

INDIVIDUAL ASSIGNMENT FALL 2021

MODULE 1

1.1 Concepts, definitions, and history of 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?

During world war II, the history of how AI came about began. This was the time where the potential of computation was established by its role in code breaking. A leading code breaker, Alan Turing, wrote in 1949 an important article in the *London Times*; “I do not see why [the computer] should not enter any one of the fields normally covered by the human intellect, and eventually compete on equal terms” (Grudin, 2009). The term *Artificial intelligence* first appeared in a workshop in 1956, written by John McCarthy, an American mathematician and logician. Although AI created engagement in the beginning, the history of AI has been a rollercoaster ride. However, in recent years the development in AI has made it gain more momentum and interest among researchers, businesses, and organizations (Bratteig, 2018). Today we see AI being used in a lot of different forms, like communications systems, spell-checking, chatbots and so on. In 1960 AI pioneer Herb Simon wrote, “Machines will be capable, within twenty years, of doing any work that a man can do” (Grudin, 2009). Although it turned out Simon was wrong, researchers claim we’re getting there eventually.

Then, find three different definitions of AI. Describe and explain these three definitions, for example by when it was defined, by whom and in what community. Based on these three definitions, make one definition yourself – and describe and explain your definition.

McCarthy: *It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable (McCarthy, 1956).* (Computer Science Department, Stanford University).

Bratteig: *AI is a subfield of computer science aimed at specifying and making computer systems that mimic human intelligence or express rational behaviour, in the sense that the task would require intelligence if executed by a human* (Verne & Bratteteig, 2018). University of Oslo.

The European commission's definition: *Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. (European Commission, 2018). Brussels, December 2018.*

My own definition: *AI can be defined as a technic that intend to give computers and digital systems an intelligent response, by making them learn from their own experiences and solve complex problems in different environments.* My definition is inspired by the other definitions above, with the focus on how AI learns from its own experiences rather than being implemented with predicted rules to follow. With the AI we know today, the algorithms are more complex, and the systems change over time as it learns.

Select one of the articles from the curriculum. Write a brief review from this article. If there is something that is unclear, or you disagree with, or that you question with the article – write about this.

I chose the article “*Does AI make PD obsolete? Exploring challenges from Artificial Intelligence to Participatory design*”.

The paper explores how Artificial Intelligence challenges Participatory Design by discussing how and what kind of design decisions users are able to participate in when technology that includes AI is designed (Bratteig, 2018). In the article they claim that users only can participate to a certain extent when designing an AI system. However, the article concludes that even though AI challenges PD, classic PD methods can be very useful for parts of the design process (Bratteig, 2018). As I will learn more about PD this semester, I'm curious to find out if similar issues often appear in PD in general. When including users in a design process, it will always be somehow limited. However, I do think it must be even more challenging to test an AI system because of the difficulty to predict its behaviour. Another interesting thought is how AI will affect a designer's job when developing a new system. Maybe AI eventually will make it difficult or even impossible for a non-expert to fully predict

and develop a great interactive design. I think this is a very interesting topic, and I would like to learn even more about it.

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

SoundHound presents their product, *Houndify*, as an AI platform that combines the smartest voice AI with engineering expertise to help brands built conversational voice assistants. They present it as a product that can be customized to all different kinds of voice user interfaces. They claim that it is an independent platform with voice AI technology for any need. The demo video illustrate how the AI system navigates to a lot of different restaurants nearby, based on several conditions communicated by the user (Soundhound 2021).

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

AI has been a popular subject for the entertainment-business for several years, and a lot of series, films and books have told different stories about it in different perspectives. A thriller movie from 2015 called *Ex Machina* portrays AI as something scary and powerful. The movie is about a young programmer that is selected to participate in a breakthrough experiment in AI by evaluating the human qualities of a breath-taking female robot (Amazon 2021). The trailer uses quotes from famous scientists such as Elon Musk and Stephen Hawking to empathize the message – artificial intelligence will one day take over humanity. The movie illustrates the interaction between human and AI by making it to a story about a man and a woman - but the woman is a robot. I think the most interesting part of the movie is how they manufactures AI by portraying a robot with human personality traits. The movie is a classic way of presenting AI – that it will someday destroy us. Let’s hope they are wrong.

1.2 Robots and AI systems

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

The term *robot* originally come from a Slavic root, and the meaning is associated with labor. The word was first used to denote a fictional humanoid in a 1920 play by Karel Capek, even though it was Karel's brother Josef who was the word's true inventor (Wikipedia 2021).

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.

The robot institute of America (1979) defines a robot as *“a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through various programmed motions of the performance of a variety of tasks”* (Thrun, 2004). This definition does not include the aspect of humanity when describing a robot, even though they tend to do tasks humans usually do.

The Webster dictionary defines robots as *“An automatic device that performs functions normally ascribed to humans or a machine in the form of a human”* (Thrun, 2004). This definition includes the aspect of human properties but does not mention whether a device should be independent or not to be referred as a robot.

