



IN5480 individual assignment fall 2021



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# Module 1

- Concepts, definitions and history of interaction with AI
- Human Robot Interaction
- Universal Design and Interaction with AI

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

### History of AI

The first use of the term AI (Artificial Intelligence), was used in 1956 by a mathematician and logician named John McCarthy (Grudin, 2009). Some people call him the father of AI because of his ideas and thoughts about this field. The same year, McCarthy did a workshop with several researchers from different fields: scientists, psychologists and mathematicians. The result of this was a positive and optimistic group of researchers who seemed curious about his ideas.

### Three definitions of AI

*"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, 2007)*

This definition is focusing on the science and machine parts of AI, rather than the human aspect. Back in the 50s, they could not know how quick the future data revolution would develop. Rather not how the human aspect of AI could be so important to protect people's privacy. This definition does not include every part of AI.

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

This definition is focusing on both science and human intelligence, and more specifically about how to deal with situations that normally require human intelligence, like social situations or maybe feelings.

*“An interdisciplinary field, usually regarded as a branch of computer science, dealing with models and systems for the performance of functions generally associated with human intelligence, such as reasoning and learning.” (ISO/IEC 2382-28:1995(En), Information Technology — Vocabulary — Part 28: Artificial Intelligence — Basic Concepts and Expert Systems, n.d.)*

This definition is focusing on both human intelligence and science, but mainly how AI works as a concept and its associations.

## My definition

Based on these three definitions, my definition of AI is:

Artificial Intelligence (AI) are machines using computer science designed to operate like a human being, experience and adapt to new situations, with the ability to learn human behaviors.

This describes both that AI is based on science and that it is designed, but still acts like a human being.

## Article about AI

*I chose the article "Does AI make PD obsolete? Exploring challenges from Artificial Intelligence to Participatory Design" by Bratteteig and Verne.*

Bratteig and Verne are concluding that AI challenges PD because of the fact that AI technologies change unpredictably over time, and its behavior. I agree with their conclusion. As they talk about, machine learning (ML) systems do learn from people's actions and present it in a complex way. It can be difficult for a designer to know what they are making if the technology is complicated and complex.

## Company that works with AI

### **Google AI**

Google is presenting AI both as an idea and also as a product. They have a webpage "[www.ai.google](http://www.ai.google)" that describes how Google is working and developing products to ensure that everyone can access AI. Furthermore, they explain how AI is affecting their products in a positive way, and also how it helps to solve big and small problems for people all over the world. Google does not present any disadvantages or dangerous factors around AI and human interaction directly. Even though they don't talk about the danger behind it, the page is referring to the responsibilities that come along with developing artificial intelligence. To empathize with these responsibilities they made a principle guide to show how they include AI and what kind of applications they will not pursue making

## Documentary or fictional film, book or game

### **Iron Man**

In the movie Iron Man we are following Tony Stark, who has an AI assistant called JARVIS. JARVIS is helping Stark with things like mathematical equations. The assistant also has a speech function, and is helping Tony

Stark with both running businesses and daily arends, and interacting with the other Avengers.

## 1.2 Robots and AI systems

### **Robota**

The word “robot” comes from the czech language (“robota”) and means slave. The first use of “robot” was in the entertainment industry in 1921 in a live play called R.U.R (by Karel Čapek). The plot in this play was about robots created by humans suddenly became self-aware and attempted to destroy mankind (R.U.R and the Invention of Science Fiction on Stage!, n.d.).

*“A robot ... refers to a physical object that interacts with the physical environment, either on its own or via a person, to accomplish a task.” (Schulz, 2020).*

This definition is describing what a robot can do and the interaction it has with either itself or a human being.

*“Actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks” - ISO 8373:2012 (ISO 8373:2012(En), Robots and Robotic Devices — Vocabulary, n.d.)*

This definition is focusing on how a robot works and that the robot has a kind of

The common thing of the two definitions are the description of robots as physical objects doing a task. The ISO definition uses the word “autonomy” which can be confusing if you don´t know these concepts. The explanation from Trenton Schultz is probably more easy to understand for more people, also for people outside of the IT industry.

## My definition

Based on the definitions mentioned over, and what I have read, my definition is:

A robot is a physical object programmed with computer science that is able to perform tasks, sense, or use technologies like video, voice control or AI.

