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Preparing health and social care workers to work with socially assistive artificially intelligent robots in health and social care environments

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Learning Tools

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Introduction to the report

This document is part of the Intellectual Output (IO) 3 of the project “Preparing health and social care workers to work with socially assistive artificially intelligent robots in health and social care environments” - IENE10.

The overall aim of IENE 10 is to develop a European Transcultural Robotic Nursing (TRN) curriculum model and learning materials suitable for training health and social care workers and educators, not only within the partnership of this project but also internationally.

This document reports about the development of the 16 Learning Units (LU) that represent a key output of the IENE-10 project, divided into the four IENE-10 curriculum modules:

- MODULE 1 - TRN AWARENESS
- MODULE 2 – TRN KNOWLEDGE
- MODULE 3 – TRN SENSITIVITY
- MODULE 4 – TRN COMPETENCE

The LUs described in this document will be uploaded to the MOOC platform, possibly after revisions to their content to make them suitable for online publication, and tested with MOOC participants in the subsequent months of the project. Please notice that some learning tools proposed in the following LUs require online resources (e.g., quizzes, chatbots, online games) whereas other learning tools are based on the use of paper and pen. When publishing LUs to the MOOC platform, IENE-10 partners will look for solutions that maximize the use of online resources, and therefore some solutions proposed in the current documents may be re-considered. Also, throughout the document we refer to a “social platform for collaborative learning”: as you will see, some LUs require participants to post their considerations and comments on such platform, and possibly discuss them with other participants. A final decision about the platform to be used for such a purpose has not been taken yet and will require a deeper investigation to choose a platform free of charge that ensures both ease of use and versatility.

The report begins with the instructions shared with all contributing partners for creating the Learning Units, including a Word template, and it is followed by the presentation of the 16 Learning Units divided into the four IENE-10 modules.

The development of LUs and learning tools therein has been informed by

- Intellectual Output 1.2, Transcultural Robotics Nursing (TRN) Curriculum Model
- Intellectual Output 2.2 Transcultural Robotics Nursing (TRN) Modules.

In particular, the methodology for developing learning tools, and grouping them into LUs and modules, have been discussed in detail in IO2.2, which we suggest reading before proceeding with the following document.

The key contributors of this Intellectual Output were

- Middlesex University (UK): Irena Papadopoulos, Runa Lazzarino
- Cyprus University of Technology (Cyprus): Christiana Kouta, Elena Nikolaidou, Elena Rousou, Panagiota Ellina
- Edunet Organization (Romania): Victor Dudau
- University of Bedfordshire (UK): Chris Papadopoulos, Deevi-Johanna Voki
- FHV (Austria): Andreas Künz, Andrea Kuckert-Wöstheinrich, Jürgen Bachmann, Tobias Werner
- Università degli Studi Di Genova (Italy): Antonio Sgorbissa, Carmine Tommaso Recchiuto

Each partner produced two or three LUs, which were revised by other partners, and then edited and merged by the coordinator of IO3 (Università degli Studi di Genova), which prepared this final document.

This report will also be available on the project website at www.ieneproject.eu.

The components of a Learning Unit (information provided to contributors)

In Intellectual Output 2.2, learning has been organized into 4 modules, each module divided into 4 topics

- MODULE 1 - TRN AWARENESS
- MODULE 2 – TRN KNOWLEDGE
- MODULE 3 – TRN SENSITIVITY
- MODULE 4 – TRN COMPETENCE

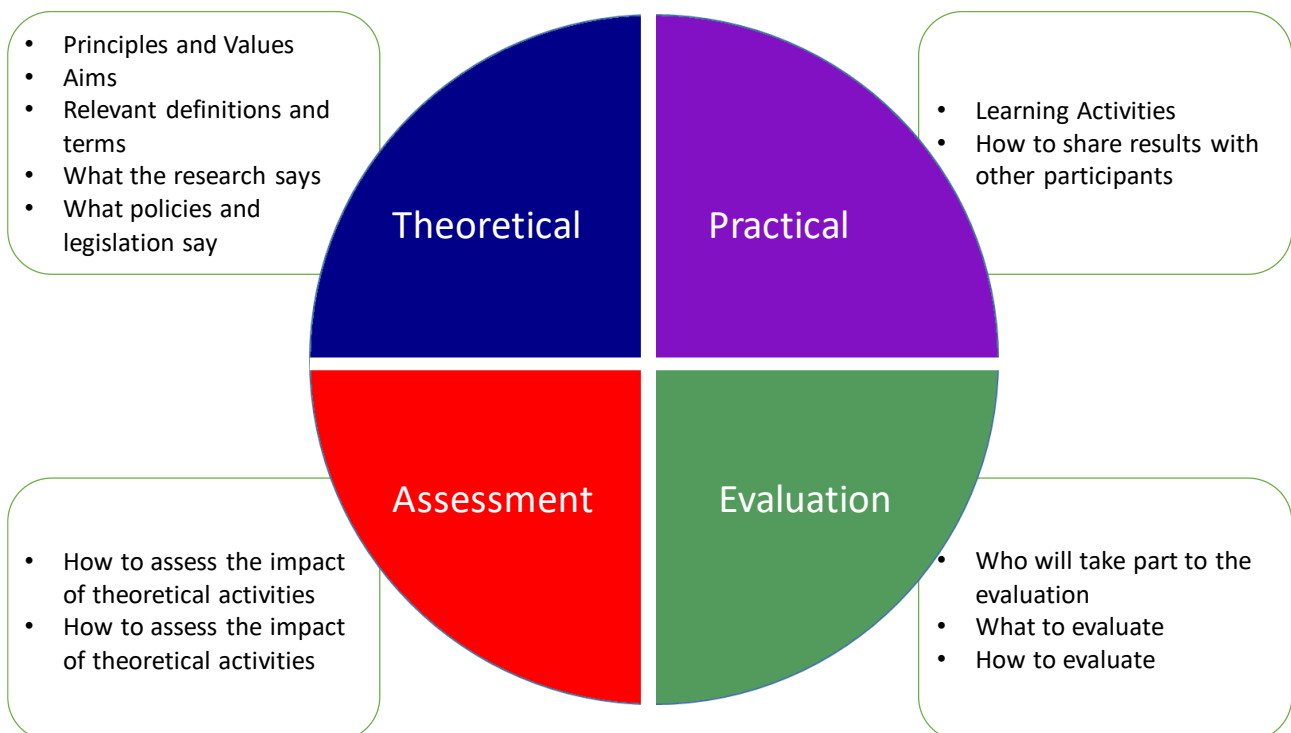
The template on the next page should be filled for any LU: this process will produce 16 filled-in templates to be collected into the 4 modules.

Please, notice that IO2.2 gives some suggestions on the learning/teaching tools associated with each topic. However, these shall be considered as suggestions that partners may revise or completely discard.

The Figure below, inspired by the IENE-3 project, identifies the main components we can use to develop LUs.

These are:

- the theoretical component
- the practical component
- the assessment component
- the evaluation component



Module Template [number and name of the module], topic [number and name of the topic]

[add here authors names, add here partner's name]

THEORETICAL COMPONENT

Principles and Values

Articulate the principles and values relevant to the tool, as well as a brief summary of the activities (1/3 page)

Aims

Describe the overall aim for the tool (1 paragraph)

Learning outcomes

At the end of this training, the participants (add up to six learning outcomes)

- Outcome 1
- Outcome 2
- ...

Relevant definitions and terms

Add relevant definitions and terms (1/2 page).

Please, notice that Topic 1 of Module 1 focuses on learning the relevant definitions and terminology that students shall acquire. However, the definitions and terms added in this section of each learning tool have a different purpose, as they are used to support understanding this document and fill in the IENE glossary.

What the research says

Add at least 6 research references with a brief summary for each and relevant URLs where available.

- Research reference 1
- Research reference 2
- ...

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

Add local, European and/or International references with brief summaries and relevant URLs

- National law 1
- EU Directive 1
- International standard 1
- ...

