WASC | Senior College and University Commission

University of San Diego
SHILEY-MARCOS
SCHOOL OF ENGINEERING

Master of Science in Applied Artificial Intelligence

CURRICULUM DESIGN

The University of San Diego's Master of Science in Applied Artificial Intelligence (AAI) is committed to training current and future artificial intelligence professionals for success in this fast-growing field.

This 30-unit program is offered in two distinct formats:

- Part-Time, 100% Online (16–20 Months): Students take two asynchronous courses per 14-week semester, focused entirely on one 7-week course at a time.
- Full-Time, On-Campus (16 Months): Students take three courses each Fall semester and four in the Spring.

The full-time, on-campus program admits new students in the Fall or Spring terms, while online students have the option to start in Fall, Spring, or Summer terms. Program courses place a significant emphasis on real-world applications, ethics, privacy, moral responsibility and social good in designing AI-enabled products.

CURRICULUM STRUCTURE

- Orientation: AAI 550
- Foundational Courses: Applied Probability & Statistics (AAI 500) | Intro to AI & Machine Learning (AAI 501)
- Core AI Modules: Agentic Systems, Neural Networks, NLP & GenAI, Computer Vision, and LLM Engineering
- Advanced Operations & Capstone: MLOps (AAI 540) and your final Capstone Project (AAI 590)

Online Format:

30-unit program
16-20 months

$995 per unit
Total Cost = $29,850

On-Campus Format:

30-unit program
16 months

$2,000 per unit
Total Cost = $60,000

PROGRAM OBJECTIVES

- *Develop structures within organizations for the deployment of AI-based systems and software for automated decision-making.*
- *Successfully apply principles of AI tools such as machine learning and neural networks to tackle problems in the industry related to technology, operations, finance, marketing, and corporate development.*
- *Apply ethical standards to the collection, dissemination, and analysis of data for data-driven business decision-making.*
- *Be effective leaders and managers in articulating the value of AI-based systems and software for organizations in corporations.*

Learn more at
SanDiego.edu/AI-Masters

Call (619) 333-5469 or (888) 832-0239
Email: ai@sandiego.edu

ORIENTATION COURSE

AAI 550 - New Student Orientation

This orientation course introduces students to the University of San Diego and provides important information about the MS-AAI program and the technologies that will be used throughout the program. In the orientation, students will learn to successfully navigate through the learning environment and locate helpful resources. Students will practice completing tasks as preparation for success in their online graduate courses. This orientation course will be available to students as a reference tool throughout the entirety of the program.

FOUNDATIONAL COURSES

AAI 500 - Applied Probability and Statistics for AI

This course is an introduction to probability and statistical concepts and their applications in solving real-world problems, along with an introduction to coding in Python. The course provides a solid foundation in probability and statistics that underpins modern artificial intelligence and data-driven decision-making. Topics include statistical concepts, probability theory, random and multivariate variables, data and sampling distributions, descriptive statistics, estimation of population parameters, and hypothesis testing. Students are also introduced to probabilistic reasoning concepts that form the basis for advanced AI methods, including foundational ideas relevant to Bayesian reasoning and machine learning. The course emphasizes the use of Python to perform basic statistical analyses, including numerical and graphical data exploration, elements of probability, sampling distributions, probability distribution functions, estimation, and hypothesis testing. Practical problem-solving skills are developed through applied examples, case studies, and standard organizational workflows, with an emphasis on structuring and executing analyses as they would occur in large enterprise environments. Team collaboration, professional presentation skills, and academic writing are reinforced through a final team project that integrates statistical reasoning, coding, and communication.

AAI 501 - Introduction to Artificial Intelligence and Machine Learning

Artificial Intelligence (AI) and Machine Learning (ML) are transforming society through their ability to model complex systems and compute how to act effectively and safely in a wide variety of situations. This course provides a structured introduction to the fundamental principles and core techniques that underpin AI/ML, while also exploring their practical applications and limitations. Students will engage with topics ranging from intelligent agents and heuristic search to mathematical optimization, supervised and unsupervised learning, forecasting, deep learning architectures, and reinforcement learning. The course emphasizes critical thinking about problem formulation, algorithm selection, and evaluation, preparing students to navigate the full lifecycle of AI/ML projects. Real-world applications in areas such as computer vision, natural language processing, forecasting, and decision-making are examined to connect theory with practice. By the end of the course, students will have the knowledge necessary to apply these techniques in a wide range of professional contexts.

