approved for Academic Affairs Curriculum Manager
4. Thu, 27 Mar 2025 19:59:17 GMT
   Jason Farman (jfarman): Approved for Graduate School Curriculum Manager
5. Thu, 27 Mar 2025 20:02:16 GMT
   Jason Farman (jfarman): Approved for Graduate PCC Chair
6. Mon, 31 Mar 2025 21:05:00 GMT
   Stephen Roth (sroth1): Approved for Dean of the Graduate School
7. Fri, 04 Apr 2025 18:32:50 GMT
   Wendy Stickle (wstickle): Approved for Senate PCC Chair
8. Fri, 13 Jun 2025 14:26:57 GMT
   Michael Colson (mcolson): Approved for University Senate Chair
9. Fri, 13 Jun 2025 14:28:38 GMT
   Michael Colson (mcolson): Approved for President
10. Fri, 13 Jun 2025 14:31:24 GMT
    Michael Colson (mcolson): Approved for Board of Regents
11. Fri, 13 Jun 2025 14:31:34 GMT
    Michael Colson (mcolson): Approved for MHEC
12. Mon, 16 Jun 2025 13:37:06 GMT
    Michael Colson (mcolson): Approved for Provost Office

New Program Proposal

Date Submitted: Sun, 02 Mar 2025 02:19:12 GMT

Viewing: 1007 : Artificial Intelligence
Last edit: Fri, 13 Jun 2025 14:33:14 GMT

Changes proposed by: Amy Chester (alevine)

Program Name

Artificial Intelligence

Program Status

Active

Effective Term

Fall 2025

Catalog Year

2025-2026

Program Level

Graduate Program

Program Type

Master's

Delivery Method

On Campus

Departments

Department
Computer, Mathematical, and Natural Sciences

Colleges

College
Computer, Mathematical, and Natural Sciences

MHEC Inventory Program

Artificial Intelligence

CIP Code

11.0102 - 11.0102

HEGIS

079904

Degree(s) Awarded

Degree Awarded
Master of Science

Proposal Contact

David Jacobs and Hal Daume; Amy Chester

Proposal Summary

CMNS proposes an MS in Artificial Intelligence; CIP code: 11.0102 (Artificial Intelligence)

(PCC Log Number 24072)

Program and Catalog Information

Provide the catalog description of the proposed program. As part of the description, please indicate any areas of concentration or specializations that will be offered.

Artificial Intelligence (AI) technologies are rapidly evolving and being more integrated into various aspects of society and industry, leading to a growing demand for Artificial Intelligence professionals. The MS in Artificial Intelligence will combine technical courses in the fundamentals of AI and courses that address the interaction between AI and humans and society. During their coursework, students will build solid foundations in mathematics, statistics and computing and also obtain a broader view of human centered AI and its societal implications. Students will gain expertise in machine learning, deep learning, and AI-driven decision-making while exploring areas such as AI ethics, human-computer interaction, explainable AI, and policy considerations. The program prepares graduates to develop AI solutions that enhance human well-being, promote fairness, and integrate seamlessly into social and professional contexts.The program consists of 30-credit course work and is a non-thesis MS program. Students will be prepared for careers across disciplines and they will develop skills to be collaborative, adaptable problem solvers in a rapidly changing field.

Catalog Program Requirements. Please click on the help bubble for more specific information about formatting requirements.

Course	Title	Credits
Core		
MSAI601	Course MSAI601 Not Found (Probability and Statistics)	3
MSAI602	Course MSAI602 Not Found (Principles of Data Science)	3
MSAI603	Course MSAI603 Not Found (Principles of Machine Learning)	3
MSAI605	Course MSAI605 Not Found (Computing Systems for AI)	3
MSAI606	Course MSAI606 Not Found (Human-Centered and Participatory Approaches to AI)	3
MSAI630	Course MSAI630 Not Found (Safe and Trustworthy AI)	3
MSAI631	Course MSAI631 Not Found (AI and Society)	3
Electives		**9**
MSAI632	Course MSAI632 Not Found (Generative AI)	
MSAI633	Course MSAI633 Not Found (AI Policy)	
MSAI634	Course MSAI634 Not Found (AI in Engineering)	
MSAI604	Course MSAI604 Not Found (Introduction to Optimization for AI)	
MSAI612	Course MSAI612 Not Found (Deep Learning for AI)	
MSAI640	Course MSAI640 Not Found (Computer Vision for AI)	
MSAI641	Course MSAI641 Not Found (Natural Language Processing for AI)	
MSAI642	Course MSAI642 Not Found (Robotics for AI)	
MSAI650	Course MSAI650 Not Found (Cloud Computing for AI)	
MSAI651	Course MSAI651 Not Found (Big Data Analytics for AI)	
MSAI635	Course MSAI635 Not Found (Reinforcement Learning)	
MSAI636	Course MSAI636 Not Found (Explainable and Interpretable AI)	
MSAI660	Course MSAI660 Not Found (Probabilistic Graphical Models and Bayesian Learning)	
MSAI661	Course MSAI661 Not Found (Causal Inference and AI Decision Making)	
MSAI662	Course MSAI662 Not Found (Adversarial Machine)	
MSAI663	Course MSAI663 Not Found (Graph Neural Networks and Structured Data Learning)	
MSAI664	Course MSAI664 Not Found (Meta-Learning and Few-Shot Learning)	
MSAI665	Course MSAI665 Not Found (AI for Healthcare and Biomedical Applications)	
MSAI666	Course MSAI666 Not Found (AI for Cybersecurity)	
MSAI667	Course MSAI667 Not Found (AI for Finance and Algorithmic Trading)	
MSAI670	Course MSAI670 Not Found (Applied Ethics of AI)	
Total Credits		**30**

Sample plan. Provide a term by term sample plan that shows how a hypothetical student would progress through the program to completion. It should be clear the length of time it will take for a typical student to graduate. For undergraduate programs, this should be the four-year plan.

First Year					
Semester 1	**Credits**	**Semester 2**	**Credits**	**Semester 3**	**Credits**
MSAI 601: PROBABILITY AND STATISTICS	3	MSAI 605: COMPUTING SYSTEMS FOR AI	3	ELECTIVE	3
MSAI 603: PRINCIPLES OF MACHINE LEARNING	3	MSAI 606: HUMAN-CENTERED AND PARTICIPATORY APPROACHES TO AI	3		
MSAI 631 AI AND SOCIETY	3	MSAI 630: SAFE AND TRUSTWORTHY AI	3		
	9		**9**		**3**

Second Year	
Semester 1	**Credits**
MSAI 602: PRINCIPLES OF DATA SCIENCE	3
ELECTIVE 2	3
ELECTIVE 3	3
	9

Total Credits 30

Part Time

First Year					
Semester 1	**Credits**	**Semester 2**	**Credits**	**Semester 3**	**Credits**
MSAI 601: PROBABILITY AND STATISTICS	3	MSAI 606: HUMAN-CENTERED AND PARTICIPATORY APPROACHES TO AI	3	ELECTIVE 1	3

MSAI 603: PRINCIPLES OF MACHINE LEARNING	3	MSAI 605: COMPUTING SYSTEMS FOR AI	3	ELECTIVE 2	3
	6		**6**		**6**

Second Year

Semester 1	Credits	Semester 2	Credits
MSAI 602: PRINCIPLES OF DATA SCIENCE	3	MSAI 631 AI AND SOCIETY	3
MSAI 630: SAFE AND TRUSTWORTHY AI	3	ELECTIVE 3	3
	6		**6**

Total Credits 30

List the intended student learning outcomes. In an attachment, provide the plan for assessing these outcomes.

Learning Outcomes
Understand the theoretical foundations of artificial intelligence, including mathematics and statistics, machine learning, deep learning, and optimization techniques.
Develop advanced problem-solving and analytical skills in AI by gaining proficiency in scripting and programming, leveraging machine learning frameworks, and employing high-performance computing platforms to optimize AI solutions.
Apply AI technologies to address critical societal challenges and to solve complex problems in disciplines such as healthcare, finance, climate change, and public policy.
Design AI systems to work effectively alongside people in healthcare, education, business, and creative industries.
Analyze the impact of AI-driven automation in real-world settings by evaluating its effectiveness and efficiency.
Describe the societal implications of AI, including issues of safe and trustworthy AI.
Evaluate the ethical and legal implications of AI by analyzing issues such as bias, privacy, accountability, and transparency, and developing strategies for responsible AI design, governance, and policy compliance.
Explain practical strategies for implementing and scaling AI solutions within enterprise and societal contexts.
Communicate AI technologies and applications in a variety of fields to technical and non-technical audiences.

New Program Information

Mission and Purpose

Describe the program and explain how it fits the institutional mission statement and planning priorities.

As stated in the Letter of Intent submitted to the University System of Maryland in July 2024, the proposed MS in AI is in direct response to the need for more AI professionals in Maryland due to the rapid pace of AI development which is transforming industries.

Given the rapid pace of AI development is transforming industries, the educational mission of UMD will reimagine learning in the face of these drastic changes through the introduction of the Master of Science in Artificial Intelligence. As the premiere, public, land grant, research university inside the nation's beltway, and as the flagship university in the State of Maryland, we have an opportunity to build on our extensive strengths in AI research across our campus to push AI education in directions that advances the public good. The proposed MS in AI will be aimed as a continuing education option for professionals in Maryland and beyond. It will be distinguished by its interdisciplinary curriculum that focuses on applied and computational science while ensuring that students are exposed to humanistic and social approaches to AI. This will enable students to gain proficiency in AI subfields while understanding the implications of this work from the perspective of ethics, human values, and social policy. This will ensure that the Maryland workforce, and the national workforce, is trained not just in AI technology but also in methods for understanding AI in social contexts. With the introduction of an MS in AI, UMD has an opportunity to lead in the transformation that AI is having globally by building a workforce and future researchers that will shape the new AI-driven economy in the state of Maryland and beyond by creating ethically sound and sustainable AI systems, policies, and practices across fields.

The University System of Maryland's strategic plan, Vision 2030, emphasizes the importance of innovation and research excellence. Implementing the MS in AI program supports these priorities by promoting graduate education in a cutting-edge field and preparing students for careers in a technology-driven economy.

Program Characteristics

What are the educational objectives of the program?

The objective of the program is to blend highly technical, applied, experiential learning in AI with courses on AI's societal impact, human-AI collaboration, and responsible AI development. Graduates will be prepared to enter into industry at the completion of the program. Courses will combine a theoretical foundation from tenured professors and researchers on campus with applied learning from lecturers and industry practitioners. Students will build a solid foundation in mathematics, statistics, and computing, and pair this foundation with hands-on application to real world problems. They will learn different methods and approaches to solve complex problems using artificial intelligence, data analysis techniques, modern tools, and state-of-the-art technologies while also recognizing potential ethical implications of AI. Assessments will be project based using publicly available data when possible, to create innovative solutions to societal challenges.

Describe any selective admissions policy or special criteria for students interested in this program.

Any student applying for admission to a graduate program at the University of Maryland must meet the following minimum admission criteria as established by the Graduate School.
Applicants must have earned a four-year baccalaureate degree from a regionally accredited U.S. institution, or an equivalent degree from a non-U.S. institution.
Applicants must have earned a 3.0 GPA (on a 4.0 scale) in all prior undergraduate and graduate coursework.
Applicants must provide an official copy of a transcript for all of their post-secondary work.

General Requirements:
Statement of Purpose
Transcript(s)
TOEFL/IELTS/PTE (international graduate students)

Program-Specific Requirements:
Graduate Record Examination (GRE) (optional)
CV/Resume
Description of research/work experience
Prior coursework establishing quantitative ability (including calculus II, linear algebra, statistics, etc.)
Proficiency in programming languages, demonstrated either through prior programming coursework or substantial software development experience

Summarize the factors that were considered in developing the proposed curriculum (such as recommendations of advisory or other groups, articulated workforce needs, standards set by disciplinary associations or specialized-accrediting groups, etc.).

When developing the proposed curriculum, several factors were considered to ensure the program will be successful. The following advisory group structured the program in order to satisfy the learning outcomes listed above. The advisory committee included CMNS Dean Amitabh Varshney, MATH Department Chair Doron Levy, Computer Science Chair Matthias Zwicker, AIM Director Hal Daume III and Professor David Jacobs.

The group explored extensive market research to identify necessary skills, capacities and capabilities in job postings in the market. These in demand skills led the curriculum development to ensure our students will be qualified to satisfy the workforce gap at the time of graduation.

Additional members from outside of STEM may be added to the advisory group as the program expands in scope.

Select the academic calendar type for this program (calendar types with dates can be found on the Academic Calendar). Please click on the help bubble for more specific information.

Traditional Semester

For Master's degree programs, describe the thesis requirement and/or the non-thesis requirement.

The program is a 30 credits, non-thesis program.

Identify specific actions and strategies that will be utilized to recruit and retain a diverse student body.

The primary recruitment activities will be via the CMNS Science Academy. The Science Academy uses a diverse, targeted approach when recruiting students. This digital strategy focuses on UMD alumni, current UMD graduating seniors, and working professionals in the DMV area. The admissions review process evaluates applicants for not only academic readiness but also diversity in experiences, industries, backgrounds, and career aspirations to recruit a diverse student body.

To attract a diverse student population, we will engage in the following activities:
• Representing the program in educational fairs, conferences and events, e.g. the National Leadership Conference of the National Society of Black Engineers, GEM Grad Labs.
• Advertising the program to the National Society of Black Engineers (NSBE), the Society of Women Engineers (SWE), Associate for Women in Mathematics (AWM) and the Association for Women in Computing (AWC).
• Direct email campaigns to domestic and international colleges with relationships to CMNS
• Outreach to UMD Campus organizations and clubs
• Holding online (virtual) open houses, information sessions and career panels
• Outreach to US Military to attract veterans
• Social media and online advertising

Once enrolled, the Science Academy staff and faculty are committed to creating and fostering a supportive environment for all students to thrive. We regularly share resources and opportunities for counseling, support, and funding. All students are expected to complete and honor the TerrapinSTRONG orientation and initiatives. Students are encouraged to take part in Grad School programs that address diversity and inclusion in higher education, build communities of support and success, and create meaningful dialogue among graduate students. Such programs include"Cultivating Community Conversations" and the "Annual Office of Graduate Diversity and Inclusions Spring Speaker Services." Faculty that are involved in the Science Academy represent many departments, have a diversity of appointments (both tenure track, professional track, and lecturer) exposing students to many future career paths. The Science Academy and faculty provide student advising, academic support, and career guidance to students to retain all students and support timely graduation.

Our student retention efforts will consist of:

• Holding “Women in Engineering, Computing and STEM” seminars to addresses the obstacles faced by women in today’s technical workplace and guide our women students to maneuver through the internship and job application process
• Requiring students to attend mandatory advising sessions with the program adviser to ensure that the students’ study plans are in line with their interests and career goals, and that the students make satisfactory progress toward meeting the degree requirements
• Implementing an early warning system that detects students struggling with core courses and alerts the
academic advisor, who meets with the students and designs a study plan to get them back on track

Relationship to Other Units or Institutions

If a required or recommended course is o#ered by another department, discuss how the additional students will not unduly burden that department’s faculty and resources. Discuss any other potential impacts on another department, such as academic content that may significantly overlap with existing programs. Use space below for any comments. Otherwise, attach supporting correspondence.

The majority of these courses will be newly designed courses specific to the MS in AI and will not pose any burden on the rest of the Science Academy or any other department. Three courses, MSAI 601: Probability and Statistics for AI; MSAI 602: Principles of Data Science and MSAI 603: Principles of Machine Learning are current Science Academy courses. Each department is in support and prepared to add additional sections of the shared courses.

Accreditation and Licensure. Will the program need to be accredited? If so, indicate the accrediting agency. Also, indicate if students will expect to be licensed or certified in order to engage in or be successful in the program’s target occupation.

n/a

Describe any cooperative arrangements with other institutions or organizations that will be important for the success of this program.

n/a

Faculty and Organization

Who will provide academic direction and oversight for the program? In an attachment, please indicate the faculty involved in the program. Include their titles, credentials, and courses they may teach for the program. Please click on the help bubble for a template to use for adding faculty information.

The CMNS Science Academy will work with the MATH and Computer Science department chairs, as well as the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM) for oversight. A Computer Science faculty member will serve as the faculty director. This faculty director will provide the curriculum oversight, course evaluation, and advise students. In addition, the academic faculty director, in collaboration with the Assistant Dean for Professional Graduate Education, is responsible for all instructor selections and appointments.

Full list of faculty expected to participate in the program is available in attached documents.

Indicate who will provide the administrative coordination for the program

The Science Academy in the College of Computer, Mathematics and Natural Science Dean’s Office will provide administrative coordination for the program, in collaboration with the Office of Extended Studies. The Office of Extended Studies provides program development support (budget development and projections, inhouse
marketing research, preparation of PCC document), program management (UMD policies and procedures compliance, program website, data requests), student and program services (admission support, scheduling, registration, billing and payment, graduation, appeals), and financial management (faculty contracts, payment processing, course charge processor, net revenue distribution),

Resource Needs and Sources

Each new program is required to have a library assessment prepared by the University Libraries in order to determine any new library resources that may be required. This assessment must be done by the University Libraries. Add as an attachment.

Attached is the library assessment completed by the University Library. As communicated by Dan Mack, the library assessment completed for the BS in AI is appropriate for the MS in AI as well.

Discuss the adequacy of physical facilities, infrastructure and instructional equipment.

No additional physical facilities, infrastructure and instructional equipment is required for this program. Existing facilities (e.g., general purpose classrooms) and resources (e.g., instructional equipment) will be used, and these are demonstrably adequate for the proposed program. It is anticipated that most of the instruction will be in the evenings, as befitting the target student population of working adults. Thus, the use of classrooms will be outside the hours used for instruction by most programs.

Discuss the instructional resources (faculty, staff, and teaching assistants) that will be needed to cover new courses or needed additional sections of existing courses to be taught. Indicate the source of resources for covering these costs.

Instructional resources for the program will comprise current tenure track faculty, professional track faculty, and adjunct instructors. These instructional personnel will come from the Computer Science Department and the Mathematics Department, AIM, outside the university (e.g., ARLIS, NASA, federal agencies, and industry). Instructors may come from adjacent federal agencies, which will increase the exposure of students to real-world problems as part of the program curriculum.The funding source of covering instructional costs will come from tuition both from the program and the Science Academy if needed. No state resources will be used to support the program.

Discuss the administrative and advising resources that will be needed for the program. Indicate the source of resources for covering these costs.

The CMNS Science Academy will provide the academic and advising oversight to incoming and admitted students. Revenue generated from the program will be used to support administrative and advising resources including Program Managers. No state resources will be used to support the program

Use the Maryland Higher Education Commission (MHEC) commission financial tables to describe the program's financial plan for the next five years. See help bubble for financial table template. Use space below for any additional comments on program funding. Please click on the help bubble for financial table templates.

Based on the attached proposed budget, the program tuition will cover all costs. This program will not use any state funds and will be revenue generating. All expenses will be paid for by the tuition revenue for this program. The budget is very conservative in enrollment numbers- prior success in the other Science Academy programs suggests a steady state enrollment could be upwards for 50-100 per cohort. See attached document.

Implications for the State (Additional Information Required by MHEC and the Board of Regents)

Explain how there is a compelling regional or statewide need for the program. Argument for need may be based on the need for the advancement of knowledge and/or societal needs, including the need for "expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education." Also, explain how need is consistent with the Maryland State Plan for Postsecondary Education. Please click on the help bubble for more specific information.

As stated in the Letter of Intent submitted to the University System of Maryland in July 2024, the proposed MS in AI is in direct response to the need for more AI professionals in Maryland due to the rapid pace of AI development which is transforming industries.

The attached document, AI Market Analysis, includes a full analysis of the market as of Spring 2024. Our research indicates a much faster than average growth in computer and information research scientist positions nationally in the next 10 years. This 26% projected job growth nationally means more jobs will become available, and it is our responsibility to respond to this need by preparing the workforce. According to the US Bureau of Labor Statistics' Occupational Outlook Handbook, the regional area also boasts a higher than average concentration of employment in computer and information research scientists. Our graduates will complete the program with the skills and knowledge to fill the open positions in the market. As artificial intelligence becomes more prominent in our society, we need programs that address the market gap and provide students with a formal education in AI to make better decisions and further advancements in the field.

Our program directly aligns with the Maryland State Plan for Postsecondary Education and the principles of public education in the State of Maryland. This program in the Science Academy increases access to higher education (specifically graduate level education) and increases the diversity of graduate students. Lastly, the program is an example of creativity and collaboration- a true partnership across departments on campus.

Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program. Possible sources of information include industry or disciplinary studies on job market, the USBLS Occupational Outlook Handbook, or Maryland state Occupational and Industry Projections over the next five years. Also, provide information on the existing supply of graduates in similar programs in the state (use MHEC's Office of Research and Policy Analysis webpage for Annual Reports on Enrollment by Program) and discuss how future demand for graduates will exceed the existing supply. As part of this analysis, indicate the anticipated number of students your program will graduate per year at steady state.) Please click on the help bubble for specific resources for finding this information.

See attached for a full job posting analysis as of February 2025. The US Bureau of Labor Statistics' Occupational Outlook Handbook indicates a much faster than average growth, 26% nationally for computer and information research scientist positions in the next 10 years. This is the 8th highest growing profession. The state of Maryland is projecting a 21% growth in these jobs. Additionally, our market research data shows an upward trend in unique job postings related to AI since February 2024, and the education breakdown within these postings shows that 41% have master's degrees. The data also show that Washington, D.C. is in the top 10 cities posting such roles. Of the job titles posted related to AI, "artificial intelligence engineers" were the most common. This program seeks to equip those professionals with the skills necessary to be successful in these roles. Artificial intelligence and generative AI are listed as skills with a 12.4% and 18.1% projected growth, respectively, so there's a need for professionals to be trained in utilizing AI.

Our program will be attractive to the professional learner because of its applied and experiential nature as well as evening and online course offerings. Lastly, following the enrollment trends at other Maryland programs, our successful enrollments in other related programs, coupled with the projected job growth in this area, the program anticipates enrollment much greater than 20 students per year.

Identify similar programs in the state. Discuss any di#erences between the proposed program and existing programs. Explain how your program will not result in an unreasonable duplication of an existing program (you can base this argument on program di#erences or market demand for graduates). The MHEC website can be used to find academic programs operating in the state. Please click on the help bubble for specific information on finding similar programs within the state.

While other Computing and Computer Science programs exist in the State, no other programs cover both the technical preparation and societal impact of AI at the graduate level with both in person and online options. Other programs are either heavy research focused degrees or they approach AI for a specific domain, such as engineering. The existing MS in AI at Johns Hopkins is only 100% online with no in person coursework. This program will not result in unreasonable duplication of existing programs because the MS in AI will be offered both in person and online, and will be a broad approach to fundamental knowledge and techniques of AI with a focus on the interaction between machine learning, human users and broader social concerns.

Discuss the possible impact on Historically Black Institutions (HBIs) in the state. Will the program affect any existing programs at Maryland HBIs? Will the program impact the uniqueness or identity of a Maryland HBI?

We do not foresee any negative impacts on the uniqueness or identity of any Maryland HBIs. Rather, we see our program complementary in several ways. First, most HBIs in the state do not have related degree programs. This program will expand the opportunities for an advanced degree in AI. Second, there is distinct differentiation between the somewhat related programs at Maryland HBIs. The Computer Science MS program at Bowie State and the Advanced Computing MS program at Morgan State University, are fundamentally different in subject matter. The Bowie State and Morgan State programs are more broadly computer science-focused research based programs with an optional AI specialization/concentration. These degree programs are geared toward students who would be employed in various areas of computer science, most likely entering into research roles. Our degree program is geared toward data-informed or data-driven employment opportunities and emphasizes the interdisciplinary nature of artificial intelligence.The program covers the entire AI landscape while offering electives to go deeper into specific areas of AI such as AI in the Arts or AI Policy.

