New Academic Degree Program
Full Proposal Application
South Dakota Board of Regents
Academic Affairs Forms

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Use this form to propose a new degree program. The Board of Regents, Executive Director, and/or their designees may request additional information about the proposal. After the university President approves the proposal, submit a signed copy to the Executive Director through the System Academic Officer (through the online submission process).

Note: Within the proposal, all references to external sources should be documented with a footnote (including web addresses where applicable).

University	DSU - Dakota State University
Degree	MS : Master of Science
Name of Major	X999 : New Major Requested **Artificial Intelligence**
Specialization Required?	No

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
Planned CIP Code	110102
WICHE WRRGP Eligibility	Yes

Program Description

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

The Master of Science in Artificial Intelligence (MSAI) program is for students who desire to acquire advanced knowledge in the rapidly growing field of AI (Artificial Intelligence). The program is designed to teach students the core foundations of the field by providing a comprehensive curriculum of the core components of AI, including computer science, mathematics & statistics, and current AI models and frameworks, which will allow them to create practical applications for various industry and academic purposes. With new AI technologies appearing yearly, this program is designed to provide the foundations needed to be successful and agile enough to bring new and emergent technologies to students.

2. Does the university request any exceptions to any Board policy for this program?
Explain any requests for exceptions to Board Policy. If not requesting any exceptions, indicate ***"None."***

None

Strategic Impact

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

The MSAI program fits squarely with DSU's mission statement and strategic plan. Under SDCL 13-59, the primary purpose of Dakota State University is to provide instruction in computer management, computer information systems, electronic data processing, and other related undergraduate and graduate programs. The field of artificial intelligence falls directly into this description. DSU's Cyber 27 [1] initiative looks to establish the university as the top cyber program in the country. A.I. is the point of the spear in leading this initiative of introducing new and innovative programs. Not only will the MSAI program be a great asset for the students pursuing it, but it will also help us set a cornerstone to add components of AI to other existing programs, helping fulfill the AI for All philosophy.

Dakota State University's mission statement goes on to empower people with STEM-based education, preparing them for compelling, creative, and lasting careers. Artificial intelligence is one of the fastest-growing fields, not only related to technology, but in relation to all known fields. The proposed program would not only train students directly in the application of known technologies, but also prepare them for advanced research in cutting-edge degree programs. Students from other related degrees can also benefit by taking AI courses to increase their literacy in artificial intelligence and STEM (Science, Technology, Engineering & Mathematics) as AI continues to affirm its place in the daily lives of average citizens.

The proposed MS Artificial Intelligence is also directly aligned to two pillars within DSU's strategic plan, ADVANCE:
• Pillar 5 Increase Sustainability and Resiliency
☐ Goal: Equip the Beacom College of Computer and Cyber Sciences to double the number of graduates in computer science, cyber operations, and artificial intelligence by 2027. This goal is directly aligned to the projected staffing needs of the new DSU Applied Research Corporation in Sioux Falls, funded by state, municipal and private funds. The addition of a master's degree in artificial intelligence would attract new students, leading to additional graduates in artificial intelligence.
• Pillar 3 Grow Scholarship, Research, Intellectual Property and Economic Development
☐ Goal: Increase research and scholarly activities. This goal contains milestones on faculty and student research productivity and expenditures. Faculty and students are actively engaged in research on artificial intelligence, and the addition of a dedicated master's program would attract new students interested in research in this field.

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

NA

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

The Board of Regents' mission is to provide an excellent, efficient, accessible, equitable, and affordable public university and special schools system that improves South Dakota's overall educational attainment and research productivity, while enriching the intellectual, economic, civic, social, and cultural life of the state, its residents, and its communities. It goes on to say that the public university and special schools' system will educate more individuals at higher levels to enhance state workforce development and increase research into viable businesses, supporting state economic development.

This program aligns to this plan by providing the education needed to create the future AI-related workforce necessary to compete on national and international levels. As discussed in the Market Demand section below, AI-related job openings are numerous and expected to grow in the short and long term. By offering the program on campus and online, the program will meet the needs of rural students and those from other regions. Additionally, this program will help meet the demand for graduates equipped to serve as research engineers employed by the Applied Research Corporation in Sioux Falls.

Program Summary

5. 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.

6. 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	Fall 2024	

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

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

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

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

Asynchronous : Students are not required to attend the course at a specific time or location.

8. What are the student learning outcomes for this program?

- Analyze the fundamental current algorithms of Artificial Intelligence.
- Describe the underlying methodologies (mathematical and statistical) needed for modern AI algorithms and models.
- Apply AI techniques to solve real-world problems.
- Make ethical Artificial Intelligence development decisions.

