

Intent to Plan for a New Program
South Dakota Board of Regents
Academic Affairs Forms

Internal Ticket ID: 7430
Created: 4/3/2023
Modified: 7/11/2023

Use this form to request authorization to plan a new baccalaureate major, associate degree program, or graduate program; formal approval or waiver of an Intent to Plan is required before a university may submit a related full proposal request for a new program. The Executive Director and/or their designees may request additional information. After the university President approves the Intent to Plan, submit a signed copy to the Executive Director through the System Academic Officer through the proper process. Only post the Intent to Plan to the university website for review by other universities after approval by the Executive Director, System Academic Officer or designee. This form is meant to capture critical elements for stakeholders to review prior to a full proposal.

University DSU - Dakota State University

Degree MS : Master of
Science

Name of Major X999 : New Major Requested **Artificial Intelligence and Machine Learning (MSAIML)**
No

Specialization Required? *Note: If the new proposed program includes specific specializations within it, complete and submit a New Specialization Form for each proposed specialization and attach it to this form. Since specializations appear on transcripts, they require Board approval.*

College/Department 8N : DSU Beacom Comp Cyber Sciences/DCSI : Computer Science

Intended Date of Full Proposal Fall 2024

Planned CIP Code 110102

Program Description

1. Provide the working program description that may appear in the university catalog.

Dakota State University's Master of Science in Artificial Intelligence (AI) and Machine Learning (ML) provides students with a foundation in intelligent interaction, knowledge management and deep learning. The programs seeks to help students understand AI/ML frameworks so that application may be made to their own work and learning environments. Available electives are designed to build on the core outcomes of AI/ML. The courses will be accessible online to accommodate working professionals interested in this area of graduate study.

Additional information on Artificial Intelligence/Machine Learning -

Computer Science (CS) covers a broad range of topics, including databases, networking, software engineering, algorithm design & analysis, the theory of computation, human & computer interaction, cyber operations, data structures, and much more, including artificial intelligence (A.I.). The M.S. in CS is designed to allow students to study these different topics or pursue a specialization further into one of these areas while maintaining a strong foundation in pure CS. Students who elect to pursue the M.S. in CS with a specialization in A.I. can expect to receive a foundational understanding of Computer Science and Artificial Intelligence. Students can elect to focus on A.I. topics that are traditionally considered part of CS, such as pathfinding, process automation, and A.I. specific algorithms; or they may elect to get a foundational understanding of related A.I. topics, such as data analysis, computer vision, and natural language processing that they can continue to study beyond their graduation.

Artificial intelligence has traditionally been considered a field of computer science that contains many subfields within itself. Topics include machine learning, deep learning, natural language processing, large language models, computer vision, robotics & autonomous systems, swarm behavior, pathfinding, game playing, reinforcement learning, and much more. In its modern state, A.I. is considered an interdisciplinary field that incorporates elements from computer science, data science, probability & statistics, and even psychology, linguistics, ethics, and philosophy. Students pursuing the M.S. in A.I. will gain the foundational elements from these different disciplines and will still have the capacity to dive deeply into a topic of choice.

The primary difference between the two programs is that the M.S. in Computer Science (CS) requires students to study core CS course topics for half of their required credits. Those who wish to pursue the A.I. specialization must take a specialized mathematics course and then A.I. topics of their choice for their remaining credits. The M.S. in A.I. covers the foundations of CS, data science, mathematics, statistics, and ethics that are needed to dive more deeply into modern A.I. fields.

Students who are accepted into the M.S. in CS program are expected to have a solid background in computer science with a certain degree of mathematics. Many have bachelor's degrees in CS, information systems, mathematics, cyber operations, and other highly technical fields. Students accepted into the M.S. in A.I. will be required to have some programming experience, where a scripting language such as Python or R is sufficient, along with calculus and statistics. Students may not necessarily have a strong technical background and have bachelor's degrees from an Arts & Sciences field, such as Philosophy, Social Sciences, or Linguistics. This allows students who learn A.I. to apply it to the fields related to their background.

