

AI - Concepts, definition and history

The term “AI”

The term Artificial intelligence originated in mathematics and engineering and started appearing during World War II when governments were funding bigger and stronger computers (Grudin, 2009). The British mathematician Alan Turing was involved with cracking the encrypted “Enigma” code during the time and played a key role in understanding the possibilities of computational force (Grudin, 2009). Even though Turing published the work “Computing Machinery and Intelligence” in 1950, it was the American mathematician and logician John McCarthy who first coined the term “Artificial Intelligence” in his workshop in 1956 (Grudin, 2009).

Definitions of AI

I feel like it is natural to start with the definition from John McCarthy. He explained AI like this; “It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.” (McCarthy, 1998)

A newer approach to explaining the term comes from Wikipedia. I chose to use this because of its availability; it is the first thing that gets presented when people google the term AI, and therefore many people may base their knowledge on it. This explanation is also based on the thoughts of Stuart J. Russel and Peter Norvig who divides historical definitions into four groups; “thinking humanly”, “thinking rationally” “acting humanly” and “acting rationally” (Russel & Norvig, 2009).

“In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving".” (Wikipedia, 2019).

The third definition is one that is mentioned within the “acting humanly” definitions from Russel & Norvig (2009). Rich & Knight (2009) are mentioning that this is “by no means a universally accepted definition”; “Artificial Intelligence (AI) is the study of how to make computers do things which, at the moment, people do better” (Rich & Knight, 2009). This definition avoids philosophical issues regarding the meaning of *artificial* and *intelligence* but still tries to give an outline of what AI is (Rich & Knight, 2009). The bold statement originated from the first version of their book in 1991 and may seem outdated today where there are computational tasks where AI clearly outperforms humans.

The way I coin the term “artificial intelligence” in today's setting; **is machine learning that is using algorithms to interpret and see patterns in big data mimicking intelligence and outputting something trivial**. Increasing processing power and larger data sets has skyrocketed the use of the term Artificial intelligence. I feel like AI is often mixed up with the term “general intelligence”, or that the machines learn the way a human would, which is not the case. The AI may interpret a picture of a cat, but it does not really understand what a cat is, it only matches the input to previous data.

Company that works with AI: Facebook

Facebook is presenting the title “Bringing the world closer together by advancing artificial intelligence” with terms like natural language processing, computer vision and conversational AI (Facebook AI, 2019). Facebook is speaking of AI as the thing to bring people closer, using the technology to strengthen their functions as a social media company. They are mentioning multiple times that they are developing AI “that has a positive impact on people and society” (Facebook AI, 2019), maybe trying to avoid the potential stigma that AI is something bad.

Movie that uses AI: Ex Machina

The movie Ex Machina is about Caleb, a 26-year-old programmer who wins a competition to spend a week at a private mountain retreat/facility belonging to Nathan, his CEO which is comparable to real-life Steve Jobs and Larry Page. Caleb will have to participate in a fascinating experiment in which he must interact with the robot girl Ava; the world's first true artificial intelligence. (Garland, 2014)

In the movie, AI is portrayed as extremely detailed humanoid robots that have been developed beyond the uncanny valley. The movie is proving that the Turing test may not be enough to distinguish an AI from a human. The human-robot interaction is based around speech and natural language between the human and the AI. Even though we can clearly see that it is a robot, the AI is learning from Caleb and the result is that it is able to trick him into thinking it is being fully conscious and intelligent. The movie also touches on an alternative of the Turing test; Mark O. Riedl's The Lovelace 2.0, which rather focuses on creativity to measure intelligence (Riedl, 2014). This can be seen in the movie as the humanoid robot has multiple scenarios of human-like creativity.

Robots and AI systems

The word “robot”

The word robot has been developed over centuries, and what was considered to be robots 20 years ago is now highly outdated (Dautenhahn, 2018). Robots have their roots in automation, doing automated or engineered tasks including water, falling weights, and steam in the early centuries (Britannica, 2013). It has developed to the modern word “robot” or in Czech “robota”, originally meaning hard work or slavery (Britannica, 2019). Going from something humanoid that mainly appeared in science fiction like in Isaac Asimov’s science-fiction story Runaround from 1942 (Britannica, 2019), to a more broad meaning of the word including lawnmowers and voice assistants. It is still a word that is changing rapidly, and we do not have a common reference point when talking about “robots”, for all we know it may have a completely different meaning in 50 years (Dautenhahn, 2018)

Definitions of “robot”

The Oxford University Press (Lexico.com) has some different definitions of “robot”.