Supporting Documents

Attachments

MS in AI LOI.docx
MS in AI_MarketResearch_Overview_AI_Nationwide.pdf
MS in AI_JobAnalytics-Feb25.pdf
MS in AI_Summary of Learning Outcome Assessments.docx
MS in AI_Market Analysis-2024.xlsx
MS in AI_Library Assessment.pdf
MS in AI_Budget.xlsx
MS in AI_Faculty List .docx
MS in AI_Course Descriptions (1).xlsx

Administrative Documents

25187 University of Maryland College Park MS in Artificial Intelligience.pdf
Presidential_Approval_PCC_Establish_MS_Artificial_Intelligence_24-25-32_signed.pdf

Key: 1007

UNIVERSITY SYSTEM OF MARYLAND

LETTER OF INTENT TO DEVELOP NEW ACADEMIC PROGRAM

A Letter of Intent is for distribution only within the USM. Please limit your discussion to 2 pages.

Institution: University of Maryland College Park

Name of New Program Under Development: MS in Artificial Intelligence

Contact Person: Hal Daumé III

E-mail: hal3@umd.edu Phone: 301-405-1073

Anticipated Month/Year of Program Proposal Submission: June 2025

Need for Program: (Briefly describe the need—internal and/or external--for the proposed program and its importance to the programmatic emphases in the approved institutional mission.)

Given the rapid pace of AI development is transforming industries, the educational mission of UMD will reimagine learning in the face of these drastic changes through the introduction of four new interdisciplinary programs, including a Professional Masters of Science in Artificial Intelligence. As the premiere, public, land grant, research university inside the nation's beltway, and as the flagship university in the State of Maryland, we have an opportunity to build on our extensive strengths in AI research across our campus to push AI education in directions that advances the public good. The proposed professional MS in AI will be aimed as a continuing education option for the workforce in Maryland and beyond. It will be distinguished by its interdisciplinary curriculum that focuses on computational science and engineering while ensuring that students are exposed to humanistic and social approaches to AI. This will enable students to gain proficiency in AI subfields while understanding the implications of this work from the perspective of ethics, human values, and social policy. This will ensure that the Maryland workforce, and the national workforce, is trained not just in AI technology but also in methods for understanding AI in social contexts. With the introduction of an MS in AI, UMD has an opportunity to lead in the transformation that AI is having globally by building a workforce and future researchers that will shape the new AI-driven economy in the state of Maryland and beyond by creating ethically sound and sustainable AI systems, policies, and practices across fields.

Students/Constituencies to be Served:

The MS in AI is aimed at continuing education students in the Maryland area. The program is designed for students to acquire the skills and knowledge necessary in today's and tomorrow's AI-infused world. Students are expected to have previously earned a baccalaureate degree from an accredited U.S. institution (or equivalent non-U.S.) with at least a 3.0 GPA (on a 4.0 scale). Students are expected to have some level of programming proficiency, as demonstrated either through prior coursework or through software development outside of their prior degree programs. The courses for this degree will be created specifically for continuing education students, and will primarily be offered in the evenings–and potentially online–to accommodate students who complete the degree program while employed.

Students with an MS in AI will be well prepared for both AI-focused careers, as well as for careers outside of AI in which AI will play an increasingly important role. As the job market continues to change and evolve due to AI deployments, this program will both help the Maryland workforce stay ahead of the curve, and also help employees transition to alternative career paths. The skills developed in this program will be useful in AI development and AI application areas such as natural language processing, computer vision, data science and analytics, user experience and design, robotics, business analytics, and geospatial reasoning. Students can also use their technical expertise to enter careers in policy, law, education, agriculture, or healthcare.

Brief Summary of the Proposed Program:

Following the conceptual approach for incorporating AI across our new academic programs, the MS will be structured around three categories of courses:

- Core: Foundational technologies for AI;
- Connections: Applications and drivers for AI; and,
- Context: Critical aspects that determine the impact on society: Human factors, ethics, legal, privacy, policy, sustainability, bias, etc.

While the MS will have a well-defined technical core, it will also provide interdisciplinarity through connections and context course offerings and experiential learning. Experiential learning will be enhanced through partnerships with government and industry.

The program is designed to be a 30-credit, 10-course, non-thesis graduate program, consisting of 6 core courses and 4 elective courses. The goal is that this program can be completed in 4-5 semesters. The technical core courses will include topics like neural networks and deep learning, and reinforcement learning. The social core courses will include topics like AI ethics and responsible AI design. And the electives will include courses like natural language processing, computer vision, and race and gender in AI. Students will be encouraged to bring problems from their current careers to motivate the experiential learning components of the MS degree.

Program Overview

Artificial Intelligence

Lightcast Q1 2024 Data Set

May 2024

Maryland

Parameters

Completions Year: 2022

Jobs Timeframe: 2020 - 2030

Job Postings Timeframe: Jan 2021 - Mar 2024

Programs:

Code	Description
11.0102	Artificial Intelligence

Regions:

Code	Description
0	United States

Award Levels:

Description	Description
Postbaccalaureate certificate	Master's Degree

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

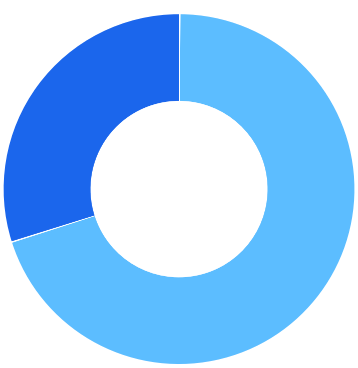
Residency: In-State

42	554	Completions Distribution
Institutions	**Completions**	Average: 13.2
282% Growth (2018-2022)	170% Growth (2018-2022)	1 — 114
		Median: 7

Program Overview

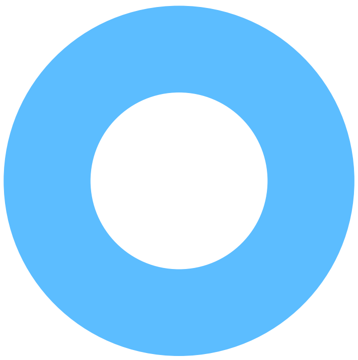
	Completions (2022)	% Completions	Institutions (2022)	% Institutions
All Programs	554	100%	42	100%
Distance Offered Programs	43	8%	9	21%
Non-Distance Offered Programs	511	92%	33	79%

Market Share by Institution Type



Institution Type	Completions (2022)	Market Share
Private not-for-profit, 4-year or above	388	70.0%
Public, 4-year or above	166	30.0%

Market Share by Program

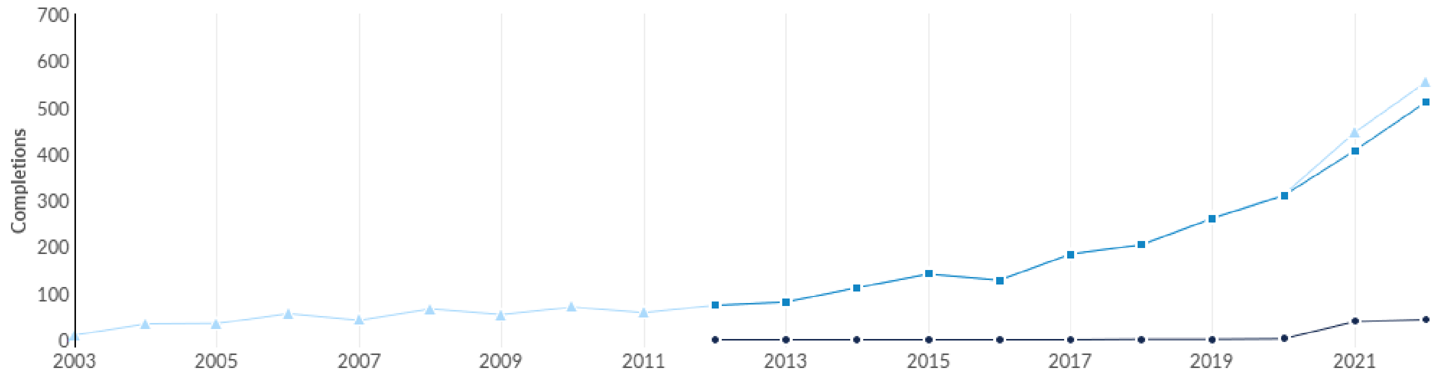


	Program	Completions (2022)	Market Share
●	Artificial Intelligence (11.0102)	554	100.0%

Completions by Institution

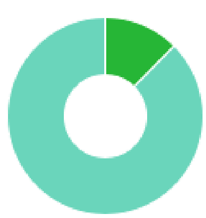
Institution	Completions (2022)	Growth % YOY (2022)	Market Share (2022)	IPEDS Tuition & Fees (2022)	Completions Trend (2018-2022)
Carnegie Mellon University	114	-9.5%	20.6%	$60,854	
University of Pennsylvania	66	-24.1%	11.9%	$63,452	
University of Washington-Seattle Campus	31	-39.2%	5.6%	$12,242	
Boston University	30	20.0%	5.4%	$62,360	
University of North Texas	28	Insf. Data	5.1%	$11,140	
University of Southern California	23	228.6%	4.2%	$64,726	
Northeastern University	22	2,100.0%	4.0%	$60,192	
University of California-Santa Cruz	20	Insf. Data	3.6%	$14,240	
Brandeis University	17	0.0%	3.1%	$62,322	
Florida Atlantic University	15	66.7%	2.7%	$4,879	

Regional Trends



		2012 Completions	2022 Completions	% Change
●	Distance Offered Programs	0	43	Insf. Data
■	Non-Distance Offered Programs	74	511	+590.5%
▲	All Programs	74	554	+648.6%

Regional Completions by Award Level



	Award Level	Completions (2022)	Percent
●	Postbaccalaureate certificate	69	12.5%
●	Master's Degree	485	87.5%

Similar Programs

98	212,495
Programs (2022)	Completions (2022)

CIP Code	Program	Completions (2022)
52.0201	Business Administration and Management, General	108,896
11.0701	Computer Science	12,271
11.0101	Computer and Information Sciences, General	10,638
11.1003	Computer and Information Systems Security/Auditing/Information Assurance	7,784
14.1901	Mechanical Engineering	7,056
14.1001	Electrical and Electronics Engineering	6,877
11.0103	Information Technology	6,769
11.0401	Information Science/Studies	6,075
52.0299	Business Administration, Management and Operations, Other	4,273
14.0801	Civil Engineering, General	4,135

Appendix A

Program Selection Details

CIP Code	Program Name
11.0102	Artificial Intelligence

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

State Data Sources

This report uses state data from the following agencies: Alabama Department of Labor; Alaska Department of Labor and Workforce Development; Arizona Commerce Authority; Arkansas Division of Workforce Services; California Employment Development Department; Colorado Department of Labor and Employment; Connecticut Department of Labor; Delaware Office of Occupational and Labor Market Information; District of Columbia Department of Employment Services; Florida Department of Economic Opportunity; Georgia Labor Market Explorer; Hawaii Workforce Infonet; Idaho Department of Labor; Illinois Department of Employment Security; Indiana Department of Workforce Development; Iowa Workforce Development; Kansas Department of Labor; Kentucky Center for Statistics; Louisiana Workforce Commission; Maine Department of Labor; Maryland Department of Labor; Commonwealth of Massachusetts, Mass.gov; Michigan Department of Technology, Management and Budget; Minnesota Department of Employment and Economic Development; Mississippi Department of Employment Security; Missouri Economic Research and Information Center; Montana Department of Labor and Industry; Nebraska Department of Labor, NEworks; Nevada Department of Employment, Training and Rehabilitation; New Hampshire Employment Security; New Jersey Department of Labor and Workforce Development; New Mexico Department of Workforce Solutions; New York Department of Labor; North Carolina Department of Commerce; North Dakota Job Service; Ohio Department of Job and Family Services; Oklahoma Employment Security Commission; Oregon Employment Department; Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis; Rhode Island Department of Labor and Training; South Carolina Department of Employment and Workforce; South Dakota Department of Labor and Regulation; Tennessee Department of Labor & Workforce Development; Texas Workforce Commission; Utah Department of Workforce Services; Vermont Department of Labor; Virginia Employment Commission; Washington State Employment Security Department; West Virginia Department of Commerce; Wisconsin Department of Workforce Development; Wyoming Department of Workforce Services

Job Posting Analytics

Lightcast Q1 2025 Data Set

February 2025

Maryland

Parameters

Select Timeframe: Jan 2020 - Jan 2025

Regions:

Code	Description
0	United States

Job Title:

Results should include

Description
"Artificial" Job Titles with 16 matches

Minimum Experience Required: Any

Advertised Salary: Include all postings regardless

Education Level: Any

Job Type: Include Internships

Keyword Search:

Posting Type: Newly Posted

Job Postings Overview

30,290
Unique Postings
70,939 Total Postings

5,187
Employers Competing
2.03M Total Employers

24 Days
Median Posting Duration
Regional Average: 28 Days

2 : 1
Posting Intensity
Regional Average: 3 : 1

Advertised Salary

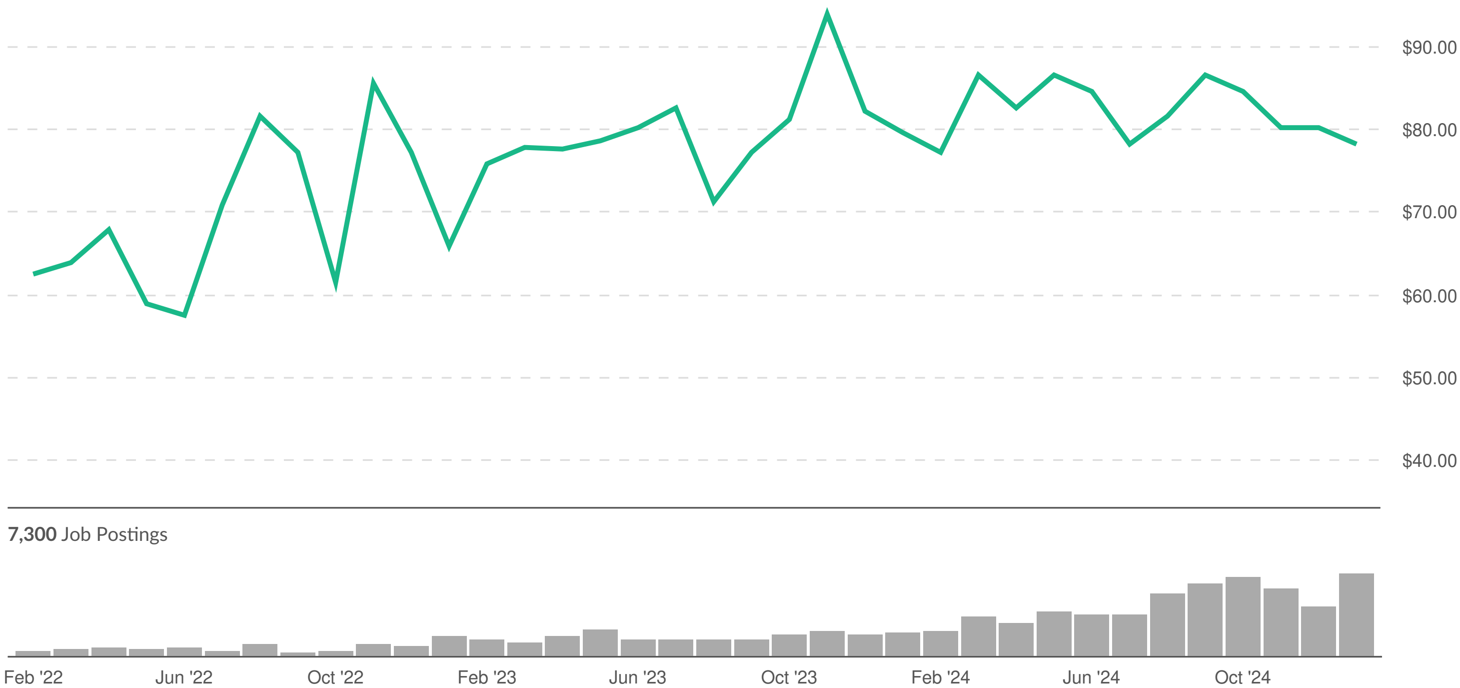
*There are **8,183** advertised salary observations (27% of the 30,290 matching postings).*

$80.18/hr
Median Advertised Salary

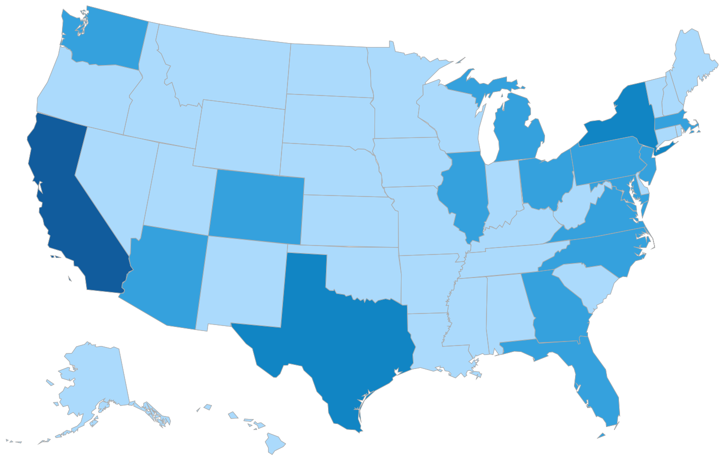
Advertised Salary Trend

▲ 25.1% Feb 2022 – Jan 2025

$81.17 **Median**

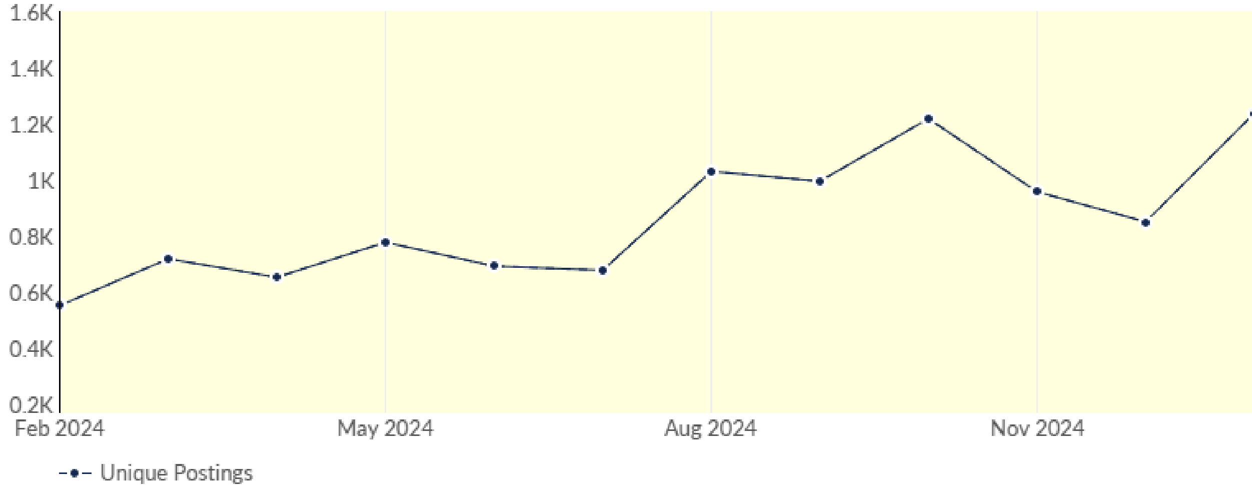


Job Postings Regional Breakdown



State	Unique Postings (Jan 2020 - Jan 2025)
California	5,726
Texas	2,649
New York	1,954
Virginia	1,534
Massachusetts	1,326

Unique Postings Trend



Month	Unique Postings	Posting Intensity
Jan 2025	1,237	2 : 1
Dec 2024	850	2 : 1
Nov 2024	957	2 : 1
Oct 2024	1,218	3 : 1
Sep 2024	995	2 : 1
Aug 2024	1,030	2 : 1
Jul 2024	677	2 : 1
Jun 2024	692	2 : 1
May 2024	777	2 : 1
Apr 2024	652	2 : 1
Mar 2024	718	2 : 1
Feb 2024	551	2 : 1

Education Breakdown

Education Level	Unique Postings	% of Total
No Education Listed	8,533	28%
High school or GED	627	2%
Associate's degree	432	1%
Bachelor's degree	16,256	54%
Master's degree	12,334	41%
Ph.D. or professional degree	6,182	20%

Minimum Education Breakdown

Minimum Education Level	Unique Postings (minimum)	Unique Postings (max advertised)	% of Total (minimum)
High school or GED	627	0	2%
Associate's degree	377	22	1%
Bachelor's degree	15,678	386	52%
Master's degree	3,646	6,613	12%
Ph.D. or professional degree	1,429	4,753	5%

Experience Breakdown

Minimum Experience	Unique Postings	% of Total
No Experience Listed	11,134	37%
0 - 1 Years	848	3%
2 - 3 Years	3,866	13%
4 - 6 Years	7,617	25%
7 - 9 Years	3,220	11%
10+ Years	3,605	12%

Top Companies Posting

	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Deloitte	3,299 / 1,841	2 : 1	22 days
Elevance Health	1,471 / 748	2 : 1	13 days
Amazon	1,989 / 630	3 : 1	29 days
Apple	1,361 / 337	4 : 1	25 days
Wells Fargo	1,396 / 335	4 : 1	23 days
JPMorgan Chase	1,255 / 325	4 : 1	33 days
MITRE Corporation	736 / 319	2 : 1	19 days
General Motors	711 / 302	2 : 1	20 days
Booz Allen Hamilton	895 / 298	3 : 1	23 days
PricewaterhouseCoopers	528 / 274	2 : 1	25 days

Top Cities Posting

City	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
New York, NY	4,017 / 1,610	2 : 1	28 days
San Francisco, CA	2,875 / 992	3 : 1	27 days
Seattle, WA	2,051 / 745	3 : 1	26 days
Chicago, IL	1,731 / 668	3 : 1	24 days
Atlanta, GA	1,223 / 619	2 : 1	21 days
Austin, TX	1,361 / 615	2 : 1	21 days
Boston, MA	1,475 / 559	3 : 1	25 days
Washington, DC	1,167 / 535	2 : 1	22 days
Charlotte, NC	1,200 / 526	2 : 1	19 days
Dallas, TX	996 / 474	2 : 1	18 days

Top Posted Occupations

	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Software Developers	11,700 / 5,505	2 : 1	21 days
Data Scientists	10,107 / 4,173	2 : 1	26 days
Computer Occupations, All Other	8,127 / 3,626	2 : 1	22 days
Marketing Managers	4,359 / 1,718	3 : 1	28 days
Computer and Information Research Scientists	3,079 / 1,334	2 : 1	25 days
Database Architects	1,639 / 722	2 : 1	25 days
Computer Programmers	1,289 / 592	2 : 1	20 days
Financial Managers	1,531 / 530	3 : 1	31 days
General and Operations Managers	1,328 / 525	3 : 1	31 days
Detectives and Criminal Investigators	986 / 445	2 : 1	20 days

Top Posted Occupations

Occupation (O*NET)	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Software Developers	11,700 / 5,505	2 : 1	21 days
Data Scientists	9,146 / 3,709	2 : 1	27 days
Information Technology Project Managers	5,555 / 2,346	2 : 1	22 days
Marketing Managers	4,359 / 1,718	3 : 1	28 days
Computer and Information Research Scientists	3,079 / 1,334	2 : 1	25 days
Database Architects	1,393 / 622	2 : 1	25 days
Computer Systems Engineers/Architects	1,264 / 608	2 : 1	22 days
Computer Occupations, All Other	1,139 / 602	2 : 1	21 days
Computer Programmers	1,289 / 592	2 : 1	20 days
General and Operations Managers	1,328 / 525	3 : 1	31 days
Business Intelligence Analysts	961 / 464	2 : 1	26 days
Architectural and Engineering Managers	1,032 / 438	2 : 1	23 days
Intelligence Analysts	941 / 425	2 : 1	20 days
Database Administrators	687 / 332	2 : 1	20 days
Sales Managers	676 / 329	2 : 1	29 days
Managers, All Other	612 / 317	2 : 1	21 days
Management Analysts	687 / 277	2 : 1	19 days
Financial Managers	841 / 272	3 : 1	29 days
Postsecondary Teachers, All Other	665 / 267	2 : 1	35 days
Treasurers and Controllers	688 / 256	3 : 1	31 days
Web and Digital Interface Designers	456 / 252	2 : 1	23 days
Registered Nurses	845 / 229	4 : 1	25 days
Computer and Information Systems Managers	454 / 220	2 : 1	30 days
Project Management Specialists	451 / 207	2 : 1	18 days
Computer Network Architects	436 / 201	2 : 1	30 days
Web Developers	359 / 200	2 : 1	28 days

Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	397 / 179	2 : 1	33 days
Medical and Health Services Managers	336 / 159	2 : 1	33 days
Human Resources Managers	496 / 154	3 : 1	31 days
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	296 / 152	2 : 1	19 days
Mechanical Engineers	328 / 146	2 : 1	16 days
First-Line Supervisors of Office and Administrative Support Workers	311 / 136	2 : 1	28 days
Human Resources Specialists	201 / 116	2 : 1	32 days
Sales Engineers	256 / 109	2 : 1	34 days
Civil Engineers	217 / 105	2 : 1	17 days
Licensed Practical and Licensed Vocational Nurses	909 / 105	9 : 1	25 days
Data Warehousing Specialists	246 / 100	2 : 1	17 days
Financial and Investment Analysts	196 / 94	2 : 1	30 days
Supply Chain Managers	343 / 91	4 : 1	34 days
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	273 / 91	3 : 1	34 days
Aerospace Engineers	272 / 90	3 : 1	22 days
Chefs and Head Cooks	174 / 87	2 : 1	33 days
Industrial Engineers	133 / 82	2 : 1	22 days
Market Research Analysts and Marketing Specialists	187 / 81	2 : 1	23 days
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	211 / 79	3 : 1	18 days
Financial Risk Specialists	194 / 76	3 : 1	31 days
Computer User Support Specialists	239 / 76	3 : 1	29 days
First-Line Supervisors of Production and Operating Workers	127 / 74	2 : 1	42 days
Lawyers	148 / 73	2 : 1	10 days
Chief Executives	171 / 69	2 : 1	29 days

Top Posted Occupations

Occupation	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Software Developer / Engineer	11,234 / 5,273	2 : 1	21 days
Data Scientist	7,886 / 3,156	2 : 1	24 days
IT Manager / Director	4,786 / 2,074	2 : 1	22 days
Product Manager	3,722 / 1,432	3 : 1	29 days
Computer Scientist	3,079 / 1,334	2 : 1	25 days
Computer Systems Engineer / Architect	1,529 / 732	2 : 1	22 days
Technology Consultant	1,194 / 616	2 : 1	21 days
Database Architect	1,376 / 614	2 : 1	25 days
Computer Programmer	1,289 / 592	2 : 1	20 days
Analytics Manager	1,260 / 553	2 : 1	29 days
Engineering Manager	1,032 / 438	2 : 1	23 days
Security / Defense Intelligence Analyst	941 / 425	2 : 1	20 days
General Manager	1,008 / 378	3 : 1	30 days
Business / Management Analyst	810 / 366	2 : 1	26 days
Business Development / Sales Manager	676 / 329	2 : 1	29 days
Data Engineer	664 / 319	2 : 1	20 days
Program Manager	596 / 307	2 : 1	22 days
IT Project Manager	824 / 307	3 : 1	23 days
College Professor (Other)	721 / 288	3 : 1	35 days
Marketing Manager	569 / 270	2 : 1	25 days
Researcher / Research Associate	786 / 259	3 : 1	22 days
UI / UX Designer / Developer	456 / 252	2 : 1	23 days
Financial Manager	748 / 230	3 : 1	29 days
Treasurer / Controller	630 / 230	3 : 1	31 days
Sales Representative	405 / 216	2 : 1	23 days
Network Engineer / Architect	436 / 201	2 : 1	30 days

Web Developer	359 / 200	2 : 1	28 days
Project Manager	414 / 194	2 : 1	18 days
Business Intelligence Architect / Developer	415 / 192	2 : 1	18 days
Data / Data Mining Analyst	420 / 176	2 : 1	24 days
Account Executive	340 / 163	2 : 1	29 days
Mechanical Engineer	335 / 151	2 : 1	15 days
Registered Nurse	628 / 137	5 : 1	25 days
Operations Manager / Supervisor	293 / 133	2 : 1	38 days
Product Owner	263 / 133	2 : 1	27 days
Sales Engineer	256 / 109	2 : 1	34 days
Licensed Practical / Vocational Nurse	909 / 105	9 : 1	25 days
Civil Engineer	210 / 100	2 : 1	16 days
Data Warehousing Specialist	239 / 99	2 : 1	17 days
Office / Administrative Assistant	276 / 94	3 : 1	33 days
Supply Chain / Logistics Manager	343 / 91	4 : 1	34 days
Chief Human Resources Officer	354 / 91	4 : 1	34 days
Aerospace Engineer	272 / 90	3 : 1	22 days
Nursing Manager / Supervisor	214 / 90	2 : 1	25 days
Chef	174 / 87	2 : 1	33 days
Cyber / Information Security Engineer / Analyst	182 / 86	2 : 1	25 days
Healthcare Administrator	152 / 83	2 : 1	33 days
Industrial Engineer	133 / 82	2 : 1	22 days
Risk Manager / Analyst	194 / 76	3 : 1	31 days
Business Intelligence Analyst	158 / 76	2 : 1	24 days

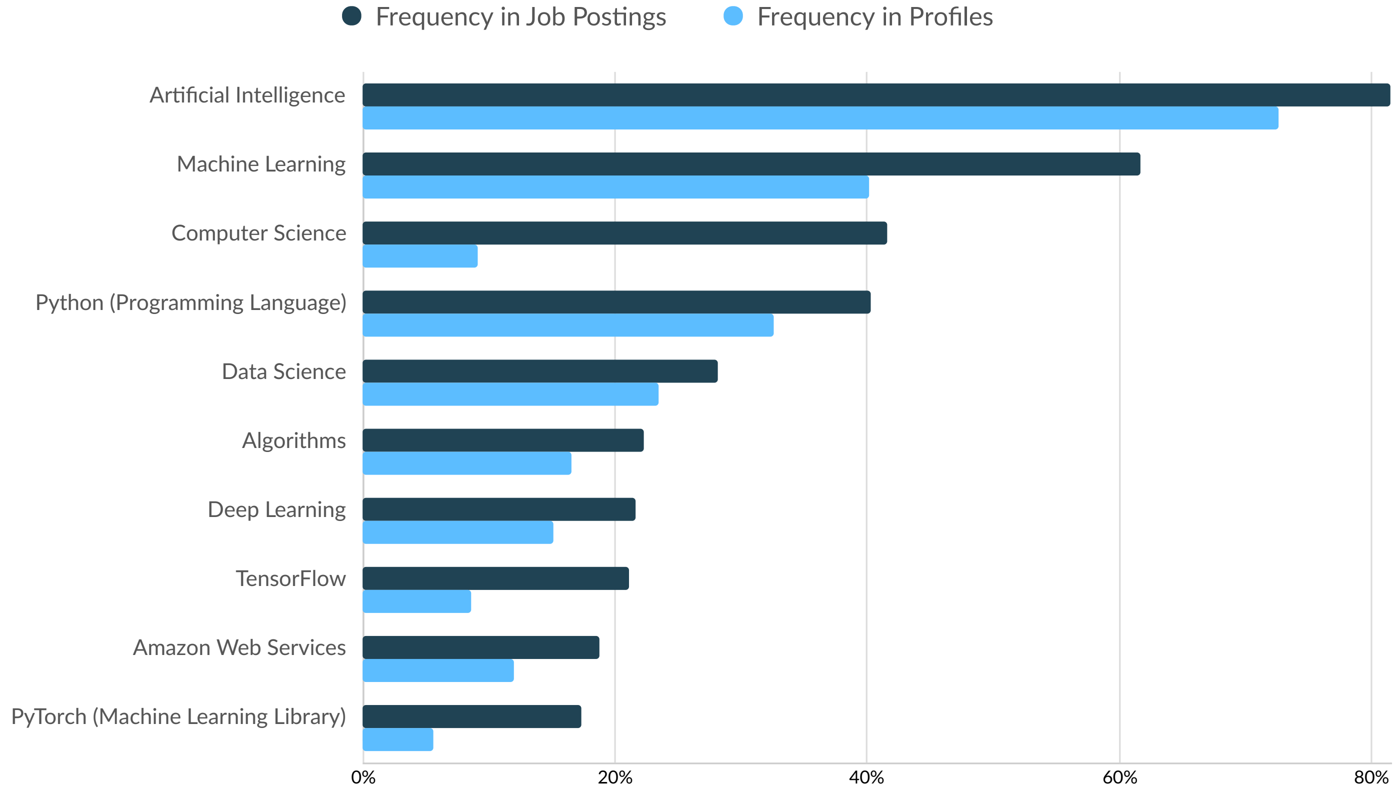
Top Posted Job Titles

	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Artificial Intelligence Engineers	13,621 / 6,552	2 : 1	23 days
Artificial Intelligence Managers	13,848 / 5,481	3 : 1	25 days
Artificial Intelligence/Machine Learning Engineers	8,179 / 3,280	2 : 1	22 days
Artificial Intelligence Architects	6,833 / 3,065	2 : 1	19 days
Directors of Artificial Intelligence	4,747 / 1,808	3 : 1	25 days
Artificial Intelligence Consultants	3,595 / 1,563	2 : 1	22 days
Vice Presidents of Artificial Intelligence	4,060 / 1,530	3 : 1	30 days
Artificial Intelligence Solutions Leads	2,905 / 1,400	2 : 1	26 days
Artificial Intelligence Analysts	3,252 / 1,400	2 : 1	27 days
Heads of Artificial Intelligence Product	2,534 / 1,031	2 : 1	32 days

Top Industries

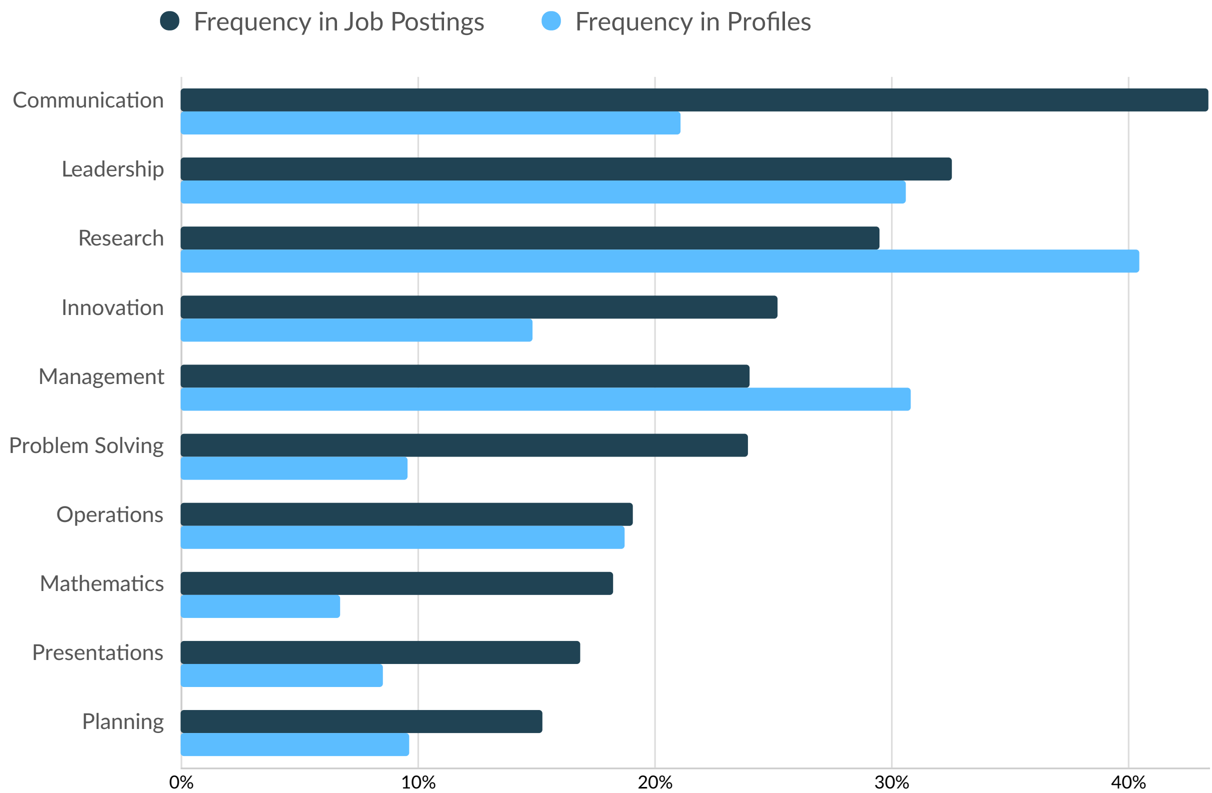
	Total/Unique (Jan 2020 - Jan 2025)	Posting Intensity	Median Posting Duration
Administrative Management and General Management Consulting Services	5,708 / 2,732	2 : 1	22 days
Custom Computer Programming Services	3,017 / 1,496	2 : 1	18 days
Employment Placement Agencies	3,474 / 1,363	3 : 1	25 days
Commercial Banking	4,057 / 1,250	3 : 1	27 days
Computer Systems Design Services	1,704 / 1,039	2 : 1	15 days
Direct Health and Medical Insurance Carriers	1,963 / 1,029	2 : 1	24 days
Colleges, Universities, and Professional Schools	2,395 / 923	3 : 1	31 days
Software Publishers	1,839 / 888	2 : 1	24 days
All Other Miscellaneous Retailers	2,048 / 667	3 : 1	28 days

Top Specialized Skills



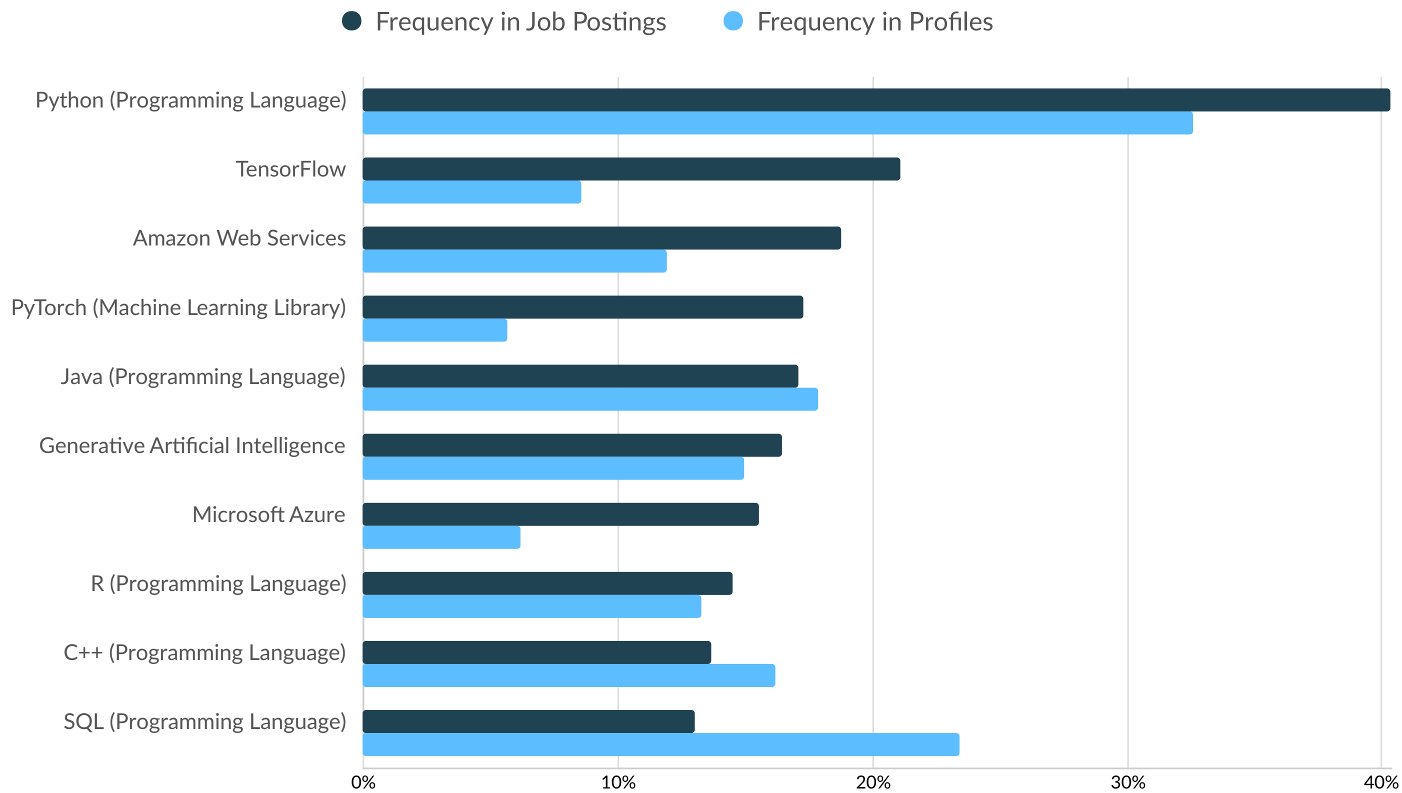
	Postings	% of Total Postings	Profiles	% of Total Profiles	Projected Skill Growth	Skill Growth Relative to Market
Artificial Intelligence	24,711	82%	9,711	73%	+12.4%	Growing
Machine Learning	18,691	62%	5,371	40%	+19.9%	Rapidly Growing
Computer Science	12,593	42%	1,215	9%	+26.8%	Rapidly Growing
Python (Programming Language)	12,226	40%	4,358	33%	+24.5%	Rapidly Growing
Data Science	8,548	28%	3,131	23%	+17.4%	Growing
Algorithms	6,771	22%	2,210	17%	+23.3%	Rapidly Growing
Deep Learning	6,549	22%	2,015	15%	+12.8%	Growing
TensorFlow	6,403	21%	1,146	9%	+11.9%	Growing
Amazon Web Services	5,701	19%	1,597	12%	+24.0%	Rapidly Growing
PyTorch (Machine Learning Library)	5,250	17%	755	6%	+9.7%	Growing

Top Common Skills



	Postings	% of Total Postings	Profiles	% of Total Profiles	Projected Skill Growth	Skill Growth Relative to Market
Communication	13,152	43%	2,823	21%	+3.6%	Lagging
Leadership	9,869	33%	4,095	31%	+8.5%	Stable
Research	8,940	30%	5,407	40%	+17.2%	Growing
Innovation	7,649	25%	1,988	15%	+25.8%	Rapidly Growing
Management	7,274	24%	4,121	31%	+5.3%	Stable
Problem Solving	7,260	24%	1,282	10%	+11.3%	Growing
Operations	5,790	19%	2,502	19%	+8.1%	Stable
Mathematics	5,530	18%	903	7%	+20.2%	Rapidly Growing
Presentations	5,109	17%	1,143	9%	+23.0%	Rapidly Growing
Planning	4,636	15%	1,294	10%	+10.9%	Growing

Top Software Skills



	Postings	% of Total Postings	Profiles	% of Total Profiles	Projected Skill Growth	Skill Growth Relative to Market
Python (Programming Language)	12,226	40%	4,358	33%	+24.5%	Rapidly Growing
TensorFlow	6,403	21%	1,146	9%	+11.9%	Growing
Amazon Web Services	5,701	19%	1,597	12%	+24.0%	Rapidly Growing
PyTorch (Machine Learning Library)	5,250	17%	755	6%	+9.7%	Growing
Java (Programming Language)	5,186	17%	2,392	18%	+17.4%	Growing
Generative Artificial Intelligence	4,981	16%	2,000	15%	+18.1%	Growing
Microsoft Azure	4,713	16%	832	6%	+28.9%	Rapidly Growing
R (Programming Language)	4,411	15%	1,779	13%	+20.3%	Rapidly Growing
C++ (Programming Language)	4,140	14%	2,166	16%	+10.0%	Growing
SQL (Programming Language)	3,958	13%	3,127	23%	+6.4%	Stable

Top Qualifications

	Postings with Qualification
Master Of Business Administration (MBA)	1,237
Security Clearance	1,231
Top Secret-Sensitive Compartmented Information (TS/SCI Clearance)	1,116
Secret Clearance	677
Project Management Professional Certification	467
Valid Driver's License	403
Top Secret Clearance	324
Registered Nurse (RN)	271
Basic Life Support (BLS) Certification	196
Certified Public Accountant	194

Appendix A

Top Posting Sources

Website	Postings on Website (Jan 2020 - Jan 2025)
dejobs.org	6,870
indeed.com	4,848
simplyhired.com	4,209
dice.com	3,285
disabledperson.com	1,762
recruiternetworks.com	1,630
myworkdayjobs.com	1,423
glassdoor.com	1,009
careerarc.com	875
clearancejobs.com	863
careerbuilder.com	714
ziprecruiter.com	583
themuse.com	469
mitalent.org	400
fairygodboss.com	368
careercast.com	332
amazon.jobs	311
greenhouse.io	298
careerjet.com	294
latpro.com	275
jobmonkeyjobs.com	270
energyjobline.com	249
monster.com	246
higheredjobs.com	232
hercjobs.org	226

Appendix B

Sample Postings

Operations Lead (GenAI and AI data services)

Link to Live Job Posting: www.dice.com

Location: Seattle, WA	**O*NET:** 11-1021.00
Company: Unclassified	**Job Title:** Artificial Intelligence Analysts

Operations Lead (GenAI and AI data services)

Role:

Operations LeadRemote (Washington OR California)

Mode of Hire:

Fulltime

Salary:

$150k/yearJob DescriptionAs an Operations Lead, you will be responsible for the discovery phase of new opportunities in GenAI and AI data services, including scope definition, interfacing with client and internal stakeholders, pricing, and design of process workflows.Additionally, the Operations Lead will support cross-functional departments to streamline operations, enhance efficiency, and drive the successful deployment of solutions that align with Client strategic goals.

Key Responsibilities:

Operational Strategy and Leadership:

Develop and maintain a knowledge base of pilot and program data to streamline the discovery phase of new opportunitiesDevelop and implement scalable operational strategies to support the delivery of solutions and services.

Process Improvement:

Identify opportunities for process improvements and drive initiatives to enhance operational efficiency and effectiveness.Analyze current processes and workflows to identify bottlenecks and areas for optimization.

Solution Deployment:

Collaborate with Solution Engineers on new tooling evaluation, testing, and integration.Coordinate with delivery teams and other stakeholders to ensure successful implementation.Client and Stakeholder ManagementEngage with clients and stakeholders to understand their needs and ensure that solutions meet their expectations.Address and resolve any issues or concerns related to the deployment and operation of solutions.

Technology and Tools:

Evaluate and implement technology solutions and tools to support operational processes.Stay up to date with industry trends and advancements to ensure that our operations remain competitive and efficient.

Cross-Functional and Global Collaboration:

Cross-Functional and Global Collaboration:

Work closely with product management, engineering, delivery teams, and other teams to align operational processes with business objectives.Facilitate communication between multicultural teams across different time-zones to ensure alignment and address any operational challenges.

Qualifications:

Education:

Bachelor s degree in Data Science, Operations Management, Engineering, or a related field.Advanced degree or relevant certifications (e.g., Masters, Six Sigma, PMP) preferred.

