SOUTH DAKOTA BOARD OF REGENTS

<u>Academic and Student Affairs</u>

REVISED
AGENDA ITEM: 7 – B (2)
DATE: June 26-27, 2024

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SUBJECT
New Program Request – USD – MS in Artificial Intelligence

CONTROLLING STATUTE, RULE, OR POLICY
BOR Policy 2.3.2 – New Programs, Program Modifications, and Inactivation/Termination

BACKGROUND / DISCUSSION
The University of South Dakota (USD) requests authorization to offer a MS in Artificial Intelligence. The proposed program is designed to equip students with advanced knowledge and skills in the rapidly evolving field of artificial intelligence, including machine learning, vision, intelligent systems, robotics and agent-based systems, knowledge discovery, data mining, and the secure, trustworthy, ethical and responsible use of AI.

The intent to plan has been approved by the Executive Director and was presented to the Board as an information item at the April 2024 Board meeting.

IMPACT AND RECOMMENDATION
A summary of the program proposal has been included as Attachment I. Additional information on this proposal is available from the Board office by request.

ATTACHMENTS
Attachment I – New Program Request Summary: USD – MS in Artificial Intelligence
Attachment II – PowerPoint Presentation

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DRAFT MOTION 20240626_7-B(2):
I move to authorize USD to offer a MS in Artificial Intelligence, as presented.

Full Proposal – MS Artificial Intelligence
University of South Dakota

BOR Recommendation: The Board of Regents Academic Affairs and the Executive Director support the program request. This program will increase the number of conferred advanced STEM degrees in South Dakota while supporting existing industrial sectors.

Program Description:

The Master of Science in Artificial Intelligence (MSAI) program is a cutting-edge graduate program designed to equip students with advanced knowledge and skills in the rapidly evolving field of artificial intelligence (AI). This knowledge and skills include but are not limited to, machine learning, vision, intelligent systems, robotics and agent-based systems, knowledge discovery, data mining, and the secure, trustworthy, ethical, and responsible use of AI. This program blends theory with hands-on practical experience, preparing graduates for leadership roles in AI research, development, and application across diverse industries.

Strategic Impact –

USD Strategic Impact: The University of South Dakota's mission statement emphasizes a commitment to academic excellence, research, innovation, and preparing students for meaningful careers in emerging fields. The MSAI program embodies these values by offering an advanced curriculum that equips students with cutting-edge AI knowledge and practical skills. It fulfills the university's mission of providing quality education while addressing the growing demand for AI expertise.

The MSAI will provide enhanced educational opportunities to USD students. The program introduces a specialized curriculum that addresses the evolving needs of students seeking AI education. These enhanced MSAI opportunities will uphold a liberal arts foundation of critical thought, reasoning, and ethical foundation. The MS AI will foster innovation through research initiatives and interdisciplinary collaboration advancing the science and technology foundation in the state. The MSAI program reflects the institution's academic priorities by a) meeting workforce needs, b) advancing research excellence, and c) promoting ethical leadership in AI.

BOR Strategic Impact: The MSAI program prepares students with in-demand AI skills, which are increasingly essential across various industries in the state. The MSAI program encourages research excellence in AI. Graduates of the program may contribute to AI-related research initiatives that can have a positive impact on South Dakota's technological and economic landscape. The MSAI program equips graduates with AI expertise that can drive innovation and economic growth in South Dakota. AI technologies have applications in various sectors, including healthcare, agriculture, manufacturing, and finance, all of which are vital to the state's economy. The proposed program instills ethical principles in AI professionals, ensuring that AI technology is developed and deployed ethically and responsibly within the state. In sum, the MSAI program is well-aligned with the strategic priorities and mission of the South Dakota Board of Regents. It contributes to workforce development, research excellence, educational enrichment, economic growth, and ethical leadership within the state, reflecting a commitment to advancing higher education and innovation in South Dakota.

Program Summary:

The classification of this program will be 11.0102 [Artificial Intelligence and Robotics]. This 30-credit graduate program is proposed to be offered on-campus in Vermillion. No new courses are requested in conjunction with this program proposal. Specific program accreditation for an MSAI does not exist.

Duplication and Competition:

The Board approved DSU's request to offer an MS in Artificial Intelligence at their April 2024 meeting. Both Dakota State University and the University of South Dakota are currently approved to offer AI specializations as part of their Computer Science MS degree programs. DSU intends to keep its AI specialization in Computer Science in addition to adding the recently approved MS in AI. USD intends to inactivate the AI specialization in their Computer Science program.

