Michigan Tech

Office Memo

Office of the Provost and
Senior Vice President for Academic Affairs

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TO: Richard Koubek, President

FROM: Andrew Storer, Provost & Senior Vice President for Academic Affairs

DATE: November 11, 2025

SUBJECT: Senate Proposal 31-25

Attached is Senate proposal 31-25, “Graduate Certificate in Foundations of Artificial Intelligence” and a memo stating the Senate passed this proposal at their November 6, 2025 meeting. I have reviewed this memo and recommend approving the proposal and sharing with the Senate that the administration appreciates the content relating to resource needs for this program and anticipates resource allocation to be consistent with existing resourcing plans (as indicated in the proposal) and the university budgeting process.

If you concur with my recommendation, advertising the new graduate certificate can begin since approvals from the Board, MASU, and in this case HLC are not required.

I concur X do not concur_____ with the provost’s recommendation as stated in this memo.

Richard Koubek, President

11/11/25

Date

University Senate

DATE:	November 06, 2025
TO:	Richard Koubek, President
FROM:	Robert Hutchinson, University Senate President
SUBJECT:	Proposal 31-25
COPIES:	Andrew Storer, Provost & Senior VP for Academic Affairs

At its meeting on November 06, 2025, the University Senate approved Proposal 31-25, “Graduate Certificate in Foundations of Artificial Intelligence.” Feel free to contact me if you have any questions.

The University Senate of Michigan Technological University
Proposal 31-25
(Voting Units: Academic)

Graduate Certificate in Foundations of Artificial Intelligence

Basic Program Information

Primary Contact: Zhenlin Wang, Chair - Computer Science
Program / Degree type: Graduate Certificate
Program Title: Graduate Certificate in Foundations of Artificial Intelligence
Planned Implementation Date: Fall 2026
Program location / modality: Face-to-face and online
Target student Population:
The new certificate is targeted towards existing graduate students in the Master's in Computer Science, Master's in Data Science, Master's in Applied Computer Science, Master's in Cybersecurity. Additionally, other graduate students with sufficient computer science, programming, and mathematical / statistical background may benefit from the new graduate certificate (for example, students with a background in environmental data science, computational biology, computational chemistry, physics, computer engineering, and more). When the certificate is made available online, additional opportunities for new students to enroll will be available.

General description and characteristics of program

The certificate in Foundations of Artificial Intelligence (AI) is a 9-credit graduate certificate designed for students to gain knowledge in the fundamental topics of AI. The curriculum of the certificate will integrate with required or elective course requirements in several graduate programs, e.g., Computer Science, Data Science, and Applied Computer Science. The new certificate will serve as an anchor towards additional credentialing, that is creating stackable certificates towards a Master's in AI, which we plan to propose in Fall. The additional graduate certificates may be focused on specialization within AI and machine learning (ML) and/or the application of artificial intelligence. In the latter, other certificates and courses across campus may be included in the future.

Rationale

AI has become a driving force of current and future innovation in industry. The demand for skilled AI professionals continues to grow rapidly. Based on the 2025 Future of Jobs Report by the Word Economic Forum, AI and big data analysis will become the leading technical skills required by employers in 2030. The market analysis by LightCast, a labor market analytics firm,

shows that the computing job market is projected to grow by 17% and 14.2%, respectively, across the nation and in the Great Lakes region from 2023 to 2028. Based on the job postings in 2024, next to the general term computer science, Python, AI, and ML dominate the most desired skills. Note that Python is the most popular programming language for AI and ML. Based on this trend, even professionals with a computer science background can benefit from this certificate by equipping themselves with necessary AI and ML expertise demanded by the market and employers. This certificate offers students in the computing field and other professionals the foundational post-graduate skills in AI and prepares them for the growing market. We plan to offer the certificate both in-person and online.

