Individual assignment (third iteration)

1. Search and find three definitions of AI, describe these briefly. Make references.
John McCarthy (1998) defines Artificial Intelligence (AI) as the science and engineering of making intelligent machines, especially computer programs. He also states that AI is related to computers' tasks on understanding human intelligence (p.2).

In the documentary "Open Source Stories: Road to AI" by Red Hat Videoes (2017) Chris Nicholson present AI as a box with math and encoding. Data goes into the box and decisions based on the data come out. Francois Chollet (Red Hat Videoes, 2007), from the same documentary, formulated this definition as follows: *input + output = rules*.

Kok et al. (2009) has several definitions of AI. One of those is that Artificial Intelligence is the concept where machines can have human-like intelligence; they can learn, self-correct, adapt etc. (p.2).

Discuss definitions relative to discussions of AI in the course
In this course's first lecture Jo Herstad said that AI is an established research field in computer science. He pointed out that even though it is somewhat well known, interaction with AI is very new. The definitions discussed in class were similar to the definitions by by McCarthy (1998), Red Hat Videoes (2017) and Kok et al. (2009). Følstad (2018) defined AI as "Computer systems learning and improving on the basis of large data sources" in a lecture, this is similar to Red Hat Videoes' (2017) definition.

2. Search and find three definitions of Robotics, describe these briefly.
According to Owen-Hill (2017), Robotics is a branch of technology that deals with robots. He says that robots are programmable machines that can usually carry out a series of actions autonomously.

Siciliano et al. (2010) explains that Robotics is about the study of the machines that replace human tasks, both physical activities and decision making (p.1). Robotics' common definition in the science field is a "intelligent connection between perception and caution" (p.2). He also writes that Robotics is a subject concerning the cultural area of mechanics, computers, control and electronics (p.3).

Laumond (2012) defines Robotics as the relationship a machine, that can move and who's motions are computer-controlled, can have in the real world. He says Robotics differ from automats and computers.

3. Search and find three definitions of Machine Learning, describe these briefly.
Kim, Flaxman and Teh (2017) explain that Machine Learning teaches computers how to learn. It is, according to them, a field of computer science.

Yufeng (2018) has a somewhat abstract definition of Machine Learning. He says that Machine Learning brings the promise of deriving meaning from data. Everything from music, word, pictures, spreadsheets and more (2017).

Thirdly, Sims (2015) expresses Machine Learning is the extraction of knowledge from data. He claims that it's related more to statistical analysis and data mining than AI is.

Discuss definitions relative to discussions of Machine Learning in the course
As mentioned in the course (Følstad, 2018, p.1) Machine Learning is a way of achieving AI. AI does not have to have Machine Learning, but it is in most cases used. The definitions discusses in the course were similar to Sims' (2015).

4. Write in three to five sentences the relationship between AI and Robotics as you understand this.
As I understand it AI and Robotics are two very different branches of science and technology. AI is about developing computer programs that can complete tasks presumed that only humans can do, whereas Robotics is about creating machines (robots) that require guidance and instructions given by humans. Robotics involve the mechanical parts of robots as well as their programs.

5. Make a text to describe your own definition of AI. Explain briefly this definition.
As I explained in my previous answer my perception is that AI are computer programs that have human-like intelligence. They can learn, correct themselves and adapt.

Expand on this text to explain the relation between AI and Machine Learning
As far as I understand Machine Learning is a field of technology that teaches computers how to learn based on input. Based on this I'd say that the difference between Machine Learning and AI is that AI does more; an AI program can have Machine Learning, but Machine Learning in itself can't have AI. Machine Learning is, as mentioned, a way of achieving AI.

6. Make a drawing of an interaction with an AI - something that you imagine. Describe your drawing with some sentences.
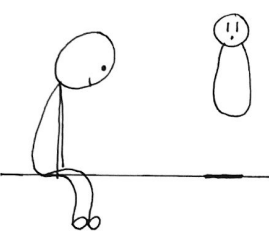
Figure 1: Drawing of dialogue between human and robot

Figure 1 is from the year is 2031. A school with a lot of troubled children hire an service robot with AI (Octa) that specializes in children and young adults' mental health, illnesses and issues. Octa is autonomous, level 9 og 10 on the Autonomy Scale (Sheridan and Verplank, 1978), so he operates independently.

