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IN5480

Individual Assignment IN5480

Module 1

1.1 Concepts, definition, and history of AI and interaction with AI

First, write a section about how AI came about, the history of AI. When, and by whom, was the term first used?

It was the American mathematician and logician John McCarthy who first used the term Artificial Intelligence. He and two others proposed the term Artificial Intelligence in a paper for the Dartmouth conference in 1956.

Definitions of artificial intelligence:

Definition 1:

"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" (The English Oxford Living Dictionary).

This definition focuses on artificial intelligence as a computer system that can perform tasks that normally require human intelligence.

Definition 2:

"*Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform a task commonly associated with intelligent beings"* (Copeland, B.J, 2006, Encyclopedia Britannica).

This definition focuses on the intelligence aspect of artificial intelligence, as artificial intelligence does tasks that previously were done by humans.

Definition 3:

"AI is a subfield of computer science aimed at specifying and making computer systems that mimic human intelligence or express rational behavior, in the sense that the task would require intelligence if executed by a human" (Bratteteig & Verne: 2018:1-2).

This is a definition that came in a paper from 2018, by two researchers from the DESIGN group at IFI, this research group focuses on participatory design and user-centered processes. It is interesting that in their definition focuses on the fact that Artificial Intelligence mimics human intelligence, but they issue an explicit difference between human intelligence and machine intelligence.

My definition of artificial intelligence: *Artificial intelligence (AI) are computer systems that are created to give computers the ability to do tasks and reason with human-like intelligence.*
I wanted to focus my definition on that artificial intelligence gives computers the ability to "think" and with that could do tasks that need cognitive ability. I think this is important because of the learning aspect with AI, the AI has to learn to do these tasks, like a human needs to do as well.

Find one contemporary company that works with AI and describe how this company presents AI on their web pages. In what way does this company talk about AI, as a product, as a service, framework, or "idea"?

I choose Netflix, and how they use artificial intelligence/machine learning in their streaming platform. Other companies think that Netflix uses AI to improve the personalization of Movie recommendations. They use the watching history of other users with similar tastes, to recommend what you might be interested in watching next. Netflix uses AI to improve its product for every user, by personalizing the content.

Select one documentary or a fictional film, book, or game that is about the use and interaction with AI. Describe with your own word how human interaction with AI is portrayed in this work.

Iron Man

In this movie, which is set in the future, we follow Tony Stark, who has an AI assistant named JARVIS. JARVIS helps Tony Stark throughout the movie with mathematical equations, consults in daily questions about how the weather is, and all sorts of stuff. Tony interacts with JARVIS continuously through the movie through speech and is a very intelligent AI.

1.2 Robots and AI systems

First, write a section about how the word Robot came about.

The word "robot" was first used in the Czech play "R.U.R or Rossum's Universal Robots". Where the word originated from the Church Slavic and meant "servitude", "forced labor" or "drudgery". The word was a product of the central European system of serfdom by which a tenant's rent was paid for in forced labor.

Then, find two different definitions of "robot". Describe and explain these definitions. Based on these definitions, make one definition yourself, and describe and explain this definition. 2(3)

Definition 1:

"Actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks" (ISO 8373: 2012).

This definition says that it's a mechanism that is programmable in two or more axes, meaning that it can move in different directions to perform tasks.

Definition 2:

"A robot … refers to a physical object that interacts with the physical environment, either on its own or via a person, to accomplish a task" (Schulz, Trenton, 2020).

This definition focuses on that a robot is a physical object that can interact with the physical environment to perform tasks. It is important to understand that in this definition Schulz refers to a robot as a physical thing, not something on the web.

My definition: A robot is a physical object that is programmed to do a set of tasks in the physical environment.

My definition of a robot agrees with Schulz with the aspect of being an actual physical object, that will interact physically with either humans or the environment to do a set of tasks.

Discuss the relation between AI and Robots. Is "a robot" different from "an AI"? In what ways are they different and similar? Bring in the definitions that you described earlier about robots and AI for this discussion.

The central to the definitions of robots is that the robots are set to do tasks. The tasks they are set to do are either tasks humans don't want to do and are highly specialized in the way they do it. This is a central aspect that separates robots from AI, robots are not able to "learn" by themselves, but are programmed to do the tasks given to them.

Find one contemporary physical robot, either described in a research article - or a commercial robot and describe how this robot moves and how a human user is interacting and using the robot in a specific situation.

Lawnmower robot

The lawnmower robot is a commercial robot that has a highly specialized task to perform. The robot cuts grass in a specified area and through the sensors, across the lawn, the robot knows

the boundaries. When the robot gets to a boundary it turns and moves on with the task. This is in compliance with the definitions above, where the robot has a specific set of tasks to be done and is a physical object that interacts with the physical environment.

