

Intro to Artificial Intelligence

Syllabus

» Course Overview

It seems like many elementary to high school robotics courses are focused on simply coding a Lego robot to move its mechanical arm up and down. This course, in contrast, teaches students what a robot is and how it relates to other key technologies such as artificial intelligence and machine learning. Then the course examines 10 applications of robots and how they will change and impact various aspects of our lives and the economy. Will robots simply steal our jobs, or will they be a tool that will create new opportunities and even free humans to use our creativity and curiosity to their full potential? Students will grapple with this and many other questions as they explore this vital, future-focused subject.

» Course Outline by Module

Module 1	Introduction to Artificial Intelligence	Module 5	Deep Learning & Neural Networks
Module 2	Perception and Intelligence	Module 6	Humans and AI
Module 3	Algorithms in AI	Module 7	Ethical AI and Biases
Module 4	Machine Learning	Module 8	AI and Jobs

» Module Overview and Learning Objectives

| Module 1. Introduction to Artificial Intelligence

This module provides students with a basic overview and introduction to key concepts related to artificial intelligence. Students will be given a history of AI from the 1950s to today. Next, students will understand what AI is, what robotics is, how the two technologies are different, and how/where they overlap. Students will become familiar with terms such as machine learning, deep learning, and neural networks. The module will discuss The Turing Test and how it relates to AI. Students will also be introduced to theories of singularity. Finally, the module will conclude with an overview of what is to come in the course

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Learning Objectives: In this module, students will:

- Describe the history of artificial intelligence
- Differentiate between robotics and artificial intelligence
- Define keywords related to artificial intelligence
- Examine the Turing test and theories of singularity
- Outline the topics that will be covered throughout this course (algorithms, machine learning, deep learning, bias and ethics, applications, and AI's impact on the future)

| Module 2. Perception and Intelligence

Which is more intelligent, a human or a computer? This is not a new question. This module will explore how and why it is a complicated question. The module begins by exploring machine perception and how it differs from human perception. Next, it will differentiate between human intelligence and machine intelligence. Then students will understand the difference between artificial general intelligence and artificial narrow intelligence. The module will then present some of the limitations of machine perception. Finally, the module will examine the mechanics behind AI implementations such as picture/video recognition, and biometrics analysis.

Learning Objectives: In this module, students will:

- Describe how computers perceive the world using sensors and data
- Differentiate between human intelligence and machine intelligence
- Compare general vs. narrow artificial intelligence
- Identify the limitations of machine perception
- Evaluate the mechanics of how AI is used in picture/video recognition, and biometrics analysis

| Module 3. Algorithms in AI

This module provides a closer examination and understanding of algorithms. It begins by defining algorithms and decision tree algorithms. Students will then apply the knowledge to create a basic decision tree algorithm of their own. Next, students will understand how algorithms form the basis of AI. The module will then provide examples of algorithms that students interact with daily. Finally, it will conclude with a look at how AI and algorithms are used in the field of astronomy.

Learning Objectives: In this module, students will:

- Define algorithm and decision tree
- Create a basic decision tree algorithm
- Describe how algorithms form the basis of artificial intelligence
- Provide examples of algorithms that students interact with daily
- Evaluate how AI and algorithms are used in the field of astronomy to find exoplanets

| Module 4. Machine Learning

This module will explore the relationship between artificial intelligence and machine learning. First, it will examine what machine learning is. Then it will outline the four drives behind the emergence of machine learning that have enabled it to become a reality in today's world. Next, the module will discuss machine learning training data and how it is used. Three different types of machine learning- supervised, unsupervised, and reinforcement- will be compared. Finally, the module will evaluate the use of AI and machine learning to generate movie and music recommendations.

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Learning Objectives: In this module, students will:

- Define machine learning
- Outline four drivers behind the emergence of machine learning 1) improvements in computing speed/memory, 2) transition from physically to electronically stored data, 3) easier access to data through the internet, 4) low-cost, high resolution digital sensors
- Describe how training data is acquired and used
- Compare supervised learning, unsupervised learning, and reinforcement learning
- Evaluate the use of AI and machine learning to generate movie and music recommendations

| Module 5. Deep Learning & Neural Networks

This module takes a closer look at deep learning and neural networks. It starts by defining deep learning. Next, it explains neural networks and what the components of a neural network are. Then the module will examine how deep learning will affect society and the economy. Finally, it evaluates how AI and deep learning create technology for self-driving cars.

Learning Objectives: In this module, students will:

- Define deep learning
- Explain the components of a neural network
- Differentiate between deep learning and machine learning
- Describe how deep learning will affect society and the economy
- Evaluate how AI and deep learning is used to operate self-driving cars

| Module 6. Humans and AI

We are experiencing a unique time in history. We are experiencing the dawn of an age where AI is all around us. The AI and Humans Module examines the ways humans already interact with AI. It will also explore design thinking and how it relates to AI. Next, the module will provide an overview of how AI can be used for social good. The current limitations of AI will also be discussed. Finally, the module will evaluate common AI uses such as personal assistants, chatbots, and language translators.

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Learning Objectives: In this module, students will:

- Describe the ways in which humans interact with AI through interfaces and robotics
- Define design thinking and explain how it relates to AI
- Outline ways that AI can be used for social good
- Discuss the limitations of current AI technology
- Evaluate the use of AI in personal assistants, chatbots, and language translators

| Module 7. Ethical AI and Biases

In this module, we explore the ethics and biases in AI creation and application. First, the module introduces the ethical challenges that AI presents and defines what ethical criteria AI systems should be required to meet. Second, it pinpoints areas where AI can be particularly threatening including loss of privacy and mass surveillance. Next, the module discusses biases in AI systems- what causes them and why this is a problem. Then it examines diversity, why we need it in programming and how lack of diversity perpetuates biases. Finally, it evaluates the uses of AI in the U.S. criminal justice system.

Learning Objectives: In this module, students will:

- Describe ethical challenges that AI presents and define what ethical criteria AI systems should be required to meet
- Identify and outline areas where AI could be used in harmful ways such as mass surveillance and contribute to a loss of privacy
- Discuss the cause and problems of biased AI systems
- Describe how the lack of diversity in programming and AI jobs can impact and perpetuate bias
- Evaluate the uses of AI in the U.S. criminal justice system in places like policing applications, and sentencing / parole decisions

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| Module 8. AI and Jobs

News headlines seem to focus on automation, robots, and AI taking away jobs. But is that the only side to the story? True, AI will continue to displace many workers as other technologies, outsourcing, and other trends have done in the past. While this issue should not be forgotten, on the other end there is a tremendous opportunity for young people to educate themselves on AI and prepare for jobs of the future in this dynamic field. This module discusses the skills and qualifications to secure a job in the AI field. Various career possibilities will be explored, and the module will conclude with an evaluation of AI's use in healthcare diagnostics.

Learning Objectives: In this module, students will:

- Compare the potential for both job destruction and job creation through AI
- Describe how AI will impact all jobs across the economy and how people will work together with AI in future jobs
- List the skills and educational requirements necessary to have a career in an AI field
- Examine career possibilities in the field of Artificial Intelligence
- Evaluate the use of AI in healthcare diagnostics and analyze the effects it will have on future jobs in healthcare