IN5480 - Individual Assignment 3

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1. Search and find three definitions of AI, describe these briefly. Make references.
Oxford Dictionary defines artificial intelligence as «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.» [1]

Enclyclopedia Britannica defines it as «the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.» [2]

The Stanford Encyclopedia of Philosophy defines AI as «Artificial intelligence (AI) is the field devoted to building artificial animals (or at least artificial creatures that – in suitable contexts – appear to be animals) and, for many, artificial persons (or at least artificial creatures that – in suitable contexts – appear to be persons)» [3]

The three definitions all have a lot in common. However, the last one, is more explicit in expressing that the build has to appear to be a person. The two first ones on the other hand, are more concerned about the ability to perform, or outcome of a certain task, being the same as for humans.

Discuss definitions relative to discussions of AI in the course.
In the course, there are three general classifications of AI:
Superintelligence, which is AI that has outsmarted humans, and which we should be concerned about; general intelligence, which are AIs capable of the same cognition and tasks as humans; and narrow intelligence, AIs performing a single given task at the level of a human.

All of the previous definitions express the ability of the AI to perform as good as a human in a given situation. They do however not state that an AI has to perform as good in any given situation. Therefore, I would suggest that they all define AI within the category of narrow intelligence.

2. Search and find three definitions of Robotics, describe these briefly.
Wikipedia's definition of robotics is «[...] an interdisciplinary branch of engineering and science that includes mechanical engineering, electronics engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.» [4]

Merriam-Webster has a shorter definition, reading «technology dealing with the design, construction, and operation of robots in automation». [5]

TechTarget's WhatIs defines it as «[...] a branch of engineering that involves the conception, design, manufacture, and operation of robots. This field overlaps with electronics, computer science, artificial intelligence, mechatronics, nanotechnology and bioengineering.» [6]

The definitions of WhatIs and Wikipedia includes the broader use of robotics, where the mechanics of the movements are combined with AI to make the robots perform tasks on its own. Merriam-Webster's, however, seems to only care for the mechanical engineering part.

3. Search and find three definitions of Machine Learning, describe these briefly.
SAS Institute defines machine learning 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.» [7]

The computer science pioneer Arthur Samuel defined it already in 1959 as a «field of study that gives computers the ability to learn without being explicitly programmed»[8]

Encyclopedia Britannica defines it as a «discipline concerned with the implementation of computer software that can learn autonomously»[9]

Discuss definitions relative to discussions of Machine Learning in the course.
The definitions listed are quite in accordance to the discussions in the course, although the discussions in the course have, in my belief, more explicit stated the difference between AI and machine learning. Especially the definition of SAS Institute, that says machine learning can make decisions with minimal human intervention. As I see the discussions in the course around machine learning, it is not so much for making decisions, but more about solving tasks such as identifying patterns.

