

## Individual Assignment – Iteration 1

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

The term artificial intelligence was first coined by the American John McCarty during a workshop held in 1956. Though, he was not the first to bring the concept of machines' ability to perform task previously only capable by humans into the daylight. World War II brought with it a lot of technological advancements. As a result of this the scientist Alan Turing wrote about the future of computers entering the realm of the human intellect in The Times in 1949 (Grudin, 2009).

#### *Definition 1*

The Norwegian dictionary SNL defines AI like this:

“Artificial intelligence is information technology (IT) that adjusts its activity and therefore appears intelligent.”(SNL, n.d.)

#### *Definition 2*

The consultant agency Deloitte describes a broad definition of AI in an article from 2017:

“In general terms, AI refers to a broad field of science encompassing not only computer science but also psychology, philosophy, linguistics and other areas. AI is concerned with getting computers to do tasks that would normally require human intelligence. [...]”

(Deilotte,. n.d.)

#### *Definition 3*

Tone Bratteteig and Guri Verne, both with backgrounds from research and design, defines AI in their article about PD and AI:

«AI is a subfield of computer science aimed at specifying and making computer systems that mimic human intelligence or express rational behavior, in the sense that the task would require intelligence if executed by a human.” (Bratteteig & Verne, 2018).

Based on the three definitions above I have concluded with my own definition:

AI is computer technology that seeks to accomplish tasks previously thought to require human cognition to be achievable. This includes tasks that require learning and tasks that mimic human behavior.

My definition focuses on the aspect of the technological progress connected to AI. I think AI differs from “regular computing” not because of its intelligence per se, but rather I think it is

a word we use to describe a more modern kind of “computing”, which can expand our use of computers into new areas of human activity.

I have focused on the article by D. Norman about the problem of automation (Norman, 1990). This article presents three case studies from the aviation domain on how automation has caused more risk related to unexpected situations. The article argues that to provide automation that is flexible and minimizes risk it has to be designed with feedback and interaction built in. Also, Norman suggests that the issue is not related to over-automations (which is a popular belief), rather it is a issue of under-automation.

The article discusses that in order to provide continual feedback from automated systems, without being a nuisance for the workers, the system needs to mimic human behavior. The article does not bring up the possibility of using AI technology to accomplish this. I think this may be because the article was written in 1990, and the technology has evolved a lot since then. It is intriguing to me that this is something that might be possible today. Equipped with the insights from this article, it could be possible to, for example, design a better autopilot for airplanes that provides tailored information to the crew.

The article presents a paradox that automation is often introduced to reduce workload and interactions, but that this design approach does not take into consideration the importance of feedback and interaction necessary to have a safe and efficient system. Automated systems have to be designed with errors and unexpected behavior in mind.

Tesla is a car company that produce electric vehicles, but is considered by many as more of a software company. This is due to the fact that they focus on development of autonomous cars through the use of AI technology.

“We develop and deploy autonomy at scale in vehicles, robots and more. We believe that an approach based on advanced AI for vision and planning, supported by efficient use of inference hardware, is the only way to achieve a general solution for full self-driving and beyond.”(Tesla, n.d.)

In the quote from Tesla they refer to AI as an approach. I think this very accurately describes Tesla as an innovative company. They do not just use the word AI as a “buzz-word”, and I think the company sees AI as a springboard for other innovations and opportunities to expand their reach as a software company.

In the film Ex Machina by Alex Garland the main theme explores what “artificial intelligence” is. The AI is embodied as a human looking robot called Eve. The plot of the film revolves around testing this robot and its interaction with a human participating in a project. The film defines AI as a completely conscious machine that is indistinguishable from humans.

## 1.2 Robots and AI systems

The word “robot” comes from the Slavic word “robota” which can be translated into “forced labor”. The word was first used in 1921 in the play Rossum’s Universal Robots by Karel Capek. (Wired, n.d.)

### *Definition 1*

Thrun (2004) mentions a definition from the Robot Institute of America from 1979, where a robot is defined as:

“A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks.”

### *Definition 2*

A more recent definition formulated by Matt Simons, a science journalist at Wired, defines a robot as such:

“A robot is an intelligent, physically embodied machine. A robot can perform tasks autonomously to some degree. And a robot can sense and manipulate its environment.” (Wired, n.d).

These two definitions have many similarities, but also some important differences. The first focuses solely on the technical aspects of a robot, like how it should be able to move something to perform a task. Whereas the second definition includes aspect like the robot’s ability to sense its surroundings and have intelligence. When I read the first definition I think of machines in a factory, and when I read the second, I think of a more complex robot, for example the Mars Exploration Rover.

I think the second definition is a more accurate reflection of my image of a robot, and I would therefore define a robot as: A robot is a physical machine capable of interaction with the environment autonomously through sensors and programmed actions in order to perform a task.

I think it is important to clarify that a robot is something physical that interacts with a physical environment. This is an important distinction that differentiates AI and chatbots from robots. Also, it needs to have a degree of autonomy, and not just be an extension of a human.

AI is computer technology that seeks to accomplish tasks previously thought to require human cognition to be achievable. This includes tasks that require learning and tasks that mimic human behavior.

When I look on my own definition of AI, I see a lot of overlap between AI and robots. But where the definitions differ is in the physical embodiment. AI refers to a program or algorithm that for instance can give a robot more dynamic and human behavior. A robot is a machine, whereas AI is a technology.