The Integrated Postsecondary Education Data System (IPEDS) for 2022-2023 reporting shows that South Dakota produced a total of 117 masters-prepared graduates in related fields.

Regental Universities[1]:

University	Master's Degrees Conferred in Computer and Information Sciences, General	Total Number of Master's Degrees Conferred at Each Institution
DSU – MS Computer Science	64	149
USD – MS Computer Science	45	530
SDSU – MS Computer Science	1	334
SDSMT – MS Computer Science and Engineering	7	131

Private SD Universities[2]:

University	Master's Degrees Conferred in Computer and Information Sciences, General	Total Number of Master's Degrees Conferred at Each Institution
None	0	--

Total Sum of SD Peer Findings:

University	Master's Degrees Conferred in Computer and Information Sciences, General	Total Number of Master's Degrees Conferred (All SD Universities)
Total	117	1144

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[1] Integrated Postsecondary Education Data System (IPEDS) for 2022-2023

[2] Integrated Postsecondary Education Data System (IPEDS) for 2022-2023

The number of conferred master's degrees in related fields, specifically Computer and Information Science (General), as reported by IPEDs was 117 out of a total of 1144 for all of South Dakota. This is approximately 10% of the total number of master's degrees awarded. The opportunities for students with advanced degrees in these fields exceed the current number of degrees awarded.

Competitor University Peers[3]:

Unlike the tables above, this table reports MS degree conferrals specifically in Artificial Intelligence.

University	Master's Degrees Conferred in Artificial Intelligence	Total Number of Master's Degrees Conferred at Each Institution
Northwestern University	41	5335
Carnegie Mellon University	178	4339
Johns Hopkins University	18	8840

Workforce Outlook/State Need:

This program will be a pioneering initiative in the state, aligning with the National AI Initiative Act to promote United States leadership in AI. The mission of the National AI Initiative is to ensure continued U.S. leadership in AI research and development, lead the world in the development and use of trustworthy AI in the public and private sectors, and prepare the present and future U.S. workforce for the integration of AI systems across all sectors of the economy and society [1].

According to a recent report by Bloomberg Intelligence (BI), this market is on the brink of explosive growth, with projections indicating a remarkable expansion from $40 billion (about $120 per person in the US) in 2022 to a staggering $1.3 trillion (about $4,000 per person in the US) over the next decade. This anticipated growth is underpinned by a projected compound annual growth rate (CAGR) of 42% [2]. Moreover, there has been a notable increase in job seeker interest in AI-related jobs, especially since the introduction of ChatGPT. Indeed's data showed that searches for AI jobs jumped to 147 per million total jobs searched in May 2023 [3,4].

Furthermore, the emerging landscape of AI-centered technology presents a promising horizon with an abundance of new job openings. The number of AI-related companies and startups is increasing, with substantial investments in AI research and development. As AI technology becomes increasingly prevalent, the demand for skilled professionals to navigate this dynamic field is growing rapidly. A recent report by the World Economic Forum's Future of Jobs 2023 underscores the significance of this trend, highlighting that AI and machine learning specialists are poised to claim the title of the fastest-growing job category in 2023. The report projects an impressive employment growth rate of 39% within the next five years for these specialists [5]. This surge in demand for AI experts signifies the critical need for educational initiatives such as the MSAI program, which can equip students with the specialized skills and knowledge required to excel in this rapidly evolving job market.

Nationally, AI professionals typically earn competitive salaries due to the high demand for their expertise. AI-related job roles, such as AI/machine learning engineers, data scientists, and AI

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[3] IPEDS, 2022-2023

researchers, often commanded median salaries ranging from $90,000 to $250,000 or more, depending on experience and location. Read more: https://www.scaler.com/topics/artificial-intelligence-salary-in-us/. Within South Dakota, the typical salary range for AI engineers spans from $70,000 to $100,000.

