Individual assignment - iteration 2

---

1. Search and find three definitions of AI, describe these briefly. Make references.
Discuss definitions relative to discussions of AI in the course.

Definition 1: Allen Newell describes AI as a subart of computer science concerning how to give computers the sophistication to act intelligently (Newell, 1980).

Definition 2: Joost N. Kork et al. (2002) says that AI is the extension of human intelligence through the use of computers, as in times past physical power was extended through the use of mechanical tools (Kork, Egbert, Walter & Van der Putten, 2002).

Definition 3: Ted Greenwald rather explains what AI is not, and claims that it is not a high-tech replacement for the human brain. AI is generally anything a computer can do that formerly was considered a job for human. (Greenwald, 2018).

In the first lecture of module 2, we discussed the following question "What is AI?". A quite straight forward question, but still not that easy to answer. On the basis of this discussion, I learned that it might be more accurate to speak of it as "what *can* AI be?" instead. We discussed that AI can be software that acts autonomously, with human capabilities and also physical mimics and expressions. It can also have capabilities that they can learn from experience, based on ML-model training on large datasets. When defining AI, we also learned that AI as a term can be divided into three parts: *Artificial super intelligence* (an AI that has outsmarted humans), *artificial general intelligence* (intelligence of a machine that could perform any intellectual task that a human being can - relates to the third definition above) and *artificial narrow intelligence* (AI made for narrow use, like the ones in driverless cars and so forth).

2. Search and find three definitions of Robotics, describe these briefly.

Definition 1: According to NASA, robotics is simply the study of robots. Therefore, it would be better to define a robot. (Hitt, 2017)

Definition 2: The word "robot" derived from the czech noun "robota" meaning "labour". (Capek, 1920). I assume this means that a robot was originally meant to be working.

Definition 3: According to Wikipedia, robotics is an interdisciplinary branch of engineering and science that includes mechanical and electronics engineering, computer science and others. It deals with design, construction, and use of robots. ("Robotics", 2018).

Definition 4: A robot is a machine that senses, thinks and acts. (Siegel, 2015).

3. Search and find three definitions of Machine Learning (ML), describe these briefly.

Definition 1: Wikipedia's definition is that ML is a field of computer science that uses statistical techniques to give computer systems the ability to "learn" (e-g-. progressively improve performance on a specific task) with data, without being explicitly programmed. ("Machine Learning", 2018).

Definition 2: The webpage sas.com defines ML as a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. (sas Insight, undated).

Definition 3: Pedro Domingos from the department of computer science and engineering at the University of Washington describes ML as learning algorithms that can figure out how to perform important tasks by generalizing from examples. (Domingos, undated).

Discuss definitions relative to discussions of Machine Learning in the course.

According to Goodwin, no one really understands what is going on when it comes to Machine Learning. There is something called classification learning, which means that the training model is trained to e.g. spot the difference between a dog and a cat, and it is presented with many pictures og dogs and cats, and trains by categorizing them.

4. Write in three to five sentences the relationship between AI and Robotics as you understand this.

To my understanding, Robotics is a field under AI. Some robots have artificial intelligence in them. A robot without the ability to sense and respond to its surroundings (enabled by AI) will not be a real "robot" the way I see it. It will just be a programmed object. AI makes a robot - a

