

IN5480 - Specialization in Research in Design of IT

Individual Assignment 3

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1 Task 1

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

"The ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings." [1] The Britannica dictionary focuses on the robot or digital computer performing tasks associated with intelligent beings. This is the vaguest definition of the three, and according to the definition it doesn't have to be human intelligence being replicated. This definition don't touch directly on topics discussed in the course so far.

"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." [2] Oxford Dictionary's definition mentions both the theory and the development of the computer system, but associates artificial intelligence with human intelligence in contrast to Britannica's definition. It also gives relevant examples that further helps to define what AI actually is. So far in the course we've discussed among other things the visual perception and decision-making in AI. These are two examples where AI can perform much better than humans, because they're extremely good at a specific domain. For example can an AI detect what an image contains, and through decision-making telling us how confident the AI is in its decision.

"The field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, problem solving, and pattern recognition." [3] Amazon's definition is quite similar to the one of Oxford Dictionary, while linking AI to computer science and solving cognitive problems. In the course so far we've been discussing learning, both deep learning and neural networks. They can be used to solve problems and recognize patterns through their neurons.

None of the definitions discussed the three different types of AI - artificial super intelligence, artificial general intelligence or artificial narrow intelligence.

2 Task 2

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

"The branch of technology that deals with the design, construction, operation, and application of robots." [4] Oxford Dictionaries' definition of robotics is concrete, but doesn't go into detail about the robots themselves.

"... technology dealing with the design, construction, and operation of robots in automation" [5] Merriam-Websters dictionary says that robotics is used in automation, and also mentions the different activities involved in robotics.

"Design, construction, and use of machines (robots) to perform tasks done traditionally by human beings." [6] Britannicas definition can be linked to their definition of AI - that the tasks are done by human (intelligent) beings. It also links robotics to machines for a clearer understanding.

3 Task 3

Search and find three definitions of Machine Learning, describe these briefly. Discuss definitions relative to discussions of Machine Learning in the course.

"Advanced machine learning algorithms are composed of many technologies (such as deep learning, neural networks and natural-language processing), used in unsupervised and supervised learning, that operate guided by lessons from existing information." [7] Gartner, a leading research and advisory company, has the most concrete definition, mentioning different types of machine learning (ie. deep learning, neural networks). Gartner also mentions both unsupervised and supervised learning, but the real explanation of ML is in the last sentence: "that operate guided by lessons from existing information". In the course we've discussed all three examples Gartner gives on machine learning algorithms. We've also seen examples of supervised learning, for example in image recognition.

"A branch of artificial intelligence in which a computer generates rules underlying or based on raw data that has been fed into it" [8] Collins' definition also focuses on the aspect that ML's decisions is based on rules underlying or raw data. As the course has progressed I've seen that this definition is the most vague of the three. Per my understanding, machine learning is the task of understanding data and patterns, and not necessarily generating rules.

"The capacity of a computer to learn from experience, i.e. to modify its processing on the basis of newly acquired information." [9] Oxfords definition is quite similar to Collins', focusing on the modification of processing based on new information.

4 Task 4

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

While AI is being used to make decisions based on previous information or other rules - it's confined to being "just" a brain. The AI itself can't walk, can't get new visual input or talk to a human. For an AI to walk, it needs legs, sensors and weight distribution. The making of these limbs (or machines) is Robotics. I imagine the relationship just like the human being. Our brain can't see stuff itself, it needs eyes!

