# IN5480

# Final individual report

Module 1, 2 & 3 by karlottt

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# Module 1

## Concepts, definition and history of interaction with AI

*How did AI come about & history about AI*
*When, and by whom, was the term first used?*

The term and field of artificial intelligence was first introduced and founded at a workshop in 1956 at Dartmouth College in New Hampshire, USA, but it can also be traced further back to philosophers, mathematicians, psychologists trying to describe and find out how machines and computers could be used to perform tasks previously only done by humans.

American mathematician and logician John McCarthy was the one that came up with the term at Dartmouth in 1956. The term gained traction due to the workshop participants optimistic estimate on how important and significant AI would be.

*Three different definitions of AI. Describe these three definitions(When, by whom and in what community)*

Merriam-Webster, the trusted American dictionary defines AI as:

- *The capability of a machine to imitate intelligent human behavior*
  (updated in september of 2019)

Encyclopædia Britannia is a general knowledge encyclopedia which defines AI like this:

- *The ability of a digital computer or computer controlled robot to perform tasks commonly associated with intelligent beings*
  (updated in june of 2006)

John McCarthy, the man that coined the AI discipline, defined it himself:

- *It is the science and engineering of making intelligent machines, especially intelligent computer programs*
  (1956)

In my understanding all these definitions express the same thing, although there is a difference in how technical and specific they are. Two of them are from websites that have definitions for thousands of things and words, therefore they have to be quite uncomplicated for everyone to understand them. Regardless I feel like they all describe AI well.

*Make a definition yourself - and describe and explain your definition.*

- *AI is when a digital tool/computer has the ability to perform actions which mirrors actions performed by intelligent humans.*

I appreciated the definition by Encyclopædia Britannia and therefore my definition resembles theirs. The reason why I think it's a good definition is because it's quite relatable to people's perception of how AI works.

*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 "idea"?*

In the career section of their website DNV GL(2019) has a page about artificial intelligence. They talk about AI as a part of the services they provide today and as a field which will continue to grow with great speed in the coming years, both in DNV GL and in other companies and industries. Additionally they talk about the what AI is and pitfalls within AI.

*Find a documentary, film, book or game that includes/is about AI and describe how human interaction with AI is portrayed.*

When the film 'Her' came out in 2013 I watched it together with my IT-class in upper secondary school. The film is all about a man called Theodore and how he develops a connection with his operating system. The interaction with AI in 'Her' is almost exclusively oral, and is portrayed as a seamless interaction where there is second to none bugs. The plot of the film is set to 'some time in the near future' and we can begin to believe that AI-technology has come as far as the movie depicts. The interaction between Theodore and the operating system is so human-like that he almost loses sight of reality and develops a romantic relationship with the system.

## Human Robot Interaction

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

The origin of the word robot comes from the Czech word ‘robota’. ‘Robota’ translates to slave labour. It first appeared from a play called R.U.R and which was made by writer Czech called Karel Capek.

*Two different definitions of robot. Describe and explain these definitions. Based on this definitions, make one definiton yourself, and describe and explain this definition.*

Merriam-Webster, the American dictionary:

- *a machine that resembles a living creature in being capable of moving independently (as by walking or rolling on wheels) and performing complex actions (such as grasping and moving objects)*
  (updated in september of 2019)

Anca Dragan, roboticist of UC Berkeley:

- *a robot is a physically embodied artificially intelligent agent that can take actions that have effects on the physical world*
  (august of 2017)

My definition of robot is:

- a intelligent computer/machine with the ability to move parts of it’s build in order to perform tasks and interact with humans

I feel that the Merriam-Webster definition is a way too specific definition, because in my eyes being a robot doesn't necessarily mean that it has wheels or is walking. Ancas definition is much broader and fits the image I have of robots to a greater degree.
In my definition I chose to focus on that a robot is perceived as a machine or a computer which is included in a sort of body or build where parts of it can move to perform actions and interact with humans. The definition fits the image I have of robots in my head.

*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 main difference I would like to emphasize is that a robot is viewed as more of a physical thing that has the ability to move, rather than just a program within a computer or another digital platform. There are words that are common in the both the definitions of 'Robot' and 'AI', such as 'intelligent', 'artificial', 'performing actions/tasks'. There is definitely common factors between them, but as mentioned also big differences.