PRACTICAL COMPONENT

Please remember that this course is all online. We have not decided on the platform to use, but it will most likely be a combination of videoconference lectures, activities that students perform on their own, and collaborative learning using social media (e.g., Facebook groups).

Learning Activities

Provide the summary here. The complete activity description with facilitators instructions and specific materials to be used for the MOOC (e.g., a game-board, a power-point presentation, etc.) will be available on the platform we will use for the course. Later, when the course is finished, we will upload all the materials on the IENE website (which is being upgraded soon) as open access to be used by anyone who wishes to use them.

Activity 1: Name of activity]

- Summary of activity (1-2 paragraphs).
- Resources/material needed (e.g., multimedia material, website, online software or game, etc.)
- Duration of activity

Activity 2: Name of activity]

- Summary of activity (1-2 paragraphs).
- Resources/material needed (e.g., multimedia material, website, online software or game, etc.)
- Duration of activity

ASSESSMENT COMPONENT

In this paper, the term ‘assessment’ refers to those activities used by facilitators and students to confirm what students have learned, demonstrating whether they have achieved the learning outcomes of the tool.

Please refer to IO2.1 & IO2.2 for suggestions of assessments. The assessments may be a small quiz requiring answers or completing sentences or ranking concepts, etc.

Assessment Activities

Activity 1: [Name of assessment activity]

- Summary of activity (1-2 paragraphs).
- Resources/material needed (e.g., multimedia material, website, questionnaire, quiz, etc.)
-

EVALUATION COMPONENT

In this paper, the term ‘evaluation’ refers to the evaluation of the tool used for a specific topic, not the evaluation of students.

We aim to develop generic evaluation form to be submitted online that can be used for all topics/tools. However, please feel free to specify the most important aspects to evaluate in this specific topic, which will help us to prepare the final evaluation form.

Participants to evaluation

Please suggest who should participate in the evaluation and why, e.g., students and/or facilitators (1-2 paragraphs).

What to evaluate

Please clarify what should be evaluated, for example, the quality of the materials used in the tool, the relevance between learning outcomes and the tool's content, the user-friendliness of the tool, etc. (1-2 paragraphs).

Module 1 TRN CULTURAL AWARENESS, Learning Unit 1.1 Definitions, terminology and course orientation

*Chris Papadopoulos, Deevi-Johanna Voki and Antonio Sgorbissa
University of Bedfordshire and Università degli Studi di Genova*

THEORETICAL COMPONENT

Principles and Values

The first topic of this course will be centred around key terms and definitions. Although it might be that you have heard or already know some of the terms mentioned here, we believe it is important to cover the basic terminology to have a common understanding of the key terms used throughout this course. Hopefully, knowing relevant definitions and abbreviations will make working through this curriculum easier and clearer and support your learning. We have listed the main terms, abbreviations, and definitions here that will be relevant for you to understand the topics discussed across the modules. However, as the field of artificial intelligence and robotics continues to expand, this list is not exhaustive, and the terms might be subjected to future revisions as well as new terms might be created in the future. Also, additional terms relevant to specific topics will be explained further in the course. You will also learn that, with some terms, no universal singular definition exists as there is still no consensus. However, we think it is beneficial for your learning and understanding to have an overview of the basic terminology at the beginning of the course. You can always revisit this in case you need to check what a specific abbreviation or term means, as we do not expect you to learn these definitions by heart.

The principles and values that guide this tool include:

- Knowledge
- Accuracy
- Learning
- Effective communication

Aims

The aim of this tool is to introduce relevant definitions, terminology, and abbreviations used in this course and the domain of AI and robotics.

Learning outcomes

At the end of this training, the participants will:

- Gain knowledge related to the relevant key terms, definitions, and abbreviations used in this course and the domain of AI and social robotics

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.

Companion robot. A companion robot is a robot that can have various appearances (for example, a pet, a humanoid), recognize speech and touch, listen, and detect sound. Companion robots are designed to improve physical and psychological well-being, independence, and quality of life by offering companionship and assisting with daily life (Kim et al., 2021).

Culture. All human beings are cultural beings. Culture is the shared way of life of a group of people that includes beliefs, values, ideas, language, communication, norms, and visibly expressed forms such as customs, art, music, clothing, and etiquette. Culture influences individuals’ lifestyles, personal identity, and their relationship with others both within and outside their culture. Cultures are dynamic and ever changing as individuals are influenced by, and influence their culture, by different degrees (Papadopoulos, 2006, p 10).

Cultural awareness. The degree of awareness we have about our own cultural background and cultural identity. This helps us to understand the importance of our cultural heritage and that of others and makes us appreciate the dangers of ethnocentricity. (Papadopoulos, 2006).

Culturally competent compassion. The human quality of understanding the suffering of others and wanting to do something about it using culturally appropriate and acceptable nursing interventions. This takes into consideration both the patients’ and the carers’ cultural backgrounds as well as the context in which care is given (Papadopoulos, 2011).

Cultural Competence. The capacity to provide effective healthcare taking into consideration people’s cultural beliefs, behaviours, and needs. Cultural competence is the synthesis of a lot of knowledge and skills which we acquire during our personal and professional lives and to which we are constantly adding. (Papadopoulos, 2006).

Cultural Knowledge. It derives from a number of disciplines such as anthropology, sociology, psychology, biology, nursing, medicine, and the arts, and can be gained in a number of ways. Meaningful contact with people from different ethnic groups can enhance knowledge around their health beliefs and behaviours as well as raise understanding around the problems they face (Papadopoulos, 2006).

Cultural Sensitivity. Cultural sensitivity entails the crucial development of appropriate interpersonal relationships with our clients. An important element in achieving cultural sensitivity is how professionals view people in their care. Unless clients are considered as true partners, culturally sensitive care is not being achieved (Papadopoulos, 2006).

Health. World Health Organization (2006, p1) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity.” Health also refers to a state of well-being that is culturally defined, valued, and practised and which reflects the ability of individuals (or groups) to perform their daily role activities in culturally expressed, beneficial, and patterned lifeways (Leininger 1991).

Healthcare robot. Healthcare robots are these robots used in the healthcare setting and are designed to support and care for people with health issues including assisting with their daily tasks and boosting their overall health and well-being.

Humanoid robot. A robot which appearance resembles a human and can often carry out tasks like a human ([Ting et al., 2014](#)). Also referred to as an anthropomorphic robot, with a higher emphasis on emulating human structure, sensorimotor and cognitive skills.

Human-Robot Interaction (HRI). HRI is “the science of studying people’s behaviour and attitudes towards robots in relationship to the physical, technological and interactive features of the robots, with the goal to develop robots that facilitate the emergence of human-robot interactions that are at the same time efficient (according to original requirements of their envisaged area of use), but are also acceptable to people, and meet the social and emotional needs of their individual users as well as respecting human values” ([Dautenhahn, 2013](#)). It may also be defined as the exchanges of information and action between humans and robots to perform a task by means of a user interface. For instance, through vocal, visual, and tactile means ([International Organization for Standardization, 2012](#)).

Nursing robots. Nursing robots are the robots that assist nurses and patients in healthcare settings. The International Organization for Standardization ([2012, cited in Frazier, Carter-Templeton, Wyatt and Wu, 2019, p. 290](#)) defines a nursing robot as “systems of mechanical, electrical, and control mechanisms used by trained operators in a professional health care setting that perform tasks in a direct interaction with patients, nurses, doctors, and other health care professionals and which can modify their behaviour based on what they sense in their environment”.

Professional service robot. This term refers to service robots for professional use, used for a commercial task, usually operated by a properly trained operator. For example cleaning robots for public places, delivery robots in offices or hospitals, fire-fighting robots, rehabilitation robots, and surgery robots in hospitals ([International Organization for Standardization, 2012](#)).

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 Arab 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.”

Robotics. Science and practice of designing, manufacturing, and applying robots ([International Organization for Standardization, 2012](#)).

