IN5480 – Individual assignment 3

Concepts, definition and history of AI and interaction with AI

After playing an essential role in the British code breaking during World War II, Alan Turing wrote in the *London Times* in 1949 about how computers could enter the fields of human intellect (Grudin, 2009, p. 49). The term *artificial intelligence* was first used by the American mathematician and logician John McCarthy in 1956, in a call for participation in a workshop. Hans Moravec described how the pioneers of AI in the 1950s viewed computer as "locomotives of thought, which might outperform human in higher mental work" (Grudin, 2009, p. 49). While the interest in AI shortly declined in the early 1960s as HCI had a major breakthrough, AI research still rose through the decade. J. C. R. Licklider described how AI could be used to exploit computers, the AI research received further support, and was eventually established as a field (Grudin, 2009, p. 50). Many in the late 1960s and early 1970s believed that within few years machines would match and rival the intelligence of human beings. Later it become clear that AI had been oversold, and an AI winter lasted from the mid1970s to the early 1980s while HCI thrived (Grudin, 2009, p. 52). In the 1980s AI once again blossomed and gathered momentum, while in the 1990s the AI field entered another winter that lasted until about 1997 (Grudin, 2009, pp. 53-54). Since then and during the 2000s the field kept growing (Grudin, 2009, p. 55).

Here are three different definitions of AI:

"Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" (Copeland, 2020).

"Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems" (Burns, Laskowski, & Tucci, 2021).

"Artificial intelligence is a constellation of many different technologies working together to enable machines to sense, comprehend, act, and learn with human-like levels of intelligence" (Accenture, n.d.).

These definitions focus on the connection between machines and human intelligence, and I would define AI as the ability to simulate human-like intelligence in machines and computers.

Kerstin Dautenhahn (2018) has written an article about her thoughts on the past and future of human-robot interaction (HRI). She is excited about how the HRI community has grown, but also worried about the constraints of the experimental approach being used to study HRI.

Again X want to make investment and maintenance in real estate more sustainable, presenting AI algorithms as an important tool to make the unseeable visible and quantifiable (Again X, n.d.).

The Imitation Game (Tyldum, 2014), a film adaptation of Alan Turing's biography, explores how people think about machines and their ability to think or be intelligent. Turing puts his faith in building and developing a computer to crack the code, while the others didn't believe a machine could outperform human intelligence.

Robots and AI systems

The word "robot" derives from the Czech word "rabota", meaning forced labor, and origins from the Czezh play *R.U.R.* (Rossum's Universal Robots) by Karel Čapek, where a company mass-produced workers using biotechnology (Jordan, 2019).

Cambridge Dictionary (n.d.) defines a robot as "a machine controlled by a computer that is used to perform jobs automatically" while Erico Guizzo (2020) defines a robot as "an autonomous machine capable of sensing its environment, carrying out computations to make decisions, and performing actions in the real world". I would define a robot as an automatically operated machine that performs tasks.

While robots need to be controlled or given instructions to perform autonomously, AI allows the ability to make decisions (Sharma, 2019). Therefore, as the AI definitions describes, AI is connected and compared to human intelligence.

The AV1 robot from No Isolation is developed to help long-term sick children out of their isolation, equipped with camera, microphone and speaker, controlled by the user with a smartphone or tablet app (No Isolation, n.d.). This makes it possible for the children to participate and digitally attend to both classes and other activities.

Universal design and AI systems

"Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability" (National Disability Authority, n.d.). As this definition states, Universal Design is all about designing inclusive products and solutions, making them usable to everyone.

AI has a great potential to create inclusive solutions, especially the ability to include people with different disabilities. Robot lawn mowers and robot vacuum cleaners have already proven to make life easier for people with physical disabilities. An important thing to remember when creating new solutions, is to also be inclusive in the developing process, to make sure that the final solution doesn't exclude any potential user groups.

We use the term "understand" to describe the power of comprehension and perceiving the intended meaning of something. Although machines apparently are able to understand commands, and some even their surroundings, I believe there is a difference between how we talk about people and machines understanding things. I think we talk about machines understanding when they in fact are not understanding in the same ways as people, because of their lack of human consciousness.

Guideline for Human-AI interaction

The 9th guideline for human-AI interaction is about supporting efficient correction when something is wrong (Amershi, Vorvoreanu, & Horvitz, 2019). An example of this can be found when writing in a Word document and words get marked as written incorrectly when they are actually correctly written, but unknown to the software. In these cases, users can simply choose to ignore and remove the marking or add the word to the local dictionary.

While guidelines for human-AI interaction and HCI design have several similarities, focusing on designing inclusive and understandable solutions, they differ in that the guidelines for human-AI interaction emphasize how a solution should work over a long period of time, while the ones for HCI design emphasizes the users and their interactions. (Wong, 2020).

Feedback iteration 1

After delivering the first iteration of this individual assignment, I received both positive feedback as well as some things I could improve. I was told that I answer the questions well and should continue to use references the way I do. I have in this second iteration worked on improving my sections with discussion and my elaboration when presenting new subjects.