9. For associate's and bachelor's degree proposals, identify the 3-5 AAC&U Essential Learning Outcomes that have been selected for this program.
Use the chart below to indicate the student learning outcomes that align to the selected ELOs (See BOR Policy 2.11 and Guideline 8.5).

Essential Learning Outcomes (AAC&U)	Student Learning Outcomes
Inquiry and Analysis	
Critical and Creative Thinking	
Information Literacy	
Teamwork	
Problem Solving	
Civic Knowledge and Engagement	
Intercultural Knowledge	
Ethical Reasoning	
Foundational Lifelong Learning Skills	
Integrative Learning	

10. Enter the number of credit hours required to graduate

Credit Hours	30

11. Complete the following tables to provide a degree program curriculum summary.

A. Table 1 –Total Program Degree Credit Hours

	Credit Hours In Program	
	Hours Per Requirement	**%Total Hours**
System General Education Requirements	0	
Subtotal - Gen Ed Requirements	0	%
Program Requirements		
Required Support Courses	0	
Major Requirements	15	
Major Electives	15	
Subtotal - Program Requirements	30	%
Free Electives	0	
Subtotal - Free Electives	0	%
Degree Total	30	%

*Board Policy 2:29 requires each baccalaureate level degree program to require 120 credit hours and each associate degree program to require 60 credit hours. Exceptions to this policy require documentation that programs must comply with specific standards established by external accreditation, licensure, or regulatory bodies or for other compelling reasons, and must receive approval by the Executive Director in consultation with the President of the Board of Regents.

B. Table 2 – Insert Required Program Support Courses Impacting Other Programs (outside department). Do not include General Education courses.

*The individual curriculum tables should be included as a word document **attached** to the TDX ticket.*

C. Table 3 – Insert Major Requirements (within department)

*The individual curriculum tables should be included as a word document **attached** to the TDX ticket.*

D. Table 4 – Insert Major Electives

*The individual curriculum tables should be included as a word document **attached** to the TDX ticket.*

12. New Course Approval
New courses required to implement the new degree program may receive approval in conjunction with program approval or receive approval separately. Please check the appropriate statement:

Yes

Academic Quality

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

At the time of this writing, there are no national or accreditation standards for Artificial Intelligence programs. However, the following resources are referenced for curriculum development.
1.) ACM/IEEE-CS and AAAI Curriculum Recommendations
While artificial intelligence is at the forefront of modern interest in application and education, the largest computer science and computing research and education organization, the ACM/IEEE-CS (Association for Computing Machinery / Institute of Electrical and Electronics Engineers – Computer Science) does not currently have curriculum recommendations for AI. A special task force has been assembled including the AAAI (Association for the Advancement of Artificial Intelligence) to develop curriculum guidelines. At the time of this writing, the current document is version Gamma released in July of 2023.[1] While not fully complete, the given suggestions are taken into consideration.

2.) Pennsylvania State University – World Campus Master of Professional Studies in Artificial Intelligence
This program aims to help students gain the skills and knowledge needed to develop intelligent systems and explore topics in AI, machine learning, deep learning, natural language processing, reinforcement learning, and computer vision. This includes 21 core credit courses, 9 elective credits, and a capstone course. Core courses include foundational AI courses, ethics, machine learning, deep learning, and statistics. [2]

3.) KTH Royal Institute of Technology (Sweden)
DSU has a close relationship with KTH students and faculty through our summer Industrial Immersion Program in partnership with AI Sweden. They offer an M.S. in Machine learning that has mandatory courses in machine learning, AI, research methodology, and a capstone project. They then allow for many elective courses in various disciplines, some related to AI, others of disciplines where AI may be applied. [3]

4.) Chalmers University of Technology (Sweden)
This is another university that DSU has close ties to through students who participated in our summer Industrial Immersion Program with AI Sweden. They offer an M.S. Data Science & AI program that has strong foundations in AI and Statistics with a wide range of electives focused on AI algorithms, statistics, and machine learning applications. This is all complemented by a required thesis. [4]

5.) Johns Hopkins Whiting School of Engineering
This program is an online program designed to balance theoretical concepts with practical knowledge. Courses explore robotics, natural language processing, image processing, and others. [5]

A unifying trend among programs studied is a foundation in traditional AI algorithms, machine learning, mathematics, statistics, or analytics courses, and then courses in new and emerging technologies such as natural language processing, reinforcement learning, or robotics.

This provides a general framework for us to build our program and expand upon to meet the needs of current students.

[1] https://csed.acm.org/
[2] https://www.worldcampus.psu.edu/degrees-and-certificates/penn-state-online-artificial-intelligence-masters-degree
[3] https://www.kth.se/en/studies/master/machine-learning/courses-machine-learning-1.412669
[4] https://www.chalmers.se/en/education/find-masters-programme/data-science-and-ai-msc/
[5] https://ep.jhu.edu/programs/artificial-intelligence/

14. What program accreditation is available, if any?

There is no accreditation program available for Artificial Intelligence programs at this time. However, we will monitor traditional outlets, such as ABET (Accreditation Board for Engineering and Technology) or ACM/IEEE-CS and AAAI for future accreditation and recommendations.