## Relation between AI and robots

AI is a system, robots are a physical object, both designed with computer science. The common goal is to solve a problem or help someone. A robot can be designed with AI, which will increase the functionality, behaviour and quality of the robot.

## Physical robot

The Paro is a robot seal made for different groups of people to help them feel less alone. Especially for old people with alzheimers or young people at the hospital who have cancer or even autism. The goal is to make them feel less alone, reduce stress, and help people in a therapeutic way. Paro can also learn to behave in a way that the user prefers.

## 1.3 Universal Design and AI systems

### Definition

The definition of Universal design from the National Disability Authority webpage (2020):

*“Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability”.*

This describes the importance of including all people with all kinds of disabilities, so that everyone can use IT systems, webpages and applications without having trouble or feeling excluded.

## AI, humans and universal design

One positive thing about AI is that it can assist medical staff in finding viruses and tracking a certain pattern with the help of AI. AI can also be used in a system by for instance using sign language interpretation or speech synthesis which will include more users. AI chatbots can help people to understand a service or connect to the company in an easy way.

But AI can also be a negative thing, for instance taking over people's jobs because of how smart the system and workplace have become. If systems or webpages are designed in a certain way, they may exclude a group of people or exclude people with disabilities because of the way it is programmed.

## WCAG 2.1

The principles of WCAG 2.1 guidelines describe specific elements that are important to think about when designing something. The design and development of systems and applications has to be done by humans, I think. Artificial intelligence does not have the capability to understand the importance of including everybody's needs. As a human being you can understand something, see the consequences, and show respect. An AI machine can only learn from previous situations, and not having the ability to respect everybody's needs in a system.



## Feedback 1st iteration

*Two stars:*

*Du virker reflektert over fordeler og ulemper gjennom hele innleveringen*

*Liker at du nevner wcag!*

*And a wish:*

*I dette avsnittet tror jeg du har glemt å finne en robot? ;)*

*"Physical robot*

*Find one contemporary physical robot, either described in a research article - or a commercial robot and describe how this robot moves and how a human user is interacting and using the robot in a specific situation."*

Forgot to write about a robot, but now I have done it.

## Module 2

- Characteristics of AI-infused systems
- Human AI-interaction design
- Chatbots and conversational user interfaces

### 2.1 Characteristics of AI-infused systems

#### Key characteristics

There are three types of AI-infused systems: *artificial super intelligence*, *artificial general intelligence*, *artificial narrow intelligence*. Usually, we think of the artificial narrow intelligence, when speaking of interaction with AI.

*Artificial super intelligence*: When something goes beyond or matches human capabilities.

*Artificial general intelligence*: When it mimics human intelligence

*Artificial narrow intelligence*: When it focuses on the simple and narrow tasks.

#### AI-infused systems

Amershi et al. (2019) presents AI-infused systems as

*“have features harnessing AI capabilities that are directly exposed to the end user” Amershi et al. (2019).*

Yang et al. (2019) discuss how the lack of designers' understanding of AI-infused systems is a key challenge. The designers do not always know what AI can do with the system.

In the second lecture of module two we learned about the key characteristics of AI-infused systems:

*Learning, improving, black box and fuelled by large data sets*  
(Følstad, 2021).

By **learning**, the system gets a dynamic character. The reason for this is because AI-infused systems are constantly learning. AI-infused systems can appear different every time the user is interacting with the systems (Amershi et al. 2019), Amershi highlights in the paper.

**Improving** means that the systems dynamically learn, if we see it from a broader perspective. The systems are improving through this learning. By giving the AI-system feedback and input, the system will improve itself.

An AI-system can be seen as a "**black box**", because of the complexity of the system, behind what the user is exploring. The user does not understand how the system works technically, only how the system looks like, and what they can do.

The concept "**fuelled by large datasets**" means that the artificial intelligence can receive loads of information through interaction with the user. The system will improve by receiving data actively or passively from the users, and build a foundation of large datasets (Følstad, 2021).

## Spotify

Spotify has an AI-infused system with several of the characteristics named in the section over, *2.1 Characteristics of AI-infused systems*. As you listen to music, it collects your data and creates new playlists based on the recent music you have listened to. You can also click "Like" or save music to your library-list, which will create music from the same categories and other music you haven't listened to yet, in the same genre.