Summarize key characteristics of interaction design for AI based systems (challenges, principles, trends)
During a lecture in October we discussed user-centered design of AI. Følstad (2018) defined tentative as "interactive systems where important components are powered by AI. These systems are typically set up for learning and improvement on the basis of large datasets and gathering of new data" (Følstad, 2018, p.24). There are three tentative principles; learn (systems), improve and fuelled by large datasets. Learning systems are about designing for change; a system has to be dynamic and be prepared for possible adjustments. Improve involves designing for uncertainty, mistakes are unavoidable and you can learn from them. Fuelled by large datasets is data gathering through interaction (Følstad, 2018). My understanding is that AI can't exist and be maintained without this "fuel".

Sketch a user interface illustrating one or more of these characteristics
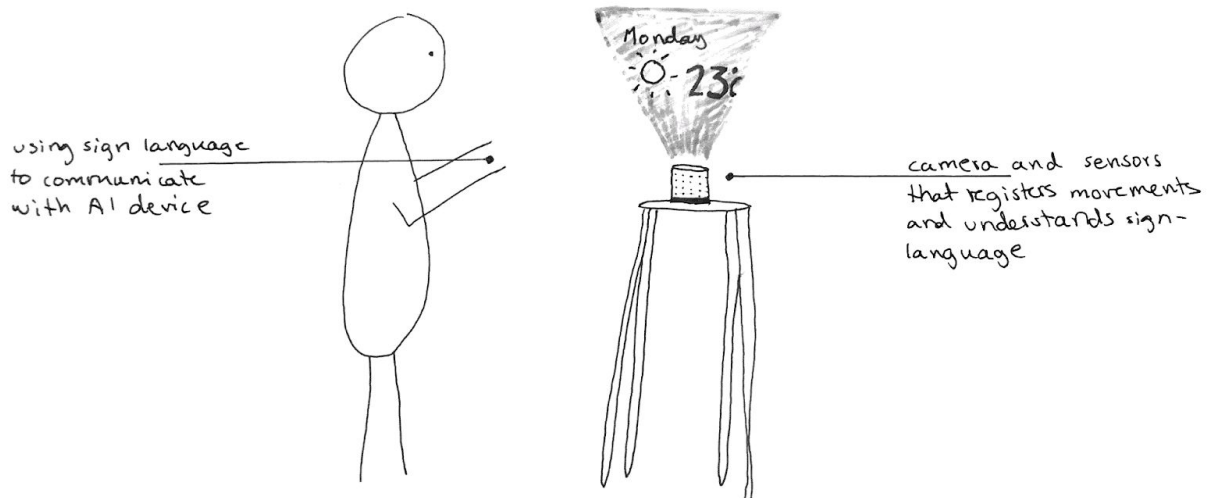

Figure 2: Human interactions with AI device by doing sign language

Figure 2 shows an AI system being *fuelled* by person using sign language. The system is designed for *change*; prepared for verbal and non-verbal users. It never knows if the user is going to use sign language or not, so the camera is always ready; the system is *prepared.*

7. Read the article: "On the Subject of Objects: Four Views on Object Perception and Tool Use" by Tarja Susi / Tom Ziemke. Write in your own words one page about the different perspectives on the human relationship with tools.
The article (Susi and Ziemke, 2005) is about the relationship and interaction between an agent (human or animal) and its environment, or a subject and an object. There are four different views/theories on this matter; functional tone (von Uexküll), equipment (Heidegger), affordance (Gibson), and, more recently, entry point (Kirsh) (Susi and Ziemke 2005, p.6). The approach used was to understand

artefacts and their use to describe the fundamental relationship between subject and object, and how we objectify our surroundings (Susi and Ziemke, 2005, p.7).

Uexküll has created a term called "Umwelt" that is a closed unit consisting of animals' perceptual world and their effector worlds (Susi and Ziemke, 2005, p.7), it is a subjective universe (Susi and Ziemke 2005, p.8). Functional tones are about how we perceive objects in Umwelt. Functional tones are about the relationships subjects (animals) have to objects; subjects imprint meaning on objects and transform them into something with meaning. What functional tone is being used depends on the subject's mood (Susi and Ziemke 2005, p.8).