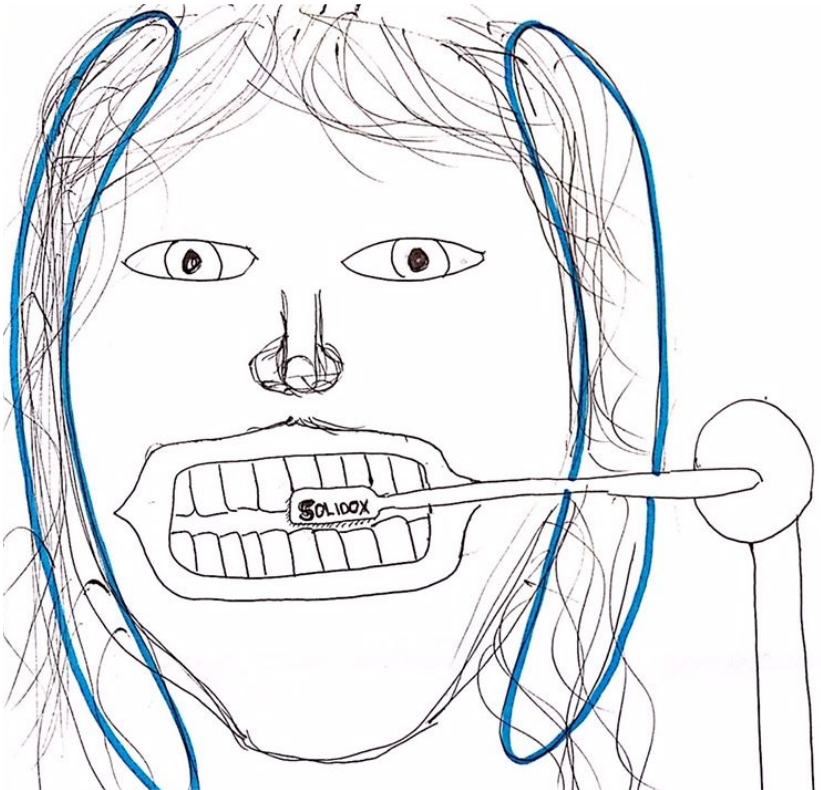
robot.

5. Make a text to describe your own definition of AI. Explain briefly this definition.
Expand on this text to explain the relation between AI and Machine Learning.

To me, artificial intelligence is a very broad term that accommodates terms such as robotics and machine learning. AI can be seen as an ideology, a technology, a philosophy and a general field of study. Its artificial - not natural, and its made by humans. I don't think artificial intelligence ever will out conquer human intelligence, because it will not be able to develop feelings and emotions, just mock them.

On the basis of discussion in the lectures, AI and ML is quite tightly coupled. They both are driven by large datasets and sufficient computational power. It is very common that the two buzzwords are used interchangeably, but they are not quite the same thing. While AI is a broader concept of machines being intelligent and able to carry out such tasks, ML is actually more of a category under AI based around the idea that we should be able to give machines access to data and let them learn for themselves. AI makes machines smarter and ML enhances its accuracy.

6. a. Make a drawing of an interaction with an AI - something that you imagine. Describe with some sentences your drawing.



This is a teeth brusher machine where you lay down with your face towards the pillows, like on a massage bench and attach your toothbrush to the AI-machine. The AI has trained on your teeth many times and knows exactly how to brush exactly your teeth. It knows it is you by reading the chip on the end of the toothbrush.

b. Summarize key characteristics of interaction design for AI-based systems (challenges, principles, trends).

Key characteristics of interaction design for AI-based systems, and how they differ from other computer systems is that it can **learn dynamically**, **improve** and **gather data through user interactions**. A challenge can for example be if it is interacted with the wrong way, due to poor UI/UX design, where e.g. the user fills in the wrong info in the wrong field. If this is done repeatedly, and the AI starts training on this data, it will believe it is right. If you compare it to a system without AI, like a calculator, the accuracy will never be as good as for the calculator, but having an accuracy above for example 80 % (if that is acceptable in the given field) might be much more valuable, considering the larger amount of results generated by using AI over humans.

With the rise of AI and interaction design, a new movement have arised: *anticipatory design.* This is a community of future thinkers who want to ideate on predictive UX. (https://www.anticipatorydesign.com/). This movement persists of ML, UX and IoT. UX design is crucial for delivering a seamless anticipated experience that take users away from technology. Anticipated Design, as design principle, is already in use without us being actively aware; a good example of this is Netflix.
[https://uxdesign.cc/designing-anticipated-user-experiences-c419b574a417] Joël van Bodegraven, Product designer at Adyen and author for UX collective, has established five design considerations to be taken into account when designing for AI systems:

