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

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

According to some, AI has existed for many decades, though not as a static field with the qualities we understand it has today. Grudin shows us an example that starts as early as in the 1950s, just about when WW2 came to an end. Although not explicitly stated to be artificial intelligence, Alan Turing made remarks regarding how a computer could be used to do the same tasks as humans: in his case crack encrypted codes that were being sent between enemy territory. AI as a term is said to be first coined by John McCarthy in 1956, an American mathematician and logician (Grudin (2009)).

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.

One definition regarding what AI is can be found in the works of Bratteteig and Verne, who describes it to be *"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 og Verne (2018)). This definition is made as the focus is shifted towards making AI a supportive tool for humans when it comes to comprehending daily tasks.

Another definition can be found at Britannica, in an article written by B.J Copeland, as "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" (Copeland, (2022)). This definition states that AI works as an engine in both a computer and robot order for them to perform tasks appropriately. Without it, both of them would become more primitive and less useful for problem solving and task comprehension.

A third definition is made by IBM: "artificial intelligence is a field, which combines computer science and robust datasets, to enable problem-solving. It also encompasses sub-fields of machine learning and deep learning, which are frequently mentioned in conjunction with artificial intelligence. These disciplines consist of AI algorithms which seek to create expert systems which make predictions or classifications based on input data." This definition does not include the use of robots, but focuses more on the software aspects of AI due to its emphasis on machine learning. Based on these three definitions, I would personally define AI as "a software engine that relies on external real life data in order to improve the system it's integrated in".

Write some sentences about the similarities and differences between human autonomy and machine autonomy. Write some sentences about similarities between the concept automatic and the concept autonomous.

A point of difference between human autonomy and machine autonomy is the fact that the process of decision-making is different. While humans rely on using reasoning when a situation occurs, a computer has to get that same reasoning implemented; it does not have this built in by default. Let's say it gets cold outside, and we live in a house where the insulation is poor. A human could reason something like: "I better turn up the ovens here, but only to a point where I get comfortable. If I increase the temperature above that level, I waste electricity and my electricity bills will become unnecessarily expensive. If we had smart ovens, they would have to be programmed to the specification of our reasoning. They are able to increase the temperature by themselves, but that temperature has to be defined by us beforehand.

There is a central similarity when it comes to the concepts "automatic" and "autonomous". Many cars today have two different functions; two of which were built for the same purpose, yet are based on different concepts. Let's say we are driving on the motorway, and we approach a speed limit. Our first option is to activate the vehicle's cruise control to maintain that speed. In less heterogeneous traffic, our second option is to use a car's autonomous functions which uses an algorithm that builds itself on external data. In short, they both do a set task automatically, once we activate them. However, the way the task is done is different.

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.

In Grudin's article, we are given a quick history walkthrough that explains how AI came about, how it was going to be used and how several notable people made theories with regards to how AI was going to be ahead of their time.
What I found interesting about this article is that it shows the uncertainty with regards to how AI is going to evolve, and how people made theories on this based on the progress and the technological context that surrounded AI back then. In addition, I do agree with one common idea that Grudin is expressing: that AI cannot be solved by logic alone; it will require notable reasoning in order for it to work the way that suits human needs.

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 platform, as a service, framework, as an ecology or as an "idea"?

BMW, known for its cars and motorcycles, has in recent years invested heavily in AI technology. When the Covid-19 pandemic was declared a global threat to public health, many companies started to implement measures that would limit physical contact and presence to be at a minimum. BMW followed suit, however decided to not cut investments in their AI projects. This is a hint towards the fact that AI has become increasingly important as a field. BMW wants to use AI as a service for people who are purchasing their vehicles. Their goal is to further enhance the experience of driving a car as a whole. Michael Würtemberger, head of the "Project AI" department at BMW, describes several examples of what their cars will be able to do with AI:

> *"The car needs to be able to recognise who is using it and which music, interior lighting and seating position that person prefers. We want to make complex operating procedures simple: If the system knows you are going shopping in town, it can guide you to a parking space – taking into account*

whether it might be raining, and whether you are someone who is prepared to pay for garage parking or would rather walk the last 500 meters and stop off somewhere for a coffee first. If AI makes this easy, you'd probably say: Hey, that was a cool experience!"

