Module 1 TRN CULTURAL AWARENESS, Learning Unit 1.2 Need for AI and robots

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THEORETICAL COMPONENT

Principles and Values

Learning about how artificial intelligence and robots work is necessary to understand what they can do, how they can facilitate caregivers, and maybe even improve the development of the robots or their algorithms. In this way, the "burden of care" is reduced and more time for the social care of older people is available. Therefore, it is important that caregivers learn to embrace change to hopefully better their working conditions. This includes being non-judgemental and open-minded for new things - which is valid in general but, in this case, concerns AI & robots specifically. Innovation concerning AI and robots won't happen without caregivers who have the willingness to cooperate with assistive robots and their respective developers. By appreciating the progress research is making in this field, they lay a foundation for gaining competence and maybe even excellence, which will benefit their future work life.

Aims

The purpose of this tool is to give a rough overview of Artificial Intelligence and to highlight the rationales, reasons, and needs of the use of AI and robots in health and social care. It explores the help provided not only to the patients/clients but also to the providers/professionals and carers.

Learning outcomes

At the end of this training, the participants will:

- Know and understand what AI means and might be capable of
- Define and judge the potential usefulness of socially assistive robots for patients, informal carers, and professional carers

Relevant definitions and terms

Artificial Intelligence. The term Artificial Intelligence (AI) has more than one definition, and no single universal definition has been approved, making understanding AI more complicated.

The English Oxford Living Dictionary (n.d) defines AI as 'The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.'

The term has been argued to originate from John McCarthy. He defined it as "the science and engineering of making intelligent machines" in 1956 at the Dartmouth Artificial Intelligence conference that gave birth to the field of AI. McCarthy also offered an updated definition for the term: "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 biologically observable methods" (McCarthy, 2007; p2).

In 1980, Searle differentiated between weak AI and strong AI (Searle, 1980). IBM describes weak or narrow AI as AI focussing on specific autonomous driving tasks, giving recommendations (Apple's Siri), etc. Strong AI, however, would either equal human intelligence or even supersede it – which still is pure Science Fiction (IBM 2020)

Other AI definitions have also been proposed. For example, Holzinger et al (2019) write that AI is "perhaps the oldest field of computer science and very broad, dealing with all aspects of mimicking cognitive functions for real-world problem solving and building systems that learn and think like people." Although many AI definitions exist, the main themes are often related to intelligence, computer science, engineering, and problem-solving.

Robot. Giving an exact definition to the term 'robot' is difficult. According to the Cambridge English Dictionary (n.d), a robot is a machine controlled by a computer that is used to perform jobs automatically. Although 'performing jobs automatically' is a key element in robotics, that element also exists in other simpler machines (i.e, dishwasher), which can make distinguishing robots based only on this criterion difficult - it is also noted that one important factor of robots that often is not mentioned in the definition, is the use of sensors (Ben-Ari and Mondada, 2018). Another definition is offered by the International Organization for Standardization (2012), stating that a robot is an actuated mechanism with a degree of autonomy, moving within its environment, to perform intended tasks.

Robots can be classified using different criteria, for example, based on their application field, environment, and mechanism of interaction (Ben-Ari and Mondada, 2018; Dobra 2014), control systems, size, design, etc. (Dobra, 2014). Whatever their application field and capabilities, robots are typically used for replacing the human component to complete a specific task (Syriopoulou-Delli & Gkiolnta, 2020). The origin of the word robot comes from the Czech word "robota" meaning forced labor (Murphy, 2000).

The concept of "robot" may be visualized differently in different cultures. According to (Haring et al. 2014), "A preliminary study through a Google image search revealed that for all countries, the term robot is mostly associated with humanoid robots, but with a different frequency of occurrence. Arabic and African countries show a high percentage of robot-related images like comics, toys, and others (e.g. United Arabic Emirates 58%, Egypt 70%) whereas countries associated as technological highly developed countries like the US, Japan or Germany not only show more "real" robots (Japan and US 71% humanoid robots) but also a wider diversity of robots. Robots that look almost exactly like human beings are mainly particular for Japan, although they exist and are also developed in other countries."

Socially assistive robot (SAR). The combination of Assistive Robots and Social Robots is called a Socially Assistive Robot (SAR). SAR is a type of robot whose primary goal is to create close and effective interaction with a human user for the purpose of providing company, fostering independent living, giving assistance, and achieving measurable progress in convalescence, rehabilitation, learning, etc. alongside or instead of physical aid (Winkle et al., 2020).

SARs share with Assistive Robots the goal to provide assistance to human users but put the emphasis on assistance through social interaction.