1. *Design against the experience bubble*
    a. Like with the filter bubble, the experience bubble leaves you stuck in a loop of returning events, actions and activities. Algorithms cannot know the difference between right and accidental behaviour. Should be a way to teach them.
2. *Focus on Extended Intelligence instead of Artificial Intelligence*
    a. It is in human nature to use technology as an extension of itself, and not for total replacement. Therefore inhuman to replace all daily activities by machines.
3. *Responsive algorithms make data understandable*
    a. Algorithms are not ready for predictive systems, and even though it might *seem* like they are understanding about our actions, it's still just a binary matter. They need to be more responsive in order to adapt to people's needs. With help from the feedback loop, responsiveness can be implemented; then people can teach algorithms what - and why - they (dis)like things.

4. *Personality make interactions more human-like*
    a. Personality adds huge value to our interactions with devices, giving it a human touch.
5. *Build trust by giving control and transparency*
    a. Much personal data ends up in a black box, and often we don't know what is being collected and how it's used. This concern has hopefully been lowered with the entry of GDPR this year (2018). Providing options for automation should build trust and enable growth.

c. Sketch a user interface illustrating one or more of these characteristics.

This poorly drawn device is an AIlarm (AI alarm) that calculates your sleep quality and wakes you up when you have had enough good sleep. It uses sleep data as fuel, thereby *learns dynamically*.

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.

In the article we are presented with four different views of the relationship between subject and object, or agent and environment - that is humans/animals and objects/artefacts/tools (hereby "objects"), and how subjects perceive objects and their possible use. The four views are von Uexküll's *functional tone*, Heidegger's *equipment*, Gibson's *affordance*, and Kirsh's *entry point*.

Von Uexküll describes the relation between subjects and objects as a situation where the subject - an animal - gives meaning to the object it encounters and thereby fits the world to itself, constructing its own so called *Umveld* (subjective universe). Thereby, the object acquires what von Uexküll calls a functional tone. Initially, objects are neutral until the subject enters into a relationship with it - only then it becomes meaningful.

Heidegger describes the subject-object relation as can only be understood in terms of being-in-the-world. He divides "being" into two categories: *Zuhandenheit* (availableness) and *Vorhandenheit* (occurrentness). A basic feature of equipment, as he also refers to as *a useful thing,* is that it is being used to get something done. He claims that things are what they are on the basis of their usefulness or functionality. This makes functionality a defining characteristic of equipment. Lastly he claims that the equipment has to fit into the context of an activity, since it is only within a meaningful context an object is what it is.

Gibson's term *affordance* says that each animal has its own niche in the environment that consist of a set of affordances. Another way of looking at affordances is as an invitation. For example a chair affords/invites to sitting (mainly). An affordance removes the subject-object distinction and focuses on the reciprocal relationship between the object (an animal) and subject (its environment). According to Gibson, affordances, unlike Uexülls view on functional tone, the affordances of something does not change according to the observers needs and demands.

The last view is Kirshs' contribution and his effort to understand and improve representation of work context. Central concepts in his approach are entry points, cognitive affordances and cognitive congeniality. He also identify two families of strategies for restructuring the environment; *deform the topology* (introducing new tools) and *increase the cognitive congeniality* (organizing activity that recruits external elements to reduce cognitive load, e.g. using your

fingers for counting). He claims that entry points is used to as a way of achieving cognitive affordances.

8. Select one of the perspectives from the article, and go into detail when you describe it.

Out of the four views introduced in the article, I have chosen to go into detail about Dave Kirsh *entry points*, as this was the one I found most interesting. As mentioned above, Kirsh uses the central concepts of cognitive congeniality, entry points and cognitive affordances. By cognitive congeniality, he refers to the fact that interactions with the environment can be made more efficient and a positive experience through restructuring it. For this, he introduces two different strategies:

- Deforming the topology: Often of the state space of a task, often through tool use.
- Increase the cognitive congeniality: Often of existing state spaces. Can be done by using additional strategies, e.g. any organizing activity which recruits external elements to reduce cognitive loads (Krish 1995a: 212; cf. Clark 1997), meaning pen and paper, fingers to count on etc.