15. Will the proposed program pursue accreditation or certifications?

No

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

No such accreditation exists at the time of this writing.

16. Did the university engage any developmental consultants to assist with the development of the curriculum? Did the university consult any professional or accrediting associations during the development of the curriculum? What were the contributions of the consultants and associations to the development of the curriculum?
Developmental consultants are experts in the discipline hired by the university to assist with the development of a new program, including content, courses, and experiences, etc. Universities are encouraged to discuss the selection of developmental consultants with Board staff.

A consultation meeting with the Beacom College Advisory Board consisting of industry and research partners convened to discuss current AI programs and ask for feedback on those and any future programs.

Partners include:
VantagePoint, Mitchell, SD
First Bank & Trust, Dell Rapids, SD
Interstates, Sioux Falls, SD
First Premier Bank, Sioux Falls, SD
Solarity, Sioux Falls, SD
Midco, Sioux Falls, SD
Convergint, Sioux Falls, SD
SDN Communications, Sioux Falls, SD

Wealth Enhancement Group, Sioux Falls, SD
Black Hills Energy, Rapid City, SD
SBS Cybersecurity, Madison, SD
Product Security & Security Compliance, Atlanta, GA
Brookings Municipal Utilities/Swiftel Communications, Brookings, SD
Daktronics, Brookings, SD
Cyber Security, Clear Ridge Defense, LLC, Baltimore, MD
BrightPlanet, Sioux Falls, SD

The MSAI program was discussed, and feedback was collected. The primary feedback was that students should have an idea of how businesses are structured and how AI can fit within the confines and ethical standards of those structures. As such, a core course titled Applications and Ethics of AI has been added to the curriculum with these principles in mind.

Through close ties with the NSA (National Security Agency) and other governmental agencies from our Cybersecurity programs, we have also had many meetings and reviews with various personnel regarding AI in cybersecurity and other areas, and how it might benefit these agencies. A large contingent of our students from other graduate programs, such as Cyber Defense and Cyber Operations, study, and research AI related to cybersecurity as part of their dissertations.

Also, DSU has a strong relationship with industrial partner AI Sweden [1]. We have partnered with AI Sweden for summer Industrial Immersion Programs the last two summers. Graduate students from Sweden and DSU work on projects proposed by industry partners, such as CNH (Case New Holland), HP, Volvo, and others and present their findings after 10 weeks of team-based research with close mentorship by the industry partners. Many students continue this research for M.S. theses, Ph.D. dissertations, and journal publications. Through this partnership, we continue to gain great insight into how industry partners view and wish to utilize A.I. and what expectations they have for graduates in AI programs.
[1] https://www.ai.se/en

17. Inclusion of High Impact Practices (HIP) across all undergraduate programs is a strategic priority of the Board of Regents to enhance academic quality and increase student engagement. For associate's and bachelor's degree proposals, which HIPs will faculty embed into the program?
Mark all that apply. To be considered as a HIP program, two or more should be selected and required in the program.

High Impact Practices	Included
Capstone courses and projects	Yes
Collaborative assignments and projects	Yes
Common intellectual experiences	Yes
Diversity/global learning	Yes
ePortfolios	No
First year experiences	No
Internships	No
Learning communities	No
Service learning, community-based learning	No
Writing intensive courses	No
Undergraduate research	No

18. For associate's and bachelor's degree proposals, discuss how HIPs will be embedded into the program
Your discussion should provide examples and include whether the HIP is required or an optional component. It should also indicate at what point the experience is offered or required. (eg "students will be required to participate in an internship during their third year of enrollment in order to develop skills in…").

Student Success

This section outlines the university's plan to assess student achievement of the program learning outcomes.

19. Complete the table below to provide evidence of a preliminary assessment plan. Place an asterisk next to assessments that are national or state-level instruments.
   Note: It is only necessary to indicate the summative assessment for each outcome, not the formative assessments used throughout the program.

Program Learning Outcome	Course	Summative Assessment
Analyze the fundamental current algorithms of Artificial Intelligence.	CSC 722 Funamentals of Machine Learning & CSC 761 Adv. Artifical Intelligence	Midterm and final exams. Comprehensive exam for graduation.
Describe the underlaying methodolgies (mathematical and statistical) needed for modern A.I. algorithms and models	CSC 702 Mathematics of AI	Midtern and final exams. Comprehensive exam for graduation.
Apply A.I techniques to solve real-world problems	CSC 789 Artifical Intelligence Capstone	Production of significant project artifact
Make ethical Artificial Intelligence development decisions	CSC 727 Applications and Ethics for A.I.	A comprehansive paper written at the end of the course.