Social Robots. A robot designed to interact with humans, with the ability to explicitly engage on a social and emotional level ([Campa, 2016; p.106](#)): for this reason, it should follow social rules and interact in a socially

acceptable fashion. For example, a robotic butler for humans would have to comply with established rules of good service. It should be anticipating, reliable, and most of all discreet.

A social robot is typically characterized by some (or full) autonomy when communicating and cooperating with humans, eventually making decisions. Social robots usually have a human-like appearance or at least some typical characteristics of humans: a human-like embodiment may signal to users that the agent affords social interactions, hence usually increasing the robot's acceptability. Zoomorphic and pet-like robots are also considered social robots. They may be used in different fields based on their capabilities: social robots are mainly used as educators for children and assistants for the elderly.

One of the most well-known social robots is Sophia, developed by Hanson Robotics. Sophia is a social humanoid robot that can display more than 50 facial expressions. Other popular social robots are NAO and Pepper by SoftBank Robotics.

Social robots such as NAO, Pepper, Paro, Huggable, Tega, and Pleo have been increasingly used in healthcare settings. Other notable examples of social robots include ASIMO by Honda, Jibo, Moxi, and Kaspar, designed by the University of Hertfordshire to help children with autism learn responses from the robot through games and interactive play have. Individuals with cognitive impairments, such as dementia and Alzheimer's disease, may also benefit from social robots. Because of their supportive element in health care settings, some social robots are labelled as "assistive," giving birth to the term Socially Assistive Robot (SAR).

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

- **European Data Protection Supervisor (2016) Artificial Intelligence, Robotics, Privacy and Data Protection.** This is a background document for the 38th International Conference of Data Protection and Privacy Commissioners in Marrakech. The 4th chapter, 'Background information' (starting on page 18), provides useful information about artificial intelligence prospects and provides different definitions of AI and robotics. It also describes where the term 'robot' originates from. For further reading, please click [here](#).
- **Haidegger, T. et al. (2013) Applied ontologies and standards for service robots. *Robotics and Autonomous Systems* 61, 1215-1223.** This article explores the need to develop robotics ontology and standards, beneficial for both users and manufacturers in relation to service robots. Authors also present in the paper how standards and ontologies can better describe the current complex world for robotic applications. For instance, Haidegger, T. et al. (2013, p1218) note that "Without ontologies, it is very difficult to establish a common vocabulary to represent all the knowledge involved. A lack of these can cause inconsistencies and hide the interaction between the various elements of the system." Full text is available [here](#).
- **Harper, C., Dogramadzi, S., & Tokhi, O. (2009). Developments in vocabulary standardisation for robots and robot devices. In O. Tosun, H. Akin, M. Tokhi, & G. Virk (Eds.), *Mobile Robotics Solutions and Challenges: Proceedings of the Twelfth International Conference on Climbing and Walking Robots and the Support Technologies for Mobile Machines, Istanbul, Turkey, 9-11 September 2009*,**

155-162. World Scientific Proceedings. A group of international robotics experts in 2007 initiated the development of new terms and regulations to modify the current robotics standard, ISO 8373. Although ISO 8373 has now been updated, this paper provides an overview of the progress of the working group and the associated challenges in updating the international robotics vocabulary terms. Full text is available [here](#).

- **Lorenčík, D., Tarhanicova, M. and Sinčák, P. (2013) Influence of Sci-Fi Films on Artificial Intelligence and Vice-Versa. 2013 IEEE 11th International Symposium on Applied Machine Intelligence and Informatics (SAMII).** This paper introduces plots about selected sci-fi movies and describes the technology used in the films concerning robotics and AI. Authors then compare the technology from the films to the technology in use or subject of research in real life and discuss the contribution of sci-fi movies for AI and robotics. Full text is available [here](#).
- **Nocks, L. (2017) 500 years of humanoid robots automata have been around longer than you think. IEEE Spectrum Volume 54 Issue 2017 pp 18–19.** Nocks discusses in a short article how the dream of humanoid robots dates back more in time than we could think of. The author also briefly talks about an exhibition about robots that was touring in the United Kingdom until 2019. Full text is available [here](#).
- **Bartneck, C. (2004) From Fiction to Science - A cultural reflection on social robots, CHI2004 Workshop on Shaping Human-Robot Interaction, Vienna.** This paper explores the culture of human-robot interaction concepts in science fiction, including some of the most famous work related to robots and AI filmed before 2004. Bartneck (2004) concludes that concepts about human-robot interaction that have been popularised by fiction can strongly influence people's feelings about the unknown. Full text is available [here](#).

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

- **The International Organization for Standardization (ISO)** is a global federation of national standards bodies. The ISO has developed the following standard named **ISO 8373:2012 Robots and robotic devices — Vocabulary**, which provides definitions and explanations of the most common terms in relation to robots and robotic devices operating in industrial and non-industrial environments. Accessible [here](#) (available in English and French)
- **The European Commission** has published a document, 'A Definition of AI: Main Capabilities and Disciplines', developed by the Independent High-Level Expert Group on Artificial Intelligence set up by the European Commission in 2018. The authors of this document expand the definition of AI by clarifying certain terms and propose an updated definition of AI (see above). Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Watch a video and explain terms

- After reading through the provided information about terms and definitions and navigating through the 'what research says' and 'what international/... treaties say' chapters, watch the following video from HARDWired by clicking [here](#) (3min. 53 sec.)
- Now visit the following [webpage](#). On the right-hand side, you can see two play buttons. Press play, and listen to how two roboticists discuss what the term "robot" means to them (audio length: 2minutes 20 seconds).

- Considering all your learning and knowledge, provide a solution to this situation: imagine you meet a person from the past who has no idea about modern-day technologies. You are asked to explain to them the terms ‘robot’ and ‘artificial intelligence.’ In your own words (max 200 words), write how you would explain these terms and post your answer on the discussion board of the social platform for collaborative learning.
- Read answers from other participants, choose the one you like the best, and leave a comment.
- Resources needed: online [video](#); [webpage](#); Word or other software for writing; social platform for collaborative learning.
- Duration of activity: 15min.

Activity 2: Reflection

- Taking into account all your learning during this topic, reflect on the following questions and post your opinion on the discussion board of the social platform for collaborative learning:
 - Can you name three terms about which you learned or gained more knowledge?
 - Why do you think it important to know the terms and definitions when learning something new?
 - Do you have any terms or abbreviations connected to AI and robotics that have not been mentioned in this tool but you wished to know about? If yes, could you name them?
- Resources needed: social platform for collaborative learning.
- Duration of activity: 10 min.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: match words with definitions.

- Match the word with the right definition (write the right number in the empty column).

1	Healthcare robot	5	A robot whose target is to create close and effective interaction with a human user for the purpose of giving assistance and achieving measurable progress
2	Nursing robot	4	A robot that communicates and interacts with humans on an emotional level
3	AI	2	Performing tasks in direct interaction with patients, nurses, doctors, and other health care professionals
4	Social robot	1	A robot used in the healthcare setting is designed to support and care for people with health issues, including assisting with their daily tasks and boosting their overall health and well-being.
5	Socially assistive robot (SAR)	3	The science of dealing with all aspects of mimicking cognitive functions for real-world problem solving

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/L9LLL9V>

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

Andreas Künz and Tobias Werner, FHV

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 Arab 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