5 Task 5

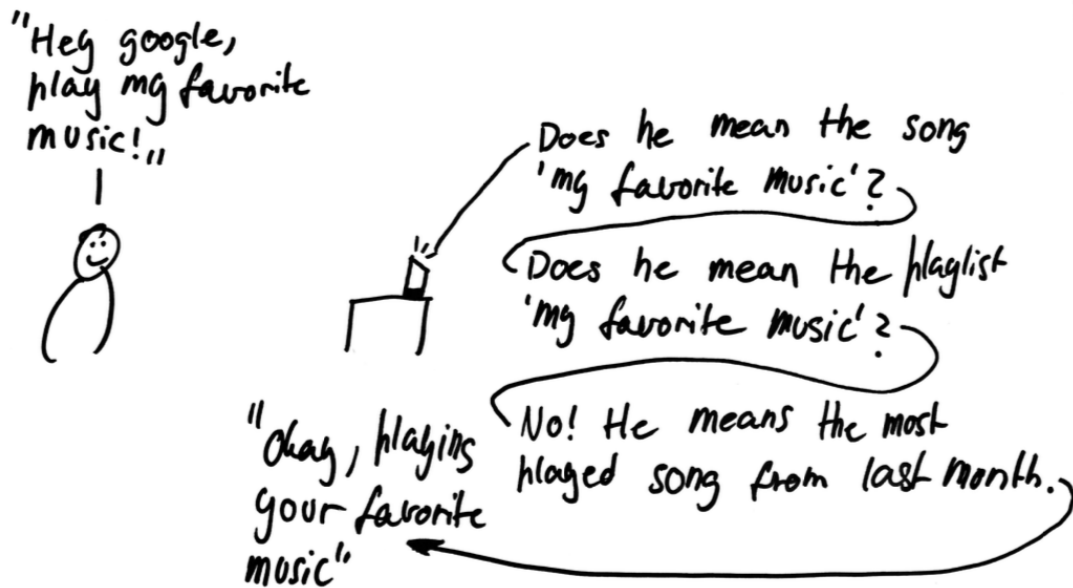
Make a text to describe your own definition of AI. Explain briefly this definition. Expand on this text to explain the relation between AI and Machine Learning.

Artificial intelligence is a field in computer science, focusing on the replication of intelligence normally found in human beings in order to perform tasks such as learning, visual perception, speech-recognition and decision-making.

In my definition, I focus on the replicating of intelligence as this is what I understand AI is mostly about. In addition to this I added examples of tasks performed that AI is currently being able to do. Per my understanding, the relation between AI and machine learning is the evolvement of the computer program. While the AI makes the decision on what to do, the machine learning algorithm makes sure that the AI knows about e.g. the probability of different outcomes. The difference between the two isn't a definite separation. They do blend into each other, and both contributes to the understanding of data, and the resulting decisions based on the data.

6 Task 6

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



My drawing tries to explain that the interaction with AI is hidden because the AI itself does actions based on what the user says - trying to figure out what he means.

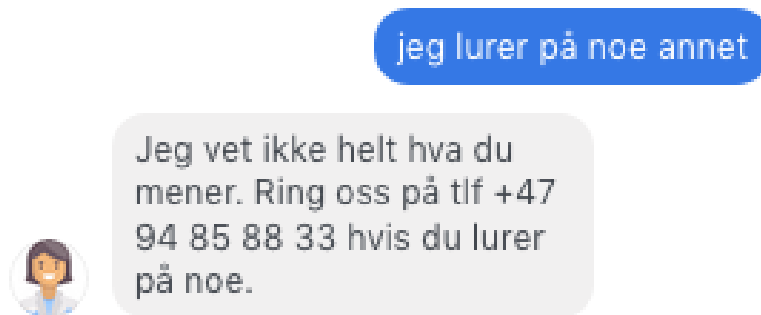
Summarize key characteristics of interaction design for AI-based systems (challenges, principles, trends). Sketch a user interface illustrating one or more of these characteristics.

The key principles in interaction design for AI-based systems are *Dynamic*, *Mistakes inevitable* and *Data gathering through interaction*[12]. Dynamic means that the system should be capable to learn and evolve on its own, and that it should be able to change based in the situation. It should also show capabilities and be clear on limitations. The fact that mistakes are inevitable is also important to show users, because they might expect it do to much more than the system actually does. It's also important for the system to gather data in order to improve the interaction with the user and evolve the AI.

Some of the challenges that AI-based interaction design face is both that it needs a *good use*

case, and that *natural speech* is hard to comprehend for a machine. Looking at the Gartner Hype Cycle it's clear that we're currently in the Innovation Trigger, and we might even be closing in on the peak [13]. This means that the term AI is being thrown around a lot, and might also be used in places where AI wouldn't make a change or improve the current processes. It's important to have a good use case in order to create successful AI interaction. Currently, the best use case is in what's called *Narrow AI*[14]. This is software where the AI is being used for a specific purpose, such as recognizing pictures, find patterns or play simple computer games like Tetris. The other challenge, natural speech, is being worked on heavily. The main challenge with natural speech is that it's evolving over time, and that it's difficult to understand context.