In "Discover Weekly" you can find new music to listen to. On the other hand, I've personally experienced that it shows some of the music tracks I have already listened to before. In the last years, Spotify has increased their

user experience by making the design more minimalistic and optimized their AI-system to give the user a good experience. The system is now more dynamic and improved. As a user I am “black boxing” the system, I don't need to know how the system behind Spotify works, as long as the experience is good.

## 2.2 Human-AI interaction design

Amershi and Kocielnik summarize

Kocielnik et al. (2019) explore different techniques for the end-user expectations of technology consisting of artificial intelligence. They are using a Scheduling Assistant to explore this field, in two different versions. The two different versions of the assistant consist of two types of errors to avoid.

Amershi et al. (2019) suggests 18 design guidelines for human AI interaction to increase the communication between the user and the technology. The AI field is advancing quickly, and these guidelines can help the result of the AI-infused systems.

### Design guidelines

*“Guideline 4: Show contextually relevant information” (Amershi et al. 2019).*

Google is an excellent example of this guideline. The search engine will always show the user what most relevant information is based on where you are located and what you have searched for.

Spotify does use this guideline by showing the user the most recently played lists and podcasts in the dashboard.

*“Guideline 1: Learn from user behaviour” (Amershi et al. 2019).*

Spotify is using their algorithms in a good way, by creating playlists based on what you have listed the most to, and which music categories you listened to. The “Made for you” folder on Spotify gives the user opportunity to explore new music based on the user's previous preferences.

## Large language models

Bender et al. (2019) discuss how large language models can be harmful and write about solutions to help solve the problem.

The paper is about the problematic aspects in the relationship between deep learning systems and financial- and environmental issues and textual content. By training one of the language models it requires the same energy as a trans-American flight (Bender et al. 2019). Training these models can cause damage to the climate and emit a large amount of CO<sub>2</sub>. The worst thing about these models is that the countries who are not taking benefit from these models, get harmed the most.

Bender et al.(2019) argues that “bigger is better” doesn't apply to large language models because of the environmental harm and financial costs.

## 2.3 Chatbots / conversational user interfaces

In conjunction with

*“the design of chatbots and user interfaces the conversations break down rapidly” (Følstad and Brandttzæg 2017).*

The conversations “*as the object of design is challenging*”, but will at the same time reduce the mechanisms for the designers repertoire (Følstad and Brandttzæg 2017). Often, the focus of design is for instance on graphical design, navigation and interaction with elements. When

designing a chatbot, the interface is often very limited and most of the services hidden from the user.

It is a big challenge to bridge the gap between the system operation and the user expectation when designing a chatbot and to understand the user intent (Luger, E. & Sellen, 2016). Every user acts differently, maybe uses different language and words to express themselves. A chatbot does not recognize the user's emotions during a conversation, which can lead to misunderstanding. Because the result from the chatbot can be different every time, the user might not get the expected answer.

## Revisiting guidelines

*G1: Make clear what the system can do (Amershi et al. 2019).*

*G2: Make clear how well the system can do what it can do. (Amershi et al. 2019).*

Guideline one means that the AI system is capable of helping the user to understand what the system is doing. Guideline two means that the system helps the user to understand how often it may make mistakes.

If an AI system were designed to ask the user to specify their inputs more it could have been easier to give the right information back. The system could inform the user of its limitations, to make the conversation smoother.

When interacting with conversational interfaces it is not always that clear what the system does and why. If the system were designed to give the user suggestions or information by making it clear that this *might* be interesting, the user would not be disappointed if the suggestion were a bit random (Amershi et. al, 2019)

## Feedback 2nd iteration

Veldig fin oppgave! 😊

Stars:

- Du har en fin og god struktur på oppgaven din! Teksten er lettleselig og du skriver på en måte som viser at du forstår hva du snakker om.
- Spennende valg av AI-infundert system, liker at du drar inn din egen erfaring med Spotify.

Wish:

- Under 2.2 Human-AI interaction design savner jeg fra oppgaveteksten at begge design guidelines blir sett opp mot AI-infunderte systemet du valgte tidligere i oppgaven.

Mvh Sigrid

Did some changes in 2.2 and added what was missing!

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