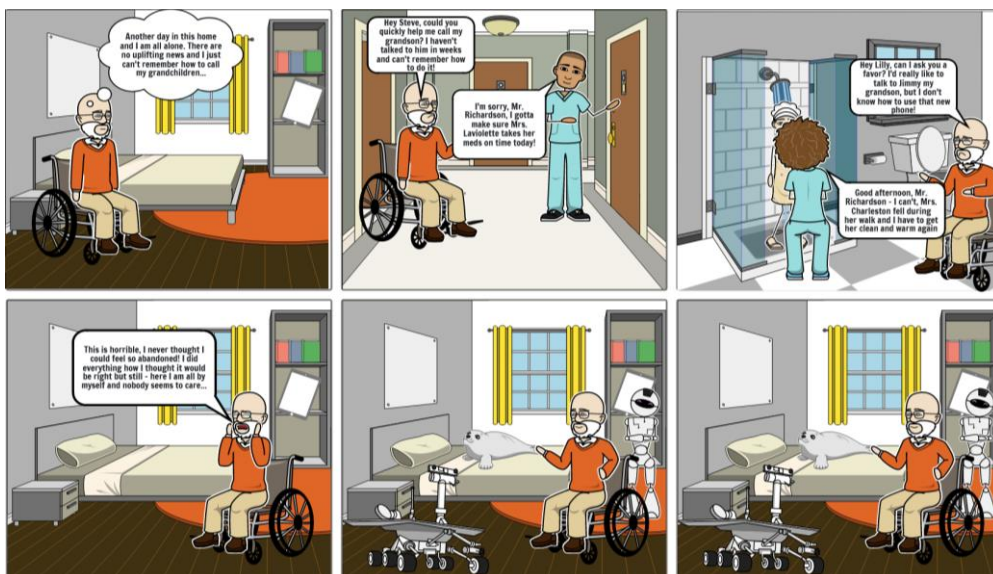
Learning Activities

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>

Module 1 TRN CULTURAL AWARENESS, Learning Unit 1.3 Misconceptions and stereotypes about robots

Andrea Kuckert-Wöstheinrich and Andreas Künz, FHV

THEORETICAL COMPONENT

Principles and Values

Stereotyping is an important tool to reduce mental load significantly. However, they can lead to wrong assumptions and misconceptions. That might be especially true regarding things we don't know well or are afraid of. For example, typical misconceptions regarding Socially Assistive Robots include the inability of the robot to provide emotional support, a possible replacement of health personnel, etc. Therefore, it is very important to reflect on your own stereotypes and keep the following values in mind:

- Acceptance
- Being non-judgemental
- Encouragement
- Flexibility
- Innovation
- Learning
- Open-mindedness

Aims

This tool aims to develop the understanding of misconceptions and stereotypes that exist regarding the use of SARs in caring for patients/clients.

Learning outcomes

At the end of this training, the participants

- Define what are SARs, misconceptions, and stereotypes
- Identify the main misconceptions and stereotypes about SARs providing care to the patient/client
- Identify the main misconceptions and stereotypes about SARs being deployed in health and social care settings
- Discuss ways to overcome these misconceptions and stereotypes towards SARs's caring for patients/clients
- Reflect on own previous professional or personal practice/behaviour and how to integrate SARs in the own professional way of caring

Relevant definitions and terms

Humanoid robot. A robot which appearance resembles a human and can often carry out tasks like a human ([Ting et al., 2014](#)). Also referred to as an anthropomorphic robot, with a higher emphasis on emulating human structure, sensorimotor and cognitive skills.

Misconception: According to the Merriam Webster dictionary a misconception is a view or opinion that is incorrect because it is based on faulty thinking or understanding ([definition of misconception, n.d.](#)). As an example, you can think of the fortune cookies you often get in a Chinese restaurant. Many people believe they belong to the Chinese cuisine, but you will only rarely find them in China. They are most likely invented by Japanese immigrants in the US ([Jing & Yoshitaka, 2008](#)).

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 Arab 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.

Stereotype. The term stereotype comes from the Greek words “στερεός” (stereos), “firm, solid” and “τύπος” (typos), “impression” or “a model” ([Schneider, 2004](#)). A stereotype is often defined as a generalization about a group of individuals ([Kanahara, 2006](#)). We could start a discussion about using the term “stereotypes” in the context of robots even knowing that robots are not humans. But leaving this aside, it can be said that stereotypes create a misconception of how people/ robots are and how those individuals are in their social lives.

What the research says

- **Chuan, C., Cindy, J., Wend, M. (2020) Health Professional and Workers Attitudes Towards the Use of Social Robots for Older Adults in Long-Term Care. *International Journal of Social Robotics*. 12, 1135–1147.** Most health personnel had positive attitudes towards using social robots in long-term care facilities as they viewed social robots as beneficial and practical in psychosocial care for older adults. Positive attitudes towards using social robots can increase the acceptance of social robots. This study strives to support nursing work by providing insights into health personnel’s perceptions of social robots, to integrate social robots into the care and lives of older adults. Available [here](#).
- **Papadopoulos, I., Koulouglioti, C., Lazzarino, R., Ali, S. (2019) Enablers and barriers to the implementation of socially assistive humanoid robots in health and social care: a systematic**

review. *BMJ Open*. **10** (1). The enablers found were enjoyment, usability, personalisation, and familiarisation. Barriers were previous experience with technology and views of formal and informal carers related to technical problems, the robot's limited capabilities, and the negative preconceptions towards using robots in healthcare. Factors that produced mixed results were the robot's human-like attributes, limited capabilities, and the negative preconceptions towards the use of robots in healthcare. Available [here](#).

- **Tuisku, O., Pekkarinen, S., Hennala, L. and Melkas, H. (2019) "Robots do not replace a nurse with a beating heart" The publicity around a robotic innovation in elderly care. *Information Technology & People*. **32** (1), 47-67.** The results show that public opinion is mainly negative but that the commentators apparently have little information about the robot and its tasks. On the other hand, the personnel had more positive views; they saw it as a recreational tool, not a replacement for their own roles. 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. In: Korn, O. (eds.) *Social Robots: Technological, Societal and Ethical Aspects of Human-Robot Interaction*, Springer, pp. 205-236.** 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' motor and cognitive skills and making them happy. 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](#) (abstract only)
- **C. Bartneck, T. Kanda, O. Mubin, and A. Al Mahmud (2009). Does the design of a robot influence its animacy and perceived intelligence? *International Journal of Social Robotics*, **1**(2):195–204.** Research has found that perceptions of animacy and intelligence are closely related and simply making a robot more human-like in its appearance and behaviour increases perceptions of intelligence. Available [here](#).
- **Stylianou, N., Nurse, T., Fletcher, G., Fewster, A., Bangay, R., Walton, J. (2015) Will a robot take your job? *BBC News*.** Researchers at Oxford University have come up with a calculation to determine how realistic it will be that a specific job is done by a robot. This calculation is based on nine key skills necessary for each job. The website allows one to search for any job and determine the likelihood that a person performing that profession is replaced by a robot. Available [here](#).

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

- **Cabral, T.S., 2018. Robotics and AI in the European Union: opportunities and challenges. *UNIO – EU Law Journal* **4**, 135–146.** This article describes robotics and AI in the European Union in general, but it also discusses and mentions typical stereotypes like "robots will replace humans." It highlights how important it is for the EU to balance debunking the prevalent fear of robots and taking precautions of possible dangers based on Artificial Intelligence. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Put misconceptions in order based on your own beliefs.

- The more people know, the less they are afraid of new things. Please read the statements on the following [webpage](#) and put them into order. The one you are highly believing in on top, the one you

don't think is true at the end. Please upload the screenshot on our social platform for collaborative learning. It might be very interesting to come back to your screenshot after the whole study programme and see what has changed.

- Resources needed: [Drag'n'survey](#), a tool for creating online surveys; social platform for collaborative learning.
- Duration of activity: 3 minutes.

Activity 2: Therapeutic robots

- Therapeutic robots, e.g., robotic pets like PARO have shown a lot of positive effects in different research trials ([Kelly et. al 2021](#), [Wada & Shibata 2007](#), [Wada et al. 2010](#), etc.). However, some differences, misconceptions, and open (sometimes ethical) questions concerning PARO and similar robots might still exist.

Watch a video about how robotic pets help dementia patients (available [here](#)). Then, write your answers down, upload them and keep them aside. After you have finished the whole IENE course, read again through your reflections report. Did anything change?

- What are your ideas about using robots in healthcare? Does this lead to worse outcomes because the human element of care is left out?
- How have the robotic pets been used in the nursing home?
- How did people react to the robotic pets?
- Which feelings did the senior nurse have when introducing the robotic pets?
- How was the process formed concerning offering the robotic pets to the inhabitants?
- Which reactions did the inhabitants show?
- If you now think about your possible misconceptions, e.g., from activity 1, did they change? If yes, why? If not, which other information might you need to get a better picture of the robotic pets?