Experience:

Minimum of 5 years of experience in service operations management, with a proven track record of leading teams and managing complex projects.Minimum of 2 years of experience vendor-side experience, especially with Fortune 200 companies and/or large tech companiesMinimum of 2 years of experience in operations and/or project managementExperience with global and remote team collaborationExperience with GenAI, AI, localization, or related projectsExperience preparing and presenting program data to client and internal stakeholdersTechnical understanding of basic file formats, scripts and data ingestion pipelines (this role will need to manage conversations with a technical audience as part of solution design)Advanced proficiency with the Office Tool Suite and JIRA workflowsClient-side experience, pre-sales and AI/ML experience is a plus

Skills:

Strong leadership and team management abilities.Excellent problem-solving and analytical skills.Proficiency in process improvement methodologies and tools.Strong communication and interpersonal skills, with the ability to collaborate effectively across departments and across time zones.Familiarity with project management software and operational tools.Ability to manage multiple projects and priorities in a fast-paced environment.Strategic thinker with a focus on results.Proactive and adaptable, with a strong sense of ownership.Detail-oriented with a commitment to quality and excellence.Employers have access to artificial intelligence language tools ("AI") that help generate and enhance job descriptions and AI may have been used to create this description. The position description has been reviewed for accuracy and Dice believes it to correctly reflect the job opportunity.Report this job

Dice Id:

91099606

Position Id:

8533005

Artificial Intelligence Security Analyst

Link to Live Job Posting: bah.wd1.myworkdayjobs.com	
Location: Washington, DC	**O*NET:** 15-1251.00
Company: Booz Allen Hamilton	**Job Title:** Artificial Intelligence Analysts

Artificial Intelligence Security Analyst The Opportunity:

As a cyber professional, you know that understanding adversary tactics, techniques, and procedures is vital to producing the intel that enables the success of government clients. At Booz Allen, you can apply your skills and broad knowledge to inform strategies and mitigate the most pressing vulnerabilities. Here, you aren't just developing reports, you're telling the story to inform our nation's most far-reaching cybersecurity decisions. As a cyber threat specialist on our team, you will establish the security requirements and assessment procedures to evaluate the client's artificial intelligence (AI) systems. You will help the client drive the requirements to ensure AI is properly developed, tested, and deployed with the necessary safeguards. You'll monitor the AI assets and identify security gaps through the eyes of an adversary. In this role, you will collaborate with key cybersecurity stakeholders and leadership to enable the client to deploy AI capabilities securely. Booz Allen is committed to creating an environment where you can expand your cyber career through mentoring, the opportunity to leverage new resources, and the ability to gain in-demand certifications to sharpen your skill set. With opportunities supporting both the private and public sectors across multiple geographies, your career is only limited by your own appetite for exploration. Work with us to secure our systems, networks, and crucial infrastructures. Join us. The world can't wait.

You Have:

5+ years of experience securing and testing AI systems Knowledge of how AI training and testing data is tagged and secured Knowledge of NIST Risk Management Framework 800-53 security controls Ability to articulate security requirements, draft test procedures, and assess risk of AI models or systems TS/SCI clearance with a polygraph Bachelor's degree in

IT or CS Nice If You Have:

Experience developing machine learning (ML) algorithms or AI systems and deploying into production Knowledge of the ML or AI data pipeline and how models are updated Ability to present briefings to senior leadership Master's degree in CS, Software Development, or IT Security+ or

CISSP Certification Clearance:

Applicants selected will be subject to a security investigation and may need to meet eligibility requirements for access to classified information; TS/SCI clearance with polygraph is required. Compensation At Booz Allen, we celebrate your contributions, provide you with opportunities and choices, and support your total well-being. Our offerings include health, life, disability, financial, and retirement benefits, as well as paid leave, professional development, tuition assistance, work-life programs, and dependent care. Our recognition awards program acknowledges employees for exceptional performance and superior demonstration of our values. Full-time and part-time employees working at least 20 hours a week on a regular basis are eligible to participate in Booz Allen's benefit programs. Individuals that do not meet the threshold are only eligible for select offerings, not inclusive of health benefits. We encourage you to learn more about our total benefits by visiting the Resource page on our Careers site and reviewing Our Employee Benefits page. Salary at Booz Allen is determined by various factors, including but not limited to location, the individual's particular combination of education, knowledge, skills, competencies, and experience, as well as contract-specific affordability and organizational requirements. The projected compensation range for this position is $84,600.00 to $193,000.00 (annualized USD). The estimate displayed represents the typical salary range for this position and is just one component of Booz Allen's total compensation package for employees. This posting will close within 90 days from the Posting Date. Identity

Statement As part of the application process, you are expected to be on camera during interviews and assessments. We reserve the right to take your picture to verify your identity and prevent fraud. Work Model Our people-first culture prioritizes the benefits of flexibility and collaboration, whether that happens in person or remotely. If this position is listed as remote or hybrid, you'll periodically work from a Booz Allen or client site facility. If this position is listed as onsite, you'll work with colleagues and clients in person, as needed for the specific role. Commitment to Non-Discrimination All qualified applicants will receive consideration for employment without regard to disability, status as a protected veteran or any other status protected by applicable federal, state, local, or international law.

Note:

Microsoft Internet Explorer is not fully compatible with Workday and users may experience systems issues with this browser. We recommend that you use one of the following browsers to avoid problems: Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, Opera Browser or Blackberry Browser. If you continue to experience issues, it is sometimes necessary to reset your browser by clearing your cache. About Booz Allen Hamilton Trusted to transform missions with the power of tomorrow's technologies, Booz Allen Hamilton advances the nation's most critical civil, defense, and national security priorities. We lead, invest, and invent where it's needed most—at the forefront of complex missions, using innovation to define the future. We combine our in-depth expertise in AI and cybersecurity with leading-edge technology and engineering practices to deliver impactful solutions. Combining more than 100 years of strategic consulting expertise with the perspectives of diverse talent, we ensure results by integrating technology with an enduring focus on our clients. We're first to the future—moving missions forward to realize our purpose: Empower People to Change the World®. Commitment to Non-Discrimination All qualified applicants will receive consideration for employment without regard to disability, status as a protected veteran or any other status protected by applicable federal, state, local, or international law. Know Your Rights Poster Accommodations If you are an individual with a disability and would like to request a reasonable workplace accommodation for any part of our employment process, please contact the Booz Allen Help Desk by calling 1-877-927-8278 or sending an email to helpdesk@bah.com. This option is reserved only for individuals who are requesting a reasonable workplace accommodation. It is not intended for other purposes or inquiries. Data Privacy For more information on how Booz Allen uses your information, please see our Privacy Policy.

AI Product Manager

Link to Live Job Posting: www.indeed.com

Location: Easton, PA	**O*NET:** 11-2021.00
Company: Victaulic Company	**Job Title:** Heads of Artificial Intelligence Product

AI Product Manager Victaulic - 3.4

Easton, PA Job Details Full-time Estimated:

$127K - $166K a year 2 days ago Benefits Paid holidays Disability insurance Health insurance Dental insurance Tuition reimbursement Paid time off Adoption assistance Employee assistance program Vision insurance 401(k) matching Life insurance Qualifications Strategic management Engineering Project management Bachelor's degree Product management Software development Business Administration Cybersecurity Senior level AI Leadership 2 years Full Job Description Position Overview We're seeking an AI Product Manager to spearhead the development and launch of our AI-enhanced products. This role combines technical AI expertise with strategic product management to deliver solutions that advance our market leadership in mechanical pipe joining systems. Key Responsibilities Strategic Leadership Define and execute the product vision for AI-integrated solutions Develop strategic roadmaps for AI product lines, focusing on mechanical system efficiency, predictive maintenance, and smart operations Lead cross-functional teams through the complete product development lifecycle Product Development & Innovation Direct AI application development in mechanical products Implement agile methodologies to ensure rapid iteration and market responsiveness Stay current with AI technology trends and integrate cutting-edge solutions Guide teams from concept through launch, emphasizing innovation and collaboration Market & Customer Focus Conduct market research and competitive analysis to inform product strategy Engage with customers to gather insights and validate product direction Position Victaulic's AI products effectively in the market Stakeholder Management Build strong relationships across all organizational levels Facilitate clear communication between technical teams, business units, and leadership Ensure alignment on product goals and vision Requirements Education & Experience Bachelor's degree in Engineering, Business Administration, or related technical field 7+ years in product management, with 2+ years focused on AI/technology products Proven success launching AI or advanced technology products Skills & Competencies Strategic thinking and project management expertise Strong leadership abilities with experience working with diverse teams Understanding of software development principles and cybersecurity concepts Excellence in communication and negotiation at all organizational levels When you join Victaulic, you do not simply advance your career. You become part of a family of talented individuals who are dedicated to innovation and progress. Victaulic offers a wide variety of benefits to full time employees, which includes: medical/Rx/dental/vision insurance, PTO, company paid holidays, company paid short-term disability, company paid long-term disability, educational reimbursement, adoption assistance, company paid EAP, 401k with company match and company paid life insurance.

EEO Statement:

Victaulic is an Equal Employment Opportunity (EOE/M/F/Vets/Disabled) employer and welcomes all qualified applicants. Applicants will receive fair and impartial consideration without regard to race, gender, color, religion, national origin, age, disability, veteran status, sexual orientation, genetic data, or other legally protected status. #TOP123 #LI-JB1 #LI-ONSITE

Sr AI Engineer I

Link to Live Job Posting: Posting is no longer active

Location: Framingham, MA	**O*NET:** 15-1252.00
Company: Staples	**Job Title:** Artificial Intelligence Engineers

Location:

Framingham MA, hybrid model 3days a week in the office mandatory. Staples is business to business . You're what binds us together. Our digital solutions team is more than a traditional IT organization. We are a team of passionate, collaborative, agile, inventive, customer-centric, results-oriented problem solvers. We are intellectually curious, love advancements in technology and seek to adapt technologies to drive Staples forward. We anticipate the needs of our customers and business partners and deliver reliable, customer-centric technology services. Join our Staples World Class Supply Chain Team and deliver essential products to our customers. What you'll be doing: Help reimagine Staples systems from the ground-up and design the next generation Generative AI and

AI/ML/NLP

applications. Develop intelligent AI systems and solutions including high-level architecture designs, code development, evaluation, and operationalizing solutions at scale. Partner with a team Software, Data, ML, and Applied engineers for building high performing applications that interact with large scale distributed systems. Incubate ideas, prototype, develop, and productionize machine learning applications. Writing software programs, test for quality and push model to cloud for production. Build integrations and fetch big data related to Staples systems, analyze, detect patterns, and build models using data. Instill best practices related to software engineering and machine learning engineering problems. Shape next generation technology at Staples by defining the future roadmap for ongoing work. The AI Engineer is responsible for developing and engineering AI systems and solutions that drive innovation, improve operational efficiency. The AI Engineer will work closely with data scientists, ML engineers, and business stakeholders to translate business needs into robust AI solutions. What you bring to the table : Design, develop, test, and deploy AI models and systems using various frameworks and tools. Monitor and evaluate the performance and accuracy of AI models and systems in production. Identify and troubleshoot issues related to data quality, model drift, scalability, and reliability. Optimize and automate the AI model lifecycle using MLOps best practices. Collaborate with data scientists, ML engineers, and business stakeholders to understand the requirements and objectives of AI projects. Research and implement new AI techniques and methodologies to improve the existing solutions and explore new opportunities.

Research and Development:

Stay abreast of the latest advancements in AI/GenIA, explore novel applications, and develop proof-of-concept projects.

Model Selection and Fine-tuning:

Select and fine-tune pretrained GenAI models (e.g., GPT4, LLaMa) for specific tasks, including text generation, image creation, code synthesis, etc.

Data Exploration and Preparation:

Prepare and analyze data sets for training and evaluation of GenAI models, ensuring data quality and addressing potential biases.

Experimentation and Evaluation:

Conduct experiments to assess the performance of GenAI models and compare different architectures and approaches.

Application Integration:

Develop and integrate GenAI models into existing or new applications, leveraging frameworks like LangChain for seamless orchestration. Collaborate with

Cross-Functional Teams:

Work closely with data scientists, software engineers, product managers, and designers to bring GenAI solutions to life. Contribute to

Knowledge Sharing:

Document your findings, share best practices, and contribute to the team's knowledge base. What's needed- Basic Qualifications Bachelor's degree or higher in Computer Science, Engineering, Mathematics, Statistics, or related field expertise. Strong experience in developing and deploying AI systems using Python, PyTorch, leveraging Databricks, Snowflake or similar frameworks and tools. Strong knowledge of machine learning, deep learning, natural language processing, computer vision, and other AI domains. 7+ years experience in prompt engineering, data preprocessing, model fine-tuning, and evaluation. Experience in MLOps, CI/CD, cloud computing, and containerization technologies Excellent communication, collaboration, and problem-solving skills. Ability to work independently and in a team environment. Hands-on experience with popular GenAI LLM models (e.g., GPT-4o, Llama, Mixtral), SLM's with Phi/Gamma/Triplex, and frameworks (e.g., LangChain, LlamaIndex, Semantic Kernel, PyTorch, and long-term memory with Mem0 or similar. Degree in Computer Science, Artificial Intelligence, or a related field experience. 3+ years of experience in AI/ML, with a strong focus on Generative AI. Deep understanding of NLP, deep learning, and data analysis techniques. Experience with large language models (LLMs), text generation, and image gen. Strong programming skills in Python, along with experience in data manipulation libraries (e.g., Pandas, NumPy). Passion for innovation and a desire to explore the frontiers of AI. What's needed- Preferred Qualifications Experience with cloud platforms (Azure, GCP) and their AI/ML services. Familiarity with vector data stores (e.g., FAISS, Qdrant, Azure Search, Databricks).

We Offer:

Inclusive culture with associate-led Business Resource Groups and resources such as the Social Justice Resource Center Flexible PTO (22 days) and Holiday Schedule (7 observed paid holidays), Online and Retail Discounts, Company Match 401(k), Physical and Mental Health Wellness programs, and more perks and benefits

Manager, Cyber Risk & Analysis (Artificial Intelligence/Machine Learning)

Link to Live Job Posting: Posting is no longer active

Location: McLean, VA	**O*NET:** 13-2054.00
Company: Information Technology Senior Management Forum (Itsmf)	**Job Title:** Artificial Intelligence/Machine Learning Engineers

Manager, Cyber Risk & Analysis (Artificial Intelligence/Machine Learning) Information Technology Senior Management Forum McLean, VA Posted Date 1/16/2025 Description Manager, Cyber Risk & Analysis (Artificial Intelligence/Machine Learning) The Enterprise Services Business Risk Office provides risk management support to several lines of business including: Tech, Digital, Brand, Enterprise Supplier Management, Capital One Ventures, External Affairs, Capital One Software (COS) and Enterprise AI/ML (Artificial Intelligence/Machine Learning). We are on the cutting edge of risk management and provide support for new and emerging technologies as well as critical business strategies. Capital One has taken a bold journey to build a technology company, while operating in a complex, highly regulated business. At Capital One, we believe that AI/ML represents one of the biggest opportunities in financial services today, and is a chance to revolutionize the industry. The Enterprise AI/ML Program is at the heart of this effort, and is leading the way towards building responsible and impactful tools, platforms, and solutions that leverage ML and Generative AI. . As the AI/ML Risk Guide supporting the Enterprise AI/ML Program, you will partner with colleagues across product, design and tech to deliver results that have a direct impact on customer experience and implement risk solutions to ensure Capital One's continued stability and success. You should consider this role if you're someone who enjoys wearing multiple hats, fast paced environments, and collaborating across teams and disciplines throughout the enterprise. This role operates within a dynamic environment with changing conditions and a core component of success is building relationships and influencing decision makers with grounded data. In this role you'll successfully manage multiple concurrent deliverables while ensuring a high level of attention to details, achieve project milestones and deliverables within established deadlines, and provide clear and consistent communication to support accuracy and team alignment.

Responsibilities:

Drive the development and execution of the ES Risk vision and deliver on enterprise and team objectives. Deliver on the identification and development of risks, issues, and/or mitigation plans to ensure [product and tech teams within] the business implement needed changes and address areas of exposure. Develop and communicate senior level risk management reporting and communications Collaborate effectively with colleagues, stakeholders, and leaders across multiple organizations to achieve strategic objectives Coordinate program-related activities and deliverables to ensure effective collaboration within the team and across stakeholder groups Continuously look for ways to improve and innovate in our approach to risk management. Establish and maintain relationships with Enterprise Services process owners, process managers, and vertical risk advisors

Basic Qualifications:

Bachelor Degree or Military Experience At least 3 years of experience in Risk Management, Cloud Risk Management, Process Management, or Project Management, or a combination At least 3 years of Compliance, Legal, Regulatory or Operations experience At least 2 years of experience in

Technology, Cybersecurity, Artificial Intelligence, or Machine Learning Preferred Qualifications:

4+ years of experience in Process management 4+ years of experience in Change Management or Risk Management 3+ years of experience as a Risk Guide 2+ years of experience in Risk Management related to Machine Learning Ability to drive results and communicate with all levels Knowledge of appropriate controls to secure cloud-based services (SaaS) products Risk Certifications (CRISC, CISM, CRCM, CIPP, ABA Risk Mgmt Certification) At this time, Capital One will not sponsor a new applicant for employment authorization for this position. At this time, Capital One will not sponsor a new applicant for employment authorization for this position. The minimum and maximum full-time annual salaries for this role are listed below, by location. Please note that this salary information is solely for candidates hired to perform work within one of these locations, and refers to the amount Capital One is willing to pay at the time of this posting. Salaries for part-time roles will be prorated based upon the agreed upon number of hours to be regularly worked.

McLean, VA:

$158,400 - $180,800 for

Manager, Cyber Risk & Analysis Richmond, VA:

$144,000 - $164,400 for Manager, Cyber Risk & Analysis Candidates hired to work in other locations will be subject to the pay range associated with that location, and the actual annualized salary amount offered to any candidate at the time of hire will be reflected solely in the candidate's offer letter. This role is also eligible to earn performance based incentive compensation, which may include cash bonus(es) and/or long term incentives (LTI). Incentives could be discretionary or non discretionary depending on the plan. Capital One offers a comprehensive, competitive, and inclusive set of health, financial and other benefits that support your total well-being. Learn more at the Capital One Careers website. Eligibility varies based on full or part-time status, exempt or non-exempt status, and management level. This role is expected to accept applications for a minimum of 5 business days.

No agencies please. Capital One is an equal opportunity employer committed to diversity and inclusion in the workplace. All qualified applicants will receive consideration for employment without regard to sex (including pregnancy, childbirth or related medical conditions), race, color, age, national origin, religion, disability, genetic information, marital status, sexual orientation, gender identity, gender reassignment, citizenship, immigration status, protected veteran status, or any other basis prohibited under applicable federal, state or local law. Capital One promotes a drug-free workplace. Capital One will consider for employment qualified applicants with a criminal history in a manner consistent with the requirements of applicable laws regarding criminal background inquiries, including, to the extent applicable, Article 23-A of the New York Correction Law; San Francisco, California Police Code Article 49, Sections 4901-4920; New York City's Fair Chance Act; Philadelphia's Fair Criminal Records Screening Act; and other applicable federal, state, and local laws and regulations regarding criminal background inquiries. If you have visited our website in search of information on employment opportunities or to apply for a position, and you require an accommodation, please contact Capital One Recruiting at 1-800-304-9102 or via email at RecruitingAccommodation@capitalone.com. All information you provide will be kept confidential and will be used only to the extent required to provide needed reasonable accommodations. For technical support or questions about Capital One's recruiting process, please send an email to Careers@capitalone.com Capital One does not provide, endorse nor guarantee and is not liable for third-party products, services, educational tools or other information available through this site. Capital One Financial is made up of several different entities. Please note that any position posted in Canada is for Capital One Canada, any position posted in the United Kingdom is for Capital One Europe and any position posted in the Philippines is for Capital One Philippines Service Corp. (COPSSC). Manager, Cyber Risk & Analysis (Artificial Intelligence/Machine Learning) The Enterprise Services Business Risk Office provides risk management support to several lines of business including: Tech, Digital, Brand, Enterprise Supplier Management, Capital One Ventures, External Affairs, Capital One Software (COS) and Enterprise AI/ML (Artificial Intelligence/Machine Learning). We are on the cutting edge of risk management and provide support for new and emerging technologies as well as critical business strategies. Capital One has taken a bold journey to build a technology company, while operating in a complex, highly regulated business. At Capital One, we believe that AI/ML represents one of the biggest opportunities in financial services today, and is a chance to revolutionize the industry. The Enterprise AI/ML Program is at the heart of this effort, and is leading the way towards building responsible and impactful tools, platforms, and solutions that leverage ML and Generative AI. . As the AI/ML Risk Guide supporting the Enterprise AI/ML Program, you will partner with colleagues across product, design and tech to deliver results that have a direct impact on customer experience and implement risk solutions to ensure Capital One's continued stability and success. You should consider this role if you're someone who enjoys wearing multiple hats, fast paced environments, and collaborating across teams and disciplines throughout the enterprise. This role operates within a dynamic environment with changing conditions and a core component of success is building relationships and influencing decision makers with grounded data. In this role you'll successfully manage multiple concurrent deliverables while ensuring a high level of attention to details, achieve project milestones and deliverables within established deadlines, and provide clear and consistent communication to support accuracy and team alignment.

Responsibilities:

Responsibilities:

Drive the development and execution of the ES Risk vision and deliver on enterprise and team objectives. Deliver on the identification and development of risks, issues, and/or mitigation plans to ensure [product and tech teams within] the business implement needed changes and address areas of exposure. Develop and communicate senior level risk management reporting and communications Collaborate effectively with colleagues, stakeholders, and leaders across multiple organizations to achieve strategic objectives Coordinate program-related activities and deliverables to ensure effective collaboration within the team and across stakeholder groups Continuously look for ways to improve and innovate in our approach to risk management. Establish and maintain relationships with Enterprise Services process owners, process managers, and vertical risk advisors

Basic Qualifications:

Bachelor Degree or Military Experience At least 3 years of experience in Risk Management, Cloud Risk Management, Process Management, or Project Management, or a combination At least 3 years of Compliance, Legal, Regulatory or Operations experience At least 2 years of experience in

Technology, Cybersecurity, Artificial Intelligence, or Machine Learning Preferred Qualifications:

4+ years of experience in Process management 4+ years of experience in Change Management or Risk Management 3+ years of experience as a Risk Guide 2+ years of experience in Risk Management related to Machine Learning Ability to drive results and communicate with all levels Knowledge of appropriate controls to secure cloud-based services (SaaS) products Risk Certifications (CRISC, CISM, CRCM, CIPP, ABA Risk Mgmt Certification) At this time, Capital One will not sponsor a new applicant for employment authorization for this position. At this time, Capital One will not sponsor a new applicant for employment authorization for this position. The minimum and maximum full-time annual salaries for this role are listed below, by location. Please note that this salary information is solely for candidates hired to perform work within one of these locations, and refers to the amount Capital One is willing to pay at the time of this posting. Salaries for part-time roles will be prorated based upon the agreed upon number of hours to be regularly worked.

McLean, VA:

$158,400 - $180,800 for

Manager, Cyber Risk & Analysis Richmond, VA:

$144,000 - $164,400 for Manager, Cyber Risk & Analysis Candidates hired to work in other locations will be subject to the pay range associated with that location, and the actual annualized salary amount offered to any candidate at the time of hire will be reflected solely in the candidate's offer letter. This role is also eligible to earn performance based incentive compensation, which may include cash bonus(es) and/or long term incentives (LTI). Incentives could be discretionary or non discretionary depending on the plan. Capital One offers a comprehensive, competitive, and inclusive set of health, financial and other benefits that support your total well-being. Learn more at the Capital One Careers website. Eligibility varies based on full or part-time status, exempt or non-exempt status, and management level. This role is expected to accept applications for a minimum of 5 business days.

No agencies please. Capital One is an equal opportunity employer committed to diversity and inclusion in the workplace. All qualified applicants will receive consideration for employment without regard to sex (including pregnancy, childbirth or related medical conditions), race, color, age, national origin, religion, disability, genetic information, marital status, sexual orientation, gender identity, gender reassignment, citizenship, immigration status, protected veteran status, or any other basis prohibited under applicable federal, state or local law. Capital One promotes a drug-free workplace. Capital One will consider for employment qualified applicants with a criminal history in a manner consistent with the requirements of applicable laws regarding criminal background inquiries, including, to the extent applicable, Article 23-A of the New York Correction Law; San Francisco, California Police Code Article 49, Sections 4901-4920; New York City's Fair Chance Act; Philadelphia's Fair Criminal Records Screening Act; and other applicable federal, state, and local laws and regulations regarding criminal background inquiries. If you have visited our website in search of information on employment opportunities or to apply for a position, and you require an accommodation, please contact Capital One Recruiting at 1-800-304-9102 or via email at RecruitingAccommodation@capitalone.com. All information you provide will be kept confidential and will be used only to the extent required to provide needed reasonable accommodations.