20. How will outcomes for graduates of the program be assessed?
   Outcomes may include employment and placement rates, licensure examination pass rates, acceptance rates to graduate school, student or employer surveys, or other assessments of graduate outcomes.

   Employment and placement rates.

Duplication and Competition

21. 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**.*

At the time of this writing, no other South Dakota public university currently offers a M.S. in Artificial Intelligence. Dakota State University and the University of South Dakota currently offer specializations in AI as part of their Computer Science M.S. degree programs.

Dakota State University (Madison, SD) M.S. in Computer Science with AI Specialization
University of South Dakota (Vermillion, SD) M.S. in Computer Science with AI Specialization
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, defend the need for an additional program within the state, Include IPEDS enrollment data and additional data as needed.

AI and Robotics falls under CIP 2000, 11.0102 as a new designation within the IPEDS system. Since there are no current M.S. AI programs, a search in the Data Explorer returns 0 items. Instead, we could use Computer Science as a similar metric.

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 (AI). 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 AI can expect to receive a foundational understanding of Computer Science and Artificial Intelligence. Students can elect to focus on AI topics that are traditionally considered part of CS, such as pathfinding, process automation, and AI specific algorithms; or they may elect to get a foundational understanding of related AI 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, AI 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 AI 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 AI specialization must take a specialized mathematics course and then AI topics of their choice for their remaining credits. The M.S. in AI covers the foundations of CS, data science, mathematics, statistics, and ethics that are needed to dive more deeply into modern AI 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 AI 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 AI 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 AI in their products. Positions include Software Engineer/Developer with a focus on building AI-enabled applications, integrating AI components into existing systems, or creating AI frameworks and libraries. Systems Architect designing large-scale AI systems at scale to support AI workflows, data pipelines, and distributed computing. Data Engineer managing large volumes of data for AI applications and algorithms. Cloud Computing Architect designing AI solutions on cloud platforms. And Algorithm Developer in an R&D role, specializing in AI applications.

Students graduating with the M.S. in AI 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 AI related topics. AI 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 AI specific jobs in their reports, generalizing them to Data Scientist or Software Engineer, but career service databases such as Indeed [1] provide a snapshot into the current AI labor needs in the economy. These positions include Machine Learning Engineer implementing AI 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 AI Scientist positions for graduate students display the need for specialties in deep learning, computer vision, natural language processing, generative models, and other specific AI fields.

Nearly every industry is looking to employ students who can assist in applying AI to their existing or emerging business. At the same time, industry is currently experiencing a boom in companies developing new AI algorithms and technologies. The largest and most recent development of AI in industry is applying large language models, such as GPT 4.0, to their business. Use cases include educational assistants, like Khan Academy's Khanmigo [2], or industry specific chat bots. Content creation is also an emerging industry that utilizes AI, with technologies such as Stable Diffusion [3] that create realistic or artistic images given a text prompt. AI Consultants provide expertise and guidance to organizations looking to adopt such AI technologies. The M.S. in AI 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 Sweden [4] is the national center for applied AI 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 program [5] 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 Health [6], Raven Industries [7], and PAR [8] 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 AI programs we offer. These partnerships have been instrumental in the formulation of what the M.S. in AI 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 a key role in their operations and are looking to hire and support students who are training in the field [9].

The current state of AI is quickly evolving and requires a distinct foundation that allows students to specialize in AI specific topics. By creating our proposed M.S. in AI, 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?
gclid=Cj0KCQjw7PCjBhDwARIsANo7CgkQVr_oYCHB39_npmp9OikIowou0uyDuRHV14OHiyfLZZfM9UsRrs4aAqJqEALw_wcB&aceid=&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
[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

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

No, DSU is appropriately resourced to offer this degree independent of another Regental institution; the university has the expertise, curriculum, infrastructure and mission to sustain and flourish the MS Artificial Intelligence without the assistance of another university. Undergraduate and graduate degree programs in computer science and computer-science related fields have strong enrollment and student success outcomes. Our graduate students have a 100% placement rate. DSU is engaged in sponsored research and partnership agreements that leverage our strength in Artificial Intelligence. We anticipate this program will attract international students, and that population is required by law to participate in their coursework on campus. Course sharing with another university would not be practical or appropriate.

Following the implementation of the MS Artificial Intelligence, the university and its faculty will be open to engaging in research and potentially specializations and/or degree programs with other Regental universities, particularly in AI with engineering, agriculture, space and healthcare. At this time, a collaborative MS Artificial Intelligence degree with another university is not planned or desired.