- Resources: [YouTube video](#); Word or similar software for writing.
- Duration of activity: 4 minutes video, 20 minutes reflection.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Crossword Puzzle

- Try to fill out the crossword puzzle containing terms and sentences concerning SAR misconceptions and stereotypes (available [here](#)). Please upload a screenshot or pdf file of the solved puzzle on the social platform for collaborative learning.
- Resource: [CrosswordLabs](#), a tool for creating online crosswords; social platform for collaborative learning.
- Duration of activity: 20 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/L2BT8R8>

Module 1 TRN CULTURAL AWARENESS, Learning Unit 1.4 Cultural values, attitudes, views about SARs

Andreas Künz, Andrea Kuckert-Wöstheinrich and Jürgen Bachmann, FHV

THEORETICAL COMPONENT

Principles and Values

It is natural for caregivers to accept people as they are and to enter a situation without prejudice. Concerning SARs, caregivers can also be expected to accept them and approach them without prejudice. Carers must be encouraged to deal with the advantages and disadvantages of SARs and learn how to handle and integrate them into everyday care. Therefore, it is very important to keep the following values in mind:

- Acceptance
- Being non-judgemental
- Flexibility
- Innovation
- Learning
- Open-mindedness

Aims

The purpose of this tool is to raise awareness on the different attitudes and values that exist regarding the use of Socially Assistive Robots (SARs) in caring for patients/clients, depending on cultural background.

Learning outcomes

At the end of this training, the participants will:

- Define relevant terms like culture, values, attitudes.
- Identify the different attitudes towards SARs of different cultures, especially regarding Eastern and Western cultures.
- Identify expectations and fears health and social care staff might have regarding SARs.
- Describe the most relevant factors leading to different attitudes regarding SARs in different cultures.

Relevant definitions and terms

Attitudes. According to the [Online Cambridge Dictionary](#): feeling or opinion about something. Professionals *expect* from SARs in regard to the social component that the robots increase the caretakers' satisfaction, well-being, social interaction, and communication and therefore reduce the pressure on the caregivers (z. B. [Liang et al. 2017](#); [Wada et al. 2009](#); [Honekamp et al. 2019](#)). Professionals *fear* that interpersonal contact gets diminished ([Bendel 2018](#), p.240), the daily routine gets disturbed, they could be replaced by robots ([Tuisku et al. 2018](#)).

Culture. All human beings are cultural beings. Culture is the shared way of life of a group of people that includes beliefs, values, ideas, language, communication, norms, and visibly expressed forms such as customs, art, music, clothing, and etiquette. Culture influences individuals' lifestyles, personal identity, and their relationship with others both within and outside their culture. Cultures are dynamic and ever changing as individuals are influenced by, and influence their culture, by different degrees ([Papadopoulos, 2006, p 10](#)).

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 Arab 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.”

Values. According to The [Online Cambridge Dictionary](#), the beliefs people have, especially about what is right and wrong and what is most important in life, that control their behaviour.

What the research says

- **Haring, K. et al. (2014) ‘Cultural Differences in Perception and Attitude towards Robots’, *International Journal of Affective Engineering*, 13, pp. 149–157.** Japanese and Europeans have different views on the application areas of robots. In Japan, people are open to more social or human activities like entertainment, massaging, etc. However, regardless of cultural background, Eastern and Western cultures seem to see robots mainly for household support. Both cultures agree that robots should look more like machines and less like humans. However, as a Google image search showed, humanoid robots are still quite common in Japan. Available [here](#).
- **Chen, SC., Jones, C. & Moyle, W. (2020) ‘Health Professional and Workers Attitudes Towards the Use of Social Robots for Older Adults in Long-Term Care’, *International Journal of Social Robotics*, 12, pp. 1135–1147.** Most health personnel had positive attitudes towards using social robots in long-term care facilities as they viewed social robots as beneficial and practical in psychosocial care for older adults. Positive attitudes towards using social robots can increase the acceptance and utilisation of social robots. This study strives to support nursing work by providing insights into health personnel’s perceptions of social robots to integrate social robots into the care and lives of older adults. Available [here](#).
- **Papadopoulos, I. and Koulouglioti, C. (2018) ‘The Influence of Culture on Attitudes Towards Humanoid and Animal-like Robots: An Integrative Review’, *Journal of Nursing Scholarship*, 50(6), pp. 653–665.** This integrative review aimed to explore the influence of culture on attitudes towards humanoid and animal-like robots. The study found that culture seems to influence attitudes and behaviour towards robots and preference about the robot’s appearance, expression of emotion, and communication style. Available [here](#).
- **Schutte, M. (2019) *Socially assistive robots in the elderly care : The attitudes of healthcare professionals towards the use of socially assistive robots.* University of Twente.** This study aims to examine the attitudes of the different professionals in the elderly care organisation towards the use

of socially assistive robots and the determinants that influenced these attitudes. Results say that the respondents' attitudes can be divided into respondents with a positive and open attitude and respondents with a wait-and-see attitude. The determinants that seemed to positively affect the attitudes were compatibility, complexity, knowledge, self-efficacy, awareness of innovation content, client cooperation, relevance for the client, and social support. The determinants with a twofold effect were observability, personal benefits/drawbacks, and time available. This study did not find an answer on differences between professions, but it found that respondents with a coordinating or facilitating role had more positive attitudes than their colleagues. The moderators that seemed to influence the relation between the determinants and attitude are the gender and level of education. Available [here](#).

- **Honekamp I., Sauer L., Wache T., Honekamp W. (2019) 'Akzeptanz von Pflegerobotern im Krankenhaus: Eine quantitative Studie', *Journal for Technology Assessment in Theory and Practice*, 28(2), pp. 58-63.** In this study 120 senior citizens who lived in an assisted living facility were interviewed about their attitude towards nursing robots. It was shown that these people do not reject the usage of nursing robots in hospitals in principle. The acceptance and scepticism depends strongly on the scenario, where robots were used. Available [here](#).
- **Tuisku O., Pekkarinen S., Hennala L., Melkas H. (2018) 'Robots do not replace a nurse with a beating heart: The publicity around a robotic innovation in elderly care', *Information Technology & People* 32(1):47-67.** In this study was shown, that the public opinion is mainly negative, but there is little information about the robot and its tasks. The views of the staff were more positive. The robot was seen as a recreational tool, not as a replacement. Available [here](#).

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

- **European Commission: Whitepaper on AI.** The European Commission claims regarding AI, that “the infrastructures should support the creation of European data pools enabling trustworthy AI, e.g. AI based on European values and rules.” “The EU will continue to cooperate with like-minded countries, but also with global players, on AI, based on an approach based on EU rules and values.” “The use of AI can affect the values on which the EU is founded and lead to breaches of fundamental rights, including the rights to freedom of expression, freedom of assembly, human dignity, nondiscrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation, as applicable in certain domains, protection of personal data and private life, or the right to an effective judicial remedy and a fair trial, as well as consumer protection. These risks might result from flaws in the overall design of AI systems (including as regards human oversight) or from the use of data without correcting possible bias (e.g. the system is trained using only or mainly data from men leading to suboptimal results in relation to women).” Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Culture shock in the robot age

- Please read the article by Emily Cross about how cultural background and attitudes influence social interactions and acceptance towards robots (available [here](#)).
- Share your thoughts on the social platform for collaborative learning. Please discuss the term “culture” in general and the common phenomenon of multicultural identities (due to migration, etc.). Try to summarise and come up with additional reasons why Western and Eastern countries have quite different attitudes towards robots.
- Resources needed: Online [article](#); social platform for collaborative learning.

- Duration of activity: 15 minutes for reading and reflecting, 10 minutes for discussing.

