IN5480 final assignment

1. Give three definitions on AI

Russell & Nordwig believe that the term should be defined in relation to its goals (Artificial Intelligence (Stanford Encyclopedia of Philosophy), 2018). They've created a two by two matrix placing four different goals along two dimensions.

	Human mimicry	**Ideal rationality**
Reasoning based	Systems that think like humans	Systems that think rationally
Behaviour based	Systems that act like humans	Systems that act rationally

Many definitions divide AI into two categories, weak (or narrow AI), and strong (or AIG – artificial general intelligence). Weak Ai refers to systems that are made for a specific purpose which simulate aspects of human cognition or behavior (Faggella, 2017). Strong AI does not simulate human intelligence, but rather equals it in problem solving, communication, learning and other cognitive capabilities. It further mimics our ability to develop a stronger intelligence through adaptive learning by itself. As of today, strong AI's do not exist (Fontinelle, n.d).

Some see AI's as functioning in a continuum. At the start of it, you've got **Assisted intelligence** that mechanize and automate relatively simple, human tasks. At the midpoint, you've got **Augmented intelligence** where humans and machines learn from each other and improve and expand on the area in which they interact. At the tail end, you've got **Autonomous intelligence** which exhibits significant or total autonomity with the ability learn adaptively and continuously ("The real meaning of artificial intelligence", 2016).

During one of our classes, we were tasked with defining AI in groups. In our group, we talked about the ability to simulate learning as being a key characteristic of AI. This learning would be based on experience, and the sophistication of this ability can of course vary. A good point that was brought up, was that improvement and data gathering with AI-based systems happen through us interacting with them.

2. Give three definitions on robotics

Merriam-Webster define robotics as following ("Definition of ROBOTICS", 2018):

> Technology dealing with the design, construction, and operation of robots in automation

Russian-American author Isaak Asimov is often referred to as the father of robotics. He first used the term in his short story *Liar!*, as a conjunction of the word robot and the suffix –ics (from disciplines such as phys**ics** for example) ("What does robotics mean?", n.d). Additionally, he established three rules in regards to how robots should behave. They've been dubbed "Asimov Three Laws of Robotics" (Rouse, n.d.), and are as following:

1. Robots must never harm human beings.
2. Robots must follow instructions from humans without violating rule 1.
3. Robots must protect themselves without violating the other rules.

A more detailed definition on the matter adds that "(…) robots are programmable machines which are usually able to carry out a series of actions autonomously, or semi-autonomously" (Owen-Hill, 2017). The author further mentions three factors he believes constitutes a robot:

1. Robots interact with the physical world via sensors and actuators.
2. Robots are programmable.
3. Robots are usually autonomous or semi-autonomous.

3. Give three definitions on machine learning

Stanford University define machine learning as following ("What is Machine Learning? - Introduction | Coursera", n.d):

> Machine learning is the science of getting computers to act without being explicitly programmed.

SAS elaborate further by stating ("Machine Learning: What it is and why it matters", n.d.):

> Machine learning is 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.

Forbes Magazine define the topic in relation to AI as they are often used interchangeably in colloquial and popular contexts (Marr, 2016).

Artificial Intelligence is the broader concept of machines being able to carry out tasks in a way that we would consider "smart".

And,

Machine Learning is a current application of AI based around the idea that we should really just be able to give machines access to data and let them learn for themselves.

Unfortunately, none of our group members were able to attend the lecture on the 8th of October, and thus missed out on the discussion regarding Machine Learning. We were though able to attend the second lecture a week later. Mr. Goodwin concluded the lecture by stating that "Neural networks are the pinnacle of AI". Artificial Neural Networks (ANN from now on), are in short machine learning algorithms modeled after how our brains work. Our brains contain countless neurons that can create connections between eachother exchange electrical signals. ANN follow this logic to some extent, but in addition, they're divided into "layers" that do certain tasks (executed by artificial neurons) and send the information on the following layer. For instance, an AI might be tasked with identifying different objects in a photograph. This is a gross simplification, but the first layer might identify shapes, the following one colors, the one after that texture and so on till the final layer. Each neuron weighs its input, and the final output is a total of these inputs, so the AI might say something along the lines of "I'm 56% sure that this object is a shoe" etc. The layers are non-linear. The ANN then learns and refines its "intelligence" based on input, so the more often it does its task, the more it learns, and hopefully, the more accurate it becomes. This entire logic is – again, a gross simplification – what's in the center of Deep learning – where ANN's algorithms are fed huge amounts of data that they sift through and learn from.

4. My understanding of the relationship between AI and robotics

There seem to be different accounts on whether AI is a superdiscipline in which robotics fall under (Beal, n.d.), or whether robotics and AI are separate fields intersecting in what is known as artificially intelligent robots (Owen-Hill, 2017). The definition on what a robot is can be rather fleeting, as some believe that robots in some way have to interact with the physical world. While I don't necessarily agree with the sentiment that robots have to be tangible in some way or another, I believe AI and robotics to be separate multidisciplinary fields that can intersect, but

not necessarily so as AI's in some way simulate intelligence, while robots can be remotely controlled and fully lacking in autonomy.