1.3 Universal Design and AI systems

Please find and describe a definition of Universal Design. Explain this definition, how you understand what Universal Design is about with respect to inclusion.

Definition: "*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: http://universaldesign.ie/What-is-Universal-Design/ (accessed 10/09/2020)

This definition by the National Disability Authority aims to include as many people as possible in as many situations and contexts as possible. They try to define the spaces where the universal design should be done/used, whether it is in the physical or digital environment.

Describe the potential of AI with respect to human perception, human movement, and human cognition/emotions. You are encouraged to use examples.

AI has a huge potential in universal design if it's designed "correctly". For example, has AI the potential to help older adults with reduced ability in movements to send a text through voice recognition. With an AI that is developed for this purpose, the elderly people can interact with friends and family in an easier manner.

Describe the potential of AI for including and excluding people. You are encouraged to use examples.

The uniqueness of humans and how we are interacting with each other get lost in numbers. This is what universal design aims to protect. As artificial intelligence uses the numbers on huge datasets to calculate averages, the potential to exclude both ends of the normal distribution curve increases rapidly. The paradox is that often these people rely on universal design mostly.

In WCAG 2.1 principles and in the Human AI-Interaction guidelines the concept "understand" and "understanding" is used. Explain briefly in what way you make sense of the concept "understand" and "understanding". Then address the question: Do machines understand?

I understand the concept as a cognitive ability, where you can make sense of something new. For example, if you learn something new at the university you can get an understanding of how you should do something and why you should do it that way.

I don't think that machines understand, but I think that machines can be exposed to a situation so many times that it learns what the outcome will be. By this, I mean that machines “learn” what to do without the understanding of why it should do it.

1.4 Guideline for Human-AI interaction

Please select one of the 18 guidelines from Microsoft, and describe this guideline with a different example than what is given by Microsoft.

I have chosen guideline number four from the Microsoft Guidelines for AI interaction. From Microsoft: “Show contextually relevant information. Display information relevant to the users’ current task and environment”. Like I explained earlier with Netflix way of using AI to show user-relevant movie recommendations, they use this guideline to show a user what they might like in the context of watching a movie.

Search, and find one set of HCI design guidelines. Discuss briefly similarities and differences between the HCI design guidelines and the Human-AI interaction guidelines.

The similarities between the HCI design guidelines and Human-AI interaction guidelines lies in the way the guidelines want a system or a product to be easy to interact with. And during the interaction both want to give feedback, either it is to the user or the AI system, both rely on good feedback during an interaction.

Some differences are that the Human-AI interaction guidelines want the AI-system to learn both from feedback and the use of the system. But in the HCI-guidelines, it is the user that has to learn from the feedback from the system. It will say that the user will learn how the system works, but the AI will learn how the user uses the system.

Module 2

Characteristics of AI-infused systems

AI-infused systems are ' systems that have features harnessing AI capabilities that are directly exposed to the end-user' (Amershi et al., 2019). Drawing on the first lecture of Module 2 and the

four mandatory articles (Amershi et al. (2019), Kocielnik et al. (2019), Liao et al. (2020), Yang et al., (2020)). Identify and describe key characteristics of AI-infused systems.

In the first lecture of module 2, it was identified four key characteristics of AI-infused systems, these were; learning, improving, black-box, and fuelled by large datasets.
Learning: This characteristic is central to AI-infused systems, because AI-infused systems are constantly learning, which makes it dynamic. Amershi et al. highlight that an AI-infused system can appear different every time a user interacts with the systems (Amershi et al. 2019).
Improving: if we see the characteristics above, that AI-systems dynamically learn, we say that they improve through this learning. It is important for an AI-infused system to be "given" an array of different inputs and feedback that the AI-infused systems are noticeably improving.
Black-box: AI-systems can be seen as a "black-box", this is because of the users' lack of insight into what happens inside the system. The user gives some sort of input to the system and receives a form of feedback, but the user will not get an explanation of how this feedback was made.
Fuelled by large datasets: Central to AI-systems is that they are made better through these enormous sets of data, but it is crucial that these datasets are made of quality.

Identify one AI-infused system which you know well, that exemplifies some of the above key characteristics. Discuss the implications of these characteristics for the example system, in particular how users are affected by these characteristics.

AI-infused system: Google search
How Google search works is a good example of the mentioned characteristics. It constantly learns from the input of the users, to make sure you get the most relevant hits on every search. This is particularly shown when searching for the same thing on your personal computer vs someone elses. The results on my personal computer are highly specialized for me, and the other are personalised for somebody else. I can also mention black-box here, for every time I search, I don't know what really happens, but the result is what I aim for. Google search is also fueled by these huge datasets, which make the system informational and learns, and further improves on these data.

