

Hands-On AI Projects for the Classroom

A Guide on Ethics and AI

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Teaching AI: Exploring New Frontiers for Learning by Michelle Zimmerman

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APPENDIX A

Unpacking Artificial Intelligence

This section provides basic explanations of fundamental AI concepts referenced in the *Hands-On AI Projects for the Classroom* series of guides, along with resources for supporting instruction.

What Is AI?

According to John McCarthy, who first coined the term, artificial intelligence is “the science and engineering of making intelligent machines, especially intelligent computer programs” (McCarthy, 2007). A technology powered by AI is capable of such things as using sensors to meaningfully perceive the world around it, of analyzing and organizing the data it perceives, and of autonomously using those data to make predictions and decisions.

AI technologies are sometimes classified as narrow and general AI. Narrow AI makes decisions about a specialized task, sometimes even based on a specific dataset of preprogrammed actions. The DeepBlue chess program that beat a human world champion in 1996, Apple’s Siri, and self-driving cars are all examples of narrow AI. In contrast, general AI could hypothetically learn and adapt to perform any task and solve any problem that a human being can. General AI does not currently exist, but there are many examples of it in fiction, such as “Walle” and “Big Hero 6”’s Baymax.

Learn More

Video: “[What is AI \(or Machine Learning\)?](#)”

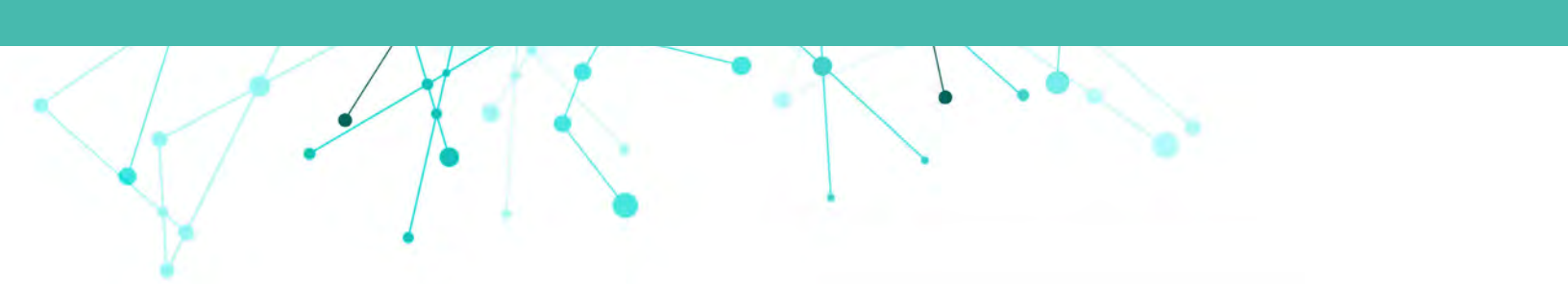
Video: “[What’s intelligent about artificial intelligence](#)”

Article: “[What Is Artificial Intelligence?](#)” by John McCarthy

Curriculum: “[AI4ALL’s Open Learning Curriculum](#)”. This free curriculum provides activities to teach students what AI is, what types of AI exist, and how to identify AI in the world around them.

How Do I Know If a Robot or Other Technology Has Artificial Intelligence?

Some robots and computer programs have AI, while others do not. A robot or software solution that has AI capabilities can do things such as recognize specific objects or faces, navigate around objects or complex maps on its own, classify or distinguish between objects, interact naturally with humans, understand or speak in a human



language, recognize or express emotions, or improvise when encountering something unexpected. In these ways, the autonomous decisions made by AI are more advanced than simple automation of a task (performed a prescribed sequence of steps), which even non-AI robots and software are frequently used for. As the cost of technology decreases and the capabilities of AI technologies increase, we will likely see increased AI use across most devices and software.

Learn More

Article: [“What’s the Difference Between Robotics and Artificial Intelligence”](#)

Article: [“How Robots Work: Robots and Artificial Intelligence”](#)

What Is Machine Learning?

Machine learning, a subset of AI, is the study of algorithms and models that machines use to perform a task without explicit instructions. Machine learning algorithms improve with experience. Advanced machine learning algorithms use neural networks to build a mathematical model based on patterns in sample “training” data. Machine learning algorithms are best used for tasks that cannot be completed with discrete steps, such as natural language processing or facial recognition.

Learn More

Video: [“Intro to Machine Learning \(ML Zero to Hero—Part 1\)”](#)

Video: [“How Does Machine Learning Work? Simply Explained”](#)

How Do Neural Networks Work?

Artificial neural networks are currently modeled after the human brain. While a brain uses neurons and synapses to process data, neural networks use layers of nodes with directed connections. Some of these connections are more important than others, so they have more weight in determining the outcome. Just like people, machines with neural networks learn through experience. As a machine processes a set of data, it recognizes patterns, assigns more weight to the most important information, learns to process inputs in order to develop the most accurate outputs, and creates a model from which to make future predictions or decisions. There are many types of neural networks, each with different design, strengths, and purposes.

Learn More

Video: [“Neural Networks and Deep Learning #3”](#)

Playlist: [“Neural Networks”](#)

Article: [“What Is Deep Learning?”](#)



What Is Natural Language Processing?

Natural language processing is the AI technology used to understand and interact with humans' natural language. Natural language processing powers technologies such as voice experiences and assistants, text predictors, grammar checks, text analyzers (such as spam filters), and language translators.

Learn More

Video: "[Natural Language Processing #7](#)"

Article: "[A Simple Introduction to Natural Language Processing](#)"

Video: "[How Do Chatbots Work? Simply Explained](#)"

Article and video: "[What Are Chatbots?](#)"

What Types of Ethical Considerations Surround AI?

All AI technologies are developed by humans. Whether they have been preprogrammed with a set of rules, or use training data to learn, they will have bias based on human input and decision making. It is important that students understand that AI decisions are not objective, as well as to understand which stakeholders might benefit from certain biases in the technologies. Moreover, many AI technologies collect, store, and apply personally identifiable information about users. Students should be aware of privacy concerns related to these technologies.

Learn More

Curriculum: "[An Ethics of Artificial Intelligence Curriculum for Middle School Students](#)"

Video: "[Algorithmic Bias and Fairness #18](#)"

Article: "[Ethical Concerns of AI](#)"

Article: "[Top 9 ethical issues in Artificial Intelligence](#)"

Video: "[The ethical dilemma of self-driving cars—Patrick Lin](#)"