However, they would also like to use it during the production of the vehicles. They believe AI is superior to classic image processing when it comes to quality control during the production process. As quoted by Michael Würtemberger,: *"AI can do a lot of things, but using it in a real process requires considerable know-how and experience from the employees on the ground."*

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

2001: A Space Odyssey
In the fictional thriller *2001: A Space Odyssey*, directed by Stanley Kubrick, AI is portrayed as a potential evil attribute to society. It is visualized through the character "HAL 9000", a computer with AI built in that is installed in a spaceship called the Discovery One. HAL 9000 is used as a main component for controlling the spaceships activities, and is in theory meant to be operated by the two astronauts sent on a mission. The system recognises speech and can be interacted with by using voice commands and gestures. It is also capable of lip reading, recognising faces, reasoning as well as the ability to control the actual spaceship, although the first is a feature the astronauts are unaware of. It also has some quirks: it is able to play chess as well as engaging in art appreciation and critiquing. Unfortunately for the astronauts, since it has the secret ability of being self aware, it eventually stops taking orders as it learns that it is in danger of being destroyed by them, something they planned once they realized the system's true intentions.

1.2 Robots and AI systems

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

The word "robot" first appeared to the world in 1920, when Czech playwriter Karel Čapek used the term in his 1920 hit play "Rossum's Universal Robots". The play was about man creating the first robots, who initially were happy to work for the humans. At the end, they become self aware, and extinguish the human race.

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.

ISO (International Organization for Standardization), defines the word "robot" as the following: "actuated mechanism programmable in two or more axes (4.3) with a degree of autonomy (2.2), moving within its environment, to perform intended tasks".
This definition is intended to cover such a broad view, that it is supposed to be seen as a universal definition. Another definition can be picked up by professor Trenton Schultz, who defines a robot to be "a physical object that interacts with the physical environment, either on its own or via a person, to accomplish a task."

Both of the definitions state that a robot has to be a physical being. But we need to understand why a “physical being” is required in order for something to be a robot. It’s not the physical materials that defines what a robot is, as this may vary greatly. Rather, it’s how the mechanics act together in order to complete a certain task, as Schultz said.

However, I question whether the existence of physical materials should be necessary in order for something to be a robot, as there are plenty of examples where non-physical materials can do tasks for us. Let’s say you place an order through an online store. That order might then be sent to the nearest warehouse, where the order is picked and processed. A robot may do this task, but the order was not given by something any of the aforementioned people would define as a robot. That means it is able to help the warehouse workers with the manual labor, but the robot’s “brain” is external. Granted, If we removed the physical parts, manual labor would still exist for the warehouse workers, but the actions that are conducted through the website are almost fully automated, and manual labor is therefore not needed here (if we look away from maintenance).

Dautenhahn suggests that it is difficult to find a common reference point for what a robot is, as many of us define it differently depending on our professional background. Despite this, basen on the aforementioned definitions regarding what a robot is, I would define a robot as *“either one or multiple entities acting alone or together in order to perform either manual or automated tasks” (Dautenhahn (2018))*.

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.

Both the terms AI and robots have been used “in the same sentence” when it comes to the use of advanced technology. What is similar, if we look at what’s under the bonnet is that both of them are constructed to be of assistance for human needs, and they can both do tasks based on commands and requests. If we look at the terms separately, however, there is a difference between them. A quote from Bratteteig and Verne sums this up: “instead of implementing rules to follow, the computer [with AI] deduces its “rules” from its own experiences with processing data” (Bratteteig and Verne (2018)). A robot without AI is programmed to do a set of tasks, while mechanisms inside AI software include machine learning: meaning that the system will continue to evolve and do tasks based on data that is feeded into it on a regular basis. This also means that the AI system can become what I would call “synthetically aware”, meaning it will develop a form of reasoning based on logic. This differs from human reasoning, where emotional factors also play a role. In short, a robot without machine learning capabilities is vastly different from an AI system. However, if said robot were to have such a system implemented, I would find it hard to argue that they’d still be two completely different things.