22. Do any related programs exist at any non-Regental college or university within 150 miles of the university?
List those programs here:

At the time of this writing, no other non-Regental college or university within 100 miles of DSU currently offers an M.S. in Artificial Intelligence. Dakota State University and the University of South Dakota currently offer specializations in AI as part of their Computer Science M.S. degree programs.

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?

Students taking the MS Computer Science, AI Specialization may want to move to this major because of the focus on AI.

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

23. 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.

In February of 2019, the White House released Executive Order 13859 announcing the American Artificial Intelligence Initiative [1]. 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.

Regarding specific careers, job titles include (but are not limited to): Machine Learning Engineer, Data Analyst, Data Scientist, AI/ML Researcher, and Software Engineer. These jobs provide distinct 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.

According to Udemy, a global marketplace for learning and instruction, the deep learning tool Tensorflow was the most popular tech skill of the last three years [3].

In South Dakota, the biggest player in the economy is agriculture. Research and deployment of AI software and robotics will be key to increasing crop and livestock production and operational throughput. Also, AI is used in many areas of medical research, which ties into Sanford and Avera hospitals in the region. Dakota State University has recently formed an academic and research partnership with CNH, further strengthening opportunities for internships and careers.

It is 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 (SDoL) website or the U.S. Bureau of Labor Statistics (BLS). These types of positions include Machine Learning Engineers, Data Scientists, and Applied AI Specialists mentioned earlier from the Indeed resource.

Only the latest Annual Report of South Dakota Job Placement Outcomes [7] has any mention of Artificial Intelligence directly with the following information.
CIP Code: 11.0102
CIP Title Degree: Artificial Intelligence
# of Graduates: N/A
# of Graduates Earning Wage in SD: N/A
# of Jobs Held by Graduates Earning Wages in SD: N/A
Average Annual Wage: $99,181

The following table includes positions that could potentially be filled by graduates with this degree.

SD Occupational Employment Growth Projections 2020-2030
South Dakota Department of Labor

Computer and Information Systems Managers: 16.53% growth
Computer Systems Analysts: 13.62% growth
Computer User Support Specialists: 6.54% growth
Database Administrators and Architects: 9.79% growth
Computer Programmers: -5.19% growth
Software Developers and Software Quality Assurance Analysts and Testers: 29.86% growth
Web Developers and Digital Interface Designers: 8.31% growth
Computer Occupations, All Other: 1.67% growth
Data Scientists and Mathematical Science Occupations, All Other: 36.84% growth
Computer Science Teachers, Postsecondary: 9.73% growth

On a national level, the long-term job increases includes:

Computer and Information Systems Managers   15.4% growth, median salary of $164,070
Computer systems analysts   9.6% growth, median salary of $102,240
Computer user support specialists 5% growth,, median salary of $57,890
Database Administrators   7% growth, median salary of $99,890
Database Architects   10% growth, median salary of $134,870
Computer Programmers -11.2% growth, median salary of $97,800
Software Developers   25.7% growth, median salary of $127,260
Software Quality Assurance Analysts and Testers 20.3% growth, median salary of $99,620
Web Developers   17% growth, median salary of $78,580
Computer Occupations, all other   9.7% growth, median salary of $98,740
Operations Research Analysts   22.5% growth, median salary of $85,720
Statisticians   31.6% growth, median salary of $98,920
Data Scientists   35.2% growth, median salary of $103,500
Computer Science Teachers, postsecondary 5.3% growth, median salary of $84,760

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

Consolidating all artificial intelligence related jobs, there has been a steady increase in job-posting, while the number of applicants has slightly shrunk, indicating an increased demand and decreased current workforce is decreasing, leaving a gap to fill. AI job postings on the job posting website Indeed saw its largest increase spike from 2016 to 2017 by 136.3%. In the following years, the spike leveled off, but the percentage of job postings continued to rise by 49.1% and 32% from the previous years in 2018 and 2019 respectively; making machine learning and deep learning engineers the most popular jobs posted that year. There has been an incredible overall increase in the last few years. In contrast, the number of jobs searched only increased by 14% in the last year mentioned; leaving a large gap to fill.

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

Pay for these jobs is also fairly high, with averages ranging from $97,850 for AI software engineers to $134,449 for machine learning engineers. [2]

See Table 2 above from section 24 for national median incomes. For SD specific salaries, this table provides the required information.

Occupational 2022 Employment and Wage Rates for Statewide South Dakota Updated Using the Employer Cost Index through June 2023

Computer and Information Systems Managers: median salary of $137,205
Computer Systems Analysts: median salary of $89,320
Computer User Support Specialists: median salary of $45,851
Database Administrators: median salary of $84,484
Database Architects: median salary of $99,466
Computer Programmers: median salary of $68,672
Software Developers: median salary of $84,242
Software Quality Assurance Analysts and Testers: median salary of $58,945
Web Developers: median salary of $48,810
Computer Occupations, All Other: median salary of $91,597
Operations Research Analysts: median salary of $67,035
Data Scientists: median salary of $113,642
Computer Science Teachers, Postsecondary: median salary of $72,197

26. 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...