For technical support or questions about Capital One's recruiting process, please send an email to Careers@capitalone.com Capital One does not provide, endorse nor guarantee and is not liable for third-party products, services, educational tools or other information available through this site. Capital One Financial is made up of several different entities. Please note that any position posted in Canada is for Capital One Canada, any position posted in the United Kingdom is for Capital One Europe and any position posted in the Philippines is for Capital One Philippines Service Corp. (COPSSC). Salary 158,400.00 - 180,800.00 Annual Type Full-time

Appendix C - Data Sources and Calculations

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

To maintain the credibility of the MS in Artificial Intelligence, the student learning outcomes will be assessed using a combination of formative and summative assessments throughout the semester and at the completion of each course. These assessments will focus on the direct application of AI technologies to ensure that students can enter the workforce with the skills necessary for success in their future career. For example, many of the elective courses will include final projects, presentations, and assignments where students have to work with real data sets. Students will be expected to process the data, perform tasks and analysis, and make recommendations as if they are entry-level AI professionals. The projects may include hands-on coding assignments, performance evaluations on AI solutions, and other assignments that utilize various machine learning frameworks. These projects may also allow students to explore different applications or areas of AI and can serve as a portfolio for future job searches. Through these assessments, students will demonstrate their problem-solving capabilities, their proficiency in scripting and programming, and their ability to leverage machine learning and computational frameworks and high-performance computing platforms by solving real-world problems in artificial intelligence.

Additionally, each course in the program will have homework assignments, quizzes, and/or other assessments that will be graded with constructive feedback to help assess the student's learning. These smaller, more formative assessments will strengthen students' understanding of the theoretical foundations of AI within each specific course. The formative assessments will be evaluated for their accuracy of the foundational knowledge and reasoning students need for more advanced applications of the materials. Summative and cumulative assessments, such as midterms and final exams or projects, will be used to determine if and to what level the student mastered the core AI concepts and specific learning outcomes for each course.

Many of the program courses will also address concerns of emerging AI, including the ethical, legal, and societal implications of AI. Assessments in these courses may include projects and presentations where students will be expected to effectively communicate AI technologies and applications to both technical and non-technical audiences. Students will also be expected to review case studies and articles in the field and to synthesize the information therein.

Lastly, students will be challenged to complete reflective assessments to apply knowledge and skills in their future professional work. This work will provide students with the skills that will assist them in the job search process and enable them to identify, apply to, and earn positions in artificial intelligence. The assessments will all follow best practices for adult and professional students. By the end of the program, students will have gained the knowledge and experience illustrated through the program-level outcomes, and their performance on the assessments will reflect how well they have achieved these goals.

OES In-House Market Research: Other Institution Comparison									
Program Name = Artificial Intelligence, M.S.									
Institution	Website	Delivery Method	Degree Name & Type (MPS, MA, MS, MPH, etc.)	Duration	# of Credits	Tuition (course or credit)		Target Population	Prior Education/ Pre-Requisites
						Resident	Non-Resident		
Big Ten Institutions									
Indiana University Harrisburg	https://engineering.indiana.edu/programs/ms-intelligent-systems-engineering.html	F2F	Intelligent Systems Engineering, MS	2 Years	30 Credits	$10,766/Year	$30,748/Year	In our Master of Science in Intelligent Systems Engineering (ISE) program, you will g technical expertise in computational engineering and artificial intelligence—the future of engineering and problem solving.	The Luddy graduate admission committees will consider students who have a three- or four-year bachelor's degree. Applicants should have a minimum of a 3.0 (B) or higher GPA. Many doctoral applicants have a GPA of 3.5 (B+) or
Northwestern University	https://www.mccormick.northwestern.edu/artificial-intelligence/	F2F	Master of Science in Artificial Intelligence, MSAI	15 Months	Five-quarter sequence	$21,228 /quarter		The growth of artificial intelligence and its use in the development of systems that can reason and respond to increasingly complex situations has exploded. This advancement results in an increased demand for individuals who can create complex systems that ca partner with, rather than replace or even augment, human users.	Bachelors degree in Computer Science or a related field.
Penn State Harrisburg	https://www.worldcampus.psu.edu/degrees-and-certificates/penn-state-online-artificial-intelligence-masters-degree	Online	Artificial Intelligence, MPS.	Not Noted	33 Credits	$1,056/Credit		This 33-credit artificial intelligence master's degree will help you gain the skills and knowledge needed to develop intelligent systems and explore new frontiers in artificial intelligence, machine learning, deep learning, natural language processing, reinforcement learning, and computer vision.	For admission to the Graduate School, an applicant must hold either (1) a baccalaureate degree from a regionally accredited U.S. institution or (2) a tertiary (postsecondary) degree that is deemed comparable to a four-year bachelor's degree from a regionally accredited U.S. institution. This degree must be from an officially recognized degree-granting institution i

Penn State Harrisburg	https://harrisburg.psu.edu/science-engineering-technology/computer-science-and-mathematics/master-science-computer-science/curriculum	F2F	Computer Science, MS	2 Years	30 Credits	$1,175/credit	$1,353/credit	Designed to prepare students for employment in industry/ government or for further study in a doctoral program, the Master of Science in Computer Science program emphasizes practical concerns and theoretical background, providing students with the skills and knowledge to perform a variety of tasks, including the development of:	Bachelors degree in Computer Science or a related field. Applicant must have completed courses in analysis of algorithms, operating systems, database, and linear algebra.
Purdue University	https://polytechnic.purdue.edu/degrees/ms-computer-and-information-technology	F2F	Computer Science and Information Technology, M.S.- Autonomy, Intelligence, and Robotics Specialization	2 Years	34 Credits	$775 /credit	$800 /credit	With an advanced degree from Purdue University, you will be poised to make high-impact contributions in the field of computer and information technology. Whether you are pursuing a master's degree or PhD, your research-oriented coursework will prepare you for leadership positions in industry, academia, and government in applied research, solution development, entrepreneurial ventures, and management.	A relevant, earned baccalaureate degree in computer science, information technology, computer engineering, information systems, informatics, or other computer-related field of study. Minimally, students should have earned 15-18 credit hours of computational coursework.
University of Michigan, Dearborn	https://umdearborn.edu/cecs/departments/computer-and-information-science/graduate-programs/ms-artificial-intelligence	F2F/Online	Artificial Intelligence, MS	2 Years	30 Credits	$17,744/Year	$29,440/Year	tudents will engage in an extensive core intended curriculum to develop depth in all the core concepts that build a foundation for artificial intelligence theory and practice. Also, they will be given the opportunity to build on the core knowledge of AI by taking a variety of elective courses selected from colleges throughout campus to explore key contextual areas or more complex technical AI applications. The program will be accessible to both full-time and part-time students, aiming to train	bachelor's degree in a science, technology, engineering, or mathematics (STEM) field earned with an average of B (or better) from an accredited program. An entering student should have completed the relevant courses in programming, mathematics, and statistics (see the list below). A course in calculus III and a course

University of Nebraska Ohmaha	information-science-and-technology/computer-science/prospective-students/graduate-programs.php	F2F	Computer Science, MS with a concentration in Artificial Intelligence	3-5 semesters	30-33 Credits	$388/Credit	$900/Credit	Vision Statement The vision of the department is to create and support dynamic research and teaching environments that promote a computationally empowered society ready to tackle	(GPA) requirement for the MS in computer science program is 3.0 or equivalent score on a 4.0 scale. Applicants should have the equivalent
University of Wisconsin - Madison	https://guide.wisc.edu/graduate/computer-sciences/computer-sciences-ms/computer-sciences-computer-sciences-ms/	F2F	Computer Science, MS with a concentration in Artificial Intelligence	2 Years	30 Credits	$12,252/Year	$25,578/Year	Research specialty areas include artificial intelligence, computational biology, comput architecture, computer graphics, computer networks, computer security, database systems, human–computer interaction, numerical analysis, optimization, performance analysis, programming languages and compilers, systems research, and theoretical computer sciences. See the department website for faculty interests, research activities courses, facilities, and degree requirements.	Graduate admissions is a two-step process between academic programs and the Graduate School. Applicants must meet the minimum requirements of the Graduate School as well as the program(s). Once you have researched the graduate program(s) you are interested in, apply online.
State of Maryland System Institutions: Overseen by MHEC (http://mhec.maryland.gov/publications/Pages/research/index.aspx)									
Bowie State University	https://bowiestate.edu/academics/colleges/college-of-arts-and-sciences/departments/computer-science/graduate-programs/masters-degree/	F2F/Online	Computer Science, MS- Artificial Intelligence/Machine Learning Specialization	2 Years	36 Credits	$448/credit	$730/credit	The gap between the real world and the virtual world grows smaller and smaller with each passing year. It's easy to fall behind, unless you have an advanced degree from Bowie State. The Master of Science in computer science helps you develop a strong scientific and technical foundation, so you can pursue advanced roles in industry, business or government. You'll find our graduates at NASA's Goddard Space Flight Center and Fort Meade, a national platform for intelligence and cybersecurity. Current	Bachelors degree from an accredited institution and completion of specific mathematics (Calc I and Calc 2 and one course beyond Calc) and computer science (Software Design and Development)
Capitol Technology University	https://www.captechu.edu/degrees-and-programs/masters-degrees/artificial-intelligence-mres	Online	Artificial Intelligence, Master of Research (MRes)	Not Noted	30 Credits	$630/Credit		As Artificial Intelligence (AI) permeates every aspect of business and modern lif professionals with a comprehensive understanding of its complex technology and implications are increasingly invaluable in any industry. The MRes in Artificial Intelligence is a research-intensive program designed for working professionals with AI-related backgrounds to develop the specialized knowledge and skills required to lead, manage, and innovate in AI, robotics, computer	accepted — at any time. No GRE or GMAT required. Courses are eight weeks long and are offered in six terms throughout the year. After filing an application, you can begin taking course in the next term. Note, however, that there are deadlines for financial aid.
Johns Hopkins University	intelligence	Online	Artificial Intelligence, M.S.	2 Years	Core and 6 Electives)	$6,470/course (but with dean support applied, $5,270/course)		can meet this demand and advance your career with an online master's degree	college or university. In addition, applicants fo
University of Maryland, Baltimore County	https://www.csee.umbc.edu/graduate/computer-science-m-s-ph-d/	F2F	Computer Science, MS with a concentration in Artificial Intelligence	2 Years	30 Credits	$720/credit	$1,237/credit	Students pursuing a Masters of Science (M.S.) in Computer Science must choose between the thesis and non-thesis options. The thesis option requires the completion of 30 credits, including six credits of CMSC 799. The thesis must be defended with an oral examination and approved by the student's master's thesis committee. The non-thesis option requires the completion of 33 credits. All students must complete CMSC 641 Algorithms, one course chosen from the "system" area, and one course chosen from the "applications" area. The degree must be completed within five years and students must maintain a minimum G.P.A. of 3.0. For more details about the Master's program in Computer Science, see the Computer Science Graduate Handbook (linked in the main menu above).	An applicant to the graduate program in compute science is expected to have a strong background in computer science and mathematics courses. Applicants are expected to have taken the equivalent of the following UMBC courses: CMSC 203: Discrete Structures CMSC 313: Computer Organization & Assembly Languages CMSC 331: Principles of Programming Languages
Colleges & Universities in the Washington DC - Baltimore MD area									
Catholic University of Americ	ate-programs/index.html	F2F	Intelligence Concentration	2 Years	24 SCH(thesis	$52,190/Year		provide assistance in human-machine cooperative tasks in complex domains such a	in the School of Engineering must have received
George Washington University	n-systems-technology	Not Noted	Artificial Intelligence, GC	Not Noted	12 Credits	$2,055/Credit		opportunities that innovations in Artificial Intelligence (AI) afford. AI is the ne	hold a bachelor's degree from a regionally
George Mason University	schools/engineering-computing/school	Online	Applied Information Technology, MS	2.5 Years	30 Credits	$13,132/Year	$29,584/Year	for high-potential leaders, especially those working on IT solutions that affect th	degree from one of the Mason-recognized U.S.
Georgetown University	https://scs.georgetown.edu/programs/423/online/online-masters-in-applied-intelligence/	F2F/Online	Applied Intelligence, MPS	2-5 Years	33 Credits	$51,909/Total		Georgetown University's Online Master of Professional Studies in Applied Intelligence program provides a solid grounding in fundamental intelligence concepts, strategy, and tactics from a global perspective. Students will become an effective leader and decisio maker in areas of law enforcement, homeland security, and competitive business intelligence. The digital world crosses all local, national, and international boundaries. In this online master's degree program, you'll learn the importance of effective cyber defense and counterintelligence. You'll identify and counteract threats to the security of any organization or state actor, and master the real-time and real-world techniques, tools, and processes to successfully lead your team.	Students should plan well in advance to complete the necessary tests and allow time for the Georgetown SCS Office of Admissions (institution code 5986) to receive the results. There are additional requirements for internationa applicants. COMPLETED ONLINE APPLICATION Our application is conveniently located online for you to complete at your own pace. If you submit your application by the priority deadline, your application fee will be waived. Applications
James Madison University	https://www.jmu.edu/grad/programs/snapshots/cyber-intelligence.shtml	Online	Cyber Intelligence, GC	Not Noted	18 Hours	$710/Credit	$700/Credit	This online graduate certificate includes analytical courses focusing on cyber intelligence, which involves tactical and strategic analysis of cyber security threats (e.g., data breaches) and adversaries (e.g., cyber security criminals and nation state groups) to support decision making. Students enhance their critical thinking, problem solving, networking and analytical skills as they explore, categorize and assess threats and adversaries in the cyber domain. They gain knowledge through the application of tools and methodologies to identify, analyze and assess cyber security trends, cyber adversaries' tactics, techniques and procedures (TTPs) and their implications for decision-making. Students enhance their cyber hygiene (cyber security awareness), ethical, social media analytic and policy	Admission to the certificate program requires that applicants have completed at least a bachelor's degree. Unofficial transcripts from all post-secondary institutions should be uploaded with your electronic application and may be used for departmental admission review purposes. If offered admission, you will be directed and required to submit to the JMU Graduate School an official transcript from any institution from which a degree has been awarded to finalize your
Other Major Institutions									
Duke University	https://ece.duke.edu/masters/degrees/ms	F2F	& Machine Learning Concentration	3-4 Semesters	30 Units	Master's students are required to enroll in and pay tuition for at least three semesters		Specialized preparation for industry, research careers or doctoral stud	accredited U.S. institution with a 3.0 GPA
Stevens Institute of Technology	https://www.stevens.edu/schaefer-school-engineering-science/departments/electrical-computer-engineering/graduate-programs/applied-artificial-intelligence-masters-program	F2F/Online	Applied Artificial Intelligence, M.S. or MSE	2 Years or Less	$30	$42,988/Year		sophisticated training for both professional and academic career tracks. The computer science master's program at Stevens is designed to meet growing demand for skilled professionals in the development and application of information technology. The program provides a solid foundation in theoretical instruction along with practical applications necessary for industry success. Available on campus or fully online through the award-winning Stevens Online, our	Bachelor's degree, with a minimum GPA of 3.0, from an accredited institution. Undergraduate degree in electrical engineering, computer engineering or a closely related discipline.

EXST/CMNS In-House Market Research: Projected Job Market Information				
Program Name = Artificial Intelligence, M.S.				
Occupation	**# of Jobs in the Field**	**Where Professionals are Employed**	**Professional Salary Information**	**Projected Job Growth**
Information from U.S. Bureau of Labor Statistics' Occupational Outlook Handbook (https://www.bls.gov/ooh/)				
Computer and Information Research Scientists	32700 (2019)- National	Federal Governement, excluding postal service Computer systems design and related services Research and development in the physical, engineering, and life sciences Software publishers Colleges, universities, and professional schools; state, local, and private	Median Pay Per Year: $122,840 Median Pay Per Hour: $59.06 per hour	15% (much faster than average)
	36600 (2023)- National	Projection of ~3,400 openings projected each year over the decade (replacing workers who transfer or exit the labor force)	Median Pay Per Year: $145,080 Median Pay Per Hour: $69.75 per hour	26% (much faster than average); 8th highest growth rate over the next 10 years
	2240 (2023)- DMV specifically (Washington-Arlington-Alexandria, DC-VA-MD-WV))		Mean Pay Per Year: $156,840 Mean Pay Per Hour: $75.40	Local Quotient: 3.12 (higher share of employment than national average)
Information from State of Maryland's Occupational and Industry Projections (http://www.dllr.state.md.us/lmi/iandoproj/)				
Computer and Information Research Scientists	2,790 (2019)- MD	Federal Governement, excluding postal service Computer systems design and related services Research and development in the physical, engineering, and life sciences Software publishers Colleges, universities, and professional schools; state, local, and private	Median Pay Per Year: $121, 910	15% (much faster than average)
	2333 (2022)- MD			21.5% (much faster than average)
	2310 (2023)- MD	note: decline from 2022- 2023?	Mean Pay Per Year: $142,570 Mean Pay Per Hour: $68.54	Local Quotient: 3.72 (higher share of employment than national average)

Five-Year Enrollment Trends		
Year	Bowie State University	Johns Hopkins University
	Computer Science, MS- Artificial Intelligence/Machine Learning Specialization	Artificial Intelligence, M.S.
	Approved in 1984	New program. No data available yet.
2014	53	
2015	52	
2016	39	
2017	32	
2018	31	
2019	30	
2020	25	60
2021	36	191
2022	27	261

Five-Year Degree Recaps		
Year	Bowie State University	Johns Hopkins University
	Computer Science, MS- Artificial Intelligence/Machine Learning Specialization	Artificial Intelligence, M.S.
2014	9	New program. No data available yet.
2015	14	
2016	23	
2017	14	
2018	12	
2019	12	

Amy Chester <alevine@umd.edu>

Library assessment for new program- MS in AI

Daniel C. Mack <dmack@umd.edu> Thu, Feb 27, 2025 at 2:06 PM
To: Amy Chester <alevine@umd.edu>
Cc: Amitabh Varshney <varshney@umd.edu>, Margaret Z Saponaro <msaponar@umd.edu>, "Daniel C. Mack" <dmack@umd.edu>

Hi Amy:

Thank you for contacting me regarding a library assessment for the new MS in AI. I have reviewed the program proposal and have discussed it with Maggie Saponaro, Director, Collection Development Strategies, copied here. Maggie and I are in agreement that the program would use the same library resources as the BS in AI so a new library assessment will not be necessary.

Please let me know if you have any questions or if you need additional information.

Dan

Daniel C. Mack (Dan: he, his, him)
Interim Dean of Libraries
Associate Dean of Libraries, Collection Strategies and Services
University of Maryland
4119 McKeldin Library | 7649 Library Lane | College Park, MD 20742-7011
email: dmack@umd.edu | voice: 301.405.9264 | fax: 301.405.9191
[Quoted text hidden]

DATE: January 15, 2025

TO: CS Department; Artificial Intelligence Interdisciplinary Institute at Maryland (AIM)

- Jordan Lee Boyd-Graber, Department of Computer Science; Institute of Advanced Computer Studies; iSchool; Language Science Center
- Neda Atanasoski, Chair, Department of Women, Gender, and Sexuality Studies; AIM Associate Director of Education
- Matthias Zwicker, Chair, Department of Computer Science

FROM: On behalf of the University of Maryland Libraries:

- Nevenka Zdravkovska, Head, STEM Library; Library Subject Liaison for Physics and Astronomy
- Kapil Vasudev, Collection Development Strategies Librarian
- Maggie Saponaro, Director, Collection Development Strategies
- Daniel Mack, Associate Dean of Libraries, Collection Strategies & Services and Interim Dean of Libraries

RE: Library Collection Assessment BS in Artificial Intelligence

We are providing this assessment in response to a proposal by the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM) in the Department of Computer Science to create a BS in Artificial Intelligence program. The Artificial Intelligence Interdisciplinary Institute at Maryland (AIM) asked that we at the University of Maryland Libraries assess our collection resources to determine how well the Libraries support the curriculum of this proposed program.

Serial Publications

The University of Maryland Libraries currently subscribe to a large number of scholarly journals—almost all in online format--that focus on artificial intelligence.

The Libraries subscribe to most of the top ranked journals that are listed in the Computer Science, Artificial Intelligence category in the 2023 Science Edition of *Journal Citation Reports.** These journals include the following, all of which are available online:

- ***Foundations and Trends in Machine Learning***
- ***IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE***
- ***Nature Machine Intelligence***
- ***Information Fusion***
- ***IEEE Transactions on Intelligent Vehicles***
- ***IEEE Transactions on Evolutionary Computation***
- ***International Journal on Computer Vision***
- ***IEEE Transactions on Image Processing***
- ***IEEE Transactions on Fuzzy Systems***

- ***Medical Image Analysis***
- ***Artificial Intelligence Review***
- ***IEEE Computational Intelligence Magazine***
- ***IEEE Transactions on Neural Networks and Learning Systems***
- ***IEEE Transactions on Affective Computing***
- ***Energy and AI***

The highly-ranked core journals to which the Libraries do not currently subscribe is *Foundations and Trends in Machine Learning* published by Now Publisher. However, articles in journals that we do not own likely will be available through Interlibrary Loan/Document Delivery. [To check if the UMD Libraries subscribes to a journal, check UMD Discover (the tab labeled Journal Search) on the top menu.]

AI research in general is very transparent (at least outside of industry), and most publications are accessible to the general public without a subscription, including:

- NeurIPS - *Neural Information Processing Systems*
- JMLR - *Journal of Machine Learning Research*
- ACL-(Association for Computational Linguistics) Publications: (EMNLP, ACL, NAACL, etc.)
- ICML - *International Conference on Machine Learning*
- UAI - *Uncertainty in Artificial Intelligence*
- ICLR - *International Conference on Learning Representations*
- TACL - *Transactions of the Association for Computational Linguistics*
- CL - *Computational Linguistics*

*Note: *Journal Citation Reports* is a tool for evaluating scholarly journals. It computes these evaluations from the relative number of citations compiled in the *Science Citation Index* and *Social Sciences Citation Index* database tools.

Databases

The Libraries' *Database Finder* (https://lib.guides.umd.edu/az.php) resource offers online access to databases that provide indexing and access to scholarly journal articles and other information sources. Some of these databases cover subject areas that would be relevant to this proposed program. Databases that would be useful in the field of artificial intelligence are *ACM* and *IEEE Xplore*. Some of the other subject databases that would be relevant to this interdisciplinary curriculum include *Agricola*, *Medline*, *Philosopher's Index with Full Text*, and *ScienceDirect.*

Also, three multidisciplinary databases, *Academic Search Ultimate, Scopus* and *Web of Science* are excellent sources of articles relevant to this topic.

In many-and likely in most--cases, these indexes offer full text copies of the relevant journal articles. In those instances, in which the journal articles are available only in print format, the Libraries can make copies available to students through either the Libraries' Interlibrary Loan service (https://www.lib.umd.edu/find/ill). (Note: See below.)

Monographs

The Libraries regularly acquire scholarly monographs in [name of subject area] and allied subject disciplines. Monographs not already part of the collection can usually be added upon request.

A search of the University of Maryland Libraries' UMD Discover catalog was conducted, using a variety of relevant subject terms. This investigation yielded sizable lists of citations of books that we own [see table below for a list sample numbers and subject terms searched]. As the table shows, the number of items dramatically increases when searching holdings worldwide. As with our own materials, students can request that chapters be copied from books if the books are not available electronically. Most of the books have been published since 2000.

Search	# items UMD only	# items Worldwide
any field, exact phrase **artificial intelligence** OR any field, contains **AI**	30,791	874,094
any field, exact phrase **artificial intelligence** OR any field, contains **AI** AND **ethic***	15,687	165,503
any field, exact phrase **artificial intelligence** OR any field, contains **AI** AND **irrigat***	15,177	161,164

UMD Discover Advanced Sample Searches UMD only and Worldwide holdings

Interlibrary Loan Services

Interlibrary Loan services (https://www.lib.umd.edu/find/ill) provide online delivery of bibliographic materials that otherwise would not be available online. As a result, remote users who take online courses may find these services to be helpful. Interlibrary Loan services are available free of charge.

The article/chapter request service scans and delivers journal articles and book chapters within three business days of the request--provided that the items are available in print on the UM Libraries' shelves or in microform. In the event that the requested article or chapter is not available on campus, the request will automatically be forwarded to the Interlibrary Loan service (ILL). Interlibrary Loan is a service that enables borrowers to obtain online articles and book chapters from materials not held in the University System of Maryland.