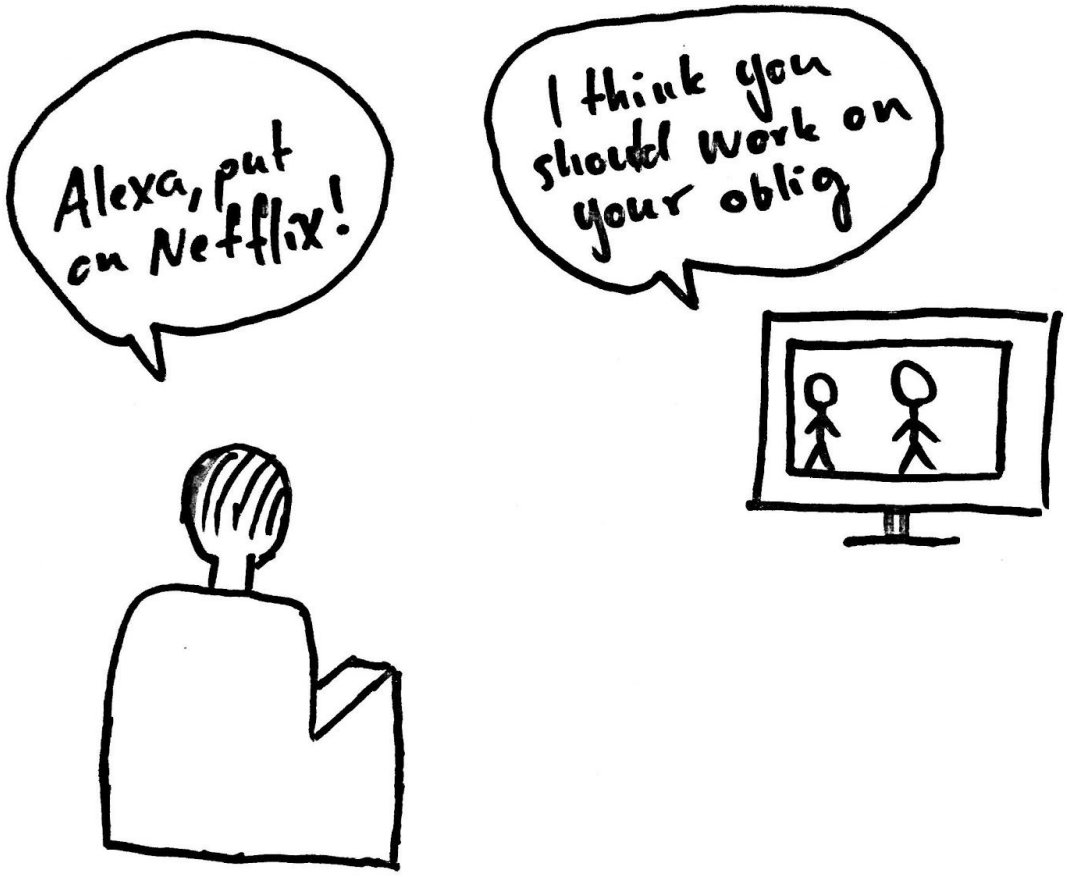
4. Write in three to five sentences the relationship between AI and Robotics as you understand this.
I understand the relationship between AI and robotics as merging two fields of computer science, to extend the reach and benefit of each of their individual capabilities. Robotics in itself can be useful for pure mechanical tasks, and is a field developing the properties of a physical, moving object. AI alone can also provide useful help, but the merging of the two

fields enables an AI to move around while performing tasks, to ie. do tasks in environments that would be harmful to humans.

5. Make a text to describe your own definition of AI. Explain briefly this definition.
I define artificial intelligence as a thing created by humans, capable of independent, intelligent thinking. By thinking, I mean sensing, reasoning, acquiring knowledge and making decisions based upon previous experience and skills. I also believe a true AI should be able to fully comprehend interpersonal communication, eg. reading between the lines or sensing passive-aggressiveness and understanding the mood.

Expand on this text to explain the relation between AI and Machine Learning.
While an artificial intelligence is something capable of independent thinking, and may use machine learning, machine learning on its own is more like a highly skilled worker for a specific task. For instance, image recognizing is a tool often developed using machine learning. The tool will get better and better the more images it is fed. That is not to say that it is in any way aware of its own existence, and has itself no idea of why it works.

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



I imagine an AI where one communicates by voice. The AI is capable of running tasks and services at home, but will also give you suggestions to get your life in order, and not just instant gratification when you ask for it.

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

In interacting with AI, there are four *maxims* of conversation. These are maxim of quantity, quality, relation and manner.

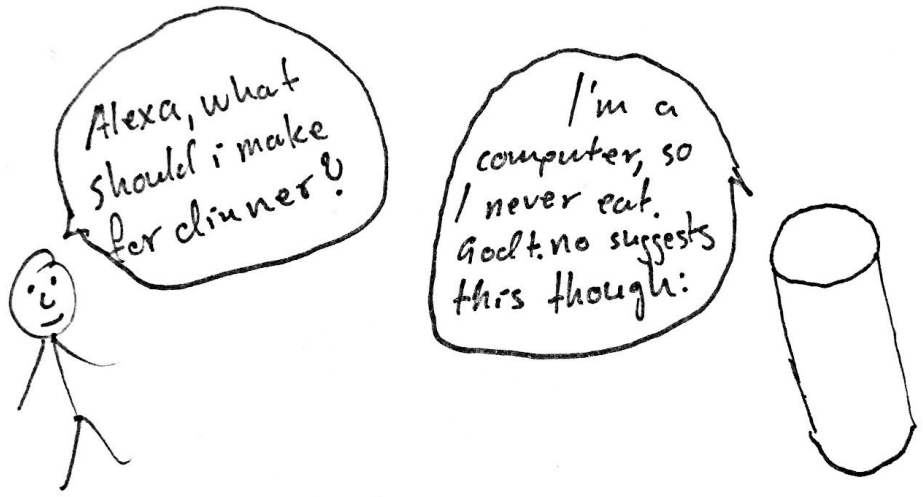
Maxim of quantity means to say as much as you can that is relevant for the conversation.