Students who graduate with an M.S. in Computer Science including a specialization in A.I. are well equipped for software and algorithm design in industries that utilize A.I. in their products. Positions include Software Engineer/Developer with a focus on building A.I.-enabled applications, integrating A.I. components into existing systems, or creating A.I. frameworks and libraries. Systems Architect designing large-scale A.I. systems at scale to support A.I. workflows, data pipelines, and distributed computing. Data Engineer managing large volumes of data for A.I. applications and algorithms. Cloud Computing Architect designing A.I. solutions on cloud platforms. And Algorithm Developer in a R&D role, specializing in A.I. applications.

Students graduating with the M.S. in A.I. have opportunities that require a foundational level of programming and algorithms, but a deeper understanding of data science, computer vision, natural language processing, or other A.I. related topic. A.I. is a quickly changing field, and the labor market is adjusting with it. The Bureau of Labor Statistics is a little slow to define and include A.I. specific jobs in their reports, generalizing them to Data Scientist or Software Engineer, but career service databases such as Indeed¹ provide a snapshot into the current A.I. labor needs in the economy. These positions include Machine Learning Engineer implementing A.I. algorithms and models to create intelligent systems. While not as trained as those who study a straight Data Science degree, students will graduate with a foundational understanding that they can use as a platform to further pursue a data science career. Research A.I. Scientist positions for graduate students display the need for specialties in deep learning, computer vision, natural language processing, generative models, and other specific A.I. fields.

Nearly every industry is looking to employ students who can assist in applying A.I. to their existing or emerging business. At the same time, industry is currently experiencing a boom in companies developing new A.I. algorithms and technologies. The largest and most recent development of A.I. in industry is applying large language models, such as GPT 4.0, to their business. Use cases include educational assistants, like Khan Academy's Khanmigo², or industry specific chat bots. Content creation is also an emerging industry that utilizes A.I., with technologies such as Stable Diffusion³ that create realistic or artistic images given a text prompt. A.I. Consultants provide expertise and guidance to organizations looking to adopt such A.I. technologies. The M.S. in A.I. program is designed to give students the skillset needed to meet these industry needs.

Dakota State University is already working with stakeholders looking for students with these specific skillsets. For example, AI Sweden⁴ is the national center for applied A.I. in Sweden, funded by the Swedish government and industry partners, such as Volvo, Dell Technologies, Google, Hewlett Packard Enterprise, Intel, and many more. We currently have a summer industrial immersion program⁵ with AI Sweden where students from both DSU and Sweden collaborate with industry partners to work on projects that lead to research papers and potentially careers. Regional companies, including Sanford Health⁶, Raven Industries⁷, and PAR⁸ have expressed similar interest for students to do internships and research projects leading to potential employment. Other proposed assistance from stakeholders includes adjunct teaching, guest lecturing, and curriculum guidance in the A.I. programs we offer. These partnerships have been instrumental in the formulation of what the M.S. in A.I. program will look like, and their on-going assistance will be utilized and greatly appreciated.

Also, Dakota State University has a strong relationship with multiple governmental agencies stemming from our nationally renowned Cybersecurity degrees. These agencies have made clear that Artificial Intelligence will play an important role in their operations and are looking to hire and support

students who are training in the field.⁹

The current state of A.I. is quickly evolving and requires a distinct foundation that allows students to specialize in A.I. specific topics. By creating our proposed M.S. in A.I., we are looking to provide a workforce with the skillset directly requested by our industry, government, and academic partners.

Citations

1 [https://www.indeed.com/lead/artificial-intelligence-report?](https://www.indeed.com/lead/artificial-intelligence-report?gclid=Cj0KCCQjw7PCjBhDwARIsANo7CgkQVr_oYCHB39_nmp9OikIowou0uyDuRHV14OHiyfLZZfM9UsRrs4aAqJqEALw_wcB&acid=&gclsrc=aw.ds)

[gclid=Cj0KCCQjw7PCjBhDwARIsANo7CgkQVr_oYCHB39_nmp9OikIowou0uyDuRHV14OHiyfLZZfM9UsRrs4aAqJqEALw_wcB&acid=&gclsrc=aw.ds](https://www.indeed.com/lead/artificial-intelligence-report?gclid=Cj0KCCQjw7PCjBhDwARIsANo7CgkQVr_oYCHB39_nmp9OikIowou0uyDuRHV14OHiyfLZZfM9UsRrs4aAqJqEALw_wcB&acid=&gclsrc=aw.ds)
August 23, 2018