Related programs: within MTU and at other institutions

Related Programs within MTU:

- Certificate in AI for Business Information Systems - a 9-credit certificate to prepare students to understand how information technology, AI, and ML can be used within organizations to support strategic and operational business objectives.
- Certificate in Artificial Intelligence in Healthcare - a 9-credit certificate to prepare students to understand how AI technologies can be applied to the healthcare industry, and use vast digital health datasets to improve health care operations, safety, and delivery.
- Certificate in Accounting Analytics - a 9-credit certificate to prepare students to develop knowledge and skills in a contemporary accounting environment that utilizes analytics to drive informed business decision making.
- Certificate in Data Science Foundations - a 9-credit certificate that focuses on the understanding of data science tools, technologies and techniques.
- MS in Applied Computer Science - a MS degree program that focuses on the practical application of computing technologies to solve real-world problems, offering students a robust curriculum to prepare them for careers in industry and applied research.
- MS in Computer Science - a MS degree program that offers a comprehensive and flexible curriculum that equips students with advanced knowledge and skills in the broad areas of computing, preparing them for successful careers in industry, academia, and research.
- MS in Cybersecurity - a MS degree program that provides students with advanced knowledge and hands-on experience in securing digital systems, networks, and data, with a focus on critical areas such as network security, cryptography, cyber-physical systems, and risk management.
- MS in Data Science - a MS degree program that equips students with the skills and knowledge needed to analyze complex data, develop predictive models, and derive actionable insights, with a focus on ML, big data analytics, data visualization, and data management.

Recent Related Programs within MASU:

- Ferris State University - BS in Artificial Intelligence
- Oakland University - BS in Artificial Intelligence, MS in Artificial Intelligence
- University of Michigan, Dearborn - MS in Artificial Intelligence

- University of Michigan, Flint - MS in Artificial Intelligence
- Wayne State University - MS in Artificial Intelligence

Related Programs in the Region:

- Purdue University - Graduate Certificate in Foundations of Artificial Intelligence, MS in Artificial Intelligence
- University of Wisconsin-Madison - BS in Computer Engineering with a focus on Machine Learning and Data Science
- University of Minnesota-Twin Cities - MS in Robotics
- Illinois Institute of Technology - BS in Artificial Intelligence
- University of Illinois at Chicago - Master in Engineering with a focus in AI and Machine Learning
- Northwestern University - MS in Artificial Intelligence

Related Programs Nationwide:

- University of Pennsylvania - Graduate Certificate in Artificial Intelligence, MSE in Artificial Intelligence
- University of Texas, Austin - MS in Artificial Intelligence
- Northeastern University - MS in Artificial Intelligence
- Washington University - Graduate Certificate in Artificial Intelligence and Machine Learning for Engineering, MS in Artificial Intelligence and Machine Learning for Engineering

Projected Enrollment

The table below shows expected enrollment. We expect interest to be high among students from the Data Science Master's, Computer Science Master's and Applied Computer Science Master's.

Table 1. Projected enrollment per year

Academic Year	**Projected Enrollment**	
	On Campus	**Online**
2026-2027	5	—
2027-2028	10	5
2028-2029	15	10
2029-2030	20	15

Specialized Accreditation Requirements

Not applicable

Professional License Requirements

Not applicable

Curriculum Details

Learning Goals

Upon successful completion of the graduate certificate, students will be able to:

1. Analyze machine learning (ML) and Artificial Intelligence (AI) algorithms to select appropriate solutions for given problems, evaluating their strengths, limitations, and computational requirements.
2. Apply or design practical AI/ML solutions for real-world problems, including model development, agent design and development, optimization, and/or results interpretation.

Assessment Plan

The following table describes the assessment points for the learning outcomes (LO) and in what course the assessment(s) will occur.

Assessment Points for Learning Outcomes (LOs)	**Learning Outcomes addressed**	**Notes on Assessment**
Analyze ML and AI	LO 1	Evaluation form filled out by course instructor of CS5851 and CS 4081
Apply AI/ML Methods	LO 2	Evaluation form filled out by course instructor of CS 4081 and CS 5841
Grades in courses	LO 1, LO 2	Excellent: all As Satisfactory: no grade <= B Marginal: only one grade <= B Deficient: more than one grad <= B

Data Compilation Plan

Course instructors will assess students on the two learning objectives using specific evaluation forms and rubrics (see table below for sample rubrics). The forms will be available as a Google Form / Spreadsheet for course instructors to input their evaluation. Results will be merged and summarized.

LO	Deficient	Marginal	Satisfactory	Excellent
LO1: Analyze ML and AI	Unable to demonstrate	Displays a limited	Displays a good understanding of	Demonstrates an exemplary

	understanding of ML and AI	understanding of ML and AI	ML and AI	understanding of ML and AI topics.
LO2: Apply practical AI and ML methods and techniques to solve real-world problems	Improper selection and/or application of AI and ML methods	Displays a basic understanding of AI and ML methods, but has some misapplications.	Displays a solid understanding of AI and ML methods.	Displays a mastery of AI and ML methods. Created elegant and efficient solutions.