CORE COURSES

AAI 510 - Agentic AI Systems

This course provides a comprehensive introduction to AI Agents, covering fundamental concepts, popular frameworks, essential tooling, and practical development. Students will learn to build, evaluate, and manage AI agents, culminating in an integration of subject matter expertise into agent outputs and the ethical considerations surrounding this rapidly evolving field. Prerequisites: AAI 500 and AAI 501

AAI 511 - Neural Networks and Deep Learning

Neural networks have enjoyed several waves of popularity over the past half-century. The many applications of neural networks include apps that identify people in photos, automated vision systems for large-scale object recognition, smart home appliances that recognize continuous, natural speech, self-driving cars, and software that translates from any language to any other language. In this course, students will learn the fundamental principles and concepts of neural networks and state-of-the-art approaches to deep learning using in-demand Python packages, such as TensorFlow and PyTorch. Students will learn to design neural network architectures and training methods using hands-on assignments and will perform comprehensive final projects in this course. Prerequisites: AAI 500 and AAI 501

AAI 520 - Natural Language Processing and GenAI

This course provides an in-depth examination of the foundations and applications of Natural Language Processing (NLP) and Large Language Models (LLMs). Students will explore text preprocessing, Named Entity Recognition (NER), and Part-of-Speech (PoS) Tagging, applying these techniques in tasks such as information extraction and sentiment analysis. The course then examines the evolution of language models, focusing on transformer architectures, BERT, GPT, and T5, with hands-on experience in fine-tuning pre-trained models. Students will also develop skills in prompt engineering and build Retrieval-Augmented Generation (RAG) systems using the Hugging Face ecosystem. The course culminates in a team-based capstone project where learners design and implement a multi-agent financial analysis system, demonstrating practical mastery of LLM integration, workflow design, and real-world AI applications. The hands on approach of this course will provide students with both conceptual knowledge and applied skills in NLP, LLMs, RAG, and agentic AI, preparing them to innovate at the forefront of AI-driven language technologies. Prerequisites: AAI 500 and AAI 501

AAI 521 - Applied Computer Vision for AI

This course provides an introduction to computer vision. Computer vision uses a combination of traditional AI, machine learning, image processing, and mathematical theories to provide ways of programming a computer to understand visual imagery, whether a static picture, stereo vision for a robot, or motion from video. Topics covered include fundamentals of feature detection and extraction, motion estimation and tracking, image processing, and object and scene recognition. Students will learn fundamental concepts of computer vision as well as gain hands-on experience in solving real-world vision problems. A variety of tools will be introduced in this course, but the main focus will be on Python and OpenCV, as well as TensorFlow and Keras. Prerequisites: AAI 500 and AAI 501

AAI 530 - Large Language Model Engineering

This course provides a comprehensive overview of the techniques and challenges involved in engineering and deploying large language models (LLMs) in applied settings. Students will gain hands-on experience with API-based LLM integration, prompt engineering, fine-tuning, and reinforcement learning strategies for model optimization. Emphasis will be placed on alignment, safety, and responsible AI development. By the end of the course, students will be able to design, deploy, and evaluate LLM-based systems with practical utility and ethical awareness. Prerequisites: AAI 500 and AAI 501