2 <https://www.khanacademy.org/khan-labs>

3 <https://stability.ai/stablediffusion>

4 <https://www.ai.se/en>

5 <https://dsu.edu/news/2022/08/cutting-edge-learning.html>. August 15, 2022

6 <https://www.sanfordhealth.org/>

7 <https://ravenind.com/>

8 <https://www.par.com/>

9 <https://www.defense.gov/News/News-Stories/Article/Article/2805760/general-says-artificial-intelligence-will-play-important-role-in-network-defense/>, October 8, 2021

Strategic Impact

2. Describe how the program fits in with the institutional mission, strategic plan, existing institutional program array, and academic priorities.

The Legislature established Dakota State University as an institution specializing in programs in computer management, computer information systems, and other related undergraduate and graduate programs as outlined in SDCL 13-59 -2.2. This mission is actualized in the Beacom College of Computer and Cyber Sciences which offers certificate and degree programs from the associate to the doctoral level in areas related to computer science, cyber operations, cyber defense, network administration, and computer game design.

Dakota State University currently offers a Bachelor of Science degree in Artificial Intelligence. In seeking to offer a Master of Science degree in Artificial Intelligence, we desire to build a synergy between AI and our other mission-centric graduate programs in Information Systems, Data Analytics, and Health Informatics, while stretching impacts with our partners into new domains like cyber-agriculture and cyber threat intelligence. In the last decade we have watched organizations embrace data-driven decision making that entails AI informed intelligence. We have prepared students for those environments by offering two related courses in AI applications and deep learning. We want students to embrace emerging forms of decision support systems, networks, and statistical models, as well as adapt to AI informed ones. Our interest in AI will be systemic, which will help us better study its economic, ethical and educational impacts.

Dakota State University's Strategic Plan ADVANCE 2027 identifies five pillars of institutional focus. The design and delivery of an MS degree in Artificial Intelligence/Machine Learning directly addresses two of these pillars over the five-year strategic plan timeline. Students prepared for emerging job opportunities in AI/ML address a milestone of Pillar 1-Enhance Student Success to place 100% of students in employment within 6 months of graduation. And increasing "the number of graduates in computer science, cyber operations, and artificial intelligence" by at least 10% is a specific milestone of Pillar 5-Increase Sustainability and Resilience.

The Legislature established Dakota State University as an institution specializing in programs in computer management, computer information systems, and other related undergraduate and graduate programs as outlined in SDCL 13-59-2.2. The Beacom College of Computer and Cyber Sciences provides complete realization of this mission in its programs related to computer science, cyber operations, cyber defense, network administration, and computer game design. The Master's Degree in Artificial Intelligence and Machine Learning is yet another step in DSU's response to the SD Board of Regents directive to provide undergraduate and graduate programs that respond to the need and environment and the ever-evolving computer-science sector (BOR Policy 1:10:5).

DSU offers a BS in Artificial Intelligence. This major started in Fall 2021 and currently has 18 students enrolled. DSU recently added an Artificial Intelligence Specialization in the MS Computer Science with enrollment at 7. MS Analytics has a six-credit track in Artificial Intelligence. In addition to these master's degrees, the university offers master's degrees in Information Systems and Cyber Defense and doctorate degrees in Information Systems, Cyber Operations, Cyber Defense and Computer Science. Given our mission and strength in computer and cyber technologies, cyber leadership, education, and business, DSU is ideally suited to offer a degree in Artificial Intelligence and Machine Learning.

If the program does not align to the strategic plan, provide a compelling rationale for the institution to offer the program.