Entry points is, as mentioned above, a way of achieving cognitive affordances. It can resemble the affordance concept, in the way that it invites us to use something in a certain way. It is a structure, or cue, that represents an invitation to enter an information space, or office task. It might be piles of paper, notes, lists etc. These collection of entry points is individual for all people, and he differs between two types of office occupants: "Neats" (well-organized, structured people) and "Scruffies" (less in control, more of a mess on their desk with many entry points etc).

The characteristics of the entry points affects the way people react to them, and these characteristics vary along different dimensions, like *intrusiveness*; how visual it is, how much attention it attracts, *richness in data*; how much the entry points lets you know about the underlying data, *visibility*; self-explanatory, *freshness*; when was the last time someone saw or made changes to it, *importance*; how pressing the activity associated with the entry point is, and lastly *relevance*; how relevant the entry point is for the current activity.

The structure that the entry points provides are helpful for reducing cognitive demands and for helping people to improve their performance.

9. Select one other article from module 1, and write with your own words what this article is about.

I have chosen to read the article called "Ironies of Automation" by Lisanne Bainbridge (1983). This article is about automation of systems that has been manually operated earlier. The irony of this automation is that it often adds to the work load rather than to eliminate it. The article explores some of the challenges with automation. For instance, a designer can create unknown errors that can be a major source to operating problems. When a person is set to monitor a system that fails rarely, even the most experienced operator can become inexperienced if he/she needs to deal with issues. Monitoring is also not an especially rewarding working task, which can lead to poor mental health. Many studies (Mackworth, 1950) have shown that it is impossible for people to maintain effective visual attention towards a source of information in which little happens, for more than about 30 minutes. The article also offers some proposed solutions for the issues it addresses. This could for example be alarms and other visual effects that goes off whenever an unfamiliar occurrence happens. Another solution when automated systems fail, is to shut down the whole system, as this is simple and low-cost. This does now work, however, if the situation needs to be stabilized, for example with a pressurized water nuclear reactor. Another solution is training simulators, though you cannot simulate unknown faults. The whole article concludes that one does not necessarily remove the difficulties by automating, and that there is also a possibility that resolving them will require even more ingenuity than with classic automation.

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 have chosen the HBO series *Westworld* for this part of the assignment. The plot revolves around a futuristic amusement park for grown ups taking place in the wild west. Here, the visitors are allowed to live out their primal fantasies with the robotic so-called "hosts", which you can't really tell are not human by the looks, and further into the story not even by their "personality". Further on in the story, the hosts evolves artificial consciousness that resembles

human consciousness more and more. Considering there are no consequences for the park's guests, no matter how illicit their fantasies might be, the hosts hunger for revenge grows. In this series, the interaction with AI is very human-to-human like, more and more throughout the episodes. In the beginning all the visitors can tell the other visitors and hosts apart, and they are superior to the host. As the story evolves, the table turns and then it comes to a point where the host are superior to the visitors. The power structures changes. One of the visitors even falls in love with one of the hosts. As this is a true emotion from the visitors perspective, it is just something inscripted in the host and by simply restarting her, the "feelings" disappears.

11. Describe what you understand by autonomy; both human autonomy and machine autonomy.

The term autonomy refers to the freedom and the capacity to make an informed, un-coerced decision, excluding any interference from others. This applies to both human and machine autonomy, because it refers to the ability to think for yourself, and be independent (de Visser, Pak & Shaw, 2018). Many IT-sceptics are worried about what happens when machines begin to make their own informed decisions, without the interference of humans, like in the example from *Westworld* in task 10. The fact that machines is becoming increasingly more autonomous contributes to redefining our relationship with technology and how we interact with them. Once an autonomous system is deployed, autonomy will evolve with use in different environments and will have the potential to evolve in unexpected ways (Vamvoudakis, Antsaklis & Dixon (2015). We are in control of the technology we create, the only question is for how long? With the technology developments speed rate, there will only be a matter of time before the machine outsmarts us (without trying to sound over dramatic). For instance, what happens when a school bus becomes driverless and there is an accident. Who will be held accountable?