A trend in interaction design of AI-based systems is in chats and messaging platforms. This concerns both chatbots that's used everywhere and the analytics of incoming messages done by Google [15].



In the groups project we've included the principle of *mistakes inevitable* because the chatbot cannot understand everything that it's given. The fallback is a phone number that when used in reality should lead to a real person.

7 Task 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.

There are four different views on object perception and tool use being discussed in the article. These are functional tone, equipment, affordance and entry-point.

Functional tone

Functional tone is described by von Uexküll. A central point for his description of the human relationship with tools is that each animal creates its own universe, or "Umwelt". This is because they apply their own meaning to the objects it encounters, leading them to fit the world to their own needs. This universe contains two different worlds, both the animals own world with their perceptions - and the "Wirkwelt", his effector world.

Let's use an example with a stick. When there's no animal nearby, the stick has a neutral functional tone. When a human comes across the stick, the human imprint meaning to the stick, and gives the tool a functional tone. For example if the human will use the stick to throw it to his dog, it's given a "play-quality". If the human will use the stick for building a house, it's given a "build-quality". This means that an object could have different functional tones or meaning in

different "Umwelts", based on the animals situation and perception of reality.

Equipment

Heideggers point is that the relation between the human and the tool is interdependent, meaning they cannot be considered as different entities. The tool and its possibilities depends on the human's ongoing activity. Heidegger meant that there is no such thing as equipment, or a useful thing. Things are defined in terms of the function they provide, but that all depends on the context in which the human is currently in. A hammer isn't a useful equipment if you're going to cut something precisely.

Affordance

Gibsons point is that every object has it's own affordances which is made available in the patterns of light that are reflected from surfaces. This means that objects has it's own affordances that will always be there. The human's need may change, but the object's affordances will be there nevertheless. An example of this could be the part of a coffee cup used for holding. Because it's hollow, circular, and inviting - this leads to it being an affordance for picking it up.

Entry-point

Kirsh studied the way people works in offices and argued that sometimes the people should fit their environment to them, instead of the opposite. This may lead to people being more productive by reduce mental efforts. He proposed the term 'entry point', which is similar to affordances, meaning they invite us to do something. It's "a structure or cue that represents an invitation to enter an information space or office task". He categorized some of these entry points in an office to: intrusiveness, richness in metadata, visibility, freshness, importance and relevance. In order to reach a good performance in the work-place, these entry points should be adapted to the humans.

Both Heidegger and von Uexküll bases their theories on the context the actor is in - in contrast to Gibson and Kirsh theories that things have their affordances / entry points no matter what the context is.

8 Task 8

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

See 'functional tone' above.

9 Task 9

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

I chose 'Five provocations for Ethical HCI Research' by Brown, B., Weilenmann, A., McMillan, D., and Lampinen, A.

The article is about five provocations as they call it, written in order to challenge the community in HCI about ethics.

The first provocation is about the use of informed consent. The authors argue that it often leads to miscommunication in regards to the benefit of the research. It's also unnecessary and might lead to the researcher being seen as trying to dupe the subject.

The second provocation is about research on vulnerable populations, especially when these aren't left with anything after the trials. The HCI-community should learn from the medical community

and leave the participants with a lasting benefit, for example when conducting experiments in poor areas. This could be done by leaving technology for them to use further. In turn, this would lead to more participants being engaged and willing to join because it could have a lasting, positive effect on the community.

The third provocation is about anonymity in HCI research. By using the word 'anonymous', we raise expectations, not only for researchers, but also for the participants. We can't guarantee their full anonymity because family and friends will always recognize blurred out faces or statements said by the subject in question. In addition to this, some might want to not be anonymous. Therefore, anonymity should be an option for participants, not 'enabled' by default.