Heidegger developed the concept of equipment and his main concern was animals (Susi and Ziemke, 2005, p.8). Figure 3 shows how Heidegger divided the term "being", and equipment focuses on non-human beings (things), this include tools and materials (Susi and Ziemke, 2005, p.9).
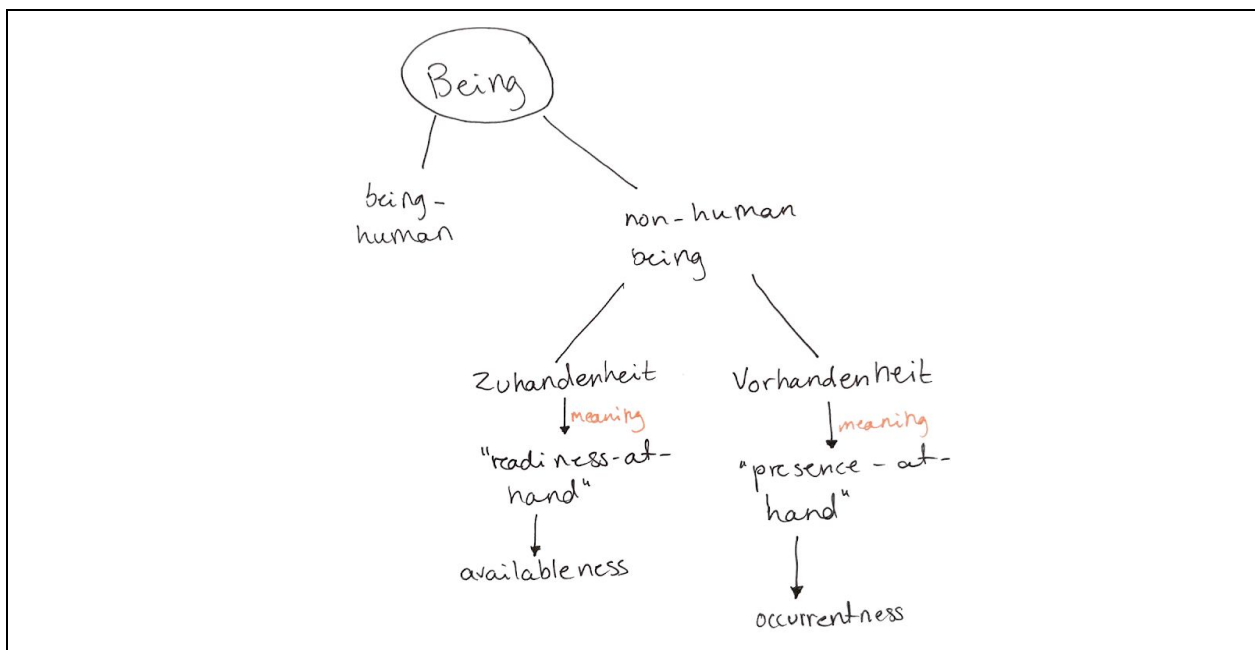

Figure 3: Heidegger's perception of beings. Self made figured based on Susi and Ziemke (2005, p.8-9)

According to Heidegger objects and subjects can't be considered separately, they have an independent relationship (Susi and Ziemke, 2005, p.10). (Equipmental) things are defined by their different functions, but equipment has to be involved with other objects, and be in a meaningful activity, to function (Susi and Ziemke 2005, p.9). Heidegger says the use of equipment gives reason to understand them (first-hand). The knowledge of the function of equipment gives us an understanding of them (second-hand) (Susi and Ziemke 2005, p.10).

Gibson emphasises the mutual relationship between subject and object. Each subject lives in its own set of affordances. The information about the environment (affordances) is what the animal can see. He describes this as light reflected from a surface. A user's needs change, but affordances doesn't, they can always be perceived (Susi and Ziemke, 2005, p.11-12).