5. My definition on AI

My personal definition of AI is as the name implies, intelligence that is artificially simulated by computers. The level of sophistication can of course vary, but at a bare minimum, I believe all AI's should have some degree of autonomy (I.E, something that is completely controlled by a human I would not consider AI, like a remote driven toy with no autonomy).

Machine learning is a part of AI, and it's what enables them to learn based on experience (a simulation of human intelligence). Not all AI is defined by machine learning though, as things like self-driving cars, follow predefined rules. They nevertheless do adapt to situations, and don't need remote human control.

6. Drawing(s)

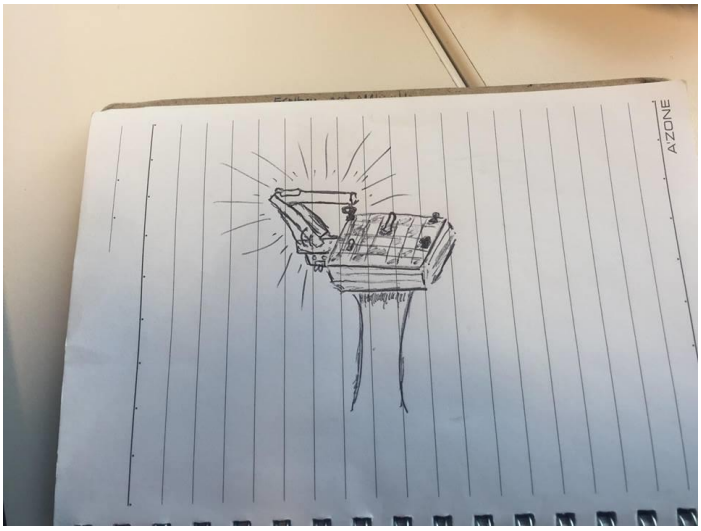

Figure 1: A chess bot

Figure 2: A door that opens by voice

An AI-based interactive system – as detailed by Mr.Følstad in our first lecture of module 2 – is an interactive system where important components are powered by AI. As mentioned on numerous occasions already, a key characteristic of most AI's (if not all), is their ability to "learn" and adapt through input. The "fuel" of AI's and their ability to improve are large datasets which they sift through (explained more thoroughly in 3). This is enabled because of the great computational power of computers today. In lecture, we saw an example of this when Mr.Følstad demonstrated "Quick, Draw", where users have a set amount of time to doodle an object on their computer which an AI will try and guess. In time, the AI improved its guessing abilities after analyzing numerous drawings, learning to distinguish certain contours and shapes with greater accuracy.

What's interesting about this, is that with AI based systems, the data gathering and "construction" of the product happens through, and not before interaction. A challenge with this of course, is that mistakes are inevitable, especially in earlier stages which might make the interaction inefficient and a tad bit frustrating to some.

7. On the subjects of objects: Four views on object perception and tool and use (Susi & Ziemke, 2005)

Uexkull believes that each animal ascribes meaning to the physical objects it encounters and fits it into the world it sees (a subjective universe known as *Umwelt* – which consists of a perceptual and physical world). Uexkull believes that objects have no intrinsic properties that decide their quality. The objects meaning is decided by the relationship the subject gets into with object which is determined by the subjects context-specific mood.

Heidegger believes that equipment are used to get things done, and are defined in relation to their use. Furthermore, their relevance is also defined in how they refer and are involved with other equipment or processes. He also that our understanding of equipment \ derives from "manipulation".

Gibbson believes that animals are afforded opportunities by its environments that are neither purely subjective nor objective, but a specific combination of a thing and its surface in relation to the animal at hand. He believes we see the environment as surfaces, and how light interacts with surfaces is how we extract information about the world around us. When looking at an object, we see its affordances that inherently invariant to the subjects mood, but how some affordances are perceived is subjective. Tools are a class of objects that are graspable, and augments our ability to act upon our environment.

Kisch conception of an entry point is – as he has admitted – quite similar to that of affordances. Unlike Gibbson, Kisch's perspective is more focused on modern contexts such as offices, and how people adapt the environment around them to achieve tasks. Entry points are "invitations" or cues in the work place that attracts one to an information space or office task. Entry points can be things like stacks of paper on a desk that organizes ones work. Entry points – Kisch believes – achieves what he has dubbed cognitive congeniality. Cognitive congeniality refers to an environments hospitability for restructuring to improve performance and efficiency. This is done through simplifying work and cognitive load.

8. Dwelve into one of the perspectives

Heidegger perspective on equipments focused to a larger extent on humans than Uexkull and what it means to be or exist. Heidegger believed in two categories of "being", Dasein (human-

being), and non human being (equipments). Equipment are used to get things done, and are defined in relation to their use. Furthermore, their relevance is also defined in how they refer and are involved with other equipment or processes inside a prefigured total relevance. I.E how a fork is needed for eating, and eating is needed for nutrition and energy. Heidegger also believes that equipment don't have intrinsic an intrinsic context-free quality, but rather that our understanding of its use derives from "manipulation". In some instances, our knowledge about how something is used is also determined by the social norms and conventions on how equipment are used.

