

Artificial Intelligence, Additional Major

Additional Major in Artificial Intelligence

Students interested in pursuing an additional major in Artificial Intelligence should first consult with the Program Administrator (bsai@cs.cmu.edu). Students must have all prerequisites completed, 21-112 or 21-120, 15-122, 15-150, one of 15-210, 15-213, or 15-251, as well as 07-280. Students must earn a "B" average in all prerequisite coursework in order to be admitted to the additional major. The additional major requires 6 mathematics courses, 5 computer science courses, 2 artificial intelligence courses, 4 courses from AI cluster areas, 1 course in ethics, and 1 course in human cognition.

Prerequisites

(1 course)		Units
15-112	Fundamentals of Programming and Computer Science	12

The following courses are required for the Addition Major in Artificial Intelligence:

Math and Statistics Core

(6 courses)		Units
21-112	Integral Calculus	10
or 21-120	Differential and Integral Calculus	
21-127	Concepts of Mathematics	12
or 21-128	Mathematical Concepts and Proofs	
or 15-151	Mathematical Foundations for Computer Science	
21-122	Integration and Approximation	10
21-241	Matrices and Linear Transformations	11
Probability and Statistics (one of)		
36-218	Probability Theory for Computer Scientists	9
15-259	Probability and Computing (if taken Sp24 or later)	12
21-325 & 36-226	Probability and Introduction to Statistical Inference	18
21-425 & 36-226	Probability and Martingales and Introduction to Statistical Inference	18
36-225 & 36-226	Introduction to Probability Theory and Introduction to Statistical Inference	18
36-235 & 36-236	Probability and Statistical Inference I and Probability and Statistical Inference II	18
Modern Regression Course		
36-401	Modern Regression	9

Computer Science Core

(5 courses)		Units
15-122	Principles of Imperative Computation	12
15-150	Principles of Functional Programming	12
15-210	Parallel and Sequential Data Structures and Algorithms	12
15-213	Introduction to Computer Systems	12
15-251	Great Ideas in Theoretical Computer Science	12

Artificial Intelligence Core

(2 courses)		Units
07-280	Artificial Intelligence and Machine Learning I	12
07-380	Artificial Intelligence and Machine Learning II	12

AI Cluster Electives

(4 courses, one from each cluster area)		Units
Cognition and Action Cluster (1 course)		
15-386	Neural Computation	9
15-482	Autonomous Agents	12
15-494	Cognitive Robotics: The Future of Robot Toys	12
16-350	Planning Techniques for Robotics	12
16-362	Mobile Robot Algorithms Laboratory	12

16-384	Robot Kinematics and Dynamics	12
Machine Learning Cluster (1 course)		
10-403	Deep Reinforcement Learning & Control	12
10-405	Machine Learning with Large Datasets (Undergraduate)	12
10-414	Deep Learning Systems: Algorithms and Implementation	12
10-417	Intermediate Deep Learning	12
10-418	Machine Learning for Structured Data	12
10-422	Foundations of Learning, Game Theory, and Their Connections	12
10-423	Generative AI	12
10-424	Bayesian Methods in Machine Learning	12
10-425	Introduction to Convex Optimization	12
11-441	Machine Learning with Graphs	9
11-485	Introduction to Deep Learning	12
36-402	Advanced Methods for Data Analysis	9
Perception and Language Cluster (1 course)		
11-411	Natural Language Processing	12
11-442	Search Engines	9
11-492	Speech Technology for Conversational AI	12
15-387	Computational Perception	9
15-463	Computational Photography	12
16-385	Computer Vision	12
Human-AI Interaction Cluster (1 course)		
05-317	Design of Artificial Intelligence Products	12
05-318	Human AI Interaction	12
05-391	Designing Human Centered Software	12
16-467	Introduction to Human Robot Interaction	12

Ethics and Human Cognition

(2 courses, one from each cluster area)

Ethics (1 course)

16-161	Artificial Intelligence and Humanity	12
16-735	Ethics and Robotics	12
17-200	Ethics and Policy Issues in Computing	9
80-249	AI, Society, and Humanity	9
Human Cognition (1 course)		
85-110	Cognitive Psychology	9
85-213	Human Information Processing and Artificial Intelligence	9
85-413	Perception	9
85-408	Visual Cognition	9
85-421	Language and Thought	9

*Note that Concepts in Artificial Intelligence (07-180) is not required for additional majors, although students interested in the additional major in AI are encouraged to take 07-180 prior to taking 07-280.

Double Counting Restrictions

Students pursuing an additional major in AI can double count at most **five courses** total, from the Computer Science Core, the Artificial Intelligence Core, and the AI Cluster Electives, towards all other majors and minors they're pursuing. The Mathematics, Ethics, and Human Cognition courses may double count without restriction, except for 36-402 Advanced Methods for Data Analysis, which is part of the Machine Learning Cluster. Students with majors that overlap substantially with AI should consult with the Program Administrator (bsai@andrew.cmu.edu) to review their audit for any potential issues.