SARs are complex types of robots since they need to mimic human behaviour as much as possible to create the image of a personality and human-like interaction. These two objectives allow the platform to generate empathy with the users and develop more efficient communication with them. Also, by adequately reacting not only to the person but the environment as well, the robot may be capable of performing multiple tasks.

What the research says

- **Pollmann, K., 2019. Behavioral Design Patterns for Social, Assistive Robots - Insights from the NIKA Research Project.** This German research project asks the question of how SARs should be designed to be accepted by the different stakeholders. Design suggestions for recurring interaction situations are developed to develop guidelines for Human-Robot Interaction regarding SARs of any appearance (human-like, animal-like, abstract, etc.). Available here.
- **Liu, B., 2021. "Weak AI" is Likely to Never Become "Strong AI", So What is its Greatest Value for us?** The authors discuss the controversies about how much AI has or has not advanced in the last decade and mainly explain that by the different definitions of AI, namely, weak vs. strong AI. They point out that applications in the sector of "weak AI" (e.g., playing games such as chess or Go, creating text, etc.) have improved very much in the last years. Available here.

- **Łukasik, S., Tobis, S., Kropińska, S., Suwalska, A. (2020) Role of Assistive Robots in the Care of Older People: Survey Study Among Medical and Nursing Students** The participants of this study believed that assistive robots should remind older people to take medication regularly, ensure their safety, monitor their health status and environment, provide cognitive training, and encourage them to maintain physical activity. Nursing students had significantly higher scores than medical students in several statements concerning everyday use of robots, including reminding about meals, monitoring the environment and intake of food, or providing advice about a healthy diet. In addition, nursing students were more focused on the social functions of robots, including encouraging contact with friends, reducing the sense of loneliness, and improving mood. In contrast, medical students were more aware of privacy issues. Available here.
- **Vänni, J.K., Sirpa E. and Salin, E.S. (2019) Attitudes of Professionals Toward the Need for Assistive and Social Robots in the Healthcare Sector.** Both professional care workers and healthcare educators perceived that robots could increase productivity. The results also showed that robots can reduce workers' mental workload and increase the diversity of work. Robots were also considered good devices for activating the patients' motoric and cognitive skills and making them happy. However, even if the attitudes were positive and people were not afraid that robots may take over workplaces, the ecosystem of social robotics is still fragmented, and the number of intervention studies among professional care workers is small. Available here.

What do national legislation and international/European treaties and conventions say on the topic?

- **European Commission (2020) on AI in general.** Through this White Paper (available here), the European Commission launches a wide-ranging consultation of civil society, industry, and academia in the Member States, with concrete proposals on a European approach to AI. AI is defined as a strategic technology that offers many benefits to citizens, businesses, and society provided that it is human-centred, ethical, sustainable, and respects fundamental rights and values. The following sections are of particular interest concerning robots and AI:
    - Chapter 1 - Introduction: highlights the necessity of trustworthiness and how Europe's laws and regulations are human centred.
    - Chapter 4 E & F - Private and public sectors: both sectors are the scope of respective actions taken by the commission - increasing a network between AI, data, and robotics and prioritising healthcare.
    - Chapter 5 D & F - Types of Requirements: shows 6 types of requirements which are signs of an "ecosystem of trust" and therefore should be of interest for any usage of AI, especially high-risk ones. Any system which interacts with (fragile) older people has to be classified as "high risk."
- **European Commission (2020) on AI regulation and legislation.** The European Commission is currently working on legal frameworks for AI (available here). The regulation should become applicable for operators in 2024 and define rules based on a risk assessment.
- **Open Letter addressing the EU to work on legal/ethical status of robots.** Several questions regarding liability, legal and ethical problems concerning human-robot interaction are mentioned here and subsequently request the European Union to work on. It shows several perspectives on how a robot can be seen.
- **Secretariat of the Bioethics Commission (2018) "Robots in the Care of Older People - Opinion of the Bioethics Commission."** This document deals with five main questions: which technical developments concern older people, what about control and responsibility of the robots, what happens to the personal data gathered by robots, who is their "social" behaviour modelled after, and how are activities and interfaces designed.

- **Future Advocacy and Welcome Trust (2018). Ethical, social and political challenges of artificial intelligence in health.** This report describes many used cases and settings and outlines several ethical, social, and political challenges associated with AI use. Key themes are consent, fairness, and rights.