Characteristics of AI-infused systems

AI-infused systems are defined by Amershi et al. (2019) as systems that have features harnessing AI capabilities that are directly exposed to the end user. Amershi et al. (2019) identify uncertainty, inconsistency, and behind the scenes personalization as key characteristics of AI-infused systems. The uncertainty is the result of the fact that errors are common, both false positives and negatives, and the sensitivity to context and small changes in input makes the systems inconsistent. Behind the scenes personalization, like automated filtering, could potentially hide important information.

Følstad (2021) identifies the following four key characteristics of AI-infused systems: learning, improving, black box, and fueled by large data sets. Learning refers to how the AI systems are dynamic and continuously learning and developing along the way as they are being used, which again improves them to do less errors. The system can also improve and become more accurate by letting the users be able to edit results and information. Learning and improving are therefore characteristics that are tightly connected to each other. Black box AI describes how inputs and operations in a system are not visible to the users or other interested parties (Wigmore, 2019), meaning that it is not always clear why different results appear. The last characteristic, fueled by large data sets, points to data gathering through interaction to improve the system. Kocielnik et al. (2019) describe AI systems as probabilistic (that they generally operate at less than perfect accuracy), impacted by user actions (such as user-generated content), and with transparency issues. Yang et al. (2020) emphasize capacity uncertainty and output complexity as sources of AI design complexity.

Snapchats's feature for identifying plants, dog breeds, and cars is an example of an AI-infused system. By selecting the feature and scanning a plant, dog, or car with your camera in Snapchat, the app presents a suggestion to the user of the plant/dog/car that has the highest matching percentage with the user's scanning. This feature is characterized by both uncertainty and inconsistency, as it often presents the wrong results, and scanning the same object several times may lead to different results. Users can not correct the result if it is wrong, which could have helped the AI system learn and improve, and the feature can therefore sometimes be more fun and bizarre than it is helpful to the users.

Human-AI interaction design

Amershi et al. (2019) present 18 human-AI interaction design principles that they categorize by when they are normally applied during the interaction with users. These four categories are initially, during interaction, when wrong, and over time. The authors argue that the guidelines could help the result of AI-infused systems. The paper by Kocielnik et al. (2019) address questions related to the users' experience and expectations with AI systems. They further point out how the users' lack of knowledge of how AI works and what it can accomplish affect how they use AI on a societal level, using a Scheduling Assistant to explore the field.

I will now take a closer look at the second and ninth AI design guideline, and address to which degree these are being applied in the previous example of Snapchat's scanning feature. The second guideline is "Make clear how well the system can do what the system can do" (Amersh et al., 2019). By this, the authors refer to how well the system helps the users understand how often the AI system may make mistakes. In the case of Snapchat's scanning feature, when the feature presents a result suggestion, it also provides a percentage of how well the result matches the scan made by the user. Displaying this "matching percentage" helps the user understand how accurate the result is, and the system therefore adheres to the second guideline.

The ninth AI design guideline presented is "Support efficient correction" (Amershi et al., 2019). This means that it should be easy to edit, recover, or refine whenever the AI system provides a wrong result. In the Snapchat feature, it is not possible to correct the AI when it is wrong. Because of this, the AI system will not continuously learn by its users, which could have improved the feature in an efficient way. However, making the users able to edit and correct the AI unregulated, also allows them to possibly train the AI incorrectly, resulting in the system making more mistakes.

Bender et al. (2021) address problematic aspects of AI-infused systems that are based on large language models. Some of the main issues of making language models larger are the environmental and financial costs. These systems do not only cost a lot of money, but they also require an enormous amount of computing power, which in turn needs electricity and leaves a massive carbon footprint. Another problem with the systems is the language being used to train them, as the language can be biased and even characterized by or containing racism and sexism.

Chatbots / conversational user interfaces

As mentioned, Yang et al. (2020) emphasize capacity uncertainty and output complexity as sources of AI design complexity. Another key challenge when designing a chatbot system is to design a conversation, including making the chatbot understand the user and how it is supposed to respond (Følstad & Brandtzæg, 2017). Kocielnik et al. (2019) emphasizes the users' expectations when interacting with AI, and this becomes important in chatbots, as breaking the expectations weakens the users' trust in the chatbot while interacting.

The first AI interaction design guideline addresses the importance of making it clear what the system can do (Amershi et al., 2019). In combination with second guideline, concerning making it clear how well the system can do what it can do, some of the challenges related to the chatbots of today may be resolved or at least improved, when applying these guidelines. By letting the users know right away what subjects the chatbot may assist with, it helps the users know if they need to speak to someone else, or if the chatbot can answers their questions. Just as important is letting the users know that they are talking to a chatbot, and that the answers may not always be correct. Maybe informing users that using the clickable options gives more accurate results than typing their own text and questions. As mentioned earlier regarding the users' expectations of the AI system, it is critical to design a chatbot that provides the users with information that make their expectations match the level of what the AI chatbot can do.

Feedback iteration 2

From the second iteration delivery I received positive feedback on my choice of AI-infused system, the Snapchat features. The feedback also told me that I reflected well on how these features adhere and deviate from the chosen design guidelines. The description of key characteristics of AI-infused systems could have been more elaborate, so I have especially worked to improve this section in this last iteration.

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