Kirsh was interested in how subjects make use of the environmental structures to achieve tasks. People

create entry points to help achieve their daily goals, especially in their working space (offices) (Susi and Ziemke 2005, p.12-13). Entry points are objective or subjective and invite people in to enter an office space or task (Susi and Ziemke, 2005, p.13).

8. Select one of the perspectives from the article, and go into detail when you describe it
I selected the perspective entry point by Kirsh, presented by Susi and Ziemke (2005). An entry point is a structure/cue that is meant as an invitation to go to a office/information space. Examples of these kinds of cues are sticky notes, analog or digital calendars with tasks and whiteboards with notes. People make collections of entry points that inform them of their schedules, tasks etc, they are informative and personal (Susi and Ziemke, 2005, p.13). Entry points created by people working in offices have different characteristics that affect how people react to them. The first entry points are user independant; intrusiveness, richness in metadata (underlying information) and the four remaining are user dependant; visibility, freshness, importance and relevance (Susi and Ziemke, 2005, p.13-14).

9. Select one other article from module 1, and write with your own words what this article is about.
Ironies of automation (Bainbridge, 1982) is about how automation of industrial processes can lead to more problems, and the fact that not everything works out as intended (hence the irony of it all) (p.129). The purpose of automation is to replace human control with automated devices (Bainbridge, 1982, p.129), but many of them still need human supervision (p.130). Other challenges and ironies include monitoring the devices, lack of decision making skills in the devices and long term knowledge about the systems and cognitive skills (Bainbridge, 1982, p.130).

10. Select one documentary or a fictional film, book or game: describe with your own word how interaction with AI is portrayed in this work.
I chose the character "Ultron" from Avengers: Age of Ultron (2015). Ultron was intended to be a "peacekeeping" program that found out that the easiest fix to all the misery on earth would be extinction. His intentions were good (in theory) because he believed that extinction would cause a fresh start, but of course no one else wanted him to kill all humans, so the movie's heroes did their best to destroy him. He was intended to be an AI program, but quickly made a "body" of robot parts for himself. He wanted to look like a human, only better, more evolved. He actually made allies throughout the movie and got humans to do his dirty work. I can't recall any scenes in the movie where he showed compassion towards others, he was always too fixated on his mission. He wanted to make peace, but also wanted the humans (especially the Avengers) to suffer along the way, maybe because he thought they had destroyed the planet in the first place. Ironically he had a sense of humour, and he often gave big speeches to explain his, it seemed like he wanted to be understood by the humans. In addition, it seemed like he had a severe God complex.

11. Describe what you understand by autonomy; both human autonomy and machine autonomy.
Based on Weinstein, Przybylski and Ryan's (2012, p.397) description my understanding is that human autonomy is about one self, what a person is driven by (when he/she isn't driven by external forces). My perception of machine autonomy, on the other hand, based on Nickerson and Reilly (2004, p.1-2), is the ability a machine has to make decision on its own.

12. When was the term "AI" first coined? Please make a reference.
According to McCorduck et al. (1977) the term "Artificial Intelligence" was first coined by John McCarthy in 1956 when he, and a number of colleagues, proposed a study to the Rockefeller Foundation that would be done in summer of 1956 at Dartmouth College in New Hampshire (1977, p.953).

13. Articulate one question for the article "What we talk about when we talk about context" by Paul Dourish in the curriculum.
How, through context, can mobile users become more aware and understanding of security in their systems and applications, based on the environment their in at a given time? Question articulated based on Dourish's (2004) article.

14. Articulate one question for any other article in the curriculum.
The purpose of replacing human control with automation is to reduce costs, but if some tasks still require human supervision and/or monitoring, can it be a valuable option to replace that worker with a supervising robot? This question is articulated for Bainbridge's (1982) "Ironies of automation".

15. Read the article "Using AI to augment human intelligence" by Carter & Nielsen. Summarize in your own words the articles discussion of different views on computers, and on how AI may augment human intelligence (½-1 pages)

The paper by Carter and Nielsen (2017) starts by asking the question "what are computers?". They answer this question by briefly explaining the history of computers, and explain that the vision of computing changed in the 50s and 60s. In 1962 Douglas Engelbart suggested that computers could be used to augment (increase) human intelligence. They write that Engelbart for instance influenced Steve Jobs and that his ideas influenced digital art and music and fields like interaction design and HCI (human-computer interaction) (Carter og Nielsen, 2017).

