

# Individual assignment

Iteration 3



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# Module 1

Slogan: The Imitation Game, The Language Game, The Learning Game and the Moving Game

## **Concepts, definition and history of interaction with AI**

### **History of AI**

The term AI was first used by John McCarthy. He is seen as 'the father of artificial intelligence' as he coined the term in 1955 for a proposal he wrote for the Dartmouth Conference, the first artificial intelligence conference. (Childs, 2011)

McCarty described AI as "the science and engineering of making intelligent machines". (Peart, 2017) But the concept was also discussed earlier in "Computing Machinery and Intelligence" by Alan Turing. (Grudin, 2009) He wrote about artificial intelligence and how the Turing could be used to judge a machines ability to imitate human intelligence. (Turing. A, 1950)

### **Definitions of AI**

The Merriam Webster dictionary defines it as :

'a branch of computer science dealing with the simulation of intelligent behavior in computers'

'the capability of a machine to imitate intelligent human behavior'(artificial solutions)

The Oxford English Dictionary describes it as:

'The capacity of computers or other machines to exhibit or simulate intelligent behaviour; the field of study concerned with this'

Both of these definitions focuses on the fact the machine should imitate human intelligence.

But neither of these definitions says anything about what they mean with 'human intelligence or 'intelligent behavior''. Often when a computer is meant to behave as a

human the focus is on training them how to interpret patterns and to come up with appropriate responses. The computer uses data to make rules that allows it to act as if it were 'intelligent', but there is many things a human can do that a computer cannot, which also relates to intelligence. A machine will for example have trouble understanding the context the data belongs in.

I would like to define AI as 'a machine that uses patterns and statistics to interpret data and come up with appropriate responses, imitating humans ability to analyse and interpret a situation'.

### **Contemporary company that works with AI**

Boost AI: Boost AI is a company that works with virtual agents and talks about they can improve the customer experience with AI. They present it as a product that they are offering with articles about how deep learning and conversational AI works.

### **Film**

'I, Robot' is as science fiction movie from 2004 about human-like robots with artificial intelligence that have become an integrated part of society with the mission to protect humans. It explores the intelligence of the robots and the trust the humans have in it.

## **Robots and AI systems**

### **The word robot**

The word 'robot' was used in a 1920 play Karel Capek, which was a play about a factory that manufactured artificial humans. Later, the altered word 'robotic' was used by the author Isaac Asimov. The word 'robot' did also appear in literature previous to this play, but the meaning differed from we think of when we use the word 'robot'. At the 19th century the word was connected to 'forced labour or services'.(Tearle, 2016)

### **Definitions of robot**

Oxford English Dictionary: 'An intelligent artificial being typically made of metal and resembling in some way a human or other animal.'

Merriam Webster:: '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)'

These definitions focuses on that computer should mimic something living, but this does not seem to be the case for all robots. My definition is that a robot is something that often uses sensors and can be programmed to a specific set of actions.

### **The relation between AI and Robots**

AI focuses on how the machine can interpret and come up with responses that would be similar to a human's way of reasoning. Robots can look similar to a human without necessarily having the ability to mimic the behaviour of a human. A robot can simply be programmed to a certain set of actions without deciding these actions 'by itself' based on rules and data. A robot does therefore not necessarily have AI, and AI is not restricted to just robots, as many different systems and machines can have AI.

### **Contemporary physical robot**

An article by Mutlu and Forlizzi describes how a robot can be used in a hospital to transport things. The robot moves autonomously through the hallways and elevators and announces its actions with a pre-recorded voice. If medicine is to be transported from one part of the hospital to another, an employee can use a combination of a touch screen monitor and buttons to get the robot to complete the task.(Mutlu and Forlizzi, 2008)

## **Universal Design and AI systems**

### **Definition of Universal Design**

"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.”(*The Centre for Excellence in Universal Design*)

Universal design is about designing for everyone. Every user is supposed to be able to access and use the application or program you have made. Making it accessible for everyone also means making it easier to use for everyone else. For example audio books, which were originally made for blind people are now used by everyone.

### **Potential of AI**

AI can make it easier to communicate your need to the machine. It can learn your habits and help you with everyday tasks. Use of sensors can make it detect where humans are in the room and recognize voices and faces. All of these features combined with machine learning can be helpful for people in different situations.

### **Potential of AI for including and excluding people**

By adapting it for everyone you are including everyone. AI is built on statistics and previous data sets, this means it is designed for the average human. Everyone who falls outside of this average can therefore easily be excluded. But AI can also learn how to adapt to specific user needs, and therefore be more including.