Boston Dynamics is a company that have been developing robots for a long time. One of their most recent developments is the robot dog called Spot. This is a human controlled robot with four legs. The four legs give it great stability and the ability to move relatively quickly. The robot uses 5 different camera arrays to scan and interact with its environment. And the view from all cameras is visible to the human on the controller unit, which looks kind of like a gaming controller. All the sensors give it the ability to walk without difficulty in many sorts of terrain and overcome obstacles. Spot is still in the research and development phase, but it is likely that a robot like this can be used in many different applications. For example, by the police or the military in search and rescue missions. It opens the possibility to accomplish tasks where it might be dangerous to send a human.

### **1.3 Universal Design and AI systems**

*Please find and describe a definition of Universal Design. Explain this definition and how you understand what Universal Design is about with respect to inclusion.*

The definition of universal design from Digitaliseringsdirektoratet translated to English is:

“Universal design [of ICT] means that the users, regardless of their abilities, should in a good way be able to use both web pages and machines they encounter in everyday life.”

(Digitaliseringsdirektoratet, n.d)

What I like about this definition is the use of the word “abilities”, and not “disabilities”. I think a very useful perspective is to look at all people as unique, and with a different set of abilities. We live in an inclusive society. This means that we should design solutions for everyone, with inclusion on mind. This also does not mean to design specialized solutions for some people, but rather to strive towards one common design that works for all people.

*Describe the potential of AI with respect to human perception, human movement and human cognition/emotions. You are encouraged to use examples. Please provide two examples of AI systems for including “more” users.*

I think AI has huge potential for improving the inclusiveness of new technology in regard to human perception, movement and cognition. For example, an AI robot that uses sensors in combination with principles of animation to mirror a human can lead to more understandable interaction (Schulz et al., 2018). Another example where AI contributes to better inclusion is via the use of chatbots on webpages. This service can help people with difficulties navigating and finding information on a web page.

Sadly, the use of AI also has the risk of excluding more people. For instance, concerns have been raised connected to ethnic biases in facial recognition software. In one study they found that a facial recognition software had a much larger percentage of mismatches of women of African and Asian origin (BBC, n.d.). These kinds of issues raise important ethical questions about the use of AI, and this is important to be aware of as designers.

*In the WCAG 2.1 principles and in many of the Human AI-Interaction guidelines the concept “understand” and “understanding” is used. Explain briefly in what way you make sense of the concept “understand” and “understanding”. Then address the question: Do machines understand?*

In the WCAG 2.1 principles it is stated that users with different abilities should be able to understand information and operations of the user interface, and also that different people understand differently. To understand something fully you also need to know the motivation or the meaning behind it, and I do not think this is something machines are capable of. For example, you could program a machine to divide a cake equally, but it would not “understand” that it should do so because we cherish equality in our society.

#### **1.4 Guideline for Human-AI interaction**

I have chosen guideline number 4 about showing contextually relevant information during interaction. This means that the information displayed should be relevant to the task the user is doing. Showing the user what options they have for interaction depending on the stage in a chatbot could be an example of this. Donald Norman’s HCI design guidelines of visibility, feedback, affordance, mapping, constraints and consistency have a lot in common with Microsoft’s guidelines (Norman, 2013). For example, visibility is about always showing the user what is going on, and giving them relevant information. This almost the same as Microsoft’s guideline number four. In general, I think that the Microsoft guidelines cover more aspects than Norman’s. I find the guidelines from the “over time” section especially interesting, and more specific to AI. For instance that the AI should learn from user behavior.

## References

Bratteteig, T. & Verne, G. Does AI make PD obsolete? Exploring challenges from Artificial Intelligence to Participatory Design. Retrieved from

<https://dl.acm.org/doi/pdf/10.1145/3210604.3210646>

BBC. Facial recognition fails on race, government study says. Retrieved from

<https://www.bbc.com/news/technology-50865437> Visited 09.09.21.

Deloitte. Artificial Intelligence Defined. Retrieved from

<https://www2.deloitte.com/se/sv/pages/technology/articles/part1-artificial-intelligence-defined.html> Visited 07.09.21

Digitaliseringsdirektoratet. Universell utforming av ikt. Retrieved from

<https://www.digdir.no/digitale-felleslosninger/universell-utforming-av-ikt/1499>

Visited 09.09.21.

Grudin, J. (2009). AI and HCI: Two Fields Divided by a Common Focus. Retrieved from

<https://aaai.org/ojs/index.php/aimagazine/article/view/2271>

Norman, D. (2013). The Design of Everyday Things. Basic Books.

Schulz, T., Herstad, J., & Torresen, J. (2018). Classifying Human and Robot Movement at Home and Implementing Robot Movement Using the Slow In, Slow Out Animation Principle. International Journal on Advances in Intelligent Systems, 11, 234–244.

SNL. n.d. Kunstig Intelligens. Retrieved from [https://snl.no/kunstig\\_intelligens](https://snl.no/kunstig_intelligens) Visited 07.09.21

Tesla. Artificial Intelligence and Autopilot. Retrieved from <https://www.tesla.com/AI>

Visited 07.09.21.

Wired. The Wire Guide to Robots. Retrieved from <https://www.wired.com/story/wired-guide-to-robots/> Visited 09.09.21.