Carter and Nielsen (2017) write that research on Intelligence Augmentation (IA) has been in competition with research on AI. According to them "IA has typically focused on building systems which put humans and machines to work together, while AI has focused on complete outsourcing of intellectual tasks to machines". They move on to introducing a new field; Artificial Intelligence Augmentation (AIA), which is the use of AI systems that helps develop new methods for IA.

They (Carter and Nielsen, 2017) move on to showing visual examples of how AIA works. The first one is a tool that creates fonts, using Machine Learning (ML), based on your input. The second example, called iGAN, is another generative model that uses 50 000 images of shoes to build an interface that lets the user sketch the shape of a shoe, and creates one for you.

Furthermore, Carter and Nielsen (2017) write about two models of computation. These are the *cognitive outsourcing model* and *cognitive transformation model*. The first one is based on the conception that computers are problem solving machines, and it's a way of outsourcing cognition. This model is a view of seeing an AI as an oracle; being able to solve large problems with a performance that's better than humans'. Secondly, the *cognitive transformation model* is about expanding the range of thoughts we can think, according to Carter and Nielsen (2017). Rather than outsourcing cognition, the model it about changing the operation and presentations we use to think. This view offers a more profound model of IA.

Lastly Carter and Nielsen (2017) asks if the interfaces used as examples inhibit creativity. To answer these questions, they describe two modes of creativity. The first mode is the everyday creativity of craft people engaged in their crafts. Craft people typically use component recombination of their best existing practices. The second mode aims toward developing new principles that "fundamentally change the

range of creative expression". It's about violating or manipulating existing principles to create new ones that enable people to see in new ways.

To summarize, Carter and Nielsen (2017) has described a view of AI they claim has changes humanity.

6. Describe with your own words what you understand by different levels of automation? What are the advantages/disadvantages related to higher/lower levels of automation? (1/2 – 1 page).

My understanding of the Autonomy Scale, created by Sheridan and Verplank (1978), is that it measure how autonomous a robot can be, from being dependant of humans (starting at level 1), because the humans control what they do and how they do it, to being completely independent and autonomous (level 10); ignoring them, doing tasks and making decisions by itself. As I explained in task 11, autonomy is about what a person (or computers) is driven by when it isn't external forces, when you're regulated by the self (Weinstein, Przybylski and Ryan, 2012, p.397).

I will divide the scale into two parts based on their level of autonomy. The lower level is level 1 (humans take all decisions) to level 5 (computer completely carries out singular or sets of tasks commanded by humans). My understanding are that these five levels represent computers that are somewhere between being completely dependent of humans because they make all the decisions (level 1) and being able to complete small tasks humans make them do. Advantages of these levels are that these computers can help humans with tasks, without the humans having to worry about the machines "taking over", because they aren't capable of doing so. This can also be a disadvantage, because in some situations, machines should be able to do everything on their own (be completely autonomous, as level 10 illustrates). If the machines in the paper Ironies of automation (Bainbridge, 1982), as I summarized in task 9, had been level 10 (computers acts autonomously ignoring the human) they wouldn't have to be monitored and regulated by humans, which would lead to work being more sufficiently done, divided between machines and humans.

The higher level on the Autonomy Scale is level 6 (computer and human generates decision options, human decides and carries out with support) to 10 (computers acts autonomously ignoring the human). My impression is that computers start being partly in control from level 6. They can do more complex tasks on their own, as well as making decisions with humans. The computers on the end of the scale are, as far as I understand it, completely autonomous, because they do not require any human support to do tasks, generate and make decisions and carry out support. A clear disadvantage of this is that humans can lose control over the machines and what they are doing, especially since they ignore humans in level 10. Does this mean that humans can't stop them or simply can't interfere with their work? On the other hand, an advantage is that the tasks highly autonomous computers can do are endless. An example of what I imagine these computers can do is shown in figure 1 (task 6), where a robot helps a child who's struggling with depression. Octa is autonomous and does not require human support to work (help children and young adults).

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