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.
For this task, I have chosen “Asimo (Advanced Step in Innovative Mobility)”, a robot line previously manufactured by Honda (now discontinued). This robot made headlines when it was first introduced in 2002, when it opened the New York Stock Exchange in 2022.

Asimo is meant to be interacted with just like its human counterparts, as it has both voice recognition and the ability to “speak” built in. It is also able to recognize moving objects, different gestures and postures, its surrounding environment as well as sounds and faces. Other than that, It operates using human-like parts; it has a head and a set of arms and legs. Among (quirky) things it can do include walking, climbing stairs, kicking a soccer ball as well as pouring a cup of coffee. The first feature took years to develop: earlier prototypes required assistance from humans as it fell down constantly when trying to walk. It has built-in sensors that adjusts its center of gravity if someone tries to push it, and facial recognition software that aids its ability to talk to people (Forbes).


Asimo (Photo: Forbes)

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.

NDA (The National Disability Association) defines universal design (UD) as “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” (NDA).
This means that everything that is constructed, be it technological artifacts, transportation solutions or architecture, shall accommodate users that have a disability or at least struggle to access certain products and services that do not follow universal design. The idea behind UD is that people should not view their disability as an issue, and everything can be used with ease by everyone regardless of physical and mental characteristics.
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.

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 can help people in many ways. For example, a group of researchers from Stanford University came up with an idea to construct a robot arm that would help aid those with motoric disabilities. They believe that implementing AI would improve its capabilities in terms of support. The robot can be used for helping people eat as well as baking. As for human cognition/emotions, startup company Embodied has developed an AI based robot called “Moxie", a social robot designed for children that wants to help promote social, emotional, and cognitive development and learning. This could amongst other things potentially help those kids that are in need of increased social contact (IEEE Spectrum).

Describe the potential of AI for both including and excluding people. You are encouraged to use examples.
AI systems have a strong potential to include more people in different contexts. Let’s say that 10 people apply for 3 jobs, and three of them are invited to stage two in the application process. An AI system can, if developed in a certain way, base its selection on several

predefined metrics that the company has set beforehand. Many worry that some people might be excluded from participation based on metrics such as gender and race. AI-based selection systems can be programmed to overlook these metrics, and instead focus on other factors such as years of experience, lists of achievements, number of positive referrals and so on. However, AI systems can also exclude people when it comes to work opportunities. Since many AI-systems become increasingly skilled in doing many jobs efficiently, several people are at risk of losing their job. However, this again might be canceled out if we create jobs related to maintenance of the systems, programming etc.

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?

First and foremost, I believe the key difference between "understand" and "understanding" is based on the stage learning occurs. An AI system may understand what to do based on what has been used as data input beforehand. On the other hand, while it trains on the data set, it is in the process of understanding what to do. In the article by L. Bainbridge, it is mentioned that "even highly automated systems (...) need human beings for supervision, adjustment, maintenance, expansion and improvement" (Bainbridge (1982)). Regarding whether a machine understands or not: it needs to go through a process of "understanding" before it can "understand" on its own. But it should be a possibility.

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.
I chose Microsoft's guideline number 9: Support Sufficient Correction. This one was made to "make it easy to edit, refine, or recover when the AI system is wrong", which means that the system should implement tools or programs that aid the user in reconstructing how the system makes choices. This is again because the system either seems to base its decisions on wrong factors, or there might simply be a bug in its system.

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.
I chose Donald Norman's 7 design principles. In some ways, the set is similar to Microsoft's guidelines. For example: Norman suggests that "one should design for error", which resembles Microsoft's guideline number 9. Norman also suggests "simplifying the task structure" and "making things visible" in the design process. The former resembles Microsoft's guideline number 1, while the latter resembles Microsoft's guideline number 4. However, Microsoft has guideline points that differ from this set of guidelines. For example, it's point number 6 that talks about mitigating social biases. Norman has no such point in his set of guidelines.

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