*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.*

When I studied at OsloMet they had cooperation with IBM where they placed a robot called Pepper on campus. Pepper is a semi-humanoid robot, meaning that a human has to control it and make functions for it. It has a tablet on it's chest and has the ability to roll around and move its hands. The main purpose of Pepper on campus was to function as a receptionist or guide at the entrance. Pepper was also used as a chatbot that you could interact orally with. As far as I know there was not programmed many tasks where Pepper actually had to move physically.

## Universal Design and Interaction with AI

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

George Anthony Giannoumis, associate professor at OsloMet:

- Universal design is the idea that we can design technology that everybody can use equally.

What Anthony really touches upon here is that technology should be designed in a way that is universal to everyone. This means that there should be no technology which discriminates users based on the way it's designed or made.

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

There are huge potential when it comes to human interaction with AI. Using AI to analyze and understand emotions, actions and other human characteristics is very likely to have very positive effects on efficiency and accuracy in a lot of industries where AI can be implemented. Examples of an industry where AI could be implemented to analyze human emotions is the car industry. What if your car could notice that you nod off or that you are distracted in some other way and act accordingly with that information? That would be great improvement in road safety.

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

One of the first thing that comes to mind when I think about AI exclusion is that AI has the potential to be racist. There are several examples of this in facial recognition software which simply doesn't recognize people if their skin tone is darker than the skin tone of the ones that made and tested the software. This is of course just a example of what can happen if AI develops bias. On the complete opposite end, AI can have positive effects when it comes to inclusion. If AI is developed in a way where inclusion is in mind from the very start there are settings where AI outperforms humans. A example of such a setting is when a human has to physically assess you and take action/choices made up how they view your appearance and also the prejudice that human has towards people with that . AI doesn't necessarily have the same opportunity to be discriminatory towards people in the same way that a human does. It all comes down to how the AI is made.

# Module 2

## Characteristics of AI-infused systems

*Drawing on the first lecture of Module 2, identify and describe key characteristics of AI-infused systems. Also read Amershi et al. (2019) and Kocielnik et al. (2019) to possibly expand on this set of key characteristics.*

*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.*

To me, AI-infused systems is an evolving phenomenon these days. Big companies like Spotify and Google use AI in their systems to, among other things, give recommendations based on earlier history and personal profile. Common for most of them is that they share core aspects.

Some of the common key characteristics that I draw from most of them is:

- That they are built on and are fuelled by huge data-sets which are evergrowing as the user continues to use and interact the system.
- Because of being fuelled by big amounts of data that is constantly changing, growing and adapting they are largely dynamic- meaning that they are characterized by constant change.
- Despite primarily being very clear to the user about being a AI-infused system there is little to no clues in the system about how the artificial intelligence is embedded in the system, and how it draws its “conclusions” based on the users interaction and data.
- It's sometimes not easy to let the system know that it's wrong or incorrect, therefore it’s not easy to tell whether the system is learning and developing.

“Discover weekly” by Spotify is a playlist that is put together in a AI-infused system, which composes it by analyzing and using of the users data and play-history. Examples of characteristic that I quickly recognize is the lack of transparency in the system, for example not showing why the specific songs are chosen in the playlist. The playlist is also dynamic and based on varying amounts of data depending on how much the user has used Spotify and if they have given preferences.

## 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.*

*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.*

Some of the main takeaways I got when reading Kocielnik et al. (2019) was firstly that by focusing on precision, among other things, you can achieve lower perception of accuracy and decreased acceptance by the user. The acceptance will also depend on how the experience and expectations the user have towards the AI-system. By design, we can change the expectation of the user so that the user will interact “more correctly” towards the system, it will likely perform better and show better accuracy.

Reading Amershi et al. (2019) I’ve gained some more ideas and a different perception on how AI-infused systems should be designed and how the guidelines in the paper will lead to a better human to AI-interaction. There are clearly new challenges and ways of thinking when designing with AI that you didn't have to think about and debate before. Reviewing the list of guidelines was made very easy by the examples they provided and gives a clear picture on why these guidelines are important to achieve better interaction.