Summary (average salary) across the states:
- Entry-level AI engineer: $70,000 to $100,000
- Mid-level AI engineer: $100,000 to $150,000
- Senior-level AI engineer: $150,000 to $250,000

Summary of the highest-paying companies for AI engineers:
- Google: $150,000 to $250,000
- Facebook/Meta: $150,000 to $250,000
- Apple: $140,000 to $220,000
- Amazon: $130,000 to $200,000
- Uber: $130,000 to $200,000

On the whole, the rationale behind transitioning the specialization in AI to a standalone Master of Science in AI (MSAI) program is primarily based on the following key points: interdisciplinary focus, market competitiveness (workforce development), and career opportunities. Evidence from job market trends and employer surveys indicates that candidates with advanced degrees specifically in AI are often preferred for roles requiring specialized AI skills. The MSAI program equips students with the depth of knowledge and expertise needed to excel in competitive job markets.

[1] https://www.ai.gov/
[2] https://www.bloomberg.com/company/press/generative-ai-to-become-a-1-3-trillion-market-by-2032- research-finds/
[3] https://www.reuters.com/technology/us-based-generative-ai-job-postings-up-20-may-data-2023-06-22/
[4] https://www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america
[5] https://gizmodo.com/ai-specialist-wef-top-10-fastest-growing-jobs-of-2023-1850447518

Student Learning Outcomes:

SO1 – Technical Proficiency. Prepare and transform data into machine-learning representations, encompassing unsupervised, supervised, or reinforcement learning.

SO2 – Mastery of AI Systems. Devise and implement intelligent agents and expert systems capable of receiving percepts from the environment and executing actions.

SO3 – Ethical AI practices. Analyze the ethical implications of AI technologies and demonstrate a commitment to responsible and unbiased AI.

SO4 – Effective communication. Effectively communicate and summarize AI solutions through written, oral, and visual means.

The outcomes for graduates of the program will be assessed by:
1. Percentage of program graduates who secure employment within one year of graduation.
2. Tracking the types of positions graduates attain and the industries they enter.

3. Percentage of program graduates who pursue a Ph.D. within 5 years of program completion.
4. Alumni surveys that target feedback on the program's effectiveness in preparing graduates for their careers.
5. Employer surveys to obtain feedback from organizations that have hired program graduates to target feedback on the program's effectiveness in preparing graduates for their careers.

Projected Enrollment:

	FISCAL YEARS*					
ESTIMATES	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Students new to the university	40	45	75	95	105	105
Students from other university programs	40	--	--	--	--	--
Students off-campus or distance	--	--	--	--	--	--
continuing students	--	72	41	68	86	95
Total students in the program (fall)	**80**	**117**	**116**	**163**	**191**	**200**
Program credit hours (major Courses)**	1440	4212	4176	5868	6876	7200
Graduates	--	70	40	66	84	93

*Do not include current fiscal year.

**This is the total number of credit hours generated by students in the program in the required or elective program courses. Use the same numbers in Appendix B – Budget.

Enrollment estimates are based on:

- Analysis of enrollment trends in USD's current computer science program and similar AI programs at peer institutions.
- Referencing IPEDS data provides insights into the demand for AI-related programs nationally.
- Aligning the program with the current and projected demand for AI professionals in the job market.

Projected Revenue/Expenses:

FINANCIAL HEALTH SUMMARY	1st	2nd	3rd	4th	5th	6th
	FY24	FY25	FY26	FY27	FY28	FY29
TUITION & FEE REVENUES	535,079	782,553	775,865	1,090,224	1,277,501	1,337,698
PROGRAM EXPENSES	-	-	163,444	158,444	158,444	274,858
NET (T&F REVENUES LESS PROGRAM EXPENSES)	535,079	782,553	612,421	931,780	1,119,057	1,062,840
OTHER SUPPORTING REVENUES	-	-	-	-	-	-
NET AFTER OTHER SUPPORTING REVENUES	535,079	782,553	612,421	931,780	1,119,057	1,062,840

No new resources are requested for this program because this proposal moves the existing AI specialization within the MS CSC at USD to a free-standing degree program, thus, existing faculty will be utilized. If this program brings in more than 30 additional students beyond what we currently have in the computer science department, two additional faculty may be hired, one in year 3 and one in year 6 if enrollment growth meets predictions. The expenses documented above assume enrollment projections will be met and that two new faculty will need to be hired.

Artificial Intelligence, M.S.

Mission

The University of South Dakota offers undergraduate, graduate, and professional programs within the South Dakota System of Higher Education. As the oldest university in the state, the University of South Dakota serves as the flagship and the only public liberal arts university in the state.

Strategic Plan

Strategic Theme One: Academic Excellence
Goal 1: Improve long-term outcomes and success of USD students as it relates to liberal arts.

