

IN5480 Assignment – Iteration 1

1.1 Concepts, definition and history of AI and interaction with AI

John McCarthy, an American mathematician and logician, was the person that coined the term *artificial intelligence* during a workshop in 1956. After World War II and up until this point the possibilities of computation had been theorized by great minds such as Alan Turing who discussed and published works regarding the possibilities of computers eventually obtaining human intelligence. During the late forties and early fifties conferences gathered researchers from many fields to discuss topics like neural network models and cybernetics. John McCarthy held one these conferences where he would put a name on the topic of discussion, *Artificial Intelligence*.¹

In an article posted at Stanford, November 12th 2007, John McCarthy shared his definition of *artificial intelligence* on a "layman's level" based on questions he often received from students, amongst others.

To answer the question "What is artificial intelligence?", he wrote:

*"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"*²

The Encyclopedia Britannica defines artificial intelligence as such:

*"Artificial intelligence (AI) is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence and discernment. Although there are no AIs that can perform the wide variety of tasks an ordinary human can do, some AIs can match humans in specific tasks."*³

The online dictionary Lexico, which is powered by Oxford, has this definition:

¹ Grudin, AI and HCI: Two Fields Divided by a Common Focus

² McCarthy, "What is AI", Stanford Education articles. 07.09.2020. <http://jmc.stanford.edu/articles/whatisai.html>

³ Britannica, s.v. "artificial intelligence". 08.09.2020. <https://www.britannica.com/technology/artificial-intelligence>

"The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages."⁴

Based on aforementioned definitions, I conclude my own:

"It is the science around creating computational intelligence, where systems or machines have the ability to perform tasks similar or equal to human capabilities"

This definition points out that artificial intelligence is about computer systems being developed to match human intelligence, and from there being able to approach and handle activities in ways a human would.

Microsoft is deeply involved with artificial intelligence. Several of their products use AI, such as Office 365, Bing and Cortana, etc. On Microsoft's website they describe their approach "to responsible AI" where they believe AI can be used to help organizations achieve more. Following a list of AI principles, they take ethics of AI into account with the help of committees and bodies of offices like Office of Responsible AI (ORA). They talk about how AI can be used for good, working with environmental and humanitarian issues amongst other topics. Their own platform, Microsoft AI is presented as "robust framework" that can be applied to machine learning, data sciences or robotics development, among many other fields. Microsoft AI offers tools, infrastructure and services as well as training within the different fields AI can be applied.⁵

The Netflix show *Altered Carbon*, which was based on a book series, has a very interesting portrayal of AI. The show takes place in the year 2384 where mankind has achieved "immortality" through the technology of *stacks*, discs that contains a copy of your consciousness. In the futuristic metropolis Bay City, the streets are filled with so-called "AI-hotels". These hotels are completely run with AI-hosts that manifests in physical holograms (made of nanobots?) which can appear anywhere around and in their hotel. The AI essentially is the hotel and can change the building's physical appearance based on their customers' needs and wants. In the year the show is set, it seems that AI hotels are a bit outdated as the protagonist is told that "nobody stays in them anymore" and that they are worse than an "over attached girlfriend" (paraphrased). In this world, all your personal information is connected to and can be

⁴ Lexico, sv. "artificial intelligence". 08.09.2020. https://www.lexico.com/definition/artificial_intelligence

⁵ Microsoft, "AI Platform".

accessed through your DNA, so in order to use the services of the hotel you can for example give your fingerprint. Once the transaction is done the AI will protect and assist its guests at all costs. The AI in this case does indeed become very attached and appear very human in the process (looks, actions, conversations etc.). Another interesting detail in the show is how the AI hotels have meetings together where they discuss how some of them take advantage of humans or how others are too fond of them.

1.2 Robots and AI systems

Karel Čapek, a Czechoslovakian writer and journalist introduced the phrase *robot* in the drama *Rossum's Universal Robots*. The story was a protest against the uprising of modern technology, in which he writes about artificial humans who evolve and turn on mankind. The word derives from the Czech word *robota*, which means serf or laborer.⁶

The International Organization for Standardization uses this definition for industrial robots:

*"automatically controlled, reprogrammable, multipurpose manipulator, programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications."*⁷

This is quite a mechanical definition of a robot as it tells us how, albeit briefly, it should be able to move and how it can be manipulated in order to be defined as a robot.

Oxford Learner's Dictionaries defines the word robot as such:

1. *A machine that can perform a complicated series of tasks automatically*
2. *(especially in stories) a machine that is made to look like a human and that can do some things that a human can do.*⁸

These definitions highlight that the robot's ability to perform actions or tasks on its own accord, just as a human would, is what makes it a robot.

Based on these definitions I have concluded my own:

"An autonomous machine, which through preprogrammed physical movements, can perform tasks in accordance with human-like abilities"

⁶ Store norske leksikon, s.v. "Karel Čapek". https://snl.no/Karel_%C4%8Capek

⁷ International Federation of Robotics. "Standardization".

⁸ Oxford learners dictionaries, s.v. "Robot".

https://www.oxfordlearnersdictionaries.com/definition/american_english/robot

In order to be defined as a robot, a machine must be able to move and perform tasks with a certain grade of independence. In order to do so it must be programmed and built in a way which allows this, hence the comparison to humans.

AI and robots are closely connected. Nearly all aforementioned definitions highlight the human-like attribute for both AI and robots. What separates them, from my point of view, is that AI can be applied to a wide variety of computational systems or machines, whereas robots require a physical and mechanical manifestation. See for example the definition by John McCarthy vs. the definition by ISO. Furthermore, it would seem that all robots are implemented with AI, while not all AI constitutes as robots. However, it makes you wonder, must a robot use AI in order to be classified a robot? If I program a robot-arm to grab an object like a human would, with some simple lines of code and without the use of AI, would it still be a robot? Based on Oxford's definition, perhaps not? Depending on the grade of independence at which this arm performs it's task. E.g. would I have to press "start" when placing an object in front of the arm, or would the arm sense the objects presence on its own and then grasp it?