PRACTICAL COMPONENT

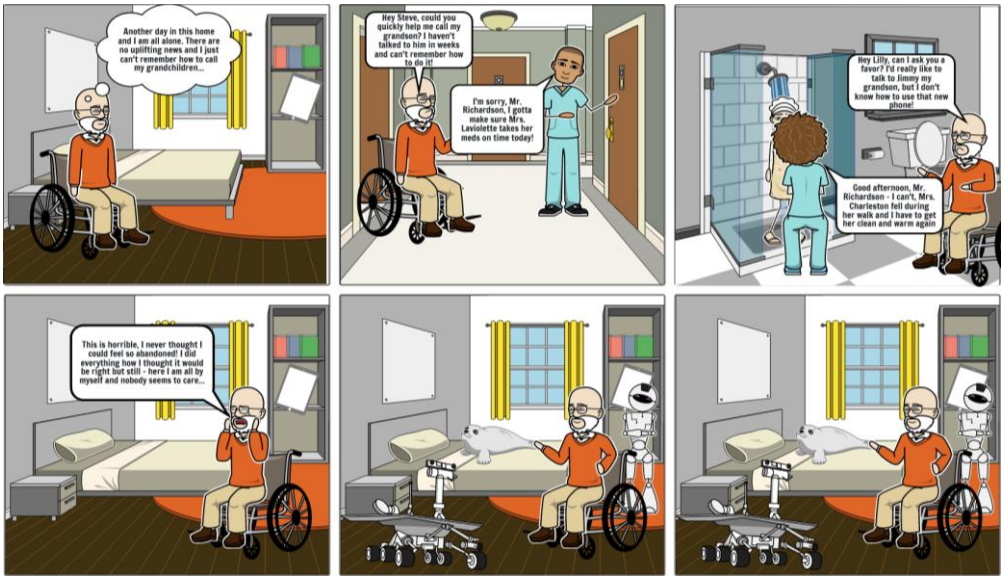
Learning Activities

Activity 1: SARs and the Growing Healthcare problem – video and discussion

- Please watch the YouTube-video by Maja Mataric, which gives a 9-minute introduction to the topic. Another more personal input is the article by Katie Engelhart. After watching the video and - if you like - reading the article, you should reflect and discuss online with other students any controversial points you see. Apart from your own ideas on the topic, especially take into consideration:
  - Would you want SARs for your (grand)parents? How about yourself?
  - Where would you "draw the line"? What should they be used for, what should be forbidden?
  - Comparing Paro to a therapeutic dog – are they equally viable?
- Resources needed: TEDxUSC - Maja Mataric: Socially Assistive Robots and the Growing Healthcare Problem (9:05 minutes); 'What Robots Can—and Can't—Do for the Old and Lonely'; social platform for collaborative learning.
- Duration of activity:
  - watching and reading: 10 minutes each;
  - discussion: 15 minutes, depending on the development of the discussion.

Activity 2: Artificial Intelligence – how can it be useful for robots?

- The comic shows a typically busy day at a care home. Focus is on a resident who feels sad because he/she is missing their grandchild and is asking if a staff member could help them make a call. Unfortunately, one of the staff members is currently doing drug rounds and cannot help the resident now. The other staff members provide personal care to other patients/clients and are also occupied.



- Open the comic at this address and click "Copy" to duplicate the template for your own edit. Read the first four panels and change the story for the better in the bottom two panels, using either the humanoid robot, the seal (representing Paro), or the mars rover (representing a care robot) and what

you learned in this unit. In the end, Mr. Robinson should not feel lonely anymore! Upload the result as a screenshot or PDF on the learning platform.

- Resources needed: StoryboardThat, online software for creating comics (2 tries per week as a free user); social platform for collaborative learning.
- Duration of activity:
    - Reading the comic: 2 minutes;
    - Creating 3 panels yourself: 15 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Card Sorting

- Instructions: Go to this website. There are 30 words in the area on the left and the possibility of creating groups/categories in the right area. Create groups and find names for them where you can assign multiple words and continue doing so until no words are left without a group.
- Summary/Background info: Card Sorting is usually used to create user-friendly interfaces – however, it poses an interesting tool to test a group of people. The results show clusters of previously created cards. If all participants correctly understood the learning activities, the clusters should align.
- Resources needed: kardSort website.
- Duration of activity: 10 minutes.

EVALUATION COMPONENT

Participants to evaluation

The online evaluation questionnaire of each Learning unit is completed by the MOOC participants (students and student/facilitators) on Survey Monkey.

What to evaluate

The Learning Unit's evaluation criteria are: coverage of the identified learning needs, innovation, quality of the content and training materials, intuitive and friendly presentation, relevance of learning activities, and efficiency for achieving established learning outputs.

Please, complete this online evaluation of the learning unit by clicking on this link:

https://www.surveymonkey.com/r/LYQDHCQ