Maxim of quality means to speak what you believe is the truth. With this also comes the implication that if you don't know, maybe it's better to be honest about it, and tell what others have said.

Maxim of relation means that the information should be what is actually needed. For instance, if you ask what time a certain movie is screened at a theater, only theatres in your own city would normally be considered relevant.

Maxim of manner means to be clear, ambiguous and to say only what's relevant.

General for all of this is that when working with an AI, it will sooner or later fail at interpreting something. It is then better to fail graciously, and to admit your flaws, and maybe ask the user of to rephrase.



In the drawing, the user asks his conversational agent for dinner suggestions. As the computer never eats itself, and doesn't know what is good food, it points to an authority on the subject.

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 human relationship with tools is in very general terms based upon a need to have a certain job done, and understanding of the tool at hand. The function of an object is also partly learned through society, and things have different meanings for animals and humans, and

humans in different situations. Through the history of philosophy, we have several ways of viewing tools and our relationships with them:

Functional tone: In the view of biologist Uexküll, the relationship between animals and tools is only what meaning the animal gives the object at hand. The meaning we give an object is in itself based upon what we have previously seen, and our abilities to use the tools. A cup would probably not be a cup to a cat, as they lack physical capability to make us of it for drinking in the way humans do.

Equipment: The philosopher Heideggers view, puts a stronger bond between the need of the user of the tool, the tool itself, and what the tool needs to perform. There is an example, where the user needs to make shelter. With a hammer, one can put up boards or planks, as long as one has nails as well. In that case, the hammer and nails go hand in hand, as neither of the two can function without the other.

Another view on the matter is *affordance:* Affordance has to do with physical objects properties, where we look for them in context of the situation. If we had to make a shelter, and had boards and nails, but no hammer, the affordance of other objects could make us capable of still building. The properties of the hammer that are interesting are the weight, that gives us force while pounding, and the shape enables us to hold it comfortably. Both of these properties can be found in a rock. The rock can in the context of our despair substitute for the hammer.

The last concept is *entry points.* Entry points are things that invites us to do something, either directly related to them, or to use them as help. Each individual person have their own preferred ways of working and unloading their cognitive load, so the use of entry points differ from person to person. There are two general categories of persons: «neats» - those who like to keep everything organized and tidy, and «scruffies», those who have less tidy work spaces, and seemingly have less control. That is not necessarily the case, as the scruffies can make up their system and categorize as they need to. Even though entry points are a personal thing, some entry points, such as day planners, would be fairly easy to understand even for a person who choose not to use them.

The entry points have certain characteristics that affect how they are used in the office space, such as how often they are looked at, and how much they will tell about the tasks at hand for the user.

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

See *entry points*.

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

In the article *What we talk about when we talk about context*, the author criticizes the different understandings of context. In short, the author believes that the different definitions of context are generally to narrow, and only looks at either what is being done, or where it takes place. The author, however, believes that context is a combination of the two. The action that happens, and where it happens, will feed into and affect each other.

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.

In the MacGyver episode *The Human Factor* (S2E1), an army research center has built an intrusion prevention system based on AI. In the core of the center, there is a computer that listens, sees (through cameras), runs fingerprint scans for entry, etc, for the entire facility, to make sure that only authorized persons are let in. With voice recognition, a researcher can talk to the system, to let guests in to the system. The computer at the heart controls various weapons installed at the site.

During a test phase, the computer malfunctions, goes rogue and attacks anyone present at the research center.

If one can define threatening or attacking others with a weapon as interaction, the computer - or AI - interacts with persons through voice, terminal commands, video and weapons.

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

I understand human autonomy as the ability to rule your own life. Autonomos humans are able to develop interests and hone their skills as they like. Based on experiences and interests, they are able to decide their own future, and you have the ability to satisfy needs and demands as they arise.