The two guidelines I feel that I could relate to “Discover weekly” service by Spotify was G9 (Support efficient correction) and G11 (Make clear why the system did what it did). When talking about G9 I undeniably think that you should be able to add, and remove songs from the playlist to show what you enjoy and what you don't enjoy for further additions of the playlist. This is not a option as it is right now. When considering the G11 guideline I realised that Spotify doesn’t give any clear picture as of how the different tracks and artist are chosen to appear in the playlist. “"Your weekly mixtape of fresh music.... chosen just for you...." is the bio of the  playlist, and that's all the info we get.

I believe that they could get more accurate playlists and better interaction if the users had some way of adding and removing songs either directly to the playlist to achieve the G9 guideline and some sort of visualization showing how they made the weekly addition of the playlist for the specific user to pursue the G11 guideline.

## Chatbots / conversational user interfaces

*Chatbots are one type of AI-infused systems. Read Følstad & Brandtzaeg (2017) and Luger & Sellen (2016) and discuss key challenges in the design of chatbots / conversational user interfaces. 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.*

There are most definitely several of the guidelines from Amershi et al. (2019) that would be applicable to the design of chatbots and conversational user interfaces in the future. As Følstad and Brandtzaeg (2017) mentions in their article there are a number of new challenges that designers and people in the HCI community will face in the effort to design better, efficient and accurate chatbots and conversational agents in the coming years and future in general.

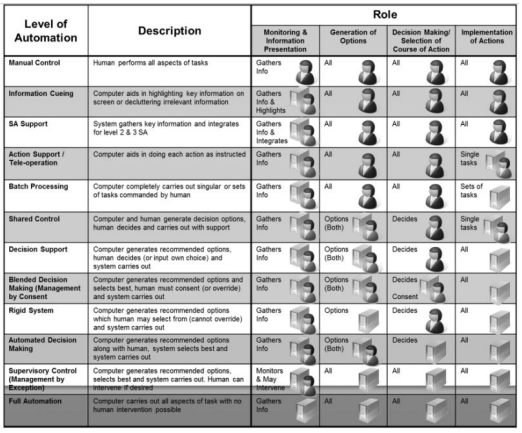
A key point from both “Chatbots and the New World of HCI” and other papers concerning the same subject is to always think about and design these systems while always having the users expectations in mind. If the user, by interaction, can achieve a picture of the limits and potential of the system you achieve a broader and well-functioning interaction where both the user and system develop.

Now, returning to the guidelines, I believe that the most applicable AI design guidelines to chatbots and technologies alike is:

- G1 (*Make clear what the system can do)* - Helps achieve better understanding towards the user and will lead to better interaction with the chatbot/agent.
- G2 (*Make clear how well the system can do what it can do*) - Same advantage as G1.
- G7 (*Support efficient invocation*) - Will make it easier to take the service in use and thereby learn to operate it.
- G9 (*Support efficient correction)* - If the user gains ability to tell the service when it’s wrong the services has the capability to learn and adapt to that in future interactions.
- G13 *(Learn from user behavior)* - Will lead to the interaction evolving as the user uses the service.

# Module 3

*Philips at al.(2016) give a taxonomy and examples of human robots collaboration. Choose 2-3 examples, describe their levels of autonomy as described in (Endsley, 2004; chapter 10.5.2), and reflect on advantages and disadvantages if we decrease/increase their current level of autonomy.*