1. “(especially in science fiction) a machine resembling a human being and able to replicate certain human movements and functions automatically.” (Lexico, n.d.)
2. “A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer.” (Lexico, n.d.)

This is a good example of how split the definitions can be, on the one side you have a humanoid machine replicating human movement and functions. And on the other side you have a complex and automatic machine, often in the form of a computer doing processes a human could never compete with.

Another definition is from Cambridge dictionary; “a machine controlled by a computer that is used to perform jobs automatically.” (Cambridge dictionary, n.d.) In this definition, a robot takes on more of a role as an effective and industrial machine, rather than something creative and human-like.

I define a robot as a programmable machine that can carry out actions automatically. They may have pre-programmed operations, or sensing its surroundings and learning through AI. Even though I do have a strong mental model of the word robot being a humanoid or cyborg-like, this may be images from a previous and outdated understanding of the word. As the term “machine” often is described as a mechanical structure that uses power to control parts, I would also say that a robot has to be tangible and control some form of movement.

AI vs Robots

I feel that the difference between the two is largely related to the mechanical and physical aspects of it. When I think of a robot, I picture something tangible that is moving or responding with physical feedback. Its hard to visualize AI in the same way, and I feel that modern robots often are a combination of an autonomous AI “brain” and a mechanical robot “body”. You can still have robots that don't use AI, and you can have AI which is not a part of a robot, both are common. Robots can still do actions *automatically* without having AI, but *autonomy* does require a degree of artificial intelligence. It is similar in that both AI and robots may have a goal of being as human-like as possible, which also implies being intelligent and creative.

“Spot” - A contemporary physical robot

Boston Dynamics is famous for its life-like moving robots and has recently launched its new robot “Spot” which is terrifyingly good at mimicking the movements of a dog. There are plenty of applications for these kinds of self-stabilizing and autonomous robots, ranging from lifting, monitoring, inspections in environments not suitable for humans and much more. Humans can interact with it by giving it autonomous commands or being the operator of the robot (Boston Dynamics, 2019). The animal-like movement is remarkably natural, placing itself somewhere in the uncanny valley.

Previous videos released from Boston Dynamics where humans are pushing the robots around to show off their stabilization and recovery, has shown that people feel bad for the robot (Boston Dynamics, 2016, 1:25). We know these are just life-like robots, but because its movement is uncannily similar to a human, we react to it.

Universal Design and AI systems

Universal design was first coined by architect Ronald L. Mace as “a concept of designing products and environments for the needs of people, regardless of their age, ability or status in life” (Persson H, Åhman H, Yngling A. A. & Gulliksen J., 2014). It has its roots in other barrier-free and accessible design approaches (Persson et.al, 2014). Mace argued that the first definition was not broad enough, giving the definition; “The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Persson et.al, 2014).

By this, it is understood that universal design is about including everyone to the greatest extent possible with your design. It is about making your design as simple, flexible and perceptible as you can to not discriminate some people from interacting with the design.

Potential of AI with respect to human cognition and emotions

AI is already being used in healthcare, and we are now seeing versions of social robots that are connecting with humans through AI. The potential for an AI to create emotions with people may be a good solution for the ones that has no other sources for this, especially the elderly and people with mental health issues. An AI can always be there to listen and talk to you, and it could offer a form of relief to have a robot to speak to that doesn't get mad or irritated, but rather a personal assistant just for you.

Some technology in this field already exists, like the PARO robot seal that is giving the therapeutic effects of an animal without the logistical difficulties at hospitals and care facilities (PARO, 2014). Or Hasbro's AI cat which is helping the elderly to remember taking their medication as well as having something to take care of. (Brown, 2017)

Potential of AI for including and excluding people

As mentioned earlier, AI is mainly machine learning training on big datasets. This makes the AI mimic real human behavior, often resulting in unwanted results. If the AI is trained on specific data, this will reflect the output and result. As it is limited to the datasets it is learning on, it may also be excluding people. An example of this is that facial recognition software wrongly recognized faces of well known African American women stated by Joy Buolamwini in her video "AI, Ain't I a woman?" (2018).

As time goes on, speech and image recognition and all other sub-categories of AI will improve. This may help inclusion in society, either it is blind people being able to talk to a voice-controlled AI assistant, or someone lonely getting someone to talk to.

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