Strategic Theme Five: Serving South Dakota
Goal 1: Address key statewide issues by leveraging USD expertise.

Workforce Needs/Program Impact

- Given the expanding importance of AI in workforce development, there is a real need for diverse AI programs across the state of SD.

- The AI market is on the brink of explosive growth, with projections indicating a remarkable expansion from $40 billion (about $120 per person in the US) in 2022 to a staggering $1.3 trillion (about $4,000 per person in the US) over the next decade.

- This program will align with the National Artificial Intelligence Initiative Act of 2020 to promote United States leadership in AI.

- USD researchers already have strong teaching, research and publication records in several core AI areas required by a growing economy: large scale image processing, language and text processing, and sound/music processing.

- Computer Science and Sanford School of Medicine researchers are already affecting health care in South Dakota, conducting collaborative cutting-edge AI image processing research that aligns well with increasingly sophisticated medical care offered by Sanford, Avera, and other health care providers.

- Up next: similar collaborative efforts between Computer Science, Sustainability, and Beacom School of Business researchers designed to benefit South Dakota's agricultural economy.

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Repackaging: MS in Computer Science with AI to MS in Artificial Intelligence

M.S. in Computer Science with a specialization in Artificial Intelligence

Note: No credit will be granted on the Program of Study for a core course with a grade of 'C' or lower.

Select 18 credit hours from the following core courses:
- CSC 705 - Design and Analysis of Computer Algorithms 3 cr
- CSC 721 - Distributed Systems 3 cr
- CSC 722 - Machine Learning Fundamentals 3 cr
- CSC 725 - Operating Systems & Architecture I 3 cr
- CSC 731 - Compiler Construction 3 cr
- CSC 751 - Programming Science 3 cr
- CSC 752 - Computer Vision (C) 3 cr
- CSC 761 - Advanced Artificial Intelligence (C) 3 cr
- CSC 762 - Advanced Computer Networks and Security 3 cr
- CSC 765 - Software Design and Development 3 cr
- CSC 785 - Information Storage and Retrieval 3 cr
- CSC 790 - Seminar (C) 3 cr
- CSC 791 - Independent Study (C) 1-5 cr
- CSC 792 - Topics (C) 1-3 cr
- CSC 7XX-Any graduate coursework in Computer Science with departmental approval

NO NEW COURSES

Artificial Intelligence specialization required coursework: 15 credit hours

Category A: Core courses (6 credit hours)
- CSC 722 - Machine Learning Fundamentals 3 cr
- CSC 724 - Applied Reinforcement Learning 3 cr
- CSC 752 - Computer Vision (C) 3 cr
- CSC 761 - Advanced Artificial Intelligence (C) 3 cr
- CSC 785 - Information Storage and Retrieval 3 cr
- CSC 787 - AI in Medical Imaging Informatics 3 cr

Category B: Foundation courses (9 credit hours)
- CSC 525 - High Performance Computing 3 cr
- CSC 542 - Applied Math for Data Science and Machine Learning 3 cr
- CSC 544 - Internet of Things (IoT) 3 cr
- CSC 547 - Artificial Intelligence (C) 3 cr
- CSC 557 - Data Analysis/Decision Making 3 cr
- CSC 586 - Data Mining 3 cr
- CSC 588 - Pattern Recognition & Machine Learning 3 cr
- STAT 580 - Applied Statistics 3 cr
- STAT 581 - Probability and Statistics 3 cr

M.S. in Artificial Intelligence

Major Requirements

Prefix	Number	Course Title (add or delete rows as needed)	Credit Hours	New (yes, no)
Complete 18 credits of Core Coursework:				
CSC	722	Machine Learning Fundamentals	3	No
CSC	724	Applied Reinforcement Learning	3	No
CSC	752	Computer Vision	3	No
CSC	761	Advanced Artificial Intelligence	3	No
CSC	785	Information Storage and Retrieval	3	No
CSC	787	AI in Medical Imaging Informatics	3	No
CSC	790	Graduate Seminar	3	No
CSC	792	Topics (related to AI approved by the Department)	3	No
		Subtotal	18	

Major Electives: List courses available as electives in the program. Indicate any proposed new courses added specifically for the major.