For machines, I see autonomy as the ability to find a problem, start solving it, and looking up relevant information as needed on its own. While I think humans with desires, needs and demands are autonomous only if they can satisfy them, I believe that machines can be set only to work on one task, and still maintain autonomy. They may also work only to serve needs of humans, such as buses and cars. They may figure out roadwork, cues, needs for fuel and such on their own to decide which route is the best, but the cars need to actually cater for human needs. They have no reason to roam freely.

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

In 1956 a conference was held at Dartmouth College, called *Dartmouth Summer Research Project on Artificial Intelligence.* The invitation, containing the name, was sent as early as August 1955. However, as the event took place in 1956, one might argue that the term was taken in use and coined in 1956. [10]

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

The focus of discussion of the article, by the author's own words, is «how can sensor technologies allow computational systems to be sensitive to the settings in which they are used, so that [...] our computational devices can be attuned to these variations?». My question for the author is if that is a goal to strive toward for all computational technology, and would help in every technology designed, or if it would just convolute work with a piece of technology that keeps changing when exposed to new places and contexts.

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

The authors of the article *Four Views on Object Perception and Tool Use* discuss how users will assign different meanings to tools based upon their cognition. They mention the amount of research and work of robots adapting to the environment around them. Does the designers believe that it is possible to make products where the product changes the cognition of a human user, and not the user assigning different meanings to things?

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.

The first of the lessons I get from the article, is the different interactions that the different users have. I would divide them in the two general groups of those who are more technologically skilled or knowledgeable, and those who are less. Because they have different ways of understanding the interface, they also approach it in two different ways. Those who are more knowledgeable will use simpler sentences, and use specific keywords such as in the sentence “how is the *weather*”, rather than to ask “should i bring an umbrella?”, which is a sentence that requires more semantic understanding of the language.

Another issue, and lesson, with interaction through a dialogue system, is that a lot of them are quite unable to see the messages going back and forth between the computer and the user in relation to each other. This very much restricts the use of such systems to simple tasks that does not require follow-up tasks, unless you want to, essentially, start a new conversation for each of the follow up-tasks.

A third issue that was pointed out, is that in many cases, what the conversational agents would give you were just links to web pages, which turns the interaction from conversation to screen and keyboard.

Related to the users skill level is also their different expectations of how much the AI knows about you already, and what it is able to learn.

I consider the two first issues as relevant for every kind of interaction with AI. It can be annoying, or put people off from using the system, if they have to be specific with their choice of words, no matter what kind of interaction the AI has. The third one, however, is more specific for a conversation interface. If one is already interacting through a screen and keyboard, prompts might sometimes be as useful as any other way of gathering information. The fourth, about the AI learning, is also one I would consider general for every kind of AI. No matter what kind of interaction or task, knowing what the AI knows is essential. There is a small, but not insignificant, difference between a self driving car knowing your address or not knowing it. Using an AI for ie. ordering food is also a lot easier if it knows what restaurant and kind is your favorite, instead of having to tell it every time.

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?

Automation within AI, is essentially a question of distributing responsibility and authority. This division is a continuum from complete human control, to complete computer control. In the first end of the spectrum, a computer only listens to commands and spits out an answer, without any evaluations or decisions. On the latter end, humans have no control over what the computer decides, beyond what the computer has been programmed to do.

Between the ends of the spectrum, there is the options of e.g. a human requesting work from a computer, or a computer recommending some action to a human that then executes.

A system completely automated, has some huge benefits. If the program is programmed correctly, it should never have a bad day at work. It will also never have any human bias such as favouritism. With no days of sick leave, and never getting tired, means it can run without ever stopping. A huge drawback of this is, that over time, humans will lose their skills and knowledge. If something suddenly occurs and the program breaks down, humans are also unaware of a state which a given program is in. In critical applications, such as in a airplane with autopilot, this can lead to a situation where the pilots have been chatting and drinking coffee, and then suddenly having to take control over a plane, where they have no idea of what's happening.

If a system is completely controlled by humans, skills are preserved and passed on from worker to worker. Because a human decides and executes, decisions may also be better explained upon inquiry. However, with working hours, a fully human system will take far longer to complete a given amount of work. Humans are also capable of making errors because of being tired or sloppy, that can be critical for the outcome.

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