## **Module 2**

### **Characteristics of AI-infused systems.**

One definition of AI infused systems are "Systems that have features harnessing AI capabilities that are directly exposed to the end user." (Amershi 2019) Artificial intelligent systems are systems that use algorithms to communicate with the user. Large data sets are used and the system trains using the data to learn how to

interpret responses and how to respond to them. The characteristics of AI systems are therefore that they can learn and improve. They can learn by adapting to user input and improve their responses based on large data sets.

There are several challenges when interacting with AI-infused systems. The design of the system is therefore very important to make it more user-friendly and easier to understand and interact with. The research from Kocielnik(2019) shows how false positive and false negatives can have different consequences when it comes to how the user interacts with the conversational agent. With false negatives some requests might be missed by the agent, but with false positives you might get irrelevant responses and requests. This article also shows how the user knowledge of how this works affects the expectations the user has regarding how to communicate with the agent. If the user contributes to the system it is also more accepting of mistakes. This also relates to G2: Make clear what the system can do. If you know that you will get false positives you are more accepting of receiving false positives from the chatbot. Because an AI system adapts and learns it can also be difficult to know what to expect when it changes behaviour. (Amershi, 2019)

### **Example of AI-infused system**

One type of AI-infused system is NAV's chatbot Frida. This chatbot answers questions regarding parental benefits and uses training sentences to improve answers and responses. User expectations are important when interacting with this chatbot. The chatbot only understands simple sentences and cannot answer questions that require personal details. If a user does not know this before starting a conversation with Frida, the user might write long sentences that contain several keywords that will confuse Frida and end up with an irrelevant answer. Mistakes like this could be frustrating for the user if it does not have knowledge of how to use keywords when interacting with AI. In addition, Frida improves and changes responses so the user might be confused when Frida provides a different answer than last time if the user did not expect this.

## Human-AI interaction design

The articles from Amershi(2019) and Kocielnik(2019) show both characteristics and challenges with using AI-infused system. As noted earlier in this assignment many challenges relates to user expectation and understand of AI. An AI system should make it clear what it is capable of and how certain it it is with the questions it provides. In addition, the users should know some basics of how it works to properly interact with to avoid confusion and frustration.

### **G11 Make clear why the system did what it did. Enable the user to access an explanation of why the AI system behaved as it did.**

When you ask a question that NAV's chatbot cannot help you with, it will tell you why it cannot help you (for example if it requires personal information) and tell you that this is the reason that she connects you to chat with a human instead. But this does not work in all instances. If the user writes to long she might just reply with 'I can't understand the question' without explaining why the chatbot cannot understand a question that long. Had she instead replied by telling how keywords work and how short the sentences should be, and that this is the reason that Frida cannot answer, it would have been easier for the user to rephrase the question and get a proper answer to what they were wondering about. In some instances she will reply 'write shorter', but there is no information about how the number of keywords affects how the question is analysed by the chatbot.

### **G5 Match relevant social norms. Ensure the experience is delivered in a way that users would expect, given their social and cultural context.**

NAV's chatbot mostly uses semi-formal language to make it easier for the user to understand, but in some cases the terms used regarding different benefits might feel confusing for the users. But usually the way the chatbot works will match social and cultural context.



According to these guidelines there are therefore several aspects of the chatbot that can be improved. However, the current version of the chatbot mostly follows the guidelines that have been discussed and the chatbot is always changing for the better.

## **Chatbots/conversational user interfaces**

Luger writes about how user expectations does not match up with what a chatbot is supposed to do and is capable of. This can result in many challenges. If the users do not know what the chatbot is capable of, it is difficult to understand how to interact with, without being misunderstood by the chatbot. The reason for this is the mental model the users have, which does not add up with how the system works. This, combined with lack of feedback regarding the systems capabilities, results in a difficulties when interacting with the chatbot. (Luger, 2019) Many companies sees chatbots as the future, but there are also concerns regarding certain uses of machine agents, like tweets made by machine agents in relation to political campaigns. (Følstad, 2017)

Many user did not know what their system could do which could which could lead to either underestimating or overestimating what a chatbot could do. The challenge with underestimating is that it can be difficult to know how to use it if you do not know all the functions. On the other hand, when the user overestimates what the chatbot can do, they can easily get disappointed and frustrated when the chatbot does not do what they think it is supposed to be capable of. (Luger, 2019) This is linked to their technical knowledge. Those with more knowledge about technology have more understanding of how difficult certain things can be and show more understanding and patient when the chatbot does not understand on the first try. These users therefore rephrase and try again because they understand that keywords are the trigger, while a less knowledgeable user will just give up. This shows how important the mental model the users have of what the chatbot is capable of, how it process information and how it completes task, is very important for how they interact with it, how useful they find it and how soon they give up.