AAI 531 - Applied AI Ethics

This course explores the ethical, social, and environmental implications of Artificial Intelligence (AI) and related technologies through the lens of core ethical principles, including human dignity, bias, fairness, privacy, safety, explainability (XAI), transparency, responsibility, and governance. Through theoretical discussions, real-world case studies, and hands-on labs, students will examine how AI systems can be designed to mitigate bias, enhance transparency, and protect user privacy while also considering AI's environmental impact, including its role in electronic waste, energy consumption, and resource extraction. Students will investigate AI's broader social, political, and economic effects, such as labor displacement, economic inequality, and systemic bias reinforcement. The course also examines how AI-driven technologies can perpetuate global power imbalances and disproportionately impact communities. To provide a structured ethical foundation, students will explore philosophical frameworks that inform AI ethics, enabling them to evaluate the ethical dimensions of AI decision-making. Through hands-on practice, students will learn to measure bias using fairness metrics, implement bias mitigation strategies, and apply XAI techniques to improve AI model transparency and accountability. They will also be introduced to ethics impact assessments, guiding them in identifying key stakeholders and evaluating risks and unintended consequences of AI systems. By engaging with real-world case studies, students will critically analyze AI's impact, assess international regulatory frameworks, and explore governance strategies to ensure AI operates within ethical and legal boundaries. By the end of the course, students will be equipped with both theoretical knowledge and practical skills to navigate the ethical complexities of AI development and deployment. They will learn to critically assess AI's societal role and adapt their approach to AI innovation in ways that prioritize equity, accountability, and sustainability. Prerequisites: AAI 500 and AAI 501

FINAL CORE AND CAPSTONE

AAI 540 - Machine Learning Operations (MLOps)

Interest in and usage of Machine Learning systems has increased dramatically in recent years. More and more innovative products and research rely on Machine Learning systems that leverage data to make predictions and identify trends. However, as with many cutting-edge fields, Machine Learning systems are often implemented improperly. As a result, many Machine Learning systems are unreliable, inefficient, or even useless. Machine Learning Operations (MLOps) is a methodology whose goal is to design, build, deploy, and maintain machine learning models properly. MLOps combines practices from Machine Learning, Data Engineering, and DevOps to ensure that Machine Learning models and algorithms are reliable, efficient, and, most importantly, useful. This course will introduce students to the key concepts of MLOps and a holistic method of designing suitable ML systems. Students will learn and perform the best practices for building Machine Learning systems with hands-on learning experiences and real-world applications. While students will learn about and implement some Machine Learning algorithms in this course, this course is not intended to teach them about the field of Machine Learning. Rather, students will learn how to properly design Machine Learning systems throughout the entire lifecycle. Prerequisites: AAI 510, AAI 511, AAI 520, AAI 521, and AAI 531

AAI 590 - Capstone Project

In this course, students learn how the knowledge and skills acquired in the Master's program can be directly applied to develop AI-enabled systems. Students will apply skills acquired in the program to effectively address ethical, moral, and social issues in their design process. Students can work individually or in teams and participate in the identification of a problem, develop a project proposal outlining an approach to the problem's solution, implement the proposed solution, and test or evaluate the result in this Capstone using tools and technologies that were taught throughout the entire program. Prerequisites: AAI 510, AAI 511, AAI 520, AAI 521, AAI 530, and AAI 531

NEW, OPTIONAL COURSE FOR ON-CAMPUS, FULL-TIME STUDENTS ONLY

AAI 589 - Directed AI Research Extension

In this optional course, students engage in a faculty-supervised research experience that extends their applied training in artificial intelligence through deeper theoretical investigation and advanced experimentation. Designed to be taken prior to the Capstone Project, the course allows students to refine a problem domain, examine relevant scholarly literature, and develop a research-informed approach that can support a more advanced and rigorous Capstone experience. Students work independently or in small groups under faculty guidance to formulate research questions, design and conduct systematic experiments, and analyze results using modern AI methods and tools. Emphasis is placed on contemporary topics such as foundation and large language models, agentic and multi-agent systems, advanced deep learning techniques, responsible and ethical AI, and modern evaluation and benchmarking practices. Course outcomes may include a research plan, technical report, or extended analysis suitable for further development into a publication-ready manuscript and an expanded capstone project. Prerequisites: AAI 500 with a minimum grade of C- and AAI 501 with a minimum grade of C-; completion of at least 21 units in the MS-AAI program; permission of Academic Director.