The fourth provocation is about Institutional review board and how they limit and makes conducting research harder than it could be. The time they use to process possible research areas could be used to save both time, and in some medical cases life of the subjects in question. The authors propose using a two-stage peer-review process instead.

The last provocation is regarding research performed with or within a commercial company. They propose to block the publication until the complete dataset is made available to others in order to guarantee transparency during review and future replicability of analysis. An example used in the article was about gambling companies doing research on gambling in general. They of course don't want to focus on the downsides for humans in gambling, and thus making the research biased.

10 Task 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.

'Her' (2013) is a fictional film about Theodore, a lonely writer. He purchases what's know as 'OS1', worlds first artificial intelligence operating system. The intelligence is named Samantha, and they quickly grow closer and closer as they talk together. Theodore even brings Samantha outside with him, and he's starting to fall in love with her. The AI is portrayed as a digital assistant who learns from the user. Sort of like a normal human being, but without the physical aspects. The interaction is through both speech and a camera that Samantha has access to. From this, she can see the world and act thereafter. If you didn't know Samatha was an AI, you wouldn't have guessed that she wasn't a human being.

11 Task 11

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

Human / personal autonomy - the ability to decide for yourself, do your own actions, without the direct influence of others.

Machine autonomy - a machine that works on it's own, without the need for a human to be involved. This might be AI, or a clock that keeps on ticking without the human interference.

12 Task 12

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

According to Smith, C. (2006) the term 'AI' was coined in 1956 by John McCarthy.[10]

13 Task 13

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

Dourish argues that users determine the meaning of the technologies that they use, and not the designers. How can designers work together to create designs effectively and change the community as a whole?

14 Task 14

Articulate one question for any other article in the curriculum.

A peer-review instead of an ethics board proposed in the article 'Five provocations for Ethical HCI Research' would impose some challenges. For example, how would one be sure that the person reviewing the work is objective and impartial?

15 Task 15

Read the article: "Like Having a Really Bad PA" by Luger, Sellen. Summarize in your own words key lessons learnt for interaction design with dialogue systems. Discuss the relevance of these lessons learnt for interaction with AI-based systems in general (1/2-1 page)

The article presents numerous findings that were gathered through 14 semi-structured interviews. Some of the findings were:

- CAs were used primarily for basic actions like checking the weather and setting reminders.
- The motivations for using the CA was that it enabled multi-tasking when their hands were otherwise engaged and that it was time-saving
- The users had to simplify what they said in order to make the CA understand what they meant
- 'Play' was an important part of getting to know the CA and its capabilities.

These findings support the argument that CAs aren't like a companion that many envisioned the future to be. [11] The participants in the article told the story of how they had to simplify their language to make the CA understand what they meant. I believe this is both because of the advertisement of the companies producing the CAs and because we expect to have a normal dialogue with the CA.

For interaction design with AI in general this highlights a couple of things. First off, the product that we make should live up to people's expectations. If we're honest with the product's limitations, people will have a better understanding of it. Secondly, the interaction we design should have a focus on making everyday life easier for the users. This could be done through enabling them to do more complex tasks via their CA (like calling the hairdresser) or be more helpful by providing context-specific information.

16 Task 16

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?

According to Parasuraman et. al. (2000) [16] these are the levels of automation. The higher the number, the more automation.

10. the computer decides everything, acts autonomously, ignoring the human
9. informs the human only if, the computer, decides to
8. informs the human only if asked, or
7. executes automatically, then necessarily informs the human, and
6. allows the human a restricted time to veto before execution, or
5. executes that suggestion if the human approves, or
4. suggests one alternative
3. narrows the selection down to a few, or
2. the computer offers a complete set of decision/action alternatives or
1. the computer offers no assistance: human must take all decisions and actions

These general levels of automation fits with many use cases, e.g. for cars. Some cars can drive all alone without a driver (7-10), while others only informs the human about its circumstances (2-4). In my view these levels seems complete, although a bit too focused on the human aspect. When reaching level 10, I believe the computer doesn't *ignore* the human. The machine is programmed to take actions on its own, thus increasing productivity and be more cost-effective. Ignoring the human would be going rouge - it could easily be turned off by editing settings or pulling the plug.