Diversity, Equity, and Inclusion

The Libraries work to build, preserve, and provide access to collections of materials that reflect and support the intellectual and cultural interests of the communities we serve. As we recognize the rich diversity of these communities and the importance of developing collections that are inclusive of the identities and contributions of all community members, the Libraries are committed to working closely with our users to fully understand and be responsive to their needs. We are also highly engaged with critical conversations in the field of collection development that help us identify and address gaps in our collections and anticipate emerging educational and research needs.

In addition to engaging proactively with our users and our peer institutions and colleagues, the Libraries also encourages our patrons to submit requests for new materials to be added to the collection. The subject specialist librarian/s for the discipline/s Sarah Weiss (Computer Science/Engineering), Nevenka Zdravkovska (Physics/Astronomy), Leah DeCeasare (Mathematics/Chemistry/Engineering) are the primary collection manager/s for materials in this/these discipline/s and work collaboratively with users to find solutions to gaps in our collections. Additionally, check the directory of subject librarians for disciplines not mentioned above.

Library users can also submit suggested titles for purchase directly to the Libraries through two methods. The first allows members of the UMD community to suggest resources for purchase and addition to the general collection (https://www.lib.umd.edu/find/purchase). The second method - the UMD Libraries Diversity Fund (https://www.lib.umd.edu/about/idea/diversity-fund) - is a program to improve access to resources related to accessibility, diversity, equity, and inclusion and welcomes suggestions from members of the UMD community for purchasing materials to diversify our collections.

Open Access

The Libraries aim to maximize access to resources while minimizing costs. The Libraries does this by working to maintain financially sustainable agreements for paywalled content; ensuring access and usability of collections and UMD-generated research through discovery, delivery, and preservation programs; promoting the open dissemination of research created and used by UMD scholars; and reviewing and incorporating appropriate open educational resources.

The Libraries participate in a number of open-access publisher agreements and journal discounts that are available to UMD scholars. Scholars can visit the Open Access Publishing Agreements guide (https://lib.guides.umd.edu/OAPublishingAgreements) or contact Olivia Isaacs, Continuing Resources Librarian (libr-contresc@umd.edu) for information on participating in these open-access publisher agreements.

The Libraries provide access to a journal search tool via *SciFree* to check if you can publish open access in your chosen journal without paying an Article Processing Charge (APC) under one of our open-access publisher agreements (https://app.scifree.se/umd).

The Libraries is committed to the University of Maryland's Equitable Access Policy, which advances equitable, open access to the University's research and scholarship (https://equitableaccess.umd.edu/). Open Scholarship Services (OSS) in the Libraries promote knowledge equity through programs and infrastructure that facilitate open sharing of research outputs in all forms (https://www.lib.umd.edu/research/oss). OSS helps researchers in the UMD community to understand the scholarly communications process. This includes providing guidance on topics such as:

- Choosing among open access publication options.
- Navigating copyright and authors' rights.

- Building or improving a scholar's online presence.
- Developing plans for data management and publication.
- Selecting an appropriate academic repository to archive research and make it accessible.

OSS also manages the University of Maryland's institutional repository, DRUM, which collects, preserves, and provides public access to the scholarly output of the university (https://drum.lib.umd.edu/home).

Additional Materials and Resources

In addition to serials, monographs and databases available through the University Libraries, students in the proposed program will have access to a wide range of media, datasets, software, and technology. Media in a variety of formats that can be utilized both on-site and via ELMS course media is available at McKeldin Library.

GIS Datasets are available through the GIS Data Repository (https://www.lib.umd.edu/research/services/gis) while statistical consulting and additional research support is available through Research Services (https://www.lib.umd.edu/research/services) and technology support and services are available through the Terrapin Learning Commons (https://www.lib.umd.edu/visit/libraries/mckeldin/techdesk).

The patent literature could be another important resource to be considered. There are several databases (many free) available all listed in the Patent and Trademark guide.

The subject specialist librarian/s for the discipline/s [list names/contact information] also serve as an important resource to programs such as the one proposed. Through departmental partnerships, subject specialists actively develop innovative services and materials that support the University's evolving academic programs and changing research interests. Subject specialists provide one-on-one research assistance online, in-person, or via the phone. They also provide information literacy instruction and can provide answers to questions regarding publishing, copyright and preserving digital works.

Other Research Collections

Because of the University's unique physical location near Washington D.C., Baltimore and Annapolis, University of Maryland students and faculty have access to some of the finest libraries, archives and research centers in the country vitally important for researchers in artificial intelligence. These include the Library of Congress, the National Archives, National Library of Medicine, National Agricultural Library, the Smithsonian, and NIST to name just a few.

Conclusion

With our journal holdings, monographs and databases, as well as additional support services and resources, at this point in time, our assessment is that the University of Maryland Libraries are able to meet the curricular and research needs of the proposed BS in Artificial Intelligence.

Every year we are faced with resource inflation costs and a finite budget allocation. The Libraries cannot guarantee that we will continue to have access to these resources in the near future. Although journal articles, books and book chapters can be requested and received via Interlibrary Loan (ILL), access to databases cannot be fulfilled this way.

MS in Artificial Intelligence					
Five-Year Program Budget					
Tuition Revenue	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
A. Total enrolled students	9	19	20	21	23
First year enrollment	9	10	10	11	12
Second year enrollment		9	10	10	11
B. Total # of 3-credit Courses (by enrollment year)	8	10	10	10	10
# of courses offered for students in year one of the program	8	8	8	8	8
# of courses offered for students in year two of the program		2	2	2	2
C. Per Course Rate	$4,146	$4,270	$4,398	$4,530	$4,666
Total Tuition Revenue	$298,512	$418,497	$439,849	$489,288	$550,630
Direct Expenses	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
A. Instructor Salaries and Fringe	$155,685	$200,696	$206,716	$212,918	$219,305
1. Subtotal: Instructor salaries	$119,850	$154,500	$159,135	$163,909	$168,826
Average 3-credit course salary	$15,000	$15,450	$15,914	$16,391	$16,883
Program specific courses (100% FTE)	7	7	7	7	7
Shared courses (33% FTE)	3	3	3	3	3
2. Fringe Benefits: 29.9%	$35,835	$46,196	$47,581	$49,009	$50,479
Total Direct Expenses	$155,685	$200,696	$206,716	$212,918	$219,305
Total Annual Tuition Revenue	$298,512	$418,497	$439,849	$489,288	$550,630
Total Annual Direct Expenses	$155,685	$200,696	$206,716	$212,918	$219,305
Total Annual OES Administrative Fee	$29,851	$41,850	$43,985	$48,929	$55,063
Annual Distributable Revenue	$112,976	$175,952	$189,148	$227,442	$276,262

Indirect Expenses					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Administrative Salaries and Fringe	$57,421	$59,144	$60,918	$62,746	$64,628
1. Administrative Salaries	$42,346	$43,616	$44,925	$46,273	$47,661
Director (20% FTE)	$25,846	$26,621	$27,420	$28,243	$29,090
Faculty Director Stipend	$15,000	$15,450	$15,914	$16,391	$16,883
Program Manager (33% FTE)	$16,500	$16,995	$17,505	$18,030	$18,571
2. Fringe Benefits: 35.6%	$15,075	$15,527	$15,993	$16,473	16,967
Hourly Wages	$6,456	$51,648	$52,552	$53,474	$54,414
1. Hourly Wages	$6,000	$48,000	$48,840	$49,697	$50,571
Graders for program specific courses ($6K per course)	0	42,000	42,840	43,697	44,571
Graders for shared courses ($2K per course)	6,000	6,000	6,000	6,000	6,000
2. Hourly Wages Benefits: 7.6%	$456	$3,648	$3,712	$3,777	$3,843
Marketing	$2,500	$2,575	$2,652	$2,732	$2,814
1. Marketing	2,500	2,575	2,652	2,732	2,814
Equipment	$1,500	$1,545	$1,591	$1,639	$1,688
1. Equipment	1,500	1,545	1,591	1,639	1,688
Travel & Recruitment	$1,500	$1,545	$1,591	$1,639	$1,688
1. Travel & Recruitment	$1,500	$1,545	$1,591	$1,639	$1,688
Total Indirect Expenses	$69,377	$116,457	$119,305	$122,229	$125,232

Net Revenue	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
OES Distribution to CMNS	$112,976	$175,952	$189,148	$227,442	$276,262
Indirect Expenses	$69,377	$116,457	$119,305	$122,229	$125,232
Balance	**$43,598**	**$59,495**	**$69,843**	**$105,212**	**$151,030**

Faculty Information- Artificial Intelligence

The following faculty members are projected to teach in the program. All faculty are full-time unless otherwise indicated.

Name	**Highest Degree Earned, Program, and Institution**	**UMD Title (indicate if part-time)**	**Courses**
Maria Cameron	Ph.D., Mathematics, UC Berkeley	Prof & Associate Chair, Mathematics. Affiliate Professor with Computer Science.	MSAI 612: Deep Learning for AI
Sandra Cerrai	Ph.D., Mathematics, Scuola Normale Superiore of Pisa	Prof & Assoc Chair, Mathematics	MSAI 601: Probability and Statistics
Yizheng Chen	Ph.D., Computer Science, Georgia Institute of Technology	Assistant Professor, Computer Science	MSAI 630: Safe and Trustworthy AI
Hal Daume III	Ph.D, Computer Science, University of Southern California	Professor, Computer Science, UMIACS; Director, AIM	MSAI 600: Human-centered and Participatory Approaches to AI MSAI 630: Safe and Trustworthy AI;
Sue Dwyer	Ph.D., Philosophy, MIT	Associate Professor, Philosophy	MSAI 670: Applied Ethics of AI
Naomi Feldman	Ph.D., Cognitive Science, Brown University	Professor, Linguistics and UMIACS	MSAI 632: Generative AI
Jonathan Fernandes	Ph.D., Mathematics, University of Maryland	Senior Lecturer, Mathematics	MSAI 601: Probability and Statistics
Nancy Gallagher	Ph.D., International Relations and National Security Studies, University of Illinois Urbana-Champaign	Research Professor, Public Policy Director, CISSM	MSAI 633: AI Policy
Charles Harry	Ph.D., Public Policy, UMD	Director, GoTech Associate Research Professor, Public Policy Operations Director, MaGIC Senior Research Associate, CISSM	MSAI 633: AI Policy; MSAI 633: AI Policy
John Horty	Ph.D., Philosophy, University of Pittsburgh	Distinguished University Professor, Philosophy Affiliate Professor, UMIACS	MSAI 670: Applied Ethics of AI
Jia-Bin Huang	Ph.D., Electrical and Computer Engineering, University of Illinois Urbana Champaign	Capital One Endowed Associate Professor, Computer Science	MSAI 632: Generative AI
David Jacobs	Ph.D., Computer Science, MIT	Professor, Computer Science, UMIACS	MSAI 632: Generative AI
Leonid Koralov	Ph.D., Mathematics, SUNY at Stony Brook	Prof & Assoc Chair, Mathematics	MSAI 601: Probability and Statistics
Vince Lyzinski	Ph.D., Applied Mathematics & Statistics, Johns Hopkins	Associate Professor	MSAI 651: Big Data Analytics for AI

Kevin McGarry	MA, Political Science and Government, University of California Berkeley	Clinical Professor, Smith School	MSAI 633: AI Policy
Paul Rodrigues	Ph.D., Linguistics, Indiana University Bloomington	Chief Artificial Intelligence Officer, Microsoft: National Security Group	MSAI 651: Big Data Analytics
Craig Schlenoff	Ph.D. Computer Science, Université de Burgundy	Deputy Associate Director of Laboratory Programs (acting) at NIST Lecturer, MATH (Part-time)	MSAI 631: AI and Society
Zoltan Safar	Ph.D., ECE, University of Maryland	Director, Telecommunications	DATA/MSML 650: Cloud Computing
Ido Sivan-Sevilla	PhD, Public Policy and Governance, The Hebrew University of Jerusalem	Assistant Professor, College of Information Affiliate Professor, Public Policy Founder, UMD Tech Policy Hub	MSAI 633: AI Policy
Shabnam Tafreshi	Ph.D., Computer Science, George Washington University	Machine Learning Senior Advisor - NLP Researcher at EviCore by Evernorth	MSAI 641- Natural Language Processing
Mohammad Teli	PhD, Computer Science, Colorado State University	Senior Lecturer, Computer Science	MSAI 605: Computing Systems for Machine Learning
Haizhao Yang	PhD, Mathematics, Stanford University	Associate Professor, Mathematics, Affiliated Associate Professor (UMIACS & CS)	MSAI 603: Principles of Machine Learning for AI
Yun Yang	Ph.D., Statistics, Duke University	Associate Professor, Mathematics	MSAI 603: Principles of Machine Learning for AI
Frauke Kreuter	Ph.D., Social Science Research Methods; Survey Methodology, University of Konstanz	Co-Director of the Social Data Science Center Professor, Joint Program in Survey Methodology	MSAI631: AI and Society
Neda Atanasoski	PhD, Literature and Cultural Studies, University of California San Diego	Professor and Chair, Harriet Tubman Department of Women, Gender and Sexuality Studies Associate Director of Education, AIM	MSAI631: AI and Society
Margrét Bjarnadóttir	PhD, Operations Research, MIT	Associate Professor of Management Science and Statistics, DO&IT group, Smith School	MSAI631: AI and Society

Holly Brewer	PhD, American History, UCLA	Burke Chair of American Cultural and Intellectual History, History Director of Undergraduate Studies, History Associate Professor, History	MSAI631: AI and Society
Elias Gonzales	M.Ed, Curriculum and Instruction, UMD	Lecturer and Curriculum Innovation Lead, Computer Science	MSAI631: AI and Society
Jordan Boyd-Graber	PhD, Computer Science, Princeton University	Associate Profession, Computer Science, UMIACS, and iSchool	MSAI 632: Generative AI MSAI 641: Natural Language Processing for AI
Tianyi Zhou	PhD, Computer Science, University of Washington	Assistant Professor, Computer Science, UMIACS, and AIM	MSAI 632: Generative AI MSAI 612: Deep Learning for AI
Bahar Asgari	PhD, Electrical and Computer Engineering, Georgia Tech	Assistant Professor, Computer Science Affiliate Professor, UMIACS	MSAI 605: Computing Systems for AI
Abhinav Bhatele	PhD, Computer Science, University of Illinois Urbana-Champaign	Associate Professor, Computer Science and UMAICS Affiliate Professor, AIM and AMSC Director, PSSG	MSAI 605: Computing Systems for AI
Sheena Erete	PhD, Technology and Social Behavior, Northwestern (joint degree in computer science and communication)	Associate Professor, College of Information Founder and Director, Community Research and Design Collective	MSAI 606: Human-centered and Participatory Approaches to AI
Katie Shilton	PhD, Information Studies, UCLA	Professor, College of Information	MSAI 606: Human-centered and Participatory Approaches to AI
Furong Huang	PhD, Electrical and Computer Engineering, University of California Irvine	Associate Professor, Computer Science	MSAI 630: Safe and Trustworthy AI MSAI 635: Reinforcement Learning MSAI 664: Meta-Learning and Few-Shot Learning
Behtash Babadi	PhD, Engineering Sciences, Harvard	Associate Professor and Associate Chair for Grad Studies, Electrical and Computer Engineering	MSAI 630: Safe and Trustworthy AI
Sanghamitra Dutta	PhD, Electrical and Computer Engineering, Carnegie Mellon University	Assistant Professor, Electrical and Computer Engineering	MSAI 630: Safe and Trustworthy AI

Soheil Feizi	PhD, EECS, MIT	Associate Professor, Computer Science Director, Reliable AI Lab	MSAI 612: Deep Learning for AI MSAI 660: Probabilistic Graphical Models and Bayesian Learning MSAI 663: Graph Neural Networks and Structured Data Learning
David Jacobs	PhD, Computer Science, MIT	Professor, Computer Science and UMIACS	MSAI 640: Computer Vision for AI
Abhinav Shrivastava	PhD, Artificial Intelligence, Carnegie Mellon University	Associate Professor, Computer Science and UMIACS	MSAI 640: Computer Vision for AI
Philip Resnik	PhD, Computer and Information Science, University of Pennsylvania	Professor, Linguistics and UMIACS Affiliate Professor, Computer Science	MSAI 641: Natural Language Processing for AI
Rachel Rudinger	PhD, Computer Science, Johns Hopkins University	Assistant Professor, Computer Science, UMIACS, and Linguistics	MSAI 641: Natural Language Processing for AI
Mohit Iyyer	PhD, Computer Science, UMD	Associate Professor, Computer Science	MSAI 641: Natural Language Processing for AI
Pratap Tokekar	PhD, Computer Science, University of Minnesota	Assistant Professor, Computer Science and UMIACS	MSAI642: Robotics for AI
Mumu Xu	PhD, Mechanical Engineering, California Institute of Technology	Associate Professor, Aerospace Engineering	MSAI642: Robotics for AI
Abdirisak Abdullahi Mohamed	PhD, Mathematics, University of Karlsruhe (KIT), Germany	Adjunct Faculty, College of Information Development Expert and AI Ambassador, SAP	MSAI 661: Causal Inference and AI Decision Making
Tom Goldstein	PhD, Applied Mathematics, UCLA	Associate Professor, Computer Science Director, Maryland Center for Machine Learning	MSAI 662: Adversarial Machine Learning and Robustness
Heng Huang	PhD, Computer Science, Dartmouth College	Brendan Iribe Endowed Professor, Computer Science, UMIACS, ECE, and CBCB	MSAI 665: AI for Healthcare and Biomedical Applications
Louiqa Raschid	PhD, Electrical Engineering, University of Florida Gainesville	Dean's Professor of Information Systems, Smith School Professor, UMIACS and Computer Science	MSAI 667: AI for Finance and Algorithmic Trading

Core/Electiv e	MSAI Course Number and Name- Proposed ** new proposed course	MSAI Description			
Core	MSAI 601: Probability and Statistics for AI	The course provides a foundational understanding of concepts in probability theory and statistics tailored for artificial intelligence. The course covers the basic probabilistic concepts such as probability spaces, random variables and vectors, expectation, covariance, correlation, probability distribution functions, and hypothesis testing. etc. Conditional probabilities, the Bayes formula, limit theorems, and properties of jointly distributed random variables are also covered. Students will explore practical applications of probabilistic and statistical methods within the field of artificial intelligence through hands-on exercises and real-world problems.	Leonid Koralov, Sandra Cerrai		
Core	MSAI 602: Principles of Data Science for AI	This course provides an introduction to the data science pipeline, including the processes of data collection, cleaning unstructured and messy data, data visualization, and statistical analysis. Students will also explore ethical considerations such as fairness, transparency, and bias mitigation. The course will offer students a broad overview of data science and the common tools and systems used in data science problems. Through case studies, students will consider different AI systems through the lens of data science.	Mohammad Teli		
Core	MSAI 603: Principles of Machine Learning for AI	This course offers an introduction to the core concepts of machine learning. Students will learn fundamental ML techniques, including supervised and unsupervised learning, neural networks, decision trees, clustering, and PCA. The course will also discuss recent applications of machine learning in AI solutions, such as computer vision, data mining, autonomous navigation, and speech recognition. Students will also gain a basic understanding of ethical AI development and AI for social good.	Haizhao Yang, Yun Yang		
Core	MSAI 605: Computing Systems for AI	This course will focus on the programming, software and hardware design, and implementation issues of computing systems for machine learning and artificial intelligence applications. Students will explore a variety of topics, including basic Python program structure, functions and modules, basic I/O, object-oriented programming, database access, computer architecture, CPUs and GPUs, memory and I/O systems, virtual memory, and different processing architectures. The course will also cover AI model deployment, edge computing, and scalability challenges in large-scale AI systems.	Bahar Asgari, Abhinav Bhatele		
Core	MSAI 606: Human-centered and Participatory Approaches to AI**	This course will cover a broad range of issues in developing human-centered AI with a focus on participatory approaches. We will look at approaches to building AI systems that expand human capabilities, and the interplay between human and AI skills. We will explore how to make use of expertise in those communities impacted by AI systems to design them better. Topics include the fundamentals of HCI and AI, interpretability and explainability in machine learning, human-centered design for AI, adaptive user interfaces, and conversational agents. The course will teach students to design machine learning systems that are well integrated with human capabilities and concerns.	Sheena Erete, Katie Shilton		
Core	MSAI 630: Safe and Trustworthy AI**	Recent advances in AI have created powerful new models, but these models are not easily understood, and it is difficult to guarantee that they will behave in safe and predictable ways. In this course we will examine several key aspects of these models ranging from data privacy, secure code generation, bias and fairness, memorization and copyright infringement, poisoning and adversarial attacks on machine learning systems, reliability, robustness and safety.	hal: Furong Huang, Behtash Babadi, Sanghamitra Dutta		
Core	MSAI631: AI and Society**	This course is an interdisciplinary exploration of the social impacts and ethical implications of AI. It examines the histories, social values and power dynamics shaping AI technologies, as well as how AI is reshaping culture, politics, and society. Students will develop a sociotechnical understanding of AI related to policy, education, labor, economic systems, and culture. Using approaches from the humanities and social sciences, students will develop frameworks to address ongoing challenges including digital inequality, bias, and surveillance. Students will also learn how AI has and can be used to foster positive social change.	hal: Frauke Kreuter, Neda Atanasoski, Margrét Bjarnadóttir, Holly Brewer, Elias Gonzales		
Elective	MSAI 632: Generative AI**	The course will explain the fundamental principles and important techniques in building large language models (LLMs), multi-modal LLMs, and image and video generation models. The class will study Transformer architectures and their use in pretraining, and discuss methods of fine-tuning models including the use of reinforcement learning. The class will study methods of data cleaning, including efficient methods of duplicate detection. And the class will examine computing methods for large scale models that are efficient and that can run in parallel. We will also discuss image and video generation methods, such as the use of stable diffusion.	hal: Jordan Boyd-Graber, Tianyi ZHou		
Elective	MSAI 633: AI Policy**	How can regulatory strategies promote innovation while safeguarding public interest? This course provides an examination of national and international regulatory and legal frameworks governing artificial intelligence. Students will learn about topics in policy considerations, including copyright, data privacy, bias and discrimination, and the explainability and accountability of AI systems in sectors finance, healthcare, and national security. Students will also learn about contemporary developments in AI governance, including through international AI regulations, national policies, and the advocacy of standards organizations.	hal: Charles Harry, Nancy Gallagher		

