What is AI actually?

Table of contents

[So, what is AI? 1](#_Toc33684711)

[Machine Learning (ML) 2](#_Toc33684712)

[Supervised Learning 3](#_Toc33684713)

[Unsupervised Learning 4](#_Toc33684714)

[Reinforcement Learning 4](#_Toc33684715)

[Artificial Neural Network (ANN) 5](#_Toc33684716)

[Deep Learning 6](#_Toc33684717)

[Some other important expressions 6](#_Toc33684718)

[Summary 7](#_Toc33684719)

# So, what is AI?

**Artificial Intelligence** is a **subset of Computer Science** and is a quite broad expression, although it is regularly associated with human-like, self-conscious entities who want to demolish the humanity. If you worry about the machines taking over the world, you can sleep leisurely. It will not happen based on current technology.

Though Artificial Intelligence strives to replicate human features and emulate the human brain, it is way far away from possessing consciousness. Current AI systems are trained to perform one human task in a smart, automated way, **but only one**. The machine playing chess will not be able to play poker or solitaire and will not acquire skills to do so. The software that controls the lights in your home cannot drive an autonomous vehicle.

AI serves by joining **large amounts of data** with quick, **iterative** algorithms, allowing the software to learn from patterns or traits in the dataset. AI is an abstract expression, a broad field of study that includes many theories, methods and technologies. It branches into several subfields: The most prevalent is Machine Learning (ML).

# Machine Learning (ML)

**Machine Learning** is a kind of Artificial Intelligence that provides computers with the ability to learn **without being explicitly programmed**. It doesn't have to be given instructions and exact steps, although it must be trained with large enough datasets to create a model which helps the machine make decisions based on its learnings.

The sorts of machine learning algorithms differ in their approach, the type of data they input and output, and the type of task or problem that they are designed to solve. One of the three major ones is Supervised Learning.

## Supervised Learning

**Supervised Learning** algorithms include **Classification** and **Regression**. Classification algorithms are used when the outputs are restricted to a limited set of values, for instance 'cat' and 'not cat' (which is literally represented by a boolean: 'true' or 'false'), whereas regression algorithms are used when the outputs can have any numerical value within a specific range.

Supervised Learning algorithms build a model of a collection of data that includes **both the inputs and the desired outputs**: The training data is a matrix and consists of a set of training examples. Each training example is represented by a vector which consists of some sample inputs and the desired output.

Supervised Learning algorithms' task is to develop a function that can be utilised to **predict** the output associated with new inputs that were **not a piece of the training data**.

There are some examples of Supervised Learning:

* You get a batch of pictures **with information about what is seen on them** and then you train a model to recognize these objects on new photos.
* You have a bunch of molecules and **information about whether a specific one is a drug,** and you train a model to return whether a new molecule is also a drug.

## Unsupervised Learning

**Unsupervised Learning** algorithms process a collection of data that contains **only inputs**: it must find a structure in the data, cluster and group them. That means that the algorithms learn from data which **has not been classified, categorised or labelled**. Unsupervised Learning algorithms search **common features and characteristics** in the data and **group the entries** according to them.

There are some examples of Unsupervised Learning:

* You have a batch of pictures of 6 people but **without information about who is on which one** and you want to **split** this dataset into 6 piles, each with the photos of one individual.
* You have molecules, some of them are drugs, the others are not. **You do not know which are which**,but you desire the algorithm to identify the drugs.

## Reinforcement Learning

**Reinforcement Learning** is also an area of Machine Learning. Reinforcement Learning algorithms **do not assume knowledge of an exact mathematical model** and are used when exact models are impossible to create. Reinforcement Learning algorithms are applied in autonomous vehicles or in a machine that beat a human player in a game.

The point is that the system must **find the way out itself towards success**. For instance, in a videogame, it needs to find out how can it beat an enemy, how can it accomplish a level, walk through the map, avoid obstacles. It is trained by giving confirmation and reward on success and punishment on fail.

It differs from supervised learning in that the labelled input-output pairs **do not have to be present**, and wrong actions do not have to be explicitly corrected. The focus is on finding a balance between **exploration** (of the undiscovered area) and **exploitation** (of current knowledge).

# Artificial Neural Network (ANN)

**Artificial Neural Network** is a type of Machine Learning. When the system models a dataset, it mostly accomplishes it with an Artificial Neural Network (ANN), which is the most used Machine Learning model.

An ANN is based on a lot of coupled units or nodes called **Artificial Neurons**, which strive to model the neurons in a biological brain.

Artificial Neurons and bonds typically have a **weight** that adjusts as learning advances. The weight **strengthens or weakens the signal**.

Generally, Artificial Neurons are **grouped into layers**. Different layers may complete **different sorts of transmutations** on their inputs. Signals travel through the **hidden layers** from the first layer, which is called the **input layer**, to the last layer, which is called the **output layer**.

Each bond (called '**edge**'), like the synapses in a biological brain, can **transmit a signal**, which is in most cases a real number, from one Artificial Neuron to another. An Artificial Neuron that receives a signal can process it: compute it with some non-linear function, and then **pass it to further Artificial Neurons** joined to it.

The process requires **multiple passes** of the data to find relationships and obtain meaning from undefined data.

# Deep Learning

You probably have already heard about **Deep Learning** since it is quite a widespread expression. However, it is just a subset of Machine Learning. It only differs in the volume: it applies several enormous neural networks, with numerous layers of nodes, that learn complex patterns in extensive amounts of data. It is much more complex than simple ML. In most cases, it builds **more models simultaneously**.

Common applications include **image and speech recognition**, **object detection**.

# Some other important expressions

**Cognitive Computing** is a subfield of AI that strives for natural, human-like interaction with machines. This is the area what people automatically associate with AI slightly exaggeratedly.

**Computer Vision** is present when the system applies Pattern Recognition and Deep Learning to recognise what is seen in a picture or video.

**Natural Language Processing (NLP)** is the skill of computers to process, analyse, understand and produce human language, including speech.

**Natural Language Interaction (NLI)** is the next stage of NLP which enables people to communicate with computers using normal, everyday language.

**Graphical Processing Units** **(GPU)** are hardware that is indispensable for AI because they provide heavy computing power. Training neural networks require big data and compute power.

**Internet of Things (IoT)** produces massive volumes of data from connected **smart devices**, which are mostly unanalysed.

# Summary

To summarise briefly, the purpose of AI is to provide software that can **reason on input** and **explain output**. AI can accomplish **one specific task** in a smart, **automated** way**.** AI can **predict**, **sort**, **cluster** and **decide** without human interaction. AI will make human-like decisions on its own, but it's **not** a replacement for humans – and won't be soon.

***Sources:***

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