Activity 2: Write a short reflective text (about 250 words)

- Please describe factors influencing health care professionals' views and attitudes towards SARS being used in care settings. Elaborate on the most relevant factor (in your opinion): why and how does it influence professionals. How does the factor influence people from different countries/cultures differently (if at all)? Upload the document on the social platform for collaborative learning.
- Select one text written by a fellow student and review this. Don't judge the paper but please share your point of view on the text based on concrete arguments.
- Resources needed: Word or similar software for writing; social platform for collaborative learning.
- Duration: 20 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Quiz

- Go to the following [address](#) and play the short quiz.
- Resources needed: [TryInteract](#), a tool for online Quizzes.
- Duration: 3 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/LCTGPP2>

Module 2- TRN CULTURAL KNOWLEDGE, Learning Unit 2.1 Types and Uses of SARs in Health and Social Care

Christiana Kouta, Elena Nikolaidou, Elena Rousou, Panagiota Ellina, Cyprus University of Technology

THEORETICAL COMPONENT

[Papadopoulos et al, 2019](#) support that socially assistive humanoid robots are considered a promising technology to tackle the challenges in health and social care posed by the growth of the ageing population, and they provide a major opportunity towards meeting some of the care needs of older adults. Social Assistive Robots (SARs) are designed and developed for use in the hospital and at home to offer patients physical, cognitive and social exercise, guidance, and monitoring. Affordable technologies of SARs can provide patients with monitoring and motivation systems for use at home, which positively affect the prevention of chronic diseases and the reintegration of patients with long-term health problems. Furthermore, SARs can offer a new dimension to the care of older people, preventing their institutionalization, delaying the onset of dementia (constantly offering new stimuli), and providing companionship by combating social isolation and depression ([Tsoulfaidou, 2019](#)).

The principles and values that guide this tool include:

- Ensuring patient dignity
- Helping
- Innovation
- Kindness
- Caring

Aims

This learning unit aims to develop your understanding of the different types of robots that can be used in health and social care in different settings and/or at home.

Learning outcomes

At the end of this training, the participants will:

- Classify the different types of SARs depending on their functionality and are used in health and social care settings
- Identify the various uses of SARs in health and social care settings

Relevant definitions and terms

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](#)).

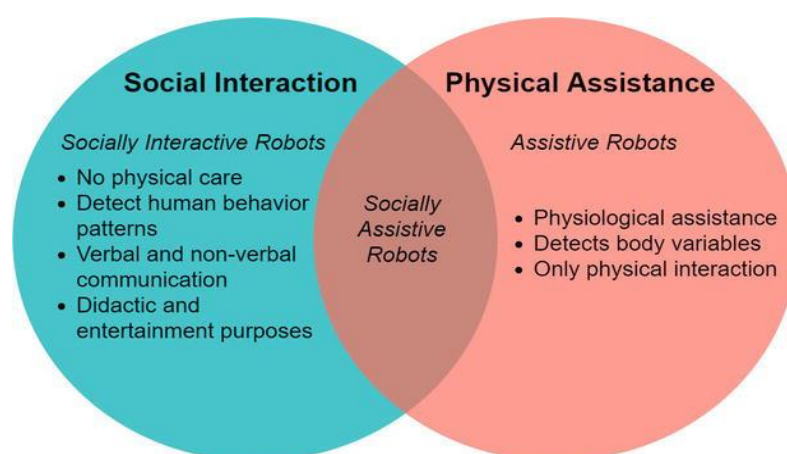
The concept of “robot” may be visualized differently in different cultures. According to ([Haring et al. 2014](#)), “A preliminary study through a Google image search revealed that for all countries, the term robot is mostly associated with humanoid robots, but with a different frequency of occurrence. Arabic and African countries show a high percentage of robot-related images like comics, toys, and others (e.g. United Arab 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.”

Assistive robotics. Assistive robotics refers to the robots which assist people with physical disabilities through physical interaction. Research in the field of assistive robotics comprises rehabilitation robots, wheelchair robots, companion robots, manipulator arms for the physically disabled ([Shah, 2017](#)). Its functionality is based only on giving physiological assistance to a patient that presents a physical disability or is recovering from a surgical operation. This type of robot usually presents a carefully designed structure depending on its functionality since they have one single task and the work environment does not vary too often.

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.



The Figure represents Socially Assistive Robots at the intersection between Social Interaction and Physical Assistance ([Lopez-Caudana, 2020](#)).

What the research says

- **Papdopoulos, I. et al. (2020). A systematic review of socially assistive robots in pre-tertiary education. Computers & Education, 155, 1-20.** The article performs a systematic literature review to

examine the use of SARs in the pre-tertiary classroom teaching of mathematics and science to identify the benefits and disadvantages of such technology. The findings showed that using SARs in pre-tertiary education is promising, but studies focussing on mathematics and science are significantly under-represented. Further evidence is also required around SARs' specific contributions to learning as well as enabling/impeding factors, such as SAR's personalisation and appearance or the role of families and ethical considerations. Available [here](#).

- **Maalouf, N., Sidaoui, A., Elhadj, I. and Asmar, D., (2018). *Robotics in Nursing: A Scoping Review. Journal of Nursing Scholarship, 50(6), pp.590-600.*** The past decade has witnessed significant growth in the use of robots in nursing, especially in countries like Japan. A scoping review is presented in this document, identifying the many different applications of robotics in nursing. A total of 1,758 articles were retrieved, from which 69 articles were included in the final review. The analysis of the chosen papers led to the categorization of robots into two main categories: assistive robots and socially assistive robots. Whereas assistive robots are used for physical care, including service and monitoring tasks, socially assistive robots focus on the cognitive and emotional well-being of patients in need of companionship. After a detailed review of the state of the art, an insight into the future of robotics in this field is provided. The recommendations include the need to intensify research on human-robot interaction, a greater focus on monitoring robots, and analysis of the psychological barriers that need to be surmounted to achieve more tolerance and acceptance of robots. Available [here](#).
- **Pampaliari, S. (2018). *Socially Assistive Robots for the social and emotional support of children with chronic diseases. The University of Macedonia.*** This is a Greek study that examined the interaction of the robot NAO with children suffering from cancer or leukemia and being hospitalized for a long period. Certain activities were designed to improve children's social skills, to help children manage the disease, and get familiarized with the medical procedures. The participants were 6 children from the pediatric oncology department of the AHEPA University Hospital. Initially, 8 interventions were designed, 4 for the first cycle and 4 for the second. The sessions' purposes were the same in both cycles; however, the roles and the scenarios were changed. Due to some problems during the intervention, only the first cycle was held. The results from children-robot interaction were positive. More specifically, from children's attitudes towards the robot, the identification with the robot, and the children's emotional alteration during the sessions, it seemed that the children had fun, communicated, and expressed their thoughts and feelings. The robot encouraged the child to talk about the disease and its problems and think about managing them. Available [here](#) (Greek only).
- **Nikolaos Fachantidis, Christine K. Syriopoulou-Delli & Maria Zygopoulou (2020). *The effectiveness of socially assistive robotics in children with autism spectrum disorder, International Journal of Developmental Disabilities, 66:2, 113-121.*** The above study was carried out to examine the role of Socially Assistive Robotics (SAR) as an innovative educational tool in developing the social skills of children with autism as they participated in structured and suitably prepared activities. The present study was conducted using a social robot, Daisy, and a human partner to compare the results of the two different interventions. Participants in the study comprised four children with autism who are pupils at elementary school and are assisted by a special support teacher. The study was carried out in a special education center, and sessions were held outside of the regular school timetable. Eight 30-minute sessions, each comprising four activities, were held with each pupil. Results indicate positive outcomes during the interaction with the robot. Specifically, there were more incidences of eye contact, proximity, and verbal interaction during sessions with the robot than during those with the teacher. Additional behaviors such as increased attention and ability to follow instructions improved during interaction with the robot. There was also a noted reduction in fidgeting. Available [here](#).
- **Christine K. Syriopoulou-Delli & Eleni Gkiolnta (2020) *Review of assistive technology in the training of children with autism spectrum disorders, International Journal of Developmental Disabilities.*** This review aims to evaluate assistive technology in training children with Autism Spectrum Disorders (ASD) in social skills. The main objective was to assess the effectiveness of several SARs devices in

developing social skills in children with ASD based on their features and characteristics, as reported in the current literature. Specifically, the authors intended to address the current literature research gap by categorizing these results by the forms of social behavior observed and discussing each one thoroughly and separately, as this hasn't been done in previous reviews. Furthermore, many reviews focus on the effects of assistive technology in enhancing the communication skills of children with autism, without any references to other forms of social skills. Therefore, the attempt was to exhibit whether or not assistive technology effectively reinforces a wide variety of social skills. Available [here](#).