G1: Make clear what the system can do

G2: Make clear how well the system can do what it can do (the AI system can make mistakes)

G1 states that you should make clear what the system can do. The user has to understand what the AI system is capable of and which tasks it can help you with. This is the solution to the problem presented in Luger's article. Use expectations that does not match what the system can actually do can lead to challenges. But these can be met with more information on how the system works; how do you interact with, how do you use keywords to make it understand what you are asking it to do, and what types of tasks is it capable of doing? These are questions that it is important the user know beforehand to avoid confusion and annoyance in meeting with intelligent systems.

G2 states that you should make clear how well the system can do what it can do. This is important because an AI system can make mistakes. These mistakes can either be regarded as false positives, where the user believes that it received an correct answer without releasing that the AI misunderstood the question or it can result in meaningless answers frustrating the user. If the user are aware of the systems limitations it is easier to be patient when using the system and have that in the back of the mind while receiving and interpreting answers from the chatbot.

## Module 3

### **Robots as teammates**

Philips(2016) describe how working with robots can be compared to working with animals. Seeing robots as teammates rather than tools make it easier to build mental models of how robotic teamwork would work. This is valuable both for designing HRI and for training users in how to complete tasks where robots are involved. It makes it easier for humans to understand purpose and functions of the robot and the limitations of what the system is capable of. A robot can complete complex tasks that humans cannot, but at the same time there are several aspects of work tasks that a robot will have problems with.

### **Example 1 - The robot Roomba**

The Roomba is a robot specialized in householding work. It can complete household cleaning tasks in a way that complement the skills of humans(Phillips, 2016) This means that the robot can vacuum, but it still needs some additional work done by humans, like tidying up and moving objects so the robot is able to move around the room.

### **Level of automation**

The roomba can move around by itself and sense the objects in room, but it can still be controlled by humans who can check its status and plan the cleaning. According to the 'Level of automation'-table(Endsley, 2004) I would place it as 'Batch processing'. This indicates that the robot can carry out singular or set of tasks, commanded by the human.

### **Advantages/disadvantages with more/less automation**

With more automation, the robot Roomba might manage to do more of the cleaning by itself, without help of the human. But seeing it as something that should complement the skills of humans(Phillips, 2016) rather than replace them, a more automated version might be counterproductive. The humans would lose some of the control they currently have and might not be satisfied with the robots decisions. If it was to be less automated, on the other hand, the humans would have to do more work to get it to clean what it was supposed to, and assign it specific tasks rather than it being able to move around by itself. Because of this the current level of automation seems best suited for the purposes it is designed for.

### **Example 2 - 'Social robot Nao'**

Nao is a robot created to be an assistant in education and research. It is also used by healthcare centers to inform and entertain visitors. It has seven touch sensors, two 2D cameras to recognize people and speech recognition with an open and fully programmable platform. (Soft Bank Robotics) His sensors allow him to recognize people, decode human voices and figure out who addresses him. He can respond to various questions, but has still some problems with responding to voices.

(Cennal-Jones, 2015)

### **Level of automation**

He can move around by himself and interact with his surrounding in a way that suggests that he has a high level of automation. By Endsley's table(2004) of the different levels of automation, the robot NAO seems to be at the 'shared control' level. The robot can carry out tasks without human needing human intervention. But it can also be programmed to fit with specific uses. However, there are still some issues. It does not always differentiate between voices and get easily distracted from tasks. This might indicate that it will need some intervention in some cases. A test done by a journalist from BBC(Cennal-Jones, 2015), show that the robot in some

cases get so distracted that it cannot complete simple tasks it is supposed to do, like talking.

### **Advantages/disadvantages with more/less automation**

As the robot has a high level of automation there are already several aspects that could have consequences if changed. If it had less automation it might not work as well for all the purposes it is supposed to, but it would have been easier to assign the specific tasks without it being distracted. With less automation it could not mimic human interaction as well, perhaps making it more difficult to use in education as a teacher or supervisor would have to specify its task and function. With the current level of automation, children can interact with it without needing a supervisor that manages the robot, leading it to be able to build so much trust from children that it could affect their choices and impact their behaviour (BBC, 2018).

Less automation could therefore make it less prone to errors as distraction, but on the other hand it would require more supervision and be more difficult to use to the purposes it was designed for. If it was to have even more automation than it currently has, it might make more errors and be more difficult to get to do exactly what you want. More automation could also might make it more similar to a interacting with a human, which might be desirable in some cases.

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# Appendix

## **Changes for module 1**

In the feedback I received it was suggested that I should explained more in the questions that asked me to describe something, and that I should write longer answers. In this iteration I have therefore added some explanations to some of the answers in Module 1 to describe the examples better. I have also thought about this while writing Module 2 and have tried to write longer, more detailed answers.

## **Changes for module 2**

I have extended some parts and added some more explanations, bases on the feedback I received.