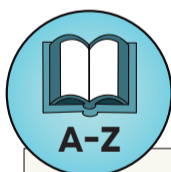


# AI decoded

AI can be roughly divided into symbolic or **rules-based computing**—typical 'if-then' statements—and **machine learning**, where AI is programmed with an algorithm that can modify itself as it gains new information. There are different ways machine learning can be employed: deep learning by using artificial neural networks, reward-based learning, and learning based on statistical

principles. Many AI programs are used for analysing and processing images or speech or extracting information from them. Deep learning is often used for making predictions, like medical diagnoses or possible credit card fraud.



## DEFINITIONS

### Artificial neural network

A computer-based system to process information, loosely modelled on the brain's architecture. It typically involves units, or 'neurons' connected to one another, comparable to how the brain's neurons communicate. Artificial neural networks are highly simplified, abstract forms of brain networks.

### Brain-computer interface

Also called brain-machine interfaces. These devices use decoded brain activity to control an external device, such as a mouse cursor or prosthetic limb.

### Deep learning

A type of machine learning that uses 'deep' neural networks. The word 'deep' refers to the many layers in the neural network. Deep learning is how most of today's artificial intelligence programs operate.

### Electrode

A device used in deep brain stimulation to measure or stimulate electrical brain activity. Any instrument used for recording brain electricity (eg. EEG or electroencephalography) or stimulation requires electrodes.

### Neural

Refers to anything relating to neurons, or the nervous system.

### Machine learning

Computer-based learning achieved by following an algorithm (a set of instructions or rules) to maximise the chance of a prediction being correct. Any program that improves its performance based on new inputs is an example of machine learning. It may involve artificial neural networks, but doesn't have to.

### Neuron

Also called a nerve cell. It is the basic unit of our nervous system. Neurons communicate via electrical impulses, and the 'unit' in artificial neural networks is based on the neuron.

### Neurofeedback

Feedback given to a person about their own brain activity, generally to help them self-regulate or train aspects of their own brain function. For example, brain signatures of attention levels can be detected and converted into a visual scale, which the user can learn to modulate themselves.

### Intelligence

The ability to acquire knowledge through learning and apply that knowledge to solve problems.

### GOFAI

Good Old Fashioned Artificial Intelligence. A traditional logic-based approach to AI, using symbol manipulation.

### Neurotechnology

Engineered hardware that connects with the nervous system. Neurotechnologies can be input devices that alter brain activity (eg. deep brain stimulation electrodes) or output devices that record brain activity (eg. EEG devices). Prosthetics such as the cochlear implant and robotic arms are also neurotechnologies.

### Reinforcement or reward-based learning

Using rewards or penalty to guide learning. With the aim of maximising its reward and minimising mistakes, the network learns an approach that meets its goal.