Student's grades will be collected from Banner each year. The grades will be mapped to the proficiency levels in the table. A summary report will be created that indicates the number of students that are deficient, marginal, satisfactory, and excellent.

Curriculum Design

The graduate certificate will require 9 credits:

- CS 5861 - Artificial Intelligence Theory and Applications (3 credits) - NEW
  Offered in Fall and Spring semester. CS5861 is dual-listed with CS4861, Introduction to Artificial Intelligence.

- CS 4801 - Foundations of Machine Learning (3 credits)
  Course added in binder process Fall 2024, will be offered in AY 2025-2026.
  Offered in Fall

- CS 5841 - Machine Learning (3 credits)
  Prerequisite: CS 4801
  Offered in Spring. We will rename this course to Deep Learning in the binder process Fall 2025.

New Course Descriptions

- CS 4861 / CS 5861 -Introduction to Artificial Intelligence / Artificial Intelligence Theory and Applications (3 credits)
  Introduction to Artificial Intelligence is currently taught in CS 4811 and a separate advanced AI course in CS 5811. We propose to create a new dual-listed course in Intro to AI / AI Theory and Applications as CS 4861 / CS 5861 that will be an adaptation of CS 4811 with some additional content for the graduate level course. What was CS 5811 - Adv. AI will become a new course CS 6811, Special Topics in AI, allowing for deeper knowledge and specialization.

- A new course form is included as an attachment for this “new” course.

Model Schedule

Students may start the certificate in either Fall or Spring. There is a restriction to complete CS 4801 before taking CS 5841, but otherwise there is flexibility of when the courses are taken. Also, the enrollment for CS 5841 is already high. If interest continues to grow in CS 5841 and CS 4081, they will be offered in both Fall and Spring (or add a summer option).

Example Schedule A			Example Schedule B			Example Schedule C	
Fall	CS 5861 CS 4801		Spring	CS 5861		Fall	CS 4081
Spring	CS 5841		Fall	CS 4081		Spring	CS 5841
			Spring	CS 5841		Fall	CS 5861

Faculty Qualifications

The faculty listed below have all taught at least one of the courses in the curriculum or strongly related to AI topics. All faculty listed, except Dr. Al Khamaiseh, has graduate faculty status. We plan to have Dr. Al Khamaiseh added by Fall 2025. All faculty have completed training to teach online courses.

- Dr. Koloud Al Khamaiseh - Assistant Teaching Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/alkhamaiseh/
  Taught CS 4811
- Dr. Laura E. Brown - Associate Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/brown/
  Taught CS 4811, CS 5811, design CS 4801
- Dr. Timothy C. Havens - Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/havens/
  Taught CS 5841
- Dr. Nilufer Onder - Associate Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/n-onder/
  Taught CS 4811, CS 5811
- Dr. Sujan Kumar Roy - Assistant Teaching Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/roy/
  Taught CS 5841, co-design CS 4801
- Dr. Leo C. Ureel II, Assistant Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/ureel/
  Taught CS 4811
- Dr. Keith Vertanen, Associate Professor, Computer Science
  https://www.mtu.edu/cs/department/people/faculty/vertanen/
  Taught CS 5090 - Natural Language Processing

Program-specific policies, regulations, and rules

The program follows the general senate policy on a graduate certificate. There are no program-specific policies and rules for this new Graduate Certificate.

Resources Needed

Online Course Development

The CS Department will work with the College of Computing and Global Campus to secure resources to develop the online courses in this certificate.

Library and other learning resources

No additional library or learning resources are needed initially. The CS Department will add a graduate learning center coach when the enrollment reaches 10. The department will depend on the online returns to hire additional TAs or graders when the enrollment grows.

Suitability of existing space, facilities, and equipment

Initially, the College of Computing plans to utilize the existing AC virtual cluster and/or cloud resources to meet the needs of AI/ML courses. With the increasing enrollment, future solutions involving GPU clusters can be explored to accommodate the growing demands.

Program Costs

The certificate is designed to use or adapt existing courses. However, if the popularity of the certificate grows the frequency of course offerings may need to increase.

If the certificate goes online fully, additional costs may be necessary to make the pedagogical shift as well as require additional faculty and GTA resources.