3. How does the program connect to the Board of Regent's Strategic Plan?

The Intent to Plan for a master's degree in Artificial Intelligence is yet another step in DSU's response to the SD Board of Regents' directive to provide undergraduate and graduate programs that respond to the growing need in the ever-evolving computer-science sector (BOR Policy 1:10:5). As one of 10 universities nationwide that carries all three of the U.S. National Security Agency's (NSA) Center of Academic Excellence (CAE) designations, the addition of a Master of Science in Artificial Intelligence/Machine Learning allows us to broaden the terms of our collaborations with Federal and international partners in alignment with the Board of Regents stated mission to provide high quality academic experiences for students that lead to high impact careers. (Board of Regents Strategic Plan 2022-2027, Goal 3: Academic Excellence, Student Outcomes, Educational Attainment, and Goal 4: Workforce and Economic Development)

Program Summary

4. If a new degree is proposed, what is the rationale?

This question refers to the type of degree, not the program. For example, if your university has authorization to offer the Bachelor of Science and the program requested is a Bachelor of Science, then the request is not for a new degree.

This is not a new degree.

5. What modality/modalities will be used to offer the new program?

Note: The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery.

	Yes/No	Intended Start Date
On Campus	Yes	2024

	Yes/No	Location(s)	Intended Start Date
Off Campus Location	No		

	Yes/No	Delivery Method(s)	Intended Start Date
Distance Delivery	Yes		Fall 2024

	Yes/No	Identify Institutions
Does another BOR institution already have authorization to offer the program online?	No	

6. If the program will be offered through distance delivery, identify the planned instructional modality:

Synchronous : Courses are offered at scheduled, pre-determined times, remotely.

Academic Quality

7. What peer institutions and current national standards will be referenced to develop the curriculum for this program? Include links to at least 3 comparable programs at peer institutions and links to national or accreditation standards, if any.

Comparable Programs at research institutions:

- University of Michigan Dearborn, College of Engineering and Computer Science, MS in Artificial Intelligence (link: [https://umdearborn.edu/cecs/departments/computer-and-information-science/graduate-programs/ms-artificial-intelligence#:~:text=The%20Artificial%20Intelligence%20master's%20degree,4\)%20Knowledge%20Management%20and%20Reasoning.](https://umdearborn.edu/cecs/departments/computer-and-information-science/graduate-programs/ms-artificial-intelligence#:~:text=The%20Artificial%20Intelligence%20master's%20degree,4)%20Knowledge%20Management%20and%20Reasoning.))
- University of Georgia, Franklin College of Engineering, MS in Artificial Intelligence (link: <https://ai.uga.edu/ms-artificial-intelligence>)
- Johns Hopkins University Whiting School of Engineering, Master of Science Artificial Intelligence (link: <https://ep.jhu.edu/programs/artificial-intelligence/>)

Current National Standards:

- Artificial Intelligence Board of America (ARTiBA). Helps institutions benchmark quality teaching, learning and research in AI and ML, part of the Data Science Council of America. (link: <https://www.artiba.org/partner-artiba/universities-partnership>)
- National Institute of Standards and Technology (NIST) Artificial Intelligence Standards. Technical standards and related tools developed by federal government with stakeholders from private and public sectors for AI use research, use and development (link: <https://www.nist.gov/system/files/documents/2023/03/30/AI%20Fact%20Sheet%200615%20FINAL.pdf>)

8. What program accreditation is available, if any?

NA

9. Will the proposed program pursue accreditation or certifications?

No

If no, why has the department elected not to pursue accreditation for the program?

Duplication and Competition

10. Do any related programs exist at other public universities in South Dakota?

*A list of existing programs is available through the university websites and the RIS Reporting: Academic Reports Database. If there are no related programs within the Regental system, indicate **none**.*

There are no graduate degrees in Artificial Intelligence offered by South Dakota Regental Institutions.

Both Dakota State University and University of South Dakota offer a BS and MS in Computer Science with specialization in Artificial Intelligence. USD offers an undergraduate and graduate certificate in Artificial Intelligence. DSU offers a BS in Artificial Intelligence, a BS in Artificial Intelligence for Organizations, a Minor in Artificial Intelligence and Machine Learning, and 30 credits of graduate instruction in artificial intelligence and machine learning. (keep the list that is currently in our response).

A. If yes, defend the need for an additional program within the state, Include IPEDS enrollment data and additional data as needed.

B. If yes, would this program be a candidate for Regental system collaboration?

11. Do any related programs exist at any non-Regental college or university within 100 miles of the university?

List those programs here:

Our review of programs in Artificial Intelligence & Machine Learning programs in Minnesota, North Dakota, Montana, or Wyoming provides no clear-cut Master's in AI or ML program. A closer lens yields offerings only at the certificate level from programs well outside the designated circumference.

