APPLIED ARTIFICIAL INTELLIGENCE

Master of Science
Applied Artificial Intelligence

The Master of Science in Applied AI (informally refer to the program as 'AI+X', where the 'X' represents different technical degree areas, which includes most STEM disciplines) is a non-thesis M.S. degree program. It is designed for students who already hold an undergraduate or graduate degree in STEM fields and wish to continue advancing in their original area of study while mastering cutting-edge AI techniques and tools to make a transformative impact in their chosen domain 'X'.

Program Objectives

1. ***Advance Understanding:*** Provide students with an advanced understanding of the foundational principles, theories, and techniques of artificial intelligence (AI), including machine learning, neural networks, and computer vision;
2. ***Develop Applied Skills:*** Foster practical skills through hands-on experience with AI tools, frameworks, and programming languages empowering students to design, implement, and evaluate AI solutions for real-world problems; and
3. ***Collaborate Across Disciplines:*** Encourage interdisciplinary collaboration by integrating AI with other STEM fields fostering innovation and addressing complex societal challenges through AI-driven solutions.

Program Outcomes

Students who complete the M.S. in AI+X program will be able to demonstrate:

1. Proficiency in advanced object-oriented programming techniques (e.g., C++ or Python), and in applying these skills in the development of cutting-edge AI systems.
2. Competence to model abstract AI challenges and the corresponding informational uncertainties into well-defined, ethical descriptions of specific AI project requirements.
3. Expertise in machine learning, game theory and multi-agent decision making, natural language processing, robotics and computer vision algorithms, models and state-of- the-art system architectures.
4. Skill to identify well-defined performance metrics (e.g., sensitivity and specificity of the AI system), and design and run simulations/ experiments to validate and enhance system/software performance.
5. Ability to design and develop scalable software on specialized hardware (e.g., graphic processor units) as well as application programming interfaces (APIs), to design state- of-the-art AI solutions.
6. Ability to work and communicate effectively in diverse teams with AI professionals, software engineers and domain experts.

Program Structure

For the M.S. degree in AI+X program, a total of **31 credit hours** will be required, of which a **minimum of 9 credit hours must come from 6000-level lecture courses**. The curriculum consists of three major parts: program core (required) courses, program elective courses, and discipline-specific elective courses.

Program-Core (Required) Courses (10 credit hours)

The following four courses (totaling to **10 credit hours**) are chosen in order to accomplish the desired Program Outcomes 1 and 2.

COMP SCI 5111	Bridge to Advanced Computing (Alternative requirement for students with B.S. degree in Comp Sci) [1]	3
COMP SCI 5206	Probability and Its Applications in Computing	3
COMP SCI 5400	Introduction To Artificial Intelligence	3
COMP SCI 6010	Seminar	1

Program-Elective Courses (9 credit hours)

In consultation with their advisor(s), students should select **9 credit hours** from the following list of AI electives currently offered by the Comp Sci department at Missouri S&T.

COMP SCI 5401	Evolutionary Computing	3
COMP SCI 5402	Introduction to Data Mining	3
COMP SCI 5403	Introduction to Robotics	3
COMP SCI 5404	Introduction to Computer Vision	3
COMP SCI 5408	Game Theory for Computing	3
COMP SCI 5411	Natural Language Processing	3
COMP SCI 5420	Introduction to Machine Learning	3
COMP SCI 5421	Reinforcement Learning	3
COMP SCI 5480	Deep Learning	3
COMP SCI 6202	Markov Decision Processes	3
COMP SCI 6400	Advanced Topics In Artificial Intelligence	3
COMP SCI 6401	Advanced Evolutionary Computing	3
COMP SCI 6402	Advanced Topics in Data Mining	3
COMP SCI 6405	Clustering Algorithms	3
COMP SCI 6406	Machine Learning in Computer Vision	3
COMP SCI 6408	Algorithmic Game Theory	3
COMP SCI 6411	Large Language Models	3

Discipline-Specific Elective Courses (12 credit hours)

Students should take at least 3 courses from the same "X" department. The discipline-specific elective courses should be at the 5000- or 6000-level lecture courses from the "X" department. Students should take at least one 6000-level lecture course from the "X" department. Students may take a fourth course from the "X" department, or any other discipline upon consulting their advisor. For example, there are existing courses in other programs, such as MATH 5762, MECH ENG 5479, SYS ENG 5212, etc.

[1] If a student has a B.S. degree of Computer Science (Comp Sci) or Computer Engineering (Comp Eng) or enrolls in Comp Sci or Comp Eng, the student can replace the core course, COMP SCI 5111, with COMP SCI 5480.