Human-AI interaction design

Summary of Amershi et al. (2019)

The authors aim to develop a set of guidelines for human-AI interaction through their research. The guidelines they develop are made from an array of other scientist writings of human-AI interaction. After development the guidelines were evaluated by UX/HCI practitioners in their respective fields; with products that have some human-AI interaction (heuristic evaluation)(Amershi et al. 2019). The authors aim with the proposal of these 18 guidelines for human-AI interaction is to give the practitioners that develop AI-infused systems a "framework" to make more human-centric AI-infused systems.

Summary of Kocielnik et al. (2019)

In the paper from Kocielnik et al., the authors investigate the end-users expectations in AI-infused systems, and how to shape these exact expectations to get the user to accept these systems. The authors use certain techniques to conciliate the shaping of these expectations, further, are these tested through an AI-powered Scheduling Assistant (Kocielnik, Amershi, and Bennet 2019). They identify three leading ways in how expectations are shaped and apply these ways in the design of AI-infused systems. These three main ways are; information from external sources, reasoning and understanding, and first-hand experience. All of these inspired the author's techniques for adjusting users' expectations; accuracy indicator, example-based explanation, and control slider (Kocielnik, Amershi, and Bennet, 2019). Through these techniques, the authors argue that shaping the expectations of users is an efficient way of improving acceptance in AI-systems.

Select two of the design guidelines in Amershi et al. (2019). Discuss how the AI-infused system you used as an example in the previous task adheres to or deviates from these two design guidelines. Briefly discuss whether/how these two design guidelines could inspire improvements in the example system.

Guideline 4: Show contextually relevant information:
Google, and especially Google Search does this constantly, as the search engine always will show you relevant content to both where you are and what you have searched for. As an example, if you search for a recipe for food, Google search will show you the recipe and the closest restaurant with the same type of food.

Guideline 7: Support efficient invocation:
This guideline has a basis in the ease of invoking the AI-systems services. Google search is a great example of this, as you get right into the search mechanism when opening the website, this makes it accessible at any given time. This follows through in the usage of the service, making it easy to search further at the website.

Chatbots / conversational user interfaces

Chatbots are one type of AI-infused system. Based on the lectures, and the mandatory articles, discuss key challenges in the design of chatbots / conversational user interfaces.

One of the key issues with the design of chatbots and conversational user interfaces is that conversations break down rapidly (Følstad and Brandttzæg 2017:40), and as Luger and Sellen notes, the potential of natural language processing is overshadowed by all the errors that occur (Luger and Sellen 2016). Another issue mentioned by Luger and Sellen, is that these user

interfaces and chatbots lack the contextual understanding that is important to the natural language (Luger and Sellen 2016:5288).

Drawing a line to Kocielnik et al. The expectations of users are central to the experience of conversational user interfaces, where the aim is to understand the user and his/her needs (Følstad and Brandtzæg 2017: 41). They need to focus more on the service of a chatbot/conversational interface, and less focus on the actual interface .

Revisit Guidelines G1 and G2 in Amershi et al. (2019). Discuss how adherence to these could possibly resolve some of the challenges in current chatbots / conversational user interfaces.

Guideline 1: Make clear what the system can do.
This is central to chatbots and other AI-infused systems and is one of the challenges these systems face. The lack of understanding of what the chatbot can do is the largest source of frustration for the end-users. Therefore is it important to design the system in a way that it is clear what the system actually can do, this should have a high priority.

Guideline 2: Make clear how well the system can do what it can do.
Guideline 2 is highly related to Guideline 1. It is not enough to only let the user know what the system does, but it is really important to tell the user how well the system can do it as well. In the case of a chatbot, making sure the user knows how well the chatbot can answer the different questions or requests, becomes crucial. This relates to what Kocielnik et al. argue with the importance of both controlling and shaping the expectations of the end-users who interact with AI-infused systems (Kocielnik, Amershi, and Bennet, 2019).

Module 3

Human AI collaboration

In their article, Philips et al.(2016) describe how robots and humans can collaborate in teams, by drawing on the experience from existing teams containing humans and animals. In the authors taxonomy of human-animal teams, the authors describe how the animals either replace, multiply or extend human physical, emotional or cognitive capabilities. By extending these taxonomies to the human-robot teams, the authors give examples of how some robots mimic the animal capabilities, and replacing the need for animal assistance.

All of the examples mentioned by Phillips et al.(2016), have different levels of autonomy. This concept is described by both Sheridan and Verplank (1987, in Schneidermann, 2020) through their one-dimensional taxonomy of automation levels. Schneiderman describes this through a two-dimensional framework of robot-human control. An example is the military assistance Big Dog, which aims to replace human capabilities in carrying heavy cargo in the combat field. This is a type of robot I think should be highly independent, which in this case means it has a high degree of autonomy. For me Big Dog can be put under level 7 of Sheridan and Verplanks taxonomy of automation. This level says: “[t]he computer executes automatically, then necessarily informs the human”, or “[t]he computer informs the human only if asked” (Parasuraman et al., 2000 in Schneiderman, 2020, p. 2). By using the framework of Schneiderman, I believe Big Dog will be described as high in computer control and low to moderate in human control. That's because Big Dog must operate autonomously in certain terrain and situations, and in these cases it has to calculate the movements itself.