Prefix	Number	Course Title (add or delete rows as needed)	Credit Hours	New (yes, no)
Complete 12 credits of Elective Coursework:				
CSC	542	Applied Math for Data Science and Machine Learning	3	No
CSC	547	Artificial Intelligence	3	No
CSC	557	Data Analysis/Decision Making	3	No
CSC	559	Introduction to Data Science and Engineering	3	No
CSC	586	Data Mining	3	No
CSC	588	Pattern Recognition and Machine Learning	3	No
		Subtotal	12	

Enrollment Projections

ESTIMATES	FISCAL YEARS*					
	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Students new to the university	40	45	75	95	105	105
Students from other university programs	40	--	--	--	--	--
Students off-campus or distance	--	--	--	--	--	--
Continuing students	--	72	41	68	86	95
Total students in the program (fall)	**80**	**117**	**116**	**163**	**191**	**200**
Program credit hours (major courses)**	1440	4212	4176	5868	6876	7200
Graduates	--	70	40	66	84	93

Does not include current fiscal year.
** This is the total number of credit hours generated by students in the program in the required or elective program courses.
Use the same numbers in Appendix B – Budget.
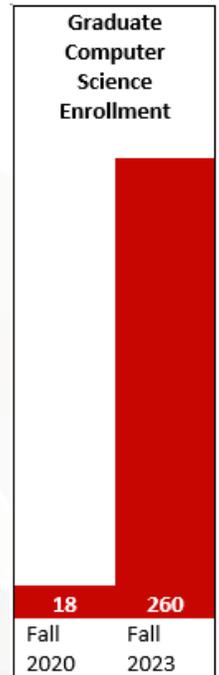
Over the last three years, total graduate computer science enrollment has surged from 18 in fall of 2020 to 260 in fall of 2023. Existing students provide the base for the MS in Artificial Intelligence, but new students will fuel further growth.

Graduate Computer Science Enrollment

| 18 | 260 |
| Fall 2020 | Fall 2023 |

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University of South Dakota, Artifical Intelligence (MS)

FINANCIAL HEALTH SUMMARY						
	1st	2nd	3rd	4th	5th	6th
	FY24	FY25	FY26	FY27	FY28	FY29
TUITION & FEE REVENUES	535,079	782,553	775,865	1,090,224	1,277,501	1,337,698
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NET (T&F REVENUES LESS PROGRAM EXPENSES)	535,079	782,553	612,421	931,780	1,119,057	1,062,840
OTHER SUPPORTING REVENUES	-	-	-	-	-	-
NET AFTER OTHER SUPPORTING REVENUES	535,079	782,553	612,421	931,780	1,119,057	1,062,840

FINANCIAL HEALTH SUMMARY - EXPANDED						
	1st	2nd	3rd	4th	5th	6th
	FY24	FY25	FY26	FY27	FY28	FY29
PROGRAM TUITION AND FEE REVENUES						
Estimated # of Students Enrolled	80	117	116	163	191	200
Tuition (Net of HEFF)	433,487	633,975	628,556	883,230	1,034,951	1,083,718
Program Fees	101,592	148,578	147,308	206,994	242,551	253,980
Total Program Tuition and Fee Revenues	535,079	782,553	775,865	1,090,224	1,277,501	1,337,698
PROGRAM EXPENSES						
Personal Services						
FTE - Faculty	0.00	0.00	1.00	1.00	1.00	2.00
FTE - NFE / CSA	0.00	0.00	0.00	0.00	0.00	0.00
# of Adjunct Course	0	0	0	0	0	0
# of GA's	0	0	2	2	2	3
Salary	-	-	105,000	105,000	105,000	195,000
Benefits	-	-	21,444	21,444	21,444	42,858
Sub-Total Personal Services	-	-	126,444	126,444	126,444	237,858
Chk	-	-	-	-	-	-
Operating Expenses (OE)						
Travel	-	-	2,000	2,000	2,000	2,000
Contractual Services	-	-	-	-	-	-
Supplies and Materials	-	-	-	-	-	-
Grants and Contracts	-	-	-	-	-	-
Capital Assets	-	-	5,000	-	-	5,000
Faculty Start-Up	-	-	30,000	30,000	30,000	30,000
Sub-Total Personal Services	-	-	37,000	32,000	32,000	37,000
Chk	-	-	-	-	-	-
Total Program Expenses	-	-	163,444	158,444	158,444	274,858
Chk	-	-	-	-	-	-
NET (T&F Revenues less Program Expenses)	535,079	782,553	612,421	931,780	1,119,057	1,062,840

Questions?