- St. Mary's University (Minneapolis, MN) Online AI Certificate (No MS)
- Minnesota State University (Mankato, MN) MS in Data Science (Machine Learning & AI Focus)
- Montana State (Bozeman, MT) Grad Certificate in AI (No MS)
- University of North Dakota (Grand Forks, ND) AI & Machine Learning Graduate Certificate (No MS)

A. If yes, use IPEDS to identify the enrollment in those programs.

B. What evidence suggests there is unmet student demand for the proposed program, or that the proposed program would attract students away from the existing program?

Market Demand

This section establishes the market demand for the proposed program (eg Regental system need, institutional need, workforce need). Use the following sources for your data:

- [South Dakota Department of Labor & Regulation](#)
- [O-Net](#)
- [US Department of Labor Projections Central](#)
- SDBOR Workforce and Degree Gap Analysis Report

12. What is the expected growth of the industry or occupation in South Dakota and nationally?

Include the number of openings, as well as the percentage of growth when possible.

The ubiquity of artificial intelligence was predicted by Ford (2021) “Artificial intelligence is a systematic, general-purpose technology not unlike electricity, and it will therefore ultimately scale across and invade every aspect of our economy and society.” (Rule of the Robots: How Artificial Intelligence Will Transform Everything. By Martin Ford. New York, NY: Hachette Book Group, Inc., 2021, 311 pp., \$30.00 hardcover. <https://www.bls.gov/opub/mlr/2022/book-review/the-artificial-intelligence-storm-is-upon-us.htm>).

From a global perspective, The Future Jobs Reports produced for the World Economic Forum (2020) estimated that artificial intelligence would create 97 million jobs, and positively impact the economy to the tune of \$15.7 trillion. According to a 2019 Dun & Bradstreet report, 40% of organizations are adding more jobs as a result of adopting AI, while only 8% are cutting jobs because of the new technology.

Artificial Intelligence is of national and international interest. In February of 2019, the White House released Executive Order 13859 ([link: https://www.epa.gov/laws-regulations/summary-executive-order-13859-maintaining-american-leadership-artificial](https://www.epa.gov/laws-regulations/summary-executive-order-13859-maintaining-american-leadership-artificial)) announcing the American Artificial Intelligence Initiative. Entailed in this document is a national strategy for promoting U.S. leadership in AI, where one of the key policies and practices included training an AI-ready workforce.

The U.S. Dept. of Labor Projections Central projects that employment in data and mathematical science will grow 31% from 2020 to 2030. And computer and information technology occupations are projected to grow 21% in the same period. This increase is expected to result in about 762,800 new jobs over the decade.

It's important to note that many new jobs created for degrees such as this are new enough such that they are not listed on the South Dakota Department of Labor's (SDLR) website or the U.S. Bureau of Labor Statistics (BLS). These types of positions include Machine Learning Engineers, and Applied AI Specialists. But between 2020 and 2030, the SDLR projects rates of growth in these AI/ML related areas: Computer and Information Systems Managers (16.5%), Computer Systems Analysts (13.2%), Information Security Analysts (42.2%), and Database Administrators and Architects (9.8%). Dakota State University received a \$30 million appropriation and \$60 million gift in 2022 to launch specific cyber initiatives within the state to culminate in the construction and staffing of a 100,000 square foot Applied Research Center (ARC) in Sioux Falls. Three specific academic programs are necessary to produce graduates with the necessary technical acumen to serve as research engineers within the ARC – computer science, cyber operations, and artificial intelligence. The development of programs in AI at DSU are critical to this endeavor. Additionally, the university is actively engaged in national and international research and collaborative endeavors pertaining to artificial intelligence and machine learning, including our membership in AI Sweden which has been funded by Case New Holland.

Students who graduate with an M.S. in Computer Science including a specialization in A.I. are well equipped for software and algorithm design in industries that utilize A.I. in their products. Positions include Software Engineer/Developer with a focus on building A.I.-enabled applications, integrating A.I. components into existing systems, or creating A.I. frameworks and libraries. Systems Architect designing large-scale A.I. systems at scale to support A.I. workflows, data pipelines, and distributed computing. Data Engineer managing large volumes of data for A.I. applications and algorithms. Cloud Computing Architect designing A.I. solutions on cloud platforms. And Algorithm Developer in a R&D role, specializing in A.I. applications.

