IN5480 Individual assignment fall 2021

1st module - and first iteration

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

1.1.1 A brief history of AI

The term “artificial intelligence” was officially coined by John McCarthy, an american mathematician and computer scientist at Stanford university in 1956. However, British mathematician and leading code breaker Alan Turing speculated in why computers shouldn’t be able to enter fields that were originally designed for humans. (Gruding 2009, p. 49). On the same note, in his article “Computing Machinery and Intelligence” from 1950, Turing presents methods for testing a machine’s intelligence, famously known as the *Turing test*. It would not surprise me if the thought of intelligent machines have existed as long as machines themselves.

1.1.2 Three definitions of AI

1st definition

John McCarthy (2004), researcher at Stanford University, defines artificial intelligence as “*the science and engineering of making intelligent machines, especially intelligent computer programs*”. He further specifies that “*...but AI does not have to confine itself to methods that are biologically observable.*”

McCarthy’s definition clearly puts that artificial intelligence is first and foremost an engineering feat; an invention created by humans in which potential we are yet to fully understand. It’s clear that McCarthy seeks to distinguish learning in humans and animals from machine learning..

2nd definition

Bratteteig and Verne (2018), researchers at Institute of informatics at UiO define AI as "*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.*"

In this rather modern depiction of AI, there is a heavy emphasis on human-like behavior within computer systems, and how they should be able to perform task that 'ordinary' machines wouldn't be able to do. I think these are tough requirements for any AI, but I think the description fits pretty good with my own imagination of AI.

3rd definition

Wikipedia, the free encyclopedia, defines artificial intelligence as "*intelligence demonstrated by machines, as opposed to the natural intelligence displayed by humans or animals.*" (Wikipedia, 2021). The article was written by an anonymous contributor.

In this definition, there is a clear boundary between natural and artificial intelligence, in the way that it is displayed by different entities. This definition lacks any further description of what actually separates different types of intelligence, but it's clear that machines are not able to display the same kind of intelligence as humans or animals.

My definition

I would define AI as: "a computer system that is able to improve its performance and adapt to changes in its environment through machine learning processes." I think it's important to specify what separates AI from traditional software, and I believe this lies in its dynamic nature, compared to 'normal', static algorithms. Improving its performance (e.g. success rate, speed, or effectiveness) through 'learning' is something that I find of key importance for a computer system to be named artificial intelligence.

1.1.4 Brief review of an article

Grudin's article "*AI and HCI: Two fields divided by a Common Focus*" takes on the two research fields of AI and HCI, and how they share a lot of common ground, both through history and in their focus on improving existing and future algorithms. The main part of the article discusses how the different fields have evolved since the 1950s. Finally, the author shares a piece on how technology trends point in the right direction, that AI and HCI research benefit one another, and that the potential for usable AI and "*synergy between the fields are outstanding*" (Grudin, 2009, p. 55).

To the article, I would like to ask the author how he imagines a hybrid field between AI and HCI could actually look like?

1.1.5 Contemporary company that works with AI

IBM presents their AI-package for business called *Watson* with a focus on making a business "smarter", stating that their solutions are "*designed to reduce the costs and hurdles of AI adoption while optimizing outcomes and responsible use of AI*." There is a clear focus on the AI being *responsible*, stating the fact that the processes of AI-led decisions are "transparent".

1.1.6 Human interaction with AI in film

In Alex Garland's film *Ex Machina* (2014), young programmer Caleb is selected to participate in an experiment with "synthetic" intelligence by evaluating the human qualities of a highly advanced humanoid AI (IMDB). A big portion of the screentime consists of Caleb interacting face-to-face with the humanoid AI, Ava. Interaction is shown through convincing, human-like conversations, including switching eye contact, emotions, learning and joking. The AI is super-convincing, and as the film goes on, Caleb grows too fond of the humanoid, and is fooled leading to helping her escape, while she leaves him to die.