Elective	MSAI 634: AI in Engineering	This course explores the role of artificial intelligence in engineering disciplines. Students will examine how AI technologies, including machine learning and neural networks, can help solve complex engineering problems and optimize processes. The course will cover a variety of topics and applications such as predictive modeling, automation, intelligent systems design, computer-aided design optimization, and environmental engineering. Students will learn how AI tools can be integrated into engineering workflows across various fields.			
Elective	MSAI 604: Introduction to Optimization for AI	This course introduces fundamental optimization techniques essential for artificial intelligence and machine learning. Students will start with an overview of linear algebra techniques, including vector spaces, linear ransformations, and eigen-decomposition, before moving to techniques in unconstrained and constrained optimization. The course will also explore global search methods, such as simulated annealing, with a focus on AI applications. Students will develop the skills to formulate and solve optimization problems, improving the efficiency and performance of AI models.			
Elective	MSAI 612: Deep Learning for AI	This course provides a comprehensive introduction to deep learning, a key driver of modern artificial intelligence, with a focus on the main features in deep neural nets and their applications in AI. Students will explore a variety of topics, including backpropagation and its importance, coding tools and their use of parallelization, autoencoders, convolutional neural networks, recurrent and recursive neural networks, and attention-based models. Students will also apply deep learning techniques to real-world problems in computer vision, natural language processing, and classification/clustering questions, gaining practical experience in building AI models.	hal: Soheil Feizi, Tianyi Zhou		
Elective	MSAI 640: Computer Vision for AI	This course provides an in-depth introduction to computer vision, a key field in artificial intelligence that enables machines to interpret and analyze visual data. Students will explore fundamental concepts such as image filtering, correlation, object detection, image segmentation, and scene reconstruction. This course will also include discussion on facial recognition, motion tracking, and ethical considerations in vision-based AI. Students will apply computer vision techniques to real-world AI problems.	hal: David Jacobs, Abhinav Shrivastava		
Elective	MSAI 641: Natural Language Processing for AI	This course provides students with the fundamental concepts related to computers generating and processing natural language, including morphological analysis, phrase structure, word sense disambiguation, word embedding models, and advanced deep learning architectures used in NLP. With a focus on the applications of NLP, students will explore topics related to question answering, sentiment analysis, machine translation, text summarization, and chatbot creation.	hal: Jordan Boyd-Graber, Philip Resnik, Rachel Rudinger, Mohit Iyyer		
Elective	MSAI642: Robotics for AI	This course introduces the design and programming of robotic systems with a focus on AI-driven applications. Students will explore core concepts such as kinematics, differential motion, velocity, dynamics, and forces, along with the integration of sensors, actuators, and drive systems. The course covers trajectory planning, motion control, and the implementation of open-loop and closed-loop controllers. Key AI techniques, including state estimation and Kalman filters, will be examined in the context of robotics. Additionally, students will study recent advancements in machine learning for motion planning, grasping, manipulation, and other AI-powered robotic applications.	hal: Pratap Tokekar, Mumu Xu		
Elective	MSAI 650: Cloud Computing for AI	This course provides an in-depth exploration of state-of-the-art cloud computing technologies and their applications in artificial intelligence. Studenst will explore topics, including telecommunication needs, architectural models, cloud computing platforms and services, and network and storage virtualization technologies. The course will also include a discussion of key concerns in cloud computing such as security, privacy, and trust management. Students will gain practical experience in utilizing cloud-based tools and services to enhance AI workflows, ensuring robust and scalable AI applications.	Zoltan Safar		
Elective	MSAI 651: Big Data Analytics for AI	This course explores the challenges, tools, and techniques for designing and implementing machine learning algorithms at scale, with a focus on AI applications. Students will learn how to configure and operate distributed computing platforms to efficiently process massive datasets. Key topics include scalable learning techniques, data streaming, data flow analytics, and machine learning on large graphs. The course covers massively parallel computing models such as MapReduce, along with methods to optimize memory, storage, and communication in parallel machine learning algorithms. Additionally, students will gain hands-on experience with SQL and NoSQL databases, distributed file systems, key-value stores, document databases, graph databases, and large-scale data visualization.	Paul Rodrigues		
Elective	MSAI 635: Reinforcement Learning	This course covers both model-free and model-based reinforcement learning (RL), and it explores Markov decision processes, dynamic programming, Q-learning, policy gradient methods, and deep RL. Applications include robotics, game AI, and real-world decision-making systems.	Furong Huang		
Elective	MSAI 636: Explainable and Interpretable AI	As AI becomes more ubiquitous, interpretability is critical. This course explores techniques for understanding deep learning models, such as feature attribution, model distillation, LIME, SHAP, and counterfactual explanations, with an emphasis on ethical and regulatory considerations.	Hal Daumé		
Elective	MSAI 660: Probabilistic Graphical Models and Bayesian Learning	This course focuses on the representation and inference of uncertainty in AI using probabilistic graphical models, such as Bayesian networks and Markov random fields. It also covers variational inference, sampling methods, and applications in decision-making and reasoning.	Soheil Feizi		

Elective	MSAI 661: Causal Inference and AI Decision Making	Unlike traditional correlation-based learning, causal AI seeks to understand cause-and-effect relationships. This course explores Pearl's causal inference framework, causal discovery, and interventions for AI decision systems.	Abdirisak Abdullahi Mohamed		
Elective	MSAI 662: Adversarial Machine Learning and Robustness	This course explores vulnerabilities in AI models, covering adversarial attacks, defenses, and the study of robustness in deep learning models against perturbations.	Tom Goldstein		
Elective	MSAI 663: Graph Neural Networks and Structured Data Learning	Graph neural networks (GNNs) enable AI models to work with non-Euclidean structured data. This course covers graph representation learning, message passing, and applications in social networks, bioinformatics, and knowledge graphs.	Soheil Feizi		
Elective	MSAI 664: Meta-Learning and Few-Shot Learning	This course explores learning-to-learn approaches, including model-agnostic meta-learning (MAML), few-shot classification, and applications in fast model adaptation.	Furong Huang		
Elective	MSAI 665: AI for Healthcare and Biomedical Applications	Applications of AI in medicine, including medical imaging, genomics, drug discovery, and personalized healthcare solutions.	Heng Huang		
Elective	MSAI 666: AI for Cybersecurity and Threat Detection	Examines AI-driven cybersecurity measures, including anomaly detection, malware analysis, adversarial robustness, and security threats in machine learning systems.	Yizheng Chen		
Elective	MSAI 667: AI for Finance and Algorithmic Trading	Covers AI applications in finance, including reinforcement learning for trading strategies, risk modeling, fraud detection, and AI-driven market forecasting.	Louiqa Raschid		
	MSAI 670: Applied Ethics of AI	As artificial intelligence tools are increasingly used in high stakes scenarios throughout our lives, it is increasingly important to understand the ethical considerations behind their use. This course will introduce students to applied ethics, a major subfield of contemporary Philosophy, as a way of making sense of how AI tools can be built and used ethically. The course will consider a broad range of topics, ranging from human-robot interaction to algorithmic bias, from autonomous weapon systems to algorithmic accountability and opacity. The tools students learn in this course will be broadly applicable to all forms of artificial intelligence, both present and future.	Sue Dwyer, John Horty		

Cell: A1
Comment: When we are ready to submit this for the proposal, I'd suggest we remove columns A-C showing the ML courses and descriptions. I just included them here for your reference
-Amy Chester

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

April 25, 2025

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 Master of Science program in Artificial Intelligence. 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 # JJ551994 ( ) Check # JJ551994	Payment Amount: 850	Date Submitted: 4/25/2025

Department Proposing Program	College of Comptuer, Mathematics, and Natural Sciences
Degree Level and Degree Type	Master's; Master of Science
Title of Proposed Program	Artificial Intelligence
Total Number of Credits	30
Suggested Codes	HEGIS: 079904 / 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 submision as per COMAR 13B.02.03.03)	(●) Fall ( ) Spring ( ) Summer Year: 2025
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: 04/25/2025
	Date of Approval/Endorsement by Governing Board:

Revised 1/2021

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

Description. The University of Maryland, College Park (UMD) proposes a **Master of Science (M.S.) in Artificial Intelligence (AI)**. This program will combine technical courses in the fundamentals of AI and courses that address the interaction between AI and humans and society. During their coursework, students will build solid foundations in mathematics, statistics and computing and also obtain a broader view of human centered AI and its societal implications. Students will gain expertise in machine learning, deep learning, and AI-driven decision-making while exploring areas such as AI ethics, human-computer interaction, explainable AI, and policy considerations. The program prepares graduates to develop AI solutions that enhance human well-being, promote fairness, and integrate seamlessly into social and professional contexts. The program consists of 30-credit course work and is a non-thesis MS program. Students will be prepared for careers across disciplines and they will develop skills to be collaborative, adaptable problem solvers in a rapidly changing field. **Please note: The program will be offered both in-person and through a fully online modality.**

Relation to Strategic Goals. UMD is the state's flagship campus and a national leader in higher education. UMD is ranked in the top 20 public universities in the nation and in the top 50 among all national institutions by US News and World Report.[1] Through our strategic partnership with the University of Maryland, Baltimore, we rank among the top 30 institutions for research funding according to the National Center for Science and Engineering Statistics.[2] UMD ranks in the top 10 for research expenditures in computer and information sciences. As written in our mission statement, "UMD embraces its flagship status and land-grant mission to share its research, educational, cultural, and technological strengths to bolster economic development, sustainability, and quality of life in Maryland and beyond." The proposed program will equip students with advanced technical skills in machine learning, data science, and AI systems, while fostering ethical, human-centered, and socially responsible innovation. Graduates will be prepared for leadership roles in AI across industry, government, and research, with the ability to develop impactful and trustworthy AI solutions.

Funding. This MS program will be self-supporting with tuition revenue. The College of Computer, Mathematical, and Natural Sciences, through its Science Academy, already offers self-support master's programs in Applied Machine Learning, Data Science, Quantum Computing, and Bioinformatics and Computational Biology. The Science Academy already has the administrative and physical infrastructure to offer the program.

Institutional Commitment. UMD is committed to being a higher education leader in AI and will leverage its instructional, research, and administrative capabilities toward this end. On April 9, 2024, the University of Maryland launched the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM) (see https://aim.umd.edu/about), a collaborative hub advancing responsible

[1] U.S. News & World Report: https://www.usnews.com/best-colleges/university-of-maryland-2103.
[2] National Center for Science and Engineering Statistics: https://ncses.nsf.gov/surveys/higher-education-research-development/2023.

and ethical AI education, research, and innovation across all disciplines. Building on UMD's existing AI expertise and over 100 faculty engaged in AI scholarship, AIM supports faculty research, experiential learning, and workforce development while coordinating new academic programs, high-performance computing resources, and partnerships with government and industry. Aligned with national and state executive orders on trustworthy AI, AIM prepares students across all majors to apply AI in their fields and drive public good in a technology-rich world.

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

Need. AI technologies are rapidly evolving and being more integrated into various aspects of society and industry. AI's evolution will rival the internet itself in terms of its potential to be both extraordinarily beneficial and profoundly detrimental to society. In January 2024, Governor Moore issued an executive order recognizing that "Artificial intelligence (AI) is transforming society and work in myriad ways, and the pace of that change will continue to accelerate-unlocking new opportunities and risks for Maryland's residents, workers, and economy."[3] AI is rapidly becoming a cornerstone of innovation across both public and private sectors, transforming industries, reshaping workforce demands, and redefining decision-making in everything from national security to consumer services. As AI capabilities expand, Maryland's public institutions, federal agencies, and private enterprises will increasingly depend on a workforce equipped not only with technical AI skills but also with the ethical and contextual understanding required to apply AI responsibly. The proposed program responds directly to this need. The program provides rigorous technical training in machine learning, data science, and computing systems, equipping students with the skills needed to build and deploy advanced AI solutions. At the same time, the program emphasizes the ethical, societal, and policy dimensions of AI through specialized coursework in responsible and human-centered design. Drawing on UMD's world-class AI research enterprise—including over 100 faculty across disciplines and the Artificial Intelligence Interdisciplinary Institute at Maryland—students gain both cutting-edge knowledge and the broader perspective needed to lead AI innovation responsibly.

State Plan. The proposed program aligns with the 2022 *Maryland State Plan for Postsecondary Education*, specifically Priority 5, "Maintain the commitment to high-quality postsecondary education in Maryland," and its Action Item to "Identify innovative fields of study." Artificial intelligence represents one of the most transformative and fast-evolving domains of the 21st-century economy, with sweeping implications for Maryland's public and private sectors. By offering interdisciplinary, ethically grounded, and technically rigorous AI education, the MSAI program prepares students to meet the workforce demands of this innovative field while upholding the state's commitment to academic excellence, equity, and responsiveness to

[3] State of Maryland Executive Order Catalyzing the Responsible and Productive Use of Artificial Intelligence in Maryland State Government: https://governor.maryland.gov/Lists/ExecutiveOrders/Attachments/31/EO%2001.01.2024.02%20Catalyzing%20the%20Responsible%20and%20Productive%20Use%20of%20Artificial%20Intelligence%20in%20Maryland%20State%20Government_Accessible.pdf

emerging global challenges. Through this program, Maryland is poised to become a national leader in responsible AI talent development.

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

There is strong and growing demand for professionals with advanced training in artificial intelligence, both nationally and in the state of Maryland. According to the U.S. Bureau of Labor Statistics, employment of computer and information research scientists—a role closely associated with AI professionals—is projected to grow by 26% nationally between 2021 and 2031, significantly faster than the average for all occupations.[4] The Maryland Department of Labor similarly projects a 21% increase in these occupations between 2022 and 2032.[5]

A labor market analysis conducted for the University of Maryland confirms this trend, showing that from January 2020 to January 2025 there were over 30,000 unique job postings nationally listing artificial intelligence as a required skill, with Washington, D.C. among the top ten U.S. cities for such postings. The analysis further reveals that 41% of these job postings required or preferred a master's degree, reinforcing the need for graduate-level training in AI.

AI will be particularly critical for Maryland and the surrounding region due to the high concentration of federal agencies, national laboratories, and private-sector firms engaged in AI research and application. The current downsizing of the federal workforce makes this need even more urgent, as agencies increasingly turn to AI to fulfill their missions and require personnel with advanced technical and analytical skills. The proposed program addresses this gap by producing graduates trained in both the technical foundations of AI and in its human-centered, ethical application. In doing so, it supports workforce development across key sectors—including healthcare, defense, finance, cybersecurity, and public policy—where AI is rapidly becoming integral to operations and strategic decision-making.

D. Reasonableness of Program Duplication

Demand for AI expertise is rapidly outpacing the supply of graduate-level programs—especially those that combine rigorous technical training with critical attention to ethical, social, and policy considerations. As AI becomes increasingly foundational to sectors such as defense, healthcare, finance, and education, Maryland must expand its capacity to educate professionals who are prepared to lead in this space.

National labor market data underscore this mismatch. From 2020 to 2025, over 30,000 unique job postings listed artificial intelligence as a required skill, yet in 2022, only 554 master's

[4] USBLS Occupational Outlook Handbook: Computer and Information Research Scientists: https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm
[5] Maryland Department of Labor: Maryland Occupational Projections 2022-2032: https://labor.maryland.gov/lmi/iandoproj/maryland.shtml

degrees were awarded in AI nationwide—yielding approximately 54 job postings per graduate. This highlights a clear shortage in the graduate talent pipeline, particularly for programs that equip students with both technical and ethical competencies. Rather than representing duplication, the proposed program addresses a quantifiable and urgent workforce need.

Only two master's programs in Artificial Intelligence are currently approved in Maryland: those at Capitol Technology University and Johns Hopkins University. Given the scale and urgency of AI's transformation across the public and private sectors, the demand for high-quality graduate programs is not only unmet—it is growing. Maryland should encourage multiple, complementary offerings to meet distinct student and workforce needs. UMD's program will help ensure the state remains at the forefront of responsible AI development while expanding access to education in a field central to its economic and civic future.

UMD's program is uniquely positioned due to its integration with the newly launched Artificial Intelligence Interdisciplinary Institute at Maryland (AIM), which unites over 100 faculty across disciplines to support innovative AI research, education, and policy development. The program also benefits from UMD's strategic location near the federal government and major employers driving AI adoption, making it an ideal hub for training the next generation of AI leaders.

E. Relevance to High-demand Programs at Historically Black Institutions (HBIs)

No HBI's currently offer a master's program in Artificial Intelligence.

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

We do not anticipate any negative impacts on the unique identities of Maryland's HBIs. UMD already offers a master's program in Computer Science with an Artificial Intelligence concentration, as well as graduate programs in Data Science and Applied Machine Learning. The proposed MS in Artificial Intelligence builds on this foundation to meet rapidly growing demand in a field that is critical to the state. As global investment in artificial intelligence continues to increase each year, we believe the state should actively encourage the development of more highly specialized, technical graduate programs—particularly in diverse geographic areas—to promote inclusive economic growth and workforce development in this vital sector.

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

Curricular Development. When developing the proposed curriculum, several factors were considered to ensure the program's success. An advisory group was formed to identify necessary skills, capacities, and capabilities in job postings in the market. These in demand skills led the curriculum development to ensure that students will be qualified to satisfy the workforce gap at the time of graduation.

Faculty Oversight. The College of Computer, Mathematical, and Natural Sciences' Science Academy will work with the Mathematics and Computer Science department chairs, as well as the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM) for oversight. A Computer Science faculty member will serve as the faculty director. This faculty director will provide the curriculum oversight, course evaluation, and advise students. In addition, the academic faculty director, in collaboration with the Assistant Dean for Professional Graduate Education, is responsible for all instructor selections and appointments. Appendix A is a list of faculty who will be teaching in the program.

Educational Objectives and Learning Outcomes. The main objective of the program is to blend highly technical, applied, experiential learning in AI with courses on AI's societal impact, human-AI collaboration, and responsible AI development. Graduates will be prepared to enter into industry at the completion of the program. Courses will combine a theoretical foundation from tenured professors and researchers on campus with applied learning from lecturers and industry practitioners. Students will build a solid foundation in mathematics, statistics, and computing, and pair this foundation with hands-on application to real world problems. They will learn different methods and approaches to solve complex problems using artificial intelligence, data analysis techniques, modern tools, and state-of-the-art technologies while also recognizing potential ethical implications of AI. The learning outcomes for the program are as follows:

1. Understand the theoretical foundations of artificial intelligence, including mathematics and statistics, machine learning, deep learning, and optimization techniques.
2. Develop advanced problem-solving and analytical skills in AI by gaining proficiency in scripting and programming, leveraging machine learning frameworks, and employing high-performance computing platforms to optimize AI solutions.
3. Apply AI technologies to address critical societal challenges and to solve complex problems in disciplines such as healthcare, finance, climate change, and public policy.
4. Design AI systems to work effectively alongside people in healthcare, education, business, and creative industries.
5. Analyze the impact of AI-driven automation in real-world settings by evaluating its effectiveness and efficiency.
6. Describe the societal implications of AI, including issues of safe and trustworthy AI.
7. Evaluate the ethical and legal implications of AI by analyzing issues such as bias, privacy, accountability, and transparency, and developing strategies for responsible AI design, governance, and policy compliance.
8. Explain practical strategies for implementing and scaling AI solutions within enterprise and societal contexts.
9. Communicate AI technologies and applications in a variety of fields to technical and non-technical audiences.

Institutional assessment and documentation of learning outcomes. Assessments will be projects based using publicly available data when possible, to create innovative solutions to societal challenges. Please see Appendix B for information about assessing the program's learning outcomes.

Course requirements. This is a 30-credit non-thesis master's degree, with no thesis option. Students complete 21 credits of required core coursework and select 9 credits of electives from a list of specialized AI courses.

Curriculum		
Course Number	**Course Title**	**Credits**
Core		
MSAI601	Probability and Statistics	3
MSAI602	Principles of Data Science	3
MSAI603	Principles of Machine Learning	3
MSAI605	Computing Systems for AI	3
MSAI606	Human-Centered and Participatory Approaches to AI	3
MSAI630	Safe and Trustworthy AI	3
MSAI631	AI and Society	3
Elective Courses – Select 3 Courses (9 Credits Total)		
MSAI604	Introduction to Optimization for AI	3
MSAI612	Deep Learning for AI	3
MSAI632	Generative AI	3
MSAI633	AI Policy	3
MSAI634	AI in Engineering	3
MSAI635	Reinforcement Learning	3
MSAI636	Explainable and Interpretable AI	3
MSAI640	Computer Vision for AI	3
MSAI641	Natural Language Processing for AI	3
MSAI642	Robotics for AI	3
MSAI650	Cloud Computing for AI	3
MSAI651	Big Data Analytics for AI	3
MSAI660	Probabilistic Graphical Models and Bayesian Learning	3
MSAI661	Causal Inference and AI Decision Making	3
MSAI662	Adversarial Machine Learning and Robustness	3
MSAI663	Graph Neural Networks and Structured Data Learning	3
MSAI664	Meta-Learning and Few-Shot Learning	3
MSAI665	AI for Healthcare and Biomedical Applications	3
MSAI666	AI for Cybersecurity and Threat Detection	3
MSAI667	AI for Finance and Algorithmic Trading	3
MSAI670	Applied Ethics of AI	3

A list of courses, including those that count for the elective category, is included in Appendix C.

General Education. Not applicable for our graduate programs.

Accreditation or Certification Requirements. No accreditation or licensure is required for this program.

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

Student Support. The Science Academy in the College of Computer, Mathematics and Natural Science will provide administrative coordination for the program, in collaboration with the Office of Extended Studies. Students will be supported through the Science Academy for academic guidance and advising. They will also have access to the Graduate School Counseling and the Counseling Center resources. The Science Academy Program Manager will be the first point of contact for students, while the Office of Extended Studies, which provides administrative services for a host of professional programs, provides student and program services, such as admission support, scheduling, registration, billing and payment, graduation, and appeals. Students will see admission criteria, financial aid resources, costs, and complaint procedures on both the Science Academy website and the Extended Studies program page. For technical aspects of both the in-person and online versions of the program, specific technological competence and equipment will be included in the admission criteria. Learning management information will also be included in these materials.

Marketing and Admissions Information. Students will see admission criteria, financial aid resources, and costs on both the Science Academy website and the Extended Studies program page.

H. Adequacy of Articulation

Not applicable for this graduate program.

I. Adequacy of Faculty Resources

Program faculty. Appendix A contains a list of faculty members who will teach in the program. Instructional resources for the program will comprise current tenure track faculty, professional track faculty, and adjunct instructors. These instructional personnel will come from the Computer Science Department and the Mathematics Department, UMD's Artificial Intelligence Interdisciplinary Institute, and outside the university (e.g., ARLIS, NASA, federal agencies, and industry). Instructors may come from adjacent federal agencies, which will increase the exposure of students to real-world problems as part of the program curriculum.

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

No additional physical facilities, infrastructure and instructional equipment is required for this program. Existing facilities (e.g., general purpose classrooms) and resources (e.g., instructional equipment) will be used, and these are demonstrably adequate for the proposed program. 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

Tables 1 and 2 contain the details of resources and expenditures.

Table 1 Resources:
The program will be self-supported through tuition revenue.

1. Line 1 shows no reallocated funds since the program is supported by tuition from existing students.
2. Graduate students pay tuition by the credit.
3. Students will complete 24 credits in the first year, and are shown in this chart as full-time students. Part-time students reflect those finishing the program in the second year.
4. No external sources of funding are assumed.
5. No other sources of funding are assumed.

Table 2 Expenditures:

1. Faculty salaries are based on cost per course. We assume an annual increase of 3% in salaries with a corresponding 35.6% benefits rate.
2. Administrative staff represents the program director salary and benefits (.2 FTE).
3. Support staff represents program manager salary and benefits (.33 FTE).

4. Other expenditures include campus administrative fees, travel and recruitment, marketing, hourly grader wages, and director stipend.

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 course feedback survey instrument for students that standardizes course feedback across campus. The course 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

Recruitment for the Master of Science in Artificial Intelligence will be led by the college's Science Academy, which employs a targeted, inclusive digital strategy focused on UMD alumni, graduating seniors, and working professionals in the Washington, D.C. metropolitan area. The admissions process evaluates not only academic readiness but also diversity in experience, background, and professional goals to ensure a well-rounded and inclusive student body.

To attract a diverse applicant pool, the program will be represented at educational fairs and conferences such as the National Society of Black Engineers Leadership Conference and GEM Grad Labs. Outreach efforts will include advertising through organizations like NSBE, SWE, AWM, and AWC; targeted email campaigns to partner institutions; engagement with UMD student organizations and military veterans; and robust digital marketing including virtual open houses and career panels.

Once enrolled, students benefit from a supportive, inclusive environment fostered by Science Academy staff and faculty. Students are encouraged to participate in diversity and inclusion programs such as TerrapinSTRONG, Cultivating Community Conversations, and the Graduate School's Spring Speaker Series. Faculty bring a variety of academic backgrounds and career experiences, offering students multiple mentorship and career development pathways. The Academy provides academic advising, access to counseling and funding resources, and ongoing student support to promote persistence and timely degree completion.

Retention strategies include hosting seminars like "Women in Engineering, Computing, and STEM," requiring regular academic advising sessions, and implementing an early warning system to identify and assist students facing academic challenges. These initiatives are designed to ensure that all students—particularly those from underrepresented groups—are supported, empowered, and well-prepared to succeed in the program and beyond.

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

The distance-education version of the program will be entirely online. This will allow the program to reach a wider audience, including those in the Washington, DC area whose professional commitments may not allow for regular travel to College Park. The online curriculum will be the same as the in-person curriculum. Learning outcomes, academic rigor and program curricula will be exactly the same for the online program as it is for the on-campus program. The program will go through periodic evaluations, at least every three years, by the Science Academy leadership and academic department chairs. Students will have access to the same services that online students and will be advised by both the Science Academy and the Office of Extended Studies.