At a recent Beacom Advisory Board meeting, industry leaders in the region explicitly stated the need for AI capable workers now, with expectations to grow in the near future. The upcoming AI Edge Summit [8] to be held in Sioux Falls this October of 2023 also illustrates the need for AI capable workers in our region. As stated on their website:
"The transformative wave of Artificial Intelligence is reshaping industries, businesses, and soon, our daily lives. Join us as we gather in the heart of the Midwest to share, learn, and discuss the future of this groundbreaking technology. Whether you're a seasoned AI user, a business owner, or simply someone curious about the potential and future of AI, there will be something for everyone!

We're bringing in local, regional and national experts from all industries and trades to showcase the wide power and influence of AI. Expect to see artists who use it to create stunning visuals and graphics, marketers who use it to reach mass audiences with a message, developers who use it to maximize their coding output, and business owners who use it to streamline operations for a profit. No matter what walk of life you're in you should be able to walk away with tangible use cases in just an afternoon!"

Several DSU faculty and leaders have been invited to conferences, summits, and expos to speak as guest lecturers about artificial intelligence. Some examples include:
•   Dakota State University (DSU) President Dr. José-Marie Griffiths moderated a briefing on AI for members of the United States Senate on Wednesday, July 26, 2023. The briefing was the third bipartisan education session hosted by the Senate's AI working group led by Senator Mike Rounds (R-S.D.), Majority Leader Chuck Schumer (D-N.Y.), Senators Martin Heinrich (D-N.M.) and Todd Young (R-Ind.). President Griffiths was invited by Senator Rounds to moderate the briefing.
•   President José-Marie Griffiths was a featured speaker at the World Summit AI Americas, held in Montréal, Canada.
•   TIE (Technology in Education) held talks   featuring our faculty in Rapid City, Aberdeen, Harrisburg, and Chamberlian, SD.
•   East River Electric Energize Forum. Sioux Falls, SD.
•   The Danebod Folk Meeting. Tyler, MN.
•   The Brookings Area Workforce Conference. Brookings, SD.

Footnotes:
[1] https://www.whitehouse.gov/ai/.
https://www.federalregister.gov/documents/2019/02/14/2019-02544/maintaining-american-leadership-in-artificial-intelligence
https://www.hsdl.org/?abstract&did=821398
[2] https://www.indeed.com/lead/top-10-ai-jobs-salaries-cities
[3] https://business.udemy.com/resources/5-workplace-learning-trends-2020/
[4] https://dlr.sd.gov/lmic/documents/projections/short_term_occupational_projections_2022-2024.xlsx
[5] https://dlr.sd.gov/lmic/documents/projections/occupational_projections_2020_2030_statewide_south_dakota.xlsx
[6] https://data.bls.gov/projections/occupationProj
[7] https://dlr.sd.gov/lmic/publications/graduate_outcomes/2022_job_placement_outcomes_report.pdf
[8] https://aiedgesummit.com/

Student Demand

27. Provide evidence of student completers/graduates at that degree level at peer institutions that offer the same/similar program using data obtained from IPEDS.

Peer Institution: Regional and Competitive institutions. 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	Computer & Information Sciences, General	98	98
University of South Dakota	SD : South Dakota	Computer & Information Sciences and Support Serviceson (Fall 22)	13	25
Pennsylvania State UNiversity - WOrld Campus	PA : Pennsylvania	Computer and Information Systems	137	137

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

DSU currently offers an Artificial Intelligence specialization within the Computer Science M.S. program, starting in the Spring semester of 2022. When the specialization was first offered, we had 2 students enroll, and since then there were 9 students enrolled in this program during the 22-23 AY. We expect the majority of these students to switch to this proposed program when offered. We also have a growing number of graduates from our B.S. Artificial Intelligence program who have expressed interest in pursuing an M.S. in AI if offered. The B.S. degree was first offered in the fall of 2021 and started with 4 students and has since grown to roughly 20 students this fall of 2023.

The Artificial Intelligence Club on campus is also growing and currently has upwards of 30+ students in their Discord Channel and 20+ members actively attending in-person meetings.

Enrollment

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

Approximately 10 students are enrolled in the MSCS – AI Specialization program. We expect at least half to change majors to this new program. After the initial year, there may still be 1-3 students who may change majors from MSCS or the M.S. in Information Systems program. Otherwise, we expect the remaining students to be from our undergraduate CSC or AI programs or other universities.