- **Cespedes, N et al. (2021) A Socially Assistive Robot for Long-Term Cardiac Rehabilitation in the Real World. *Frontiers in Neurorobotics*. Vol 15.** This paper presents a real-world, long-term study where a SAR was used to provide patients with motivation and feedback, support CR phase II therapies, and improve adherence. This is the first in-depth clinical study exploring the benefits of using a socially assistive robot for long-term cardiac rehabilitation in adherence and physiological progress. Authors claim that, in contrast to previous studies where authors analyzed patients on a case-by-case basis, this work analyzes the physiological progress through the complete CR programme (36 sessions) for all the patients recruited during the study (in addition to the perceptions of the clinicians that were part of the study for 2.5 years). The findings suggest that the robot increases adherence (by 13.3%) and leads to faster programme completion. In addition, the patients assisted by the robot had more rapid improvement in their recovery heart rate, better physical activity performance, and a greater improvement in cardiovascular functioning, which indicates a successful cardiac rehabilitation programme performance. Moreover, the medical staff and the patients acknowledged that the robot improved the patient's motivation and adherence to the programme, supporting its potential in addressing the major challenges. Available [here](#).
- **Hung, L., Liu, C., Woldum, E. et al. The benefits of and barriers to using a social robot PARO in care settings: a scoping review. *BMC Geriatr* 19, 232 (2019).** Social robots may serve multiple functions: affective therapy, cognitive training, social facilitator, companionship, and physiological therapy. Specifically, the social robot - PARO (a baby harp seal robot) was designed as pet therapy for older people with dementia. PARO has been commercialized and used in care settings for more than a decade in multiple countries. This review aims to map out the empirical evidence on the key benefits of PARO and identify barriers that may impede the adoption of this social robot. The questions guiding this review are: What has been reported in the literature regarding the benefits of PARO in dementia care? What are the barriers to adopting PARO in the care setting? The study concludes that key benefits include reducing negative emotional and behavioral symptoms, improving social engagement, and promoting positive mood and quality of care experience. While the social robot PARO offers technological opportunities in supporting dementia care and managing difficult behavioral symptoms, the adoption of PARO in care settings remains low. Key barriers to the adoption of the technology include cost and workload, infection concerns, stigma, and ethical issues. Available [here](#).

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

- **Oyarzabal, R. (2017). What is a Robot under EU Law. *The National Law Review*. Vol.VII, No 216.** This is an article that briefly and comprehensively describes all the European Commission's initiatives to shape the development of Robots in Europe so far. Furthermore, it outlines the upcoming Legal and Policy Initiatives. One of them is the implementation of safety standards in the health sector. It states that: "The development of medical and assistive technologies is a priority for the Commission, which is increasingly funding research on devices that, for example, promote healthy ageing or help personalize medicines. Both the Parliament and the Commission agree that future medical robots will have to face stringent safety standards. Whilst surgical robots and robotic prostheses are regulated under EU law, care robots (e.g., a robot that takes care of the elderly) may not always be considered a medical device. For example, care robots whose task is to fetch items around the house

would be excluded from the medical device regulation. This uncertainty may in some cases pose a problem. As robots become more common, the Commission plans to address these issues and increase regulatory monitoring for medical and care robots, in the line of the new Medical Devices Regulation". Finally, the article refers to the next steps of the European Commission in the fields of robots. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Socially Assistive Robots

- Watch the video "Socially Assistive Robots" at this [address](#) (4.05 minutes).
- Discuss with other students the functionalities of the SAR. The discussion shall give answers to the following questions:
 - How can the SAR help humans in every aspect of their lives?
 - What are the integrated functions of the SAR in the video?
 - What is the role of a bandit robot?
- Resources needed: online video on [YouTue](#); social platform for collaborative learning.
- Duration of activity: 15 minutes,

Activity 2: opinions of health and social care professionals regarding the use of SARs in the care of older people.

- Write down a small paragraph about your opinion on the use of SARs in the care of older people. In which aspects of care do you think assistance robots would help the care of seniors?
- Share your text on the social platform for collaborative learning.
- Resources needed: Word or similar software for writing; social platform for collaborative learning.
- Duration of activity: 15 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Quiz

- Go to the following [address](#) and play the short quiz.
- Resources needed: [GoCongr](#), a tool for online Questionnaires; social platform for collaborative learning.
- Post your results on the social platform for collaborative learning; social platform for collaborative learning.
- Duration: 3 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/LJCK3DT>

Module 2 TRM Cultural Knowledge, Learning Unit 2.2 Capabilities and the potential 'role' of SARs

Carmine Recchiuto, Antonio Sgorbissa, Università degli studi di Genova

THEORETICAL COMPONENT

Principles and Values

This topic will provide some practical examples of what Socially Assistive Robots can do in the health and social care scenario by highlighting some SAR capabilities and the innovation they can bring to the field. Different SARs can obviously do different things depending on the purpose for which they have been built: some are humanoid, others look like animals; some can talk with people with different accents, others can express themselves through gestures or facial expressions; some are equipped with a tablet to show videos or webpages, others have cameras and may be used to understand if an emergency occurred requiring the intervention of medical staff.

Regardless of the type of robot used, it turns out that some things may be simple for humans (e.g., pick up an object from the floor) but highly complex for a robot: we simply cannot expect a robot to do such things given the current technology. However, these limitations may not be evident to people: people's expectations are often forged by robots that they have seen in the media, in literature, movies, or comics. Therefore, as a professional using SARs for health and social care, you must open your mind to understand what is truly achievable by current technology and communicate it in the right way to your patients what robots can and cannot do. To this end, this learning unit will provide you with the skill to distinguish between the capabilities of "imaginary" robots and "true" robots available today or in the near future, to make you more aware of what we can and cannot expect from Socially Assistive Robots in the health and social care domain.

The principles and values that guide this tool include:

- Communication,
- Innovation,
- Open-mindedness,
- Professionalism,
- Truth.

Aims

This tool aims to make participants aware of the actual capabilities of Socially Assistive Robots. In addition, the tool will clarify the difference between "imaginary" robots depicted in books, movies, and comics (which may forge people's expectations) and "true" robots that are available on the market today or will be available in the near future.

Learning outcomes

At the end of this training, the participants

- will be able to distinguish between what SARs can do today and what they cannot do, given the current technology
- will be aware of SARs functionalities that can play a crucial role in health- and social care
- will be aware of the major problems that still need to be solved to make SARs capable of a full autonomous behaviour

- will be able to recognize the practical solutions that robotic scientists implement to simplify such problems.

Relevant definitions and terms

Perception. Perception, in Artificial Intelligence and Robotics, is a process that provides robots with the capability to sense the environment, interpret and understand what they have sensed, and reason about it. The essential elements of a robotic perception system are: sensors (e.g., cameras for video or microphones for audio); algorithms for sensor data acquisition and processing (e.g., to increase the luminosity in a dark image or to remove environmental noise from recorded audio); algorithms for data merging and interpretation (e.g., to detect objects in a picture or to understand the meaning of a sentence starting from the recorded audio). The last phase is possibly done through machine learning algorithms capable of merging different data to produce knowledge about the environment.

Sensors. Sensors are physical devices capable of measuring and recording a physical quantity as it evolves with time. Some examples of commonly used sensors in robotics are: cameras (to capture images or videos); RGB-D or stereo cameras (to acquire 3D information about the surrounding environment); microphones (to capture audio); ultrasound sensors (to measure the distance from the closest obstacles); laser rangefinders (to measure the distance from obstacles with a higher resolution, usually to build a map of the environment); touch sensors (to detect collisions or allow people to physically interact with robots); encoders (to measure the movements of robotic parts).