Table 1: Resource Table

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds					
2. Tuition/Fee Revenue (c+g below)	298512	418362	439800	489240	550470
a. #FT Students	9	10	10	11	12
b. Annual Tuition/Fee Rate (based on 24 credits)	33168	34152	35184	36240	37320
c. Annual FT Revenue (a x b)	298512	341520	351840	398640	447840
d. # PT Students	0	9	10	10	11
e. Credit Hour Rate	1382	1423	1466	1510	1555
f. Annual Credit Hours	6	6	6	6	6
g. Total Part Time Revenue (d x e x f)	0	76842	87960	90600	102630
3. Grants, Contracts, & Other External Sources	0	0	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 - 4)	298512	418362	439800	489240	550470

Table 2: Expenditure Table					
Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	155685	200696	206716	212918	219305
a. #FTE	2	2	2	2	2
b. Total Salary	119850	154500	159135	163909	168826
c. Total Benefits	35835	46196	47581	49009	50479
2. Admin. Staff (b+c below)	35047	36098	37182	38298	39446
a. #FTE	0.2	0.2	0.2	0.2	0.2
b. Total Salary	25846	26621	27420	28243	29090
c. Total Benefits	9201	9477	9762	10055	10356
3. Total Support Staff (b+c below)	22374	23045	23737	24449	25182
a. #FTE	0.33	0.33	0.33	0.33	0.33
b. Total Salary	16500	16995	17505	18030	18571
c. Total Benefits	5874	6050	6232	6419	6611
4. Graduate Assistants (b+c)	0	0	0	0	0
a. #FTE	0	0	0	0	0
b. Stipend	0	0	0	0	0
c. Tuition Remission	0	0	0	0	0
d. Benefits	0	0	0	0	0
5. Equipment	1500	1545	1591	1639	1688
6. Library	0	0	0	0	0
7. New or Renovated Space	0	0	0	0	0
8. Other Expenses: Operational Expenses	55307	113068	116694	123164	130862
TOTAL (Add 1 - 8)	269913	374452	385920	400468	416483

Appendix A: Faculty Information

The following faculty members are projected to teach in the program. All faculty are full-time unless otherwise indicated.

Name	Highest Degree Earned, Program, and Institution	UMD Title (indicate if part-time)	Courses
Bahar Asgari	PhD, Electrical and Computer Engineering, Georgia Tech	Assistant Professor, Computer Science Affiliate Professor, UMIACS	MSAI 605: Computing Systems for AI
Neda Atanasoski	PhD, Literature and Cultural Studies, University of California San Diego	Professor and Chair, Harriet Tubman Department of Women, Gender and Sexuality Studies Associate Director of Education, AIM	MSAI631: AI and Society
Behtash Babadi	PhD, Engineering Sciences, Harvard	Associate Professor and Associate Chair for Grad Studies, Electrical and Computer Engineering	MSAI 630: Safe and Trustworthy AI
Abhinav Bhatele	PhD, Computer Science, University of Illinois Urbana-Champaign	Associate Professor, Computer Science and UMAICS Affiliate Professor, AIM and AMSC Director, PSSG	MSAI 605: Computing Systems for AI
Margrét Bjarnadóttir	PhD, Operations Research, MIT	Associate Professor of Management Science and Statistics, DO&IT group, Smith School	MSAI631: AI and Society
Jordan Boyd-Graber	PhD, Computer Science, Princeton University	Associate Profession, Computer Science, UMIACS, and iSchool	MSAI 632: Generative AI MSAI 641: Natural Language Processing for AI
Holly Brewer	PhD, American History, UCLA	Burke Chair of American Cultural and Intellectual History, History Director of Undergraduate Studies, History Associate Professor, History	MSAI631: AI and Society
Maria Cameron	Ph.D., Mathematics, UC Berkeley	Prof & Associate Chair, Mathematics. Affiliate Professor with Computer Science.	MSAI 612: Deep Learning for AI
Sandra Cerrai	Ph.D., Mathematics, Scuola Normale Superiore of Pisa	Prof & Assoc Chair, Mathematics	MSAI 601: Probability and Statistics
Yizheng Chen	Ph.D., Computer Science, Georgia Institute of Technology	Assistant Professor, Computer Science	MSAI 630: Safe and Trustworthy AI

Sanghamitra Dutta	PhD, Electrical and Computer Engineering, Carnegie Mellon University	Assistant Professor, Electrical and Computer Engineering	MSAI 630: Safe and Trustworthy AI
Sue Dwyer	Ph.D., Philosophy, MIT	Associate Professor, Philosophy	MSAI 670: Applied Ethics of AI
Sheena Erete	PhD, Technology and Social Behavior, Northwestern (joint degree in computer science and communication)	Associate Professor, College of Information Founder and Director, Community Research and Design Collective	MSAI 606: Human-centered and Participatory Approaches to AI
Soheil Feizi	PhD, EECS, MIT	Associate Professor, Computer Science Director, Reliable AI Lab	MSAI 612: Deep Learning for AI MSAI 660: Probabilistic Graphical Models and Bayesian Learning MSAI 663: Graph Neural Networks and Structured Data Learning
Naomi Feldman	Ph.D., Cognitive Science, Brown University	Professor, Linguistics and UMIACS	MSAI 632: Generative AI
Jonathan Fernandes	Ph.D., Mathematics, University of Maryland	Senior Lecturer, Mathematics	MSAI 601: Probability and Statistics
Nancy Gallagher	Ph.D., International Relations and National Security Studies, University of Illinois Urbana-Champaign	Research Professor, Public Policy Director, CISSM	MSAI 633: AI Policy
Tom Goldstein	PhD, Applied Mathematics, UCLA	Associate Professor, Computer Science Director, Maryland Center for Machine Learning	MSAI 662: Adversarial Machine Learning and Robustness
Elias Gonzales	M.Ed, Curriculum and Instruction, UMD	Lecturer and Curriculum Innovation Lead, Computer Science	MSAI631: AI and Society
Charles Harry	Ph.D., Public Policy, UMD	Director, GoTech Associate Research Professor, Public Policy Operations Director, MaGIC Senior Research Associate, CISSM	MSAI 633: AI Policy; MSAI 633: AI Policy
John Horty	Ph.D., Philosophy, University of Pittsburgh	Distinguished University Professor, Philosophy Affiliate Professor, UMIACS	MSAI 670: Applied Ethics of AI
Furong Huang	PhD, Electrical and Computer Engineering, University of California Irvine	Associate Professor, Computer Science	MSAI 630: Safe and Trustworthy AI MSAI 635: Reinforcement Learning MSAI 664: Meta-Learning and Few-Shot Learning

Heng Huang	PhD, Computer Science, Dartmouth College	Brendan Iribe Endowed Professor, Computer Science, UMIACS, ECE, and CBCB	MSAI 665: AI for Healthcare and Biomedical Applications
Jia-Bin Huang	Ph.D., Electrical and Computer Engineering, University of Illinois Urbana Champaign	Capital One Endowed Associate Professor, Computer Science	MSAI 632: Generative AI
Hal Daume III	Ph.D, Computer Science, University of Southern California	Professor, Computer Science, UMIACS; Director, AIM	MSAI 600: Human-centered and Participatory Approaches to AI MSAI 630: Safe and Trustworthy AI;
Mohit Iyyer	PhD, Computer Science, UMD	Associate Professor, Computer Science	MSAI 641: Natural Language Processing for AI
David Jacobs	PhD, Computer Science, MIT	Professor, Computer Science and UMIACS	MSAI 640: Computer Vision for AI MSAI 632: Generative AI
Leonid Koralov	Ph.D., Mathematics, SUNY at Stony Brook	Prof & Assoc Chair, Mathematics	MSAI 601: Probability and Statistics
Frauke Kreuter	Ph.D., Social Science Research Methods; Survey Methodology, University of Konstanz	Co-Director of the Social Data Science Center Professor, Joint Program in Survey Methodology	MSAI631: AI and Society
Vince Lyzinski	Ph.D., Applied Mathematics & Statistics, Johns Hopkins	Associate Professor	MSAI 651: Big Data Analytics for AI
Kevin McGarry	MA, Political Science and Government, University of California Berkeley	Clinical Professor, Smith School	MSAI 633: AI Policy
Abdirisak Abdullahi Mohamed	PhD, Mathematics, University of Karlsruhe (KIT), Germany	Adjunct Faculty, College of Information Development Expert and AI Ambassador, SAP	MSAI 661: Causal Inference and AI Decision Making
Louiqa Raschid	PhD, Electrical Engineering, University of Florida Gainesville	Deanâ€™s Professor of Information Systems, Smith School Professor, UMIACS and Computer Science	MSAI 667: AI for Finance and Algorithmic Trading
Philip Resnik	PhD, Computer and Information Science, University of Pennsylvania	Professor, Linguistics and UMIACS Affiliate Professor, Computer Science	MSAI 641: Natural Language Processing for AI
Paul Rodrigues	Ph.D., Linguistics, Indiana University Bloomington	Chief Artificial Intelligence Officer, Microsoft: National Security Group	MSAI 651: Big Data Analytics

Rachel Rudinger	PhD, Computer Science, Johns Hopkins University	Assistant Professor, Computer Science, UMIACS, and Linguistics	MSAI 641: Natural Language Processing for AI
Zoltan Safar	Ph.D., ECE, University of Maryland	Director, Telecommunications	DATA/MSML 650: Cloud Computing
Craig Schlenoff	Ph.D. Computer Science, UniversitÃ© de Burgundy	Deputy Associate Director of Laboratory Programs (acting) at NIST Lecturer, MATH (Part-time)	MSAI 631: AI and Society
Katie Shilton	PhD, Information Studies, UCLA	Professor, College of Information	MSAI 606: Human-centered and Participatory Approaches to AI
Abhinav Shrivastava	PhD, Artificial Intelligence, Carnegie Mellon University	Associate Professor, Computer Science and UMIACS	MSAI 640: Computer Vision for AI
Ido Sivan-Sevilla	PhD, Public Policy and Governance, The Hebrew University of Jerusalem	Assistant Professor, College of Information Affiliate Professor, Public Policy Founder, UMD Tech Policy Hub	MSAI 633: AI Policy
Shabnam Tafreshi	Ph.D., Computer Science, George Washington University	Machine Learning Senior Advisor - NLP Researcher at EviCore by Evernorth	MSAI 641- Natural Language Processing
Mohammad Teli	PhD, Computer Science, Colorado State University	Senior Lecturer, Computer Science	MSAI 605: Computing Systems for Machine Learning
Pratap Tokekar	PhD, Computer Science, University of Minnesota	Assistant Professor, Computer Science and UMIACS	MSAI642: Robotics for AI
Mumu Xu	PhD, Mechanical Engineering, California Institute of Technology	Associate Professor, Aerospace Engineering	MSAI642: Robotics for AI
Yun Yang	Ph.D., Statistics, Duke University	Associate Professor, Mathematics	MSAI 603: Principles of Machine Learning for AI
Haizhao Yang	PhD, Mathematics, Stanford University	Associate Professor, Mathematics, Affiliated Associate Professor (UMIACS & CS)	MSAI 603: Principles of Machine Learning for AI
Tianyi Zhou	PhD, Computer Science, University of Washington	Assistant Professor, Computer Science, UMIACS, and AIM	MSAI 632: Generative AI MSAI 612: Deep Learning for AI

Appendix B: Plan for Assessing Learning Outcomes

To maintain the credibility of the MS in Artificial Intelligence, the student learning outcomes will be assessed using a combination of formative and summative assessments throughout the semester and at the completion of each course. These assessments will focus on the direct application of AI technologies to ensure that students can enter the workforce with the skills necessary for success in their future career. For example, many of the elective courses will include final projects, presentations, and assignments where students have to work with real data sets. Students will be expected to process the data, perform tasks and analysis, and make recommendations as if they are entry-level AI professionals. The projects may include hands-on coding assignments, performance evaluations on AI solutions, and other assignments that utilize various machine learning frameworks. These projects may also allow students to explore different applications or areas of AI and can serve as a portfolio for future job searches. Through these assessments, students will demonstrate their problem-solving capabilities, their proficiency in scripting and programming, and their ability to leverage machine learning and computational frameworks and high-performance computing platforms by solving real-world problems in artificial intelligence.

Additionally, each course in the program will have homework assignments, quizzes, and/or other assessments that will be graded with constructive feedback to help assess the student's learning. These smaller, more formative assessments will strengthen students' understanding of the theoretical foundations of AI within each specific course. The formative assessments will be evaluated for their accuracy of the foundational knowledge and reasoning students need for more advanced applications of the materials. Summative and cumulative assessments, such as midterms and final exams or projects, will be used to determine if and to what level the student mastered the core AI concepts and specific learning outcomes for each course.

Many of the program courses will also address concerns of emerging AI, including the ethical, legal, and societal implications of AI. Assessments in these courses may include projects and presentations where students will be expected to effectively communicate AI technologies and applications to both technical and non-technical audiences. Students will also be expected to review case studies and articles in the field and to synthesize the information therein.

Lastly, students will be challenged to complete reflective assessments to apply knowledge and skills in their future professional work. This work will provide students with the skills that will assist them in the job search process and enable them to identify, apply to, and earn positions in artificial intelligence. The assessments will all follow best practices for adult and professional students. By the end of the program, students will have gained the knowledge and experience illustrated through the program-level outcomes, and their performance on the assessments will reflect how well they have achieved these goals.

Appendix C: Course Descriptions

Please note that the MSAI is not yet an existing course prefix and so there are no MSAI courses listed in our Graduate Catalog: https://academiccatalog.umd.edu/.

Core Courses

MSAI601 Probability and Statistics for AI (3 Credits)
The course provides a foundational understanding of concepts in probability theory and statistics tailored for artificial intelligence. The course covers the basic probabilistic concepts such as probability spaces, random variables and vectors, expectation, covariance, correlation, probability distribution functions, and hypothesis testing. etc. Conditional probabilities, the Bayes formula, limit theorems, and properties of jointly distributed random variables are also covered. Students will explore practical applications of probabilistic and statistical methods within the field of artificial intelligence through hands-on exercises and real-world problems.

MSAI602 Principles of Data Science for AI (3 Credits)
This course provides an introduction to the data science pipeline, including the processes of data collection, cleaning unstructured and messy data, data visualization, and statistical analysis. Students will also explore ethical considerations such as fairness, transparency, and bias mitigation. The course will offer students a broad overview of data science and the common tools and systems used in data science problems. Through case studies, students will consider different AI systems through the lens of data science.

MSAI603 Principles of Machine Learning for AI (3 Credits)
This course offers an introduction to the core concepts of machine learning. Students will learn fundamental ML techniques, including supervised and unsupervised learning, neural networks, decision trees, clustering, and PCA. The course will also discuss recent applications of machine learning in AI solutions, such as computer vision, data mining, autonomous navigation, and speech recognition. Students will also gain a basic understanding of ethical AI development and AI for social good.

MSAI605 Computing Systems for AI (3 Credits)
This course will focus on the programming, software and hardware design, and implementation issues of computing systems for machine learning and artificial intelligence applications. Students will explore a variety of topics, including basic Python program structure, functions and modules, basic I/O, object-oriented programming, database access, computer architecture, CPUs and GPUs, memory and I/O systems, virtual memory, and different processing architectures. The course will also cover AI model deployment, edge computing, and scalability challenges in large-scale AI systems.

MSAI606 Human-centered and Participatory Approaches to AI (3 Credits)

This course will cover a broad range of issues in developing human-centered AI with a focus on participatory approaches. We will look at approaches to building AI systems that expand human capabilities, and the interplay between human and AI skills. We will explore how to make use of expertise in those communities impacted by AI systems to design them better. Topics include the fundamentals of HCI and AI, interpretability and explainability in machine learning, human-centered design for AI, adaptive user interfaces, and conversational agents. The course will teach students to design machine learning systems that are well integrated with human capabilities and concerns.

MSAI630 Safe and Trustworthy AI (3 Credits)
Recent advances in AI have created powerful new models, but these models are not easily understood, and it is difficult to guarantee that they will behave in safe and predictable ways. In this course we will examine several key aspects of these models ranging from data privacy, secure code generation, bias and fairness, memorization and copyright infringement, poisoning and adversarial attacks on machine learning systems, reliability, robustness and safety.

MSAI631 AI and Society (3 Credits)
This course is an interdisciplinary exploration of the social impacts and ethical implications of AI. It examines the histories, social values and power dynamics shaping AI technologies, as well as how AI is reshaping culture, politics, and society. Students will develop a sociotechnical understanding of AI related to policy, education, labor, economic systems, and culture. Using approaches from the humanities and social sciences, students will develop frameworks to address ongoing challenges including digital inequality, bias, and surveillance. Students will also learn how AI has and can be used to foster positive social change.

Electives

MSAI604 Introduction to Optimization for AI (3 Credits)
This course introduces fundamental optimization techniques essential for artificial intelligence and machine learning. Students will start with an overview of linear algebra techniques, including vector spaces, linear ransformations, and eigen-decomposition, before moving to techniques in unconstrained and constrained optimization. The course will also explore global search methods, such as simulated annealing, with a focus on AI applications. Students will develop the skills to formulate and solve optimization problems, improving the efficiency and performance of AI models.

MSAI612 Deep Learning for AI (3 Credits)
This course provides a comprehensive introduction to deep learning, a key driver of modern artificial intelligence, with a focus on the main features in deep neural nets and their applications in AI. Students will explore a variety of topics, including backpropagation and its importance, coding tools and their use of parallelization, autoencoders, convolutional neural networks, recurrent and recursive neural networks, and attention-based models. Students will also apply deep learning techniques to real-world problems in computer vision, natural

language processing, and classification/clustering questions, gaining practical experience in building AI models.

MSAI632 Generative AI (3 Credits)
The course will explain the fundamental principles and important techniques in building large language models (LLMs), multi-modal LLMs, and image and video generation models. The class will study Transformer architectures and their use in pretraining, and discuss methods of fine-tuning models including the use of reinforcement learning. The class will study methods of data cleaning, including efficient methods of duplicate detection. And the class will examine computing methods for large scale models that are efficient and that can run in parallel. We will also discuss image and video generation methods, such as the use of stable diffusion.

MSAI633 AI Policy (3 Credits)
How can regulatory strategies promote innovation while safeguarding public interest? This course provides an examination of national and international regulatory and legal frameworks governing artificial intelligence. Students will learn about topics in policy considerations, including copyright, data privacy, bias and discrimination, and the explainability and accountability of AI systems in sectors finance, healthcare, and national security. Students will also learn about contemporary developments in AI governance, including through international AI regulations, national policies, and the advocacy of standards organizations.

MSAI634 AI in Engineering (3 Credits)
This course explores the role of artificial intelligence in engineering disciplines. Students will examine how AI technologies, including machine learning and neural networks, can help solve complex engineering problems and optimize processes. The course will cover a variety of topics and applications such as predictive modeling, automation, intelligent systems design, computer-aided design optimization, and environmental engineering. Students will learn how AI tools can be integrated into engineering workflows across various fields.

MSAI635 Reinforcement Learning (3 Credits)
This course covers both model-free and model-based reinforcement learning (RL), and it explores Markov decision processes, dynamic programming, Q-learning, policy gradient methods, and deep RL. Applications include robotics, game AI, and real-world decision-making systems.

MSAI636 Explainable and Interpretable AI (3 Credits)
As AI becomes more ubiquitous, interpretability is critical. This course explores techniques for understanding deep learning models, such as feature attribution, model distillation, LIME, SHAP, and counterfactual explanations, with an emphasis on ethical and regulatory considerations.

MSAI640 Computer Vision for AI (3 Credits)

This course provides an in-depth introduction to computer vision, a key field in artificial intelligence that enables machines to interpret and analyze visual data. Students will explore fundamental concepts such as image filtering, correlation, object detection, image segmentation, and scene reconstruction. This course will also include discussion on facial recognition, motion tracking, and ethical considerations in vision-based AI. Students will apply computer vision techniques to real-world AI problems.

MSAI641 Natural Language Processing for AI (3 Credits)
This course provides students with the fundamental concepts related to computers generating and processing natural language, including morphological analysis, phrase structure, word sense disambiguation, word embedding models, and advanced deep learning architectures used in NLP. With a focus on the applications of NLP, students will explore topics related to question answering, sentiment analysis, machine translation, text summarization, and chatbot creation.

MSAI642 Robotics for AI (3 Credits)
This course introduces the design and programming of robotic systems with a focus on AI-driven applications. Students will explore core concepts such as kinematics, differential motion, velocity, dynamics, and forces, along with the integration of sensors, actuators, and drive systems. The course covers trajectory planning, motion control, and the implementation of open-loop and closed-loop controllers. Key AI techniques, including state estimation and Kalman filters, will be examined in the context of robotics. Additionally, students will study recent advancements in machine learning for motion planning, grasping, manipulation, and other AI-powered robotic applications.

MSAI650 Cloud Computing for AI (3 Credits)
This course provides an in-depth exploration of state-of-the-art cloud computing technologies and their applications in artificial intelligence. Studenst will explore topics, including telecommunication needs, architectural models, cloud computing platforms and services, and network and storage virtualization technologies. The course will also include a discussion of key concerns in cloud computing such as security, privacy, and trust management. Students will gain practical experience in utilizing cloud-based tools and services to enhance AI workflows, ensuring robust and scalable AI applications.

MSAI651 Big Data Analytics for AI (3 Credits)
This course explores the challenges, tools, and techniques for designing and implementing machine learning algorithms at scale, with a focus on AI applications. Students will learn how to configure and operate distributed computing platforms to efficiently process massive datasets. Key topics include scalable learning techniques, data streaming, data flow analytics, and machine learning on large graphs. The course covers massively parallel computing models such as MapReduce, along with methods to optimize memory, storage, and communication in parallel machine learning algorithms. Additionally, students will gain hands-on experience with

SQL and NoSQL databases, distributed file systems, key-value stores, document databases, graph databases, and large-scale data visualization.

MSAI660 Probabilistic Graphical Models and Bayesian Learning (3 Credits)
This course focuses on the representation and inference of uncertainty in AI using probabilistic graphical models, such as Bayesian networks and Markov random fields. It also covers variational inference, sampling methods, and applications in decision-making and reasoning.

MSAI661 Causal Inference and AI Decision Making (3 Credits)
Unlike traditional correlation-based learning, causal AI seeks to understand cause-and-effect relationships. This course explores Pearl's causal inference framework, causal discovery, and interventions for AI decision systems.

MSAI662 Adversarial Machine Learning and Robustness (3 Credits)
This course explores vulnerabilities in AI models, covering adversarial attacks, defenses, and the study of robustness in deep learning models against perturbations.

MSAI663 Graph Neural Networks and Structured Data Learning (3 Credits)
Graph neural networks (GNNs) enable AI models to work with non-Euclidean structured data. This course covers graph representation learning, message passing, and applications in social networks, bioinformatics, and knowledge graphs.

MSAI664 Meta-Learning and Few-Shot Learning (3 Credits)
This course explores learning-to-learn approaches, including model-agnostic meta-learning (MAML), few-shot classification, and applications in fast model adaptation.

MSAI665 AI for Healthcare and Biomedical Applications (3 Credits)
Applications of AI in medicine, including medical imaging, genomics, drug discovery, and personalized healthcare solutions.

MSAI666 AI for Cybersecurity and Threat Detection (3 Credits)
Examines AI-driven cybersecurity measures, including anomaly detection, malware analysis, adversarial robustness, and security threats in machine learning systems.

MSAI667 AI for Finance and Algorithmic Trading (3 Credits)
Covers AI applications in finance, including reinforcement learning for trading strategies, risk modeling, fraud detection, and AI-driven market forecasting.

MSAI670 Applied Ethics of AI (3 Credits)
As artificial intelligence tools are increasingly used in high stakes scenarios throughout our lives, it is increasingly important to understand the ethical considerations behind their use. This course will introduce students to applied ethics, a major subfield of contemporary Philosophy, as a way of making sense of how AI tools can be built and used ethically. The course will

consider a broad range of topics, ranging from human-robot interaction to algorithmic bias, from autonomous weapon systems to algorithmic accountability and opacity. The tools students learn in this course will be broadly applicable to all forms of artificial intelligence, both present and future.