We predict, however, that the MS Computer Science specialization in Artificial Intelligence will continue to serve a need for students who want a strong computer science core with some AI; we do not wish to terminate the specialization. The 15 credit AI specialization within the MS Computer Science contains a requirement of 9 elective credits. The new courses from the MS Artificial Intelligence will be added to the list of potential electives, reducing the likelihood of any low-enrollment offerings. Given the strong enrollment in our graduate programs, we do not believe there is a risk of low-enrolled courses in either the full MS Artificial Intelligence or the AI specialization.

30. Complete the enrollment worksheet to provide an enrollment projection for the next six academic years

Worksheet Completed	Yes

31. What is the minimum number of students required in this program to break even, with respect to the budget?

With 1 faculty member and a program coordinator stipend, we would need 9 full-time students, or a combination of full- and part-time students to generate 270 credit hours.
With 2 faculty members and a program coordinator stipend, we would need 17 full-time students, or a combination of full- and part-time students to generate 510 credit hours.
Note that this assumes an average tuition of $475, which combines multiple tuition scenarios (on campus resident, nonresident and online), and an average fee of $90, which combines multiple fee scenarios (on campus CSC fee and nonresident online fee).

32. Discuss the assumptions informing your enrollment estimates.
 (e.g. current enrollment and trends in similar programs, IPEDS data, recruitment strategies, partnerships)

Estimates come from trends seen in increased enrollment in our MSCS – AI Specialization and undergraduate Bachelor of Science in AI programs. The MSCS program, including specializations, tends to have 1/3 of students full-time on campus and 2/3 of students through our online delivery system. Other justification can be found in the Student and Market demand portions of this document.

The current enrollment numbers in related DSU masters programs also helped to justify our estimates.

Program Current Enrollment (FA 2023)
M.S. Computer Science: 59 enrolled
M.S. Cyber Defense: 64 enrolled
M.S. Information Systems: 63 enrolled

The M.S. Computer Science AI specialization was first offered in the summer of 2022 and helps give an idea of first year projections. The M.S. Cyber Defense program was first offered in 2018 and helps give a 5-year estimated projection of what we might expect for enrollment. Our 5-year estimate of 30 students may be considered to be conservative.

33. If projected program enrollment is not realized in year two, what actions is the university prepared to take?

In monitoring MSAI program enrollment at year 2 of new program implementation, college and graduate leadership will determine if the degree is aligned to market demands. If program modifications are warranted, we will engage our faculty and industry partners to make necessary changes. We will also examine our market strategies to make sure we understand our audience, that our audience understands the value of our degree program, and that we are deploying the right strategies to reach that market and draw applications to our program. We will return to the market with updates.

34. Discuss the marketing and recruitment plan for the program
 Include information on partnerships and pipelines (e.g. articulation agreements with BOTE, collaboration with partner university, community partnerships).

DSU's commitment to preparing students for careers in computer and information systems is demonstrated in outreach that amplifies our institutional mission. In graduate education, prospective students have responded. The two tables below show our enrollment trajectory over the last three years. The final column shows our growth over the last academic year in our 11 graduate programs. No regental institution has matched this Ph.D. and MS enrollment growth over the same period. Both represent institutional highs for DSU.

Total DSU Graduate Headcount 2021 - 2023.
Fall 2021 468
Fall 2022 484
Fall 2023 558
15.29% Increase in enrollment from Fall 2021 to Fall 2023 (74 students)

Total DSU Graduate Credit Hours 2021 - 2023
Fall 2021 - 2,482
Fall 2022 - 2,570
Fall 2023 - 3,018
17.43% increase in student credit hours generated from Fall 2021 to Fall 2023 (448 credit hours)

The data are only provided to demonstrate that DSU has developed an ability to reach out to prospective students in the computing and information technology domain. We have marketed primarily through social media platforms combined with complementary content marketing that have featured stories about our programs, research, or faculty in Sioux Falls Business Insider. Our primary pay-per-click platform is Google. Word of mouth has produced strong results.

In July 2023 we expanded our agreement with EAB, who has previously worked with us on our institutional retention initiative. EAB will now support an Adult and Graduate Student Recruitment Initiative with funding procured directly in conjunction with DSU's Cyber 27 Initiative [1]. This will be the first agreement with an external partner to focus on graduate student recruitment at DSU. This three-year initiative will tap into proprietary consumer databases, Cappex's student search platform, first-party targeting lists, test-taker lists and other resources to which DSU previously has not had access. This marketing initiative will focus on computer science, cyber security, and artificial intelligence-intensive programs.

In January 2023, DSU modified its graduate student support model with the hiring of two new enrollment counselors. These MS-level professionals will provide student support from program inquiry to the end of their graduate journey at commencement, assuring that no question remains unanswered.