Autonomous behaviour. Robots are considered autonomous if they are able to perceive the environment, reason about it, make decisions, and then move in complete autonomy without following a script or being teleoperated by someone. Researchers in AI and Robotics usually aim to build fully autonomous robots that may interact with people without the need of an operator: only fully autonomous SARs can assist people as companions during their everyday life. However, building fully autonomous robots is highly complex since autonomous perception, reasoning, and action execution are complex. Nowadays, no robot is capable of “understanding” the surrounding environment as humans are, and very few robots have the required skill and strength to interact with such an environment. For this reason, most of the robots that you can see on the media are not autonomous but teleoperated.

Actuator. An actuator is a component of the robot responsible for controlling a robot part and making it move, typically converting energy into a mechanical force that helps the robot achieve mechanical movements. An electrical motor is a very common type of actuator in robotics, which can be used to control robotic arms, hands, or wheels – if the robot is wheeled. Actuators usually require a significant amount of energy to move mechanical parts, and for this reason, all robots have limited energetic autonomy and need to be periodically recharged. For the same reason, many SARs have wheels, even if their upper body may have a humanoid shape in order to better communicate with people using gestures: wheels are more energetically efficient than biped locomotion (and, obviously, biped locomotion may incur a higher risk of falling).

What the research says

Research focusing on robots’ capabilities tends to be technology-oriented. Therefore some parts of the following scientific works may be hard to read for a student without a background in robotics or computer science. However, all these works contain some elements that the reader can appreciate, and therefore we warmly welcome you to look at them.

- **Zachiotis, G.A., Andrikopoulos, G., Gornez, R., Nakamura, K., Nikolakopoulos, G. A Survey on the Application Trends of Home Service Robotics (2018) 2018 IEEE International Conference on Robotics and Biomimetics, ROBIO 2018.** The article presents a survey on the possible applications of social and service robots in different scenarios, including education, entertainment, rehabilitation, social interaction, household keeping, gaming, and security. The article provides an exhaustive list of the most popular robots, their physical appearance, and capabilities, highlighting their key enabling

features that justify their inclusion in each application area. The article provides a good starting point to understand what “real” robots look like and what they can do. Available [here](#).

- **Leite, I., Martinho, C., Paiva, A., Social Robots for Long-Term Interaction: A Survey, (2013) International Journal of Social Robotics, 5 (2), pp. 291-308.** The article addresses the problem of Human-Robot Interaction over long periods by reviewing the current research on long-term interaction between users and social robots. To this aim, the article considers the most popular robots, either commercially available or used as research platforms, and highlights how their main features and characteristics may impact keeping the user’s interest high for a long period. Robots for health care, education, interaction with people in public spaces, and assistance at home are discussed by focusing on their interaction capabilities, appearance, and possibilities for adaptation. Available [here](#).
- **Kruse, T., Pandey, A.K., Alami, R., Kirsch, A. Human-aware robot navigation: A survey (2013) Robotics and Autonomous Systems, 61 (12), pp. 1726-1743.** The article addresses the problem of robotic navigation in human-populated spaces, where “navigation” is defined as the capability to move between different places safely by avoiding all possible obstacles on the robot’s path. In the last years, the article observes that human-robot interaction has addressed many different capabilities required by social robots in terms of perception, reasoning, and learning. However, for navigation, the presence of humans requires novel approaches that take into account constraints in terms of human comfort and social rules. Then the article provides a survey of existing approaches to human-aware navigation. The article is partly technical in its nature, but a significant part of it may also be appreciated by a non-technical reader. Available [here](#).
- **Yan, H., Ang Jr., M.H., Poo, A.N. A Survey on Perception Methods for Human-Robot Interaction in Social Robots (2014) International Journal of Social Robotics, 6 (1), pp. 85-119.** The article starts from the consideration that autonomous perception is one of the most important capabilities in human-robot interaction (HRI). It then reviews several widely used perception methods that can play a key role in the development of social robots. To this end, the article mentions several commercially available robots or used as research platforms, together with their main characteristics in terms of sensors used, perception methods, capabilities, and main scenarios where they have been adopted. The article is very technical in its nature: however, we suggest exploring at least the first part of the article, where a very interesting survey of the most used sensors and sensing techniques is proposed. Available [here](#).

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

- **ISO 13482:2014, Robots and robotic devices — Safety requirements for personal care robots.** International standards exist to guarantee compliance of robots with safety requirements, which are covered by ISO13482:2014 Robots and robotic devices – Safety Requirements for personal care robots. Overall, the standard specifies requirements and guidelines for the inherently safe design, protective measures, and information for the use of personal care robots. While the standards generally define requirements and guidelines for mobile servant robots, physical assistant robots, and person carrier robots, specific safety requirements for social robots include hazards related to charging batteries, robot motion, contact with moving components, robot stopping functions. Available [here](#).
- **Expert Group on Liability and New Technologies, Liability for Artificial Intelligence and other emerging technologies, 2019.** In November 2019, the European Commission published a very important document, “Liability for Artificial Intelligence and other emerging technologies.” The report addresses the problems raised by autonomous, intelligent behaviour when damage occurs and victims seek compensation. Specifically, the report discusses how the capability of robots to autonomously perceive the environment and take decisions accordingly can make the existing regulations inadequate or obsolete. Only regulation to determine the so-called “strict liability” is harmonized at the EU level: strict liability covers all cases in which damages are caused by a defective

product, which turns out to be inappropriate in the case of intelligent systems and robots in particular. For example, a SAR may not be defective when it exits from the factory, but it may learn and adapt its behaviour as it acquires new information during usage. To which extent will the producer (or a third-party operator that uses the robot) be liable, in this case? The report discusses this and other aspects that should be taken into account to allow AI and robotic technologies to become part of our lives, suggesting the use of obligatory insurance schemes for AI programs and robots and other possible solutions. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Explore robots in action and spot their strength and weaknesses

- Watch some videos on YouTube showing robots interacting with people and with the environment:
 - robots that converse with people by executing the commands people give them (available [here](#), 8.59 minutes, feel free to watch only the first two minutes only);
 - robots that search for specific objects and interact with them in different ways (available [here](#), 5.05 minutes, feel free to watch only the first two minutes only);
 - robots that move between different places in the environment (available [here](#), 1.31 minutes).
- Some tasks can be easily performed by robots, some other tasks turn out to be quite complex. While watching videos, you will have to find the “tricks” that researchers have implemented to make things easier for robots. Maybe some objects have been painted of uniform color to be more easily detected... Perhaps the person is only using a pre-defined set of sentences to interact with the robot they learned in advance... Maybe the scenario in which the robot operates has been oversimplified to make things work well... If yes, how? You will have to watch the videos and take notes by answering 3 questions for every video:
 - Is the robot really able to perform this task in complete autonomy?
 - Is the environment simplified to make operations simpler, and how?
 - Is the interaction simplified to make things work, and how?
- Discuss your answers with other participants on the social platform for collaborative learning.
- Resources needed: YouTube [video 1](#), [video 2](#), [video 3](#); social platform for collaborative learning.
- Duration of activity: about 20 minutes.

Activity 2: Control the IENE robot and understand more about its capabilities

- The second activity will require you to interact with a virtual robot that we developed using one of the most famous tools to design conversational agents, i.e., DialogFlow (available [here](#)).
- You will have to interact with the robot and ask it to perform a sequence of tasks such as: moving from one place to another, picking up objects and moving them from one place to another, setting up an alarm to remind the person about a visit to the doctor, understanding where the person is and what is doing, and in general helping the person in different ways. Different activities will require different capabilities in terms of perception, reasoning, and action: however, it turns out that this robot, as most robots in commerce, does not have all the required capabilities to perform such tasks! Therefore, when you ask the robot to perform tasks, in some cases, the robot will execute the command; in other cases, it will refuse to perform a task it has not the capability to perform; in some other cases, it will fail