Definitions

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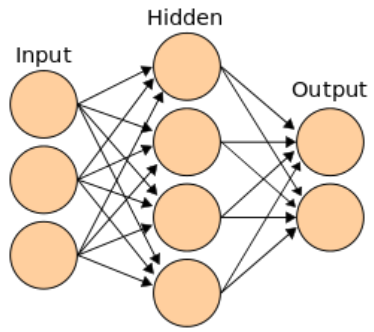
This glossary was written for educators to reference when learning about and using artificial intelligence (AI). We will start with a definition of artificial intelligence and then provide definitions of AI-related terms in alphabetical order. *This glossary was last updated on March 31, 2024*

Artificial Intelligence (AI): AI is a branch of computer science. AI systems use hardware, algorithms, and data to create "intelligence" to do things like make decisions, discover patterns, and perform some sort of action. AI is a general term and there are more specific terms used in the field of AI. AI systems can be built in different ways, two of the primary ways are: (1) through the use of rules provided by a human (rule-based systems); or (2) with machine learning algorithms. Many newer AI systems use machine learning (see definition of machine learning below).

Machine Learning (ML): Machine learning is a field of study with a range of approaches to developing algorithms that can be used in AI systems. AI is a more general term. In ML, an algorithm will identify rules and patterns in the data without a human specifying those rules and patterns. These algorithms build a model for decision making as they go through data. (You will sometimes hear the term machine learning model.) Because they discover their own rules in the data they are given, ML systems can perpetuate biases. Algorithms used in machine learning require massive amounts of data to be trained to make decisions.

Neural Networks (NN): Neural networks, also called artificial neural networks (ANN), are a subset of ML algorithms. They were inspired by the interconnections of neurons and synapses in the human brain. In a neural network, after data enter in the first layer, the data go through a hidden layer of nodes where calculations that adjust the strength of connections in the nodes are performed, and then go to an output layer.



Deep Learning: Deep learning models are a subset of neural networks. With multiple hidden layers, deep learning algorithms are potentially able to recognize more subtle and complex patterns. Like neural networks, deep learning algorithms involve interconnected nodes where weights are adjusted, but as mentioned earlier there are more layers and more calculations that can make adjustments to the output to determine each decision. The decisions by deep learning models are often very difficult to interpret as there are so many hidden layers doing different calculations that are not easily translatable into English rules (or another human-readable language).

Natural Language Processing (NLP): Natural Language Processing is a field of Linguistics and Computer Science that also overlaps with AI. NLP uses an understanding of the structure, grammar, and meaning in words to help computers "understand and comprehend" language. NLP requires a large corpus of text (usually half a million words).

NLP technologies help in many situations that include: scanning texts to turn them into editable text (optical character recognition), speech to text, voice-based computer help systems, grammatical correction (like auto-correct or grammarly), summarizing texts, and others.

Large language models (LLMs) Large language models form the foundation for generative AI (GenAI) systems. GenAI systems include some chatbots and tools including OpenAI's GPTs, Meta's LLaMA, xAI's Grok, and Google's PaLM and Gemini. LLMs are artificial neural networks. At a very basic level, the LLM detected statistical relationships between how likely a word is to appear following the previous word in their training. As they answer questions or write text, LLM's use the model of the likelihood of a word occurring to predict the next word to generate. LLMs are a type of foundation model, which are pre-trained with deep learning techniques on massive data sets of text documents. Sometimes, companies include data sets of text without the creator's consent.

Generative AI (GenAI): A type of machine learning that generates content, such as text, images, music, videos, and can create 3D models from 2D input. See ChatGPT definition, ChatGPT is a specific example of GenAI.

Chat-based generative pre-trained transformer (ChatGPT) models: A system built with a neural network transformer type of AI model that works well in natural language processing tasks (see definitions for neural networks and Natural Language Processing below). In this case, the model: (1) can generate responses to questions (**G**enerative); (2) was trained in advance on a large amount of the written material available on the web (**P**re-trained); (3) and can process sentences differently than other types of models (**T**ransformer).

Intelligent Tutoring Systems (ITS): A computer system or digital learning environment that gives instant and custom feedback to students. An Intelligent Tutoring System may use rule-based AI (rules provided by a human) or use machine learning under the hood. By under the hood we mean the underlying algorithms and code that an ITS is built with. ITSs can support adaptive learning.