9. Humans and Automation: Use, misuse, disuse and abuse (Parasuraman & Riley, 1997)

In the aforementioned text, the authors details the different types of –uses of automation, what characterizes them, the potential connection between them and how better understanding better understanding can lead to ways of improving ways of designing systems.

10. Ghost in the shell (1997) – Movie

Ghost in the Shell is set in a futuristic world where people have upgraded their bodies with cybernetic technology, and augmented their brains to the extent that they have an interface with the world's equivalent of the internet (known as cyberbrains). What remains most people have of their humanity is their conciseness (ghosts) which might be synthetic memories that are transferable to other cyberbrains. What constitutes AI's or humans in this world is deliberately left diffuse. The central antagonist known as the Puppet master was an initial AI, who claims to have reached sentiency after roaming the networks of the world. This can be seen in light of concepts such as strong AI and machine learning.

11. Autonomy

I believe autonomy to be the ability to make, independent, un-coerced decisions based on independent thinking. I believe machine autonomy – while defined by a pre programmed algorithm – to be able to act free from remote control and update the algorithm based on context without external interference.

12. AI term first coined

The term AI was first coined by John McCarthy in 1956 at the Dartmouth Conference (Press, 2016), although ideas around thinking machines had circulated earlier from notable figures such as Vannevar Bush and Alan Turing.

13. What we talk about when we talk about context. Personal and ubiquitous computing (Dourish, 2004)

With the constant renegotiation of what context means made available to the user through "embodied interaction", is it possible that systems might be too complicated to design?

14. Designing robots with movement in mind (n.d)

Are there any motions within the animal world that is/has been of interest for designing robot movements?

15. The Gulf between User Expectation and Experience of Conversational Agents (Luger & Sellen, 2016)

In this article, the authors conducted 14 interviews to map out the interactional factors affecting everyday use of Conversational Agents (CA). The authors found that users expectations veer greatly away from what's presented in the CA's. These expectations are in regards to things such as machine intelligence, systems capabilities and goals. Below are some of the lessons learned.

The authors found that one of the main motivations the participants had for using CA's, was the multitasking-capabilities they afforded. For instance, one of the participants would use CA's while biking for various reasons. They also found that participants preferred to use them while in private. They also found out that many of the participants often would "underestimate" the capabilities of the CA, when they had no previous knowledge them. Thus, they elected to assume that their capabilities were limited. Some of these issues, were also came from within the chatbot, as it wouldn't give the user feedback or inform them on what it does. This could also lead to less efficient interaction with the AI.

The authors also detailed how some of the participants who did not have previous technical knowledge about chatbots and AI's, were skeptical to their ability to learn. This was further exacerbated when system failures like adapting to the speakers accent, or difficultly phrased questions occurred. Some of these participants had high expectations that were not met, although many of them conceded that they nevertheless were impressed by some CA's capabilities.

The authors also chronicled how humor – while a good way to draw the users to more exploratory practices – could lower the users expectations in regards to the CA's capabilities. If the users had no previous knowledge of the CA's intelligence, the presence of too much humor could led them to underestimate its capabilities. An interesting thread throughout was how under certain contexts, human-like behaviors would led to people perceiving the CA as more intelligent, while being to mechanic would led them to think of it as "just a computer", whereas in other situations the opposite would happen.

16. Automation

Automation refers to somethings ability to function without or minimal human input. Sheridan and Verplank propose a 10-level scale of autonomy, where 1 denotes full human-control and 10 full computer-control. If one were to think that the purpose of robots and computers is to serve humans, then one could make an argument that it's advantageous for us to have full autonomy over them and their tasks. Of course, an issue with that is the risk of human flaws and errors. There would be nothing stopping an individual from making a potentially threatening decision if the computer was programmed in a way to give inn to all human commands. On the other side, giving a computer full automation puts us in a situation where the pros and cons of a decision is entirely analyzed by an unbiased agent, complying to predefined metrics and conditions. In an ideal world, there are of course many benefits to something like this, but in spite of everything, computers are not flawless, and completely removing our ability to intercept them could have dire consequences. While full (or close to) automation might be advised for tasks that have a low risk of failure or error, but require little flexibility in decision making, it's way too risky for very complex, time-critical situations (Cummings, 2004).

As many have talked about, while a computer can in many ways be superior to a human in mechanical tasks, there are still reservations about fully automating certain tasks as it undermines human capabilities and "deskill" them (Norman, 1998). One argument raging at the moment is that of which jobs might be taken from humans due to the implementation of automated bots in the workplace. While efficiency is an advantage mentioned for this, there are people feeling that this doesn't weigh up for the loss of "humane" labor force.

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