Another example, this from Phillips et al. (2016), called Paro, is a robot seal which attempts to bring comfort and companionship to humans. This seal can be seen as a replacement of pets. Where the humans will get the same comfort, companionship and bond with Paro as a pet. Paro both reacts and adapts to the environment, and makes decisions on the input, this makes Paro highly autonomous as well. By having these traits I would consider placing Paro on level 9 of Sheridan and Verplanks taxonomy scale, “[t]he computer informs the human only if it, the computer, decides to” (Parasuraman et al., 2000, in Schneiderman, 2020, p. 2). If we use Schneidermans framework on Paro, I think that it can be described as high in computer control and low in human control.

Advantages and disadvantages

For the first example, Big Dog, I believe there would be some extraordinary advantages with a higher level of autonomy. With a higher degree of autonomy, Big Dog could possibly move more freely. Another possible great advantage of higher degree of autonomy, Big Dog could learn about its team behaviour through training data and interaction with the team. This could lead to Big Dog anticipates its teams moves and can move from this information. A disadvantage by this is that Big Dog will be able to do tasks based on its own intuition. This leaves the humans with less control.

For the second example, Paro, the robot seal. I believe there are both advantages and disadvantages by changing the autonomy. With a higher degree of autonomy, one advantage could be that humans will become more involved in the interaction with Paro.

This could mean that humans will experience more companionship and comfort, if Paro would respond and adapt to the humans interacting with it. On the other hand, if Paro would downgrade its autonomy, I believe that humans would interact less with Paro, because they can feel that Paro is more a toy than a companion.

Current and needed explainability

The term “explainability” in the AI-cointext is made out of how and how well an AI-system explains its actions and/or predictions to the user(Hagras, 2018). An AI-system that performs complex tasks or predictions based on huge data sets and experience, is for some users hard to trust. That's because the system seldomly explains what and how it does the tasks or predictions. There is a human need for this explainability and it will be crucial for AI-development in high-risk operations or systems. A further reflection on this topic is that we can see from the examples Big Dog and Poro, it is unclear how they make their predictions and on what data they predict from. Big Dog is as mentioned a military assistance and that makes it crucial to know how it “thinks” about the actions.

References:

Bratteteig, Tone & Verne, Guri. 2018. “Does AI Make PD Obsolete?: Exploring Challenges from Artificial Intelligence to Participatory Design.” In *Proceedings of the 15th Participatory design Conference on Short Papers, Situated Actions, Workshops, and Tutorial - PDC ‘18,* Hasselt and Genk, Belgium: ACM Press, 1-5.

Copeland, B.J. 2006. “Artificial Intelligence”. Encyclopedia Britannica. britannica.com/technology/artificial-intelligence/Evolutionary-computing (Accessed 10.09.2020).

Yu, Allen. 2019. “How Netflix Uses AI, Data Science, and Machine Learning - From A Product Perspective”. Becoming Human. https://becominghuman.ai/how-netflix-uses-ai-and-machine-learning-a087614630fe?gi=b063e1fb1a7e

Luger, E., & Sellen, A. (2016). Like having a really bad PA: the gulf between user expectation and experience of conversational agents. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (pp. 5286-5297). ACM.
Kocielnik, R., Amershi, S., & Bennett, P. N. (2019). Will You Accept an Imperfect AI?: Exploring Designs for Adjusting End-user Expectations of AI Systems. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (paper no. 411). ACM.

Følstad, A., & Brandtzæg, P. B. (2017). Chatbots and the new world of HCI. interactions, 24(4), 38-42.

Amershi, S., Weld, D., Vorvoreanu, M., Fourney, A., Nushi, B., Collisson, P., ... & Teevan, J. (2019). Guidelines for human-AI interaction. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (paper no. 3). ACM.

Trenton, Schulz. 2020. “Robots and Movement” PowerPoint 1. September 2020.

Schneiderman, B. 2020. “Human-Centered Artificial Intelligence: reliable, Safe and Trustworthy”.

Phillips, E., Schaefer, K., Billings, D., Jentsch, F., & Hancock, P. 2016. “Human-Animal Teams as an Analog for Future Human-Robot Teams: Influencing Design and Fostering Trust. Journal of Human-Robot Interaction, 5, 100-125.

Appendix:

Feedback: The feedback I got, was to try and answer all of the tasks as a coherent text, which I have tried to do.