Along with the marketing avenue mentioned above, we are in constant communication with our industry partners through the Beacom Advisory Board and general relationships through faculty and administration. See section #16 for more information on our industry, academic, and community partners. Many of these students pursue graduate education to further their current careers. Our proposed program caters perfectly to working professionals who wish to study part-time online, along with those who wish to be on campus at full workload capacity. Those along with our undergraduate A.I. program help market the proposed program to a pipeline of students who are predisposed to show interest in this program. Undergraduates are encouraged to complete the M.S. program through our accelerated 4+1 program where students can take up to 9 MSAI graduate credits that will count towards both their undergraduate electives and MSAI program.
[1] https://www.dsucyber27.com/

Financial Health

35. Complete the budget worksheet to provide a budget projection for the next six academic years.

Worksheet Completed		Yes				

Financial Health Summary						
	1st FYxx	2nd FYxx	3rd FYxx	4th FYxx	5th FYxx	6th FYxx
Tuition & Fee Revenues	122490	217420	293976	370532	447089	523645
Program Expenses	152909	132909	257818	257818	257818	257818
NET	-30419	84511	36158	112714	189271	265827
Other Supporting Revenues	30419	0	0	0	0	0
NET (Other)	0	84511	36158	112714	189271	265827

36. Explain the amount and source(s) of any one-time and continuing investments in personnel, professional development, release time, time redirected from other assignments, instructional technology and software, other operation and maintenance expenses, facilities, etc., needed to implement the proposed major.
Address off-campus or distance delivery separately.

The program expenses consist of supporting three full time faculty. Dakota State University has a special appropriation through 2027 to support the cost of the three faculty members. We project the program will be revenue generating by year 5, so there are two years of projected loss the university will need to cover.

As mentioned in the Enrollment portion of this document, our enrollment projections are well supported through the history of our other programs and are somewhat conservative.

The proposed MSAI program requires the hire of 2 additional faculty members. These faculty members will focus on this top-priority area and have a 3+3 teaching workload. Beacom College will utilize existing professional development funds to support these new faculty members. The college has established infrastructure, including instructional technology, software, and a dedicated support staff, to facilitate the MSAI program. There will be no need to reallocate time from other assignments, and no additional operational or maintenance expenses or facilities will be required to implement the MSAI program. The MSAI program will be available both on-campus and online, consistent with other programs at Beacom College. We will use the existing infrastructure available at DSU to support the distance delivery of the proposed program.

37. If new faculty are not requested, describe how existing faculty will be utilized and indicate whether this action will impact other existing programs.

Currently, two new faculty are requested to contribute to the MSAI program.

38. Is the university requesting or intending to request permission for a new fee or to attach an existing fee to the program?.

Requesting Permission for Fee?	Yes, existing fee
Explanation	DSU is requesting to have the same fee structure as the MSCS for this proposed degree. The current MSCS program fees of $70.55 / credit for on campus students and $110.15 for Off Campus Delivery. For this purpose we used an average of $90/credit hour.

39. Use the table below to describe potential risks to the program's implementation over the next four years.
For each risk, identify the severity (low, medium, high), probability of occurrence (low, medium, high) and the institution's mitigation strategy for each risk.

Risk	Severity	Probability	Mitigation Strategy
Low Enrollment	Medium	Low	Increase marketing to regional, national, and global sectors. Encourage graduates of the B.S. A.I. program through the accelerated 4+1 program.
Recruiting new faculty	Medium	Low	We are aggressively recruiting new faculty for this program and offering competitive wages. We currently do have faculty to offer all required courses, but this will cause faculty overload.

External Review

40. If this proposal is for a graduate program, provide information below for at least five potential consultants who may be considered to conduct the external review.

Reviewer Name	Title	Institution
Ryan Adams, Ph.D. ryan.s.adams@und.edu/701-777-5644	Associate Dean of National Security	University of North Dakota
Changhui Yan, Ph.D. Changhui.Yan@ndsu.edu/701-231-8182	Professor	North Dakota State University
Mats Hanson, Ph.D. mats@md.kth/	Professor Emeritus	Royal Institue of Technology KTH på Kungliga Tekniska högskolan
George Hamer, Ph.D. george.hamer@sdstate.edu/605-688-5721	Dept. Head/Associate Professor	South Dakota State University
Tony Johnson ajohn260@JHU.edu/	Program Manager Arificial Intelligence	Johns Hopkins Whiting School of Engineering

Additional Information

41. (Optional) Use this space to provide pertinent information not requested above that may assist the Board in understanding the proposal.

Approvals

University Approval

To the Board of Regents and the Executive Director: *I certify that I have read this proposal, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.*

President of the University	Date
	10/18/2023
Dr. Jose Marie Griffiths	

Academic Affairs, Provost	Date
	10/18/2023
Dr. Rebecca Hoey	

Finance and Administration, Vice President	Date
	10/18/2023
Stacy Krusemark	

Enrollment Management, Vice President	Date
	11/2/2023
Amy Crissinger	