I mentioned some advantages of higher levels of automation - increasing productivity and thereby reducing costs. Other advantages include availability, reliability and performance. Automation in customer service will lead to the company being able to quicker answer customers, reducing costs by not having to pay wages to people for doing so, be available 24/7 and not having to rely on workers being healthy for example. Lower levels of automation is great for helping humans in their day-to-day lives, e.g. by giving options for dinner based on what you have in your fridge.

Disadvantages with automation has been discussed a lot in the public. The main disadvantage could be the loss of jobs. Machines does work that humans did previously, rendering some jobless. This might lead to emotional stress for the individual, and maybe having them relocate to find other work. It could also lead to people getting more education if it's available in their country of origin. Another disadvantage with higher automation is the initial costs. Having a machine tailored for a specific task is price-consuming and could put many business owners off.

References

- [1] Britannica Dictionary (2018) Artificial Intelligence [internet]. Available from: <https://www.britannica.com/technology/artificial-intelligence> [Accessed September 17th 2018].
- [2] Oxford Dictionaries (N/A) Artificial Intelligence [internet]. Available from: https://en.oxforddictionaries.com/definition/artificial_intelligence [Accessed September 17th 2018].

- [3] Amazon (N/A) What is Artificial Intelligence? Machine Learning and Deep Learning [internet]. Available from:
<https://aws.amazon.com/machine-learning/what-is-ai/> [Accessed September 17th 2018].
- [4] Oxford Dictionaries (N/A) Robotics [internet]. Available from:
<https://en.oxforddictionaries.com/definition/robotics> [Accessed September 17th 2018].
- [5] Merriam-Webster Dictionary (2018) Robotics [internet]. Available from:
<https://www.merriam-webster.com/dictionary/robotics> [Accessed September 17th 2018].
- [6] Britannica Dictionary (N/A) Robotics [internet]. Available from:
<https://www.britannica.com/technology/robotics> [Accessed September 17th 2018].
- [7] Gartner IT Glossary (N/A) Machine Learning [internet]. Available from:
<https://www.gartner.com/it-glossary/machine-learning> [Accessed September 17th 2018].
- [8] Collins Concise English Dictionary (N/A) Machine Learning [internet]. Available from:
<http://www.wordreference.com/definition/machine20learning> [Accessed September 17th 2018].
- [9] Oxford Dictionary (N/A) Machine Learning [internet]. Available from:
<https://en.oxforddictionaries.com/definition/machinelearning> [Accessed September 17th 2018].
- [10] Smith, C. (2006) The History of Artificial Intelligence [internet]. Available from:
<https://courses.cs.washington.edu/courses/csep590/06au/projects/history-ai.pdf>
 [Accessed September 17th 2018].
- [11] Apple (1987) Knowledge Navigator [internet]. Available from:
<https://www.youtube.com/watch?v=hb4AzF6wEoc> [Accessed October 16th 2018].
- [12] Asbjørn Følstad (2018) Interaction with AI - Module 2 [internet]. Available from:
<https://www.uio.no/studier/emner/matnat/ifi/IN5480/h18/undervisningsmateriale/interacting-with-ai—module-2—session-2—v03.pdf> [Accessed October 16th 2018].
- [13] Gartner (2018) Hype Cycle Research Method [internet]. Available from:
<https://www.gartner.com/en/research/methodologies/gartner-hype-cycle> [Accessed October 17th 2018].
- [14] Noessel, C. (2017) Designing Agentive technology: AI that works for people [internet]. Available from:
<https://proquest-safaribooksonline-com.ezproxy.uio.no/9781492018605> [Accessed October 17th 2018].
- [15] Ghoshal, A. (2018) Google is bringing AI-powered one-tap replies to all your messaging apps [internet]. Available from:
<https://thenextweb.com/apps/2018/02/14/google-is-bringing-ai-powered-one-tap-replies-to-all-your-messaging-apps/> [Accessed October 17th 2018].
- [16] Parasuraman, R. et. al. (2000) A model for types and levels of human interaction with automation [internet]. Available from:
<https://ieeexplore.ieee.org/abstract/document/844354> [Accessed October 29th 2018].