| Level of Automation | Description | Role | | | |
|---|---|---|---|---|---|
| | | Monitoring & Information Presentation | Generation of Options | Decision Making/ Selection of Course of Action | Implementation of Actions |
| Manual Control | Human performs all aspects of tasks | Gathers Info | All | All | All |
| Information Cueing | Computer aids in highlighting key information on screen or decluttering irrelevant information | Gathers Info & Highlights | All | All | All |
| SA Support | System gathers key information and integrates for level 2 & 3 SA | Gathers Info & Integrates | All | All | All |
| Action Support / Tele-operation | Computer aids in doing each action as instructed | Gathers Info | All | All | Single tasks |
| Batch Processing | Computer completely carries out singular or sets of tasks commanded by human | Gathers Info | All | All | Sets of tasks |
| Shared Control | Computer and human generate decision options, human decides and carries out with support | Gathers Info | Options (Both) | Decides | Single tasks |
| Decision Support | Computer generates recommended options, human decides (or input own choice) and system carries out | Gathers Info | Options (Both) | Decides | All |
| Blended Decision Making (Management by Consent | Computer generates recommended options and selects best, human must consent (or override) and system carries out | Gathers Info | Options (Both) | Decides Consent | All |
| Rigid System | Computer generates recommended options which human may select from (cannot override) and system carries out | Gathers Info | Options | Decides | All |
| Automated Decision Making | Computer generates recommended options along with human, system selects best and system carries out | Gathers Info | Options (Both) | Decides | All |
| Supervisory Control (Management by Exception) | Computer generates recommended options, selects best and system carries out. Human can intervene if desired | Monitors & May Intervene | All | All | All |
| Full Automation | Computer carries out all aspects of task with no human intervention possible | Gathers Info | All | All | All |

## Intro

Philips et al.(2016) reflects mainly upon how human-animal relationships work. What the advantages are, how it's changed with robots in contrast to animals and how animals benefits humans physically, emotionally and cognitively in ways that current robots are unable to. In the paper a great number of the examples are set to and described in a critical military context. A key point to draw from the paper is how important trust is. Trust will determine how users (humans) will interact with current and future robotic teammates. Its described as a crucial template for fostering trusting and lasting relationships in human-robot teams.

Endsley's chapter 2 is all about Situation Awareness, in short: SA. The definition of SA is "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future (Endsley, 2011). The term, and its relation to automation is specified during chapter 10 which concerns the different levels of automation in addition to what benefits and disadvantages there is in different contexts and to different users correlating to the levels of autonomy.

### Big Dog

Big Dog robot is developed by Boston Dynamics and its intent is to serve as a helping hand to military forces. Its key functions are to carry a large amount of weight through different, and sometimes challenging terrain. I would undoubtedly put the Big Dog in the Shared Control level of autonomy. The robot and its human opposite has to work together in order to accomplish the task that the robot is designed to do. They both gather information and monitor to create a situational awareness for then to generate options on which the human has to decide to act on, the robot then perform the requested actions with support from humans. Although the big dog is perceived as intelligent and free contrasting to other very static and ‘unintelligent’ robots it still needs that human intervention to function.

If you were to increase the automation in the Big Dog or robots like it to the point where it takes actions by it self, and is left unattended by any human I think it would be harder for the soldiers working in team with the robot to include it and use it in the way it’s designed. The advantage you would gain if the robot was more independent is that you could relieve resources that previously had to tend to the robot and monitor it to do other more urgent tasks. Contrary, if you were to decrease the automation you would need to use even more military resources to make the robot function and do its tasks. Degrading to a level where the robot is unable to generate options is also a serious downgrade and a little improbable.

### The Amarob FRIEND and robots alike

The Amarob FRIEND and robots alike are designed to be a helping hand towards the physically handicapped and people with cognitive challenges. You can compare it with a assistant dog. Its responsibility is to do tasks such as guidance and being a literal helping hand in everyday life. Much like the Big Dog, robots like these are not very independent from its user. The human user still has the overall control and the robot does not act without some sort of human interaction. Taking this into account I would place the Amarob FRIEND into the ‘Action support / Tele-operation’ level. The computer aids the user by doing each action, as it is instructed to do. Increasing automation of such a ‘personal’ robot will lead to the user

feel like they are being overrun and decrease general trust towards the intentions of the robot. Although, for users that are more demanding and have less ability to instruct the robot a higher level of automation could be beneficial.

Any decrease of automation would in all likelihood be ill-advised. The whole idea of a robot like this is to aid a human with actions and when a robot does not have the ability to implement those actions, it would be close to useless.

# Appendix:

### Changes after feedback

I received feedback that wished for a couple more examples in later iterations, which I added. Also mentioned was the need for a split in between the different modules in the references to make it a bit clearer - this was later added. A table of contents were also recommended and is a part of the complete iteration, which includes module 3.

Other than that I got positive feedback for my examples used in iteration 1 and for how the entirety of the text was formated, something I therefore continued with that in the subsequent iterations.

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