Personally, I think the definition of a robot should include the aspects of automation and that a robot usually does tasks humans tends to do. Therefore, my definition would be *“a physical object that is automated to do one or more concrete tasks in a certain environment, that is normally ascribed to humans.”*

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.

“AI can be defined as a technic that intend to give computers and digital systems an intelligent response, by making them learn from their own experiences and solve complex problems in different environments.”

“A robot is a physical object that is automated to do one or more concrete tasks in a certain environment, normally ascribed to humans.”

According to my own definitions of AI and Robots, I think the terms are closely related. AI is a bigger concept of a technic that can be integrated and used in several ways, and I think robotics is one of the sub concepts of AI. AI and robots are similar because they both give an intelligent response that tend to assist humans in their everyday lives. The difference is that robots are more limited because they are physical object that has one or more tasks.

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.

As the “elderly wave” begins to approach, there will be need for the elderly to live independently at home longer. One way of addressing this goal is to use *welfare technology* that can assist the elderly (Schulz, 2018). Therefore, several robots have been built with the intention of helping older people. One example is *Care-o-bot*, that can assist in multiple tasks. It can work as a butler, gather medical information, help you call someone etc. The robot intends to be a caring person that wants the best for you and are able to identify your needs. It sort of looks like a human with arms and moving eyes, but it’s clear that this is a physical object – not a human being.

1.3 Universal Design and AI systems

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

“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 and disability.” (National Disability Authority 2020). Any building, product or service should be designed to meet the needs for all people who wish to use it. For a designer this is an extremely important condition when making a good design.

Describe the potential of AI with respect to human perception, human movement and human cognition/emotions. You are encouraged to use examples. Please provide two examples of AI systems for including “more” users.

AI has a big potential of helping humans with limitations or disabilities. A good example is how robots can assist elderly people in their homes, as mentioned earlier about the care-o-bot.

The Paro seal is another good example of a robot that can help the elderly. This robot is supposed to be a pet for people with dementia that lives in nursing homes. A robot that can mimic or recognise human perception, human movement and human cognition can bond with humans in need. AI therefore has a big potential of helping people in nursing homes and hospitals when there is lack of real people in the health sector.

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

AI has the big potential to include all kinds of people. Using image recognition tools can for instance help people with reduced vision to understand different services. However, this type of systems also intends to exclude certain people. Some face recognition systems often have a hard time recognising people with a darker skin tone because the system is developed based on people with a light skin tone. This is an important aspect to consider when developing an AI system, so that the system ensures that everyone is included, regardless of people's limitations or differences.

In the WCAG 2.1 principles and in many of 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?

The artificial intelligence technology we have today are capable of doing extraordinary things. However, the human brains understanding of the world is way more complex and a hard challenge to manage for an AI system. AI can at best see people's faces, identify gender and provide very basic descriptions of that it observes. As soon as an AI system faces situations that don't match with the data they have been trained on, it starts to break. On the other hand, after several decades of research within the field, AI systems are getting better and better at learning over time. I'm both excited and nervous to see the development.

1.4 Guideline for Human-AI interaction

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

Microsoft proposes 18 guidelines for human-AI interaction, and guideline number eleven goes as follows; *make clear why the system did what it did*. This means that the system must give a clear explanation of why it behaved as it did. An example of this is when the face recognition on an iPhone tells you it “can’t recognise the face” then you try to unlock someone else’s phone.

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.

Jakob Nielsen suggested 10 heuristics for user interface design in 1994 (Nielsen Norman Group 1994). Microsoft’s guidelines for human AI-interaction and Nielsen’s heuristics both focuses on how a user interact with the system. Their purpose is to make sure the system benefits the user’s behaviour and needs. The biggest difference between the principles is that Microsoft’s guidelines try to explain how the system should behave, while Nielsen’s principles focus on what should be presented for the users.

1.5 Feedback

The student that gave me feedback on the first iteration said it was clear that I have read and understood the topics. She also got a good impression that I have used relevant sources and spent a lot of time researching for the thesis. Her wish for the next iteration was for me to write a bit more about the difference between “understand” and “understanding”, which I did before starting with module 2.

MODULE 2

2.1 Characteristics of AI-infused systems

Identify and describe key characteristics of AI-infused systems. Draw on the first lecture of Module 2 and three of the mandatory articles (Amershi et al. (2019), Kocielnik et al. (2019), Yang et al., (2020)).

During this module, we have learned that AI-infused systems are recognized by four different key characteristics: learning, improving, “blackbox” and that they are fuelled by large data sets.

By *learning* we refer to how an AI system can gather information and learn from it over time. This also implies that the system is dynamic and designed for change. An AI-system will never be done learning about the users and how to cater to them.

The second characteristic is about *improving*, which refers to how AI evolves through the learning process. Over time the system will become better at understanding the user and making the right actions. A way to learn is to make mistakes several times, and then get valuable feedback from the users.

The blackbox refers to how a lot of people view AI – as a black solid box where you are unable to see what happens inside. As a user you usually only see the result, and its therefore often difficult to understand what is going on inside. If you are an inexperienced user, it could therefore be difficult for you to use an AI system.