12. When was the term "AI" first coined? Please make a reference.

The term was allegedly first coined by John McCarthy in 1956, when he held his first academic conference on the subject (Smith, McGuire, Huang & Yang, 2006).

13. Articulate one question for the article "What we talk about when we talk about context" by Paul Dourish in the curriculum.

- How does ordinarity relate to context?
- According to Etienne Wenger - what is “practice”?

14. Articulate one question for any other article in the curriculum.

I have chosen to articulate a question from the article “Five Provocations for Ethical HCI Research” by Barry Brown, Alexandra Weilenmann, Donald McMillan & Airi Lampinen.

- Give one reason why informed consent does little to protect participants.

15. Read the article: "Using Artificial Intelligence 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

Some claim that interface design in AI systems is about making it usable and pretty, and that it’s not a hard task. This is not right, as it’s first of all a task of developing the way people think and feel. In one view, computers will continue enhancing their problem solving skills by the help of AI that continuously gets better, while humans will remain unchanged. Another view emphasizes that humans will be modified directly through neural interfaces, or indirectly through whole brain emulation. In a third view, the whole, broad term of *humanity* is changed through AI, because such technologies, like generative interfaces/interactive generative adversarial models, is helping us invent new cognitive technologies, which expands the horizon of human thought, exploration and creativity. This might, in the long run, create an interesting and virtuous feedback loop there cognitive technologies will speed up the development of AI vica versa.

References

Bainbridge, Lisanne. *Ironies of Automation.* Pergamon press Ltd. (1983).

Capek, Karel “RUR”, (1920)

De visser, Ewart J., Pak, Richard & Shaw, Tyler H. (2018). *From “automation” to “autonomy”: The importance of trust repair in human-machine interaction.* Ergonomics. https://doi.org/10.1080/00140139.2018.1457725

Domingos, Pedro, "A Few things to Know about Machine Learning", University of Washington, Seattle, WA 98195-2350, U.S.A. (undated).

Dourish, Paul, "What we talk about when we talk about Context", University of California, Irvine.

Greenwald, Ted, "Artificial Intelligence (A special report) --- What Exactly Is Artificial Intelligence, Anyway? ..." Wall Street Journal, (2018), p.1

Hitt, D. (2017). *What is Robotics?* Retrieved from: https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what_is_robotics_58.html

Kork, Joost N., Egbert J. W. Boers, Walter A. Kosters, and Peter van der Putten. 2002. "Artificial Intelligence: Definition, Trends, Techniques and Cases." Knowledge for sustainable development: an insight into the Encyclopedia of life support systems, 1: 1095-110

Machine Learning. (n.d). In *Wikipedia.* Retrieved September 12, 2018, from https://en.wikipedia.org/wiki/Machine_learning

Newell, Allen, "Principles of artificial intelligence,", Tioga Press, (1980), p.1

Robotics. (n.d). In *Wikipedia*. Retrieved September 12, 2018, from https://en.wikipedia.org/wiki/Robotics

Sas Insight. (undated). *Machine Learning: What it is and why it matters.* Retrieved from: https://www.sas.com/en_us/insights/analytics/machine-learning.html

Siegel, Mel, "What is the definition of a Robot". PostNauka, (2015). Retrieved from: http://serious-science.org/what-is-the-definition-of-a-robot-3587

Smith, Chris., McGuire, Brian., Huang, Ting. & Yang, Gary. (2006). *The History of Artificial Intelligence.* University Of Washington. Retrieved from: https://courses.cs.washington.edu/courses/csep590/06au/projects/history-ai.pdf

Susi, Tarja & Ziemke, Tom. *On the subject of Objects: Four Views on Object Perception and Tool Use.* Tripple C. (2005).

Vamvoudakis, Kyriakos G., Antsaklis, Panos J. & Dixon, Warren E. (July, 2015). *Autonomy and Machine Intelligence in complex systems: A tutorial.* Presented at the 2015 American Control Conference (ACC).

Westworld, HBO (2016 -).