13. What evidence, if any, suggests there are unfilled openings in South Dakota or nationally?

In South Dakota, the biggest impact on the economy is agriculture. Research and deployment of AI software and robotics will be a key component to increasing crop and livestock production, as well as operational throughput in 'smart agriculture' processes. DSU's specific strength in cybersecurity and its growth in AI/ML research will be critically important in protecting the agricultural industry from interference from bad actors, as has been evidenced by Russian sabotage of Ukraine's agricultural industry. AI is also used in many areas of medical research, and the placement of DSU's ARC near the planned Sanford Virtual Care Center is not accidental.

These jobs provide different roles to help firms make scientific or data-driven decisions or automate tasks to reduce costs or scale products, create physical automated bots for a myriad of purposes, or provide research into new applications. These services pertain to nearly all industries.

14. What salaries can program graduates expect to earn in South Dakota and nationally?

As of May 2021, the median annual wage for this group was \$97,430, which was higher than the median annual wage for all occupations of \$45,760 ([link: https://www.bls.gov/ooh/computer-and-information-technology/home.htm](https://www.bls.gov/ooh/computer-and-information-technology/home.htm)). Artificial Intelligence jobs include:

Machine Learning Engineer
Deep Learning Engineer
Computer Vision Engineer
Data Scientist

Algorithm Developer
 Developer Consultant
 Director of Data Science
 Computer Systems Analyst

15. Optional: Provide any additional evidence of regional demand for the program.

e.g. prospective student interest survey data, letters of support from employers, community needs...

Student Demand

16. Provide evidence of student enrollment at peer institutions that offer the same/similar program using data obtained from IPEDS.

Choose programs not already listed in question 11. Use the most recent year available.

University Name	State	Program Name	Number of Degrees Conferred in Program	Total Number of Conferrals at Level (Undergrad or Grad)
Dakota State University	SD : South Dakota	BS Artificial Intelligence (Fall 2021)		18
Dakota State University	SD : South Dakota	MS Computer Science, AI Specialization (Fall 22)		7
University of South Dakota	SD : South Dakota	MS Computer Science, AI Specialization (34 Enrolled)		

17. What evidence suggests there is interest from prospective students for this program at the university?

Current program enrollment in Dakota State University’s Master of Science in Computer Science (N=92) has held at a steady rate due to class load limitations. Consequently, for the current academic year, the acceptance rate is approximately 50% of all applicants, and our yield (proportion of those accepted who enroll in our program) is well over 90%. Up to a third of denied students (25-30 annually) are strong candidates for the MSAI/ML degree.

Recent academic programs in artificial intelligence available to DSU students, the undergraduate degree and the MS specialization, currently have 25 students enrolled. The DSU Dean of Graduate Studies and the Director of International Programs have indicated in recent dialogue with on campus graduate students from India, graduate students in their country are intensely interested in artificial intelligence programs in the U.S.

Enrollment

18. Are students enrolling in this program expected to be new to the university or redirected from existing programs at the university?

Include the number of openings, as well as the percentage of growth when possible.

The Master of Science in Computer Science program admits about 25-30 students a year. It is anticipated approximately 5-10% of students who would apply to that program would choose a Master of Science in Artificial Intelligence. Otherwise, students would be new enrollees to the institution.

19. Narrative Description of the preliminary estimates on annual enrollment in this program by year six

Include all students within the program, not just those new to the program.

Starting with an enrollment of seven students in the fall of 2024 and knowing that students MS degree completion timelines will vary from 1-3 years, Dakota State University estimates a total enrollment of 40 students by year six of program delivery (2029). To sustain an enrollment level of approximately 40 students in the MSAI/ML program, we anticipate admitting 10-20 students annually.

Through its Rising II initiative DSU has made significant faculty hiring increases for the 2023-24 AY to meet anticipated undergraduate and graduate demand in this area. Additional faculty support with AI/ML expertise will be prioritized with future enrollment growth in this area.