Being *fuelled by large data sets* refers to the fact that AI learns through receiving loads of information, collected through interactions with the users.

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.

Tiktok is a good example of an AI-infused system that I use in my everyday life. This is an online application where you can see and post videos about almost whatever you want. Some makes private videos for their own use, and others post it public to make as many people as possible to watch it. I personally use the system to watch both informative and funny videos. It's clear that the content that is presented on my page is based on the things I have liked and watched several times. If I for example like some videos with food recipes, my page will show even more videos about food.

It is obvious that the app learns and gets data based on my recent activity, and presents new content based on this. However, I have at times noticed that the system presents some random videos that I don't really show any interest towards. Even though I always scroll passed it, similar content keeps showing up. Fortunately, you can tell the system that you don't like certain videos and you will never see similar videos again.

2.2 Human-AI interaction design

Amershi et al. (2019) and Kocielnik et al. (2019) discuss interaction design for AI-infused systems. Summarize main take-aways from the two papers.

Amershi et al. (2019) presents 18 guidelines for designing Human-AI interaction. The goal for the guidelines is to give researchers a framework that can hopefully better their results and will facilitate future research into the refinement and development of principles for human-AI interaction. They are separated into four categories: “initially”, “during interaction”, “when wrong” and “over time”.

Like Amershi, Kocielnik also presents different strategies and guidelines for designing AI-infused systems. The difference is that Kocielnik’s article only represents three techniques which will maintain user satisfaction and acceptance of an imperfect AI system. The AI-system that is tested in the article is an AI-powered Scheduling Assistant they implemented themselves.

Select two of the design guidelines in Amershi et al. (2019). Discuss how the AI-infused system you used as 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 is about showing contextually relevant information and describes how the system should display information relevant to the user’s current task and environment. This principle seems to be what Tiktok is built upon. Tiktok is filled with contextually relevant information, but as mentioned the user sometimes need to tell the system that some information is irrelevant.

Guideline 7 describes how the system should make it easy to invoke or request the AI system’s service when needed. When you search for something on Tiktok, the app presents suggestions to what you might add to your search. If you for example type “food”, it suggests “food recipes” and “Foodtok”. This shows how the system gives the user easy access to the services by showing them without forcing the user to come up with related search words themselves.

Bender et al. (2021) conduct a critical discussion of a specific type of AI-infused systems – those based on large language models. Summarize their argument concerning problematic aspects of textual content and solutions based on large language models.

Bender et al. (2021) discusses how the human tendency to attribute meaning to text, in combination with large language models' ability to learn patterns of forms that humans associate with various biases and other harmful attitudes, leads to risks of real-world harm, should language model-generated text be disseminated. In the article they ask: are even larger language models necessary? They also ask questions about the costs, and what one should consider before pursuing it. They identify a wide variety of costs and risks associated with the rush for even larger language models, including the environmental costs and financial costs, which in turn erect barriers to entry, limiting who can contribute to this research area and which languages can benefit from the most advanced techniques. The article's purpose is to make researchers carefully weight these risks while pursuing this research direction, considering whether the benefits outweigh the risks.

2.3 Chatbots / conversational interfaces

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

In general, AI-systems are described as challenging to design. Yang et al. (2020) writes about how interaction designers struggle to envision and prototype AI systems. Most of the challenges the article writes about are focused on AI-systems in general, but many of them can be connected to when designing chatbots. Følstad and Brandtzæg (2017) defines chatbots as machine agents serving a natural-language user interface to data and service providers, typically in the context of messaging applications.

To find out more about the key challenges for designing chatbots, I used the Yang et al. (2020) article and the Følstad and Brandtzæg (2017) article.

Designing a chatbot can be challenging for a designer because they often are more used to design visual layouts and interaction mechanisms. When designing a chatbot you design a conversation, and the designers challenge is to focus on the interpretational task, and

understanding what the user's needs and requirements are. The key challenge is to understand the chatbots capabilities and how to envision and craft thoughtful interactions. The designer needs to try predicting what the user will answer the chatbot, and design thereafter. An example to solve this issue is to give the user different options, like categories when talking with the system. This way the designer could try to design different outcomes based on what theme the conversation is about.

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. Optionally, you may read Følstad & Brandtzaeg (2017), Luger & Sellen (2016), and Hall (2018) from the optional literature to complement your basis for answering.

The first guidelines in Amershi et al. (2019) describes how the system should make it clear to the user what the system can do and how well it can do it. Based on what I already mentioned in the last task, these two guidelines may help both the designer and the user. Before the chatbot is implemented, the designer needs to research what they want the system to do and not to do. If this process is being done properly, this will hopefully solve the issue.

A suggestion on how to tell the user what the chatbot can do or not do, is to secure a language that clearly expresses information such as “have a look at these suggestions based on the destination you asked for that you might enjoy.” This way you tell the user that the system only makes suggestions that the user might or might not agree with. The user will understand that it is not perfect, it only tries its best. Another example is as mentioned to make limitations on what the user can ask about, like making options on what to answer.

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