Boston Dynamics is a company that design and produce mobile robots. One of their products is SPOT, a medium-sized, four-legged yellow robot that can move through tough terrain, climb stairs and even get back on its "feet" after falling. SPOT can be used in a variety of contexts and for different purposes, such as construction, mining, healthcare and entertainment, just to mention a few. SPOT is equipped with several sensors and customizable software that helps it read its surroundings and perform tasks. SPOT's actions and movement can be preprogrammed but he can also be controlled with a controller. The controller has buttons for moving SPOT in different directions and to grab things etc. It also has a display which shows the views from the several cameras installed in SPOT.⁹

Take a look at SPOT's launch video or Adam Savage's take on the little robot!

<https://www.youtube.com/watch?v=wlkCQXHEgjA>, <https://www.youtube.com/watch?v=R-PdPtqw78k>

1.3 Universal Design and AI systems

The definition of universal design, originating from The Disability Act 2005, and posted by The Centre for Excellence in Universal Design, reads as follows:

⁹ Boston Dynamics. "SPOT"

1. *"The design and composition of an environment so that it may be accessed, understood and used
 - i. To the greatest possible extent
 - ii. In the most independent and natural manner possible
 - iii. In the widest possible range of situations
 - iv. Without the need for adaptation, modification, assistive devices or specialised solutions, by any persons of any age or size or having any particular physical, sensory, mental health or intellectual ability or disability, and*
2. *Means, in relation to electronic systems, any electronics-based process of creating products, services or systems so that they may be used by any person"¹⁰*

It means that electronic information systems should be available for their proper and intended use by any person, regardless of any ability or disability they might have. The purpose is to secure equal inclusion of all people who might use a certain service or product. It also avoids exclusion where some people may be unable to use the service or might require special adaptations in order to use it.

The possibilities are vast for the potential of AI when it comes to patching or extending human capabilities. One example is Elon Musk's company Neuralink that is working on an AI chip that connects to your brain. If successful, the chip could be able to give people with robot limbs the sense of touch or be able to treat illnesses like Parkinson's.¹¹ Another example comes from École polytechnique fédérale de Lausanne where they are developing an artificially intelligent robotic hand. With machine learning the hand allows the bearer to control each individual finger by learning their movements.¹²

Considering these examples and the rapid speed in which technology is evolving, we might be able to fill all the gaps in human functionality. Whether you are impaired physically or cognitively won't hold you back in society as enhancements will be able to replace, repair or even improve what you lack.

All AI models are affected by bias, whether it stems from the data scientists, data engineers or the data itself. Depending on the purpose of the model it can have negative or positive consequences. A well-known example is the AI system COMPAS which wrongly predicted a resurrection in crime of known

¹⁰ Universal Design. "Definition and overview"

¹¹ Hamilton, "Elon Musk's AI brain chip company Neuralink is doing its first live tech demo on Friday. Here's what we know so far about the wild science behind it". Business Insider. <https://www.businessinsider.com/we-spoke-to-2-neuroscientists-about-how-exciting-elon-musks-neuralink-really-is-2019-9?r=US&IR=T>

¹² Carfagno, "AI-Powered Prosthetic Hand Provides Unprecedented Control for Amputees". Docwirenews. <https://www.docwirenews.com/future-of-medicine/ai-powered-prosthetic-hand-provides-unprecedented-control-for-amputees/>

African American perpetrators.¹³ On a positive note, AI can also bring people together. DeepL is a company that builds AI translation systems. They aim to "break down the language barriers worldwide and bring cultures closer together".¹⁴

I would say, that when understanding something you can make correct assumptions and interpretations of something, perhaps new or unfamiliar, based on cognitive abilities and previous experiences. I think machines can "understand" what we program them to understand. We give it sets of data and a recipe for how to interpret it, this is how it "understands". But without this foundation it wouldn't be able to make sense of something entirely new to it the same way a human would.

1.4 Guideline for Human-AI interaction

The fourth guideline, *Show contextually relevant information*, entails that the AI steps in with relevant information to the user at appropriate times. An example of this a conversation I've had with Google Home. When asking Google Home "How nutritious are mangoes?" it tells me which page it collects the information from, reads me a snippet and then asks if I want "more context". Another example is when I ask Google Home to convert a unit for me, for example from pounds to grams. It then first tells me the conversion and after, how to calculate it myself ("divide with approximately 2.2").

When looking at the User Interface Design Guidelines: 10 Rules of Thumb from the Interaction Design Foundation, several similarities can be found. Both sets of guidelines highlights the importance of showing the user what the system is doing and making its abilities clear. Both points out how the system should match concepts between the system and the real world, making it more predictable and easier to use. Assisting users with errors and backtracking is another point they have in common. A difference between the two could be that some of the design guidelines focus a bit more on the visual design, e.g. keeping the systems "aesthetic and minimalistic". Furthermore, some of the Human-AI Interaction guidelines highlights other aspects such as the importance of avoiding social biases and how the system can learn from the user and adapt over time.¹⁵

¹³ McKenna, "Three notable example of AI bias". AI Business.

https://aibusiness.com/document.asp?doc_id=761095&site=aibusiness

¹⁴ DeepL. "Another breakthrough in AI translation Quality". <https://www.deepl.com/blog/20200206.html>

¹⁵ Wong, "User Interface Design Guidelines: 10 Rules of Thumb". <https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb>

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