1.2 Robots and AI systems

1.2.1 Robot origin

The word "Robot" was introduced by Karel Čapek in 1920, a Czech writer, in his play *Rossum's Universal Robots.* The word itself stems derived from the Czech word "robota", which loosely translates to "forced labour" (Love, 2020).

1.2.2 Two definitions of "robot"

1st definition

In 1993, Merriam Webster's collegiate dictionary defined robot as "*an automatic device that performs functions normally ascribed to humans or a machine in the form of a human.*" (Struhn, 2004, p. 11).

This definition implies that a robot is *either* an automatic device that performs a task originally performed by a human *or* that it's a machine which takes the shape of a human being, which perhaps hints to a divide in robot discussions at the time?

2nd definition

In 1979, the Robot Institute of America defined a robot as "*a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks.*" (Struhn, 2004, p.11).

Although quite a lot more aged definition, this one is more focused on a robot's traits and which specific tasks they are designed to solve. Reprogrammability and multiple functions are defined almost as requirements.

My definition

I would define a robot as "a sensory machine that performs pre-programmed tasks and responds to user input." I think importance aspects of a robot, is that it can be programmed, but at the same time takes feedback from users. I also think it's essential for a robot to be able to use sensors, in order to 'see' or navigate through its environment.

1.2.3 The relation between AI and robots

I believe that a robot can utilize AI in order to perform more generalized or complicated tasks, as AI's don't necessarily need a physical manifestation of a robot. At the same time, according to my own definitions, a robot is dependent on some sensory input, and how it's programmed to interact with its environment might be dependent on some AI under the hood in order to function as intended.

1.2.4 Description of a robot

Robotic lawnmower's have perhaps become one of the most adopted piece of robotics to enter the global market. Their entire functioning consists of autonomous actions, from driving, cutting, dodging obstacles parking in the charging port. It requires next to no human interaction, other than requiring a preset area for cutting.

1.3 Universal Design and AI systems

1.3.1 Definition of Universal Design

Uutilsynet.no (2021) defines universal design as "*the thought that services should be accessible to all, regardless of age, functional ability and level of education.*" I believe the most important aspect of universal design is accessibility, whether it being a service, a product or a building: All people should be able to use it, equally.

1.3.2 The potential of AI with respect to human reception

Self-driving vehicles have amazing potential for people with reduced eyesight, or other physical handicaps who normally might have to resort to expensive, specially designed vehicles, or who might not even be able to drive at all. In digital education, AI-based speech-to-text systems might be a fantastic option for people with reduced hearing.

1.3.3 The potential of AI for both including and excluding people

In her TED Talk, Joy Buolamwini shares her personal experience with algorithmic bias. Globally used facial recognition software was not able to detect her face, because the people behind the algorithm didn't account for it to learn a broad range of skin tones. (Buolamwini, 2016). I think developers have a responsibility to make sure that their algorithm is trained properly, as it can potentially cause unintended exclusion.

1.3.4 What does it mean to 'understand'?

To me, understanding is being able to collect information, process, reflect on it, use it, and learn from it.

1.3.5 Do machines 'understand'?

Whether machines are able to "understand" is a fantastically difficult question to answer, but I think the reflection part of understanding is something I've yet to see from an AI. Machines are undoubtedly able to process and store information, and sometimes even connect relevant information together, but to be able to reflect on the given information and connect it to a broader context in order to act, is something I think that machines aren't capable of doing - not just yet.

1.4 Guideline for Human-AI interaction

1.4.1 Microsoft guideline for Human-AI interaction

Guideline 13 "Learn from user behavior" is about "*personalizing the user's experience by learning from their actions over time.*" Using for example an AI-based web browser, it would be useful if the user was provided relevant web pages based on previous browsing.

1.4.2 HCI design guidelines vs. Microsoft guidelines

Based on Shneiderman's eight golden rules, the HCI design guidelines and Microsoft guidelines for Human-AI interaction share many similarities, especially when it comes to system feedback, ease of use and user efficiency. I do, however, notice that the Human-AI guidelines are more focused on relating to the user's context and social norms, as well as gradually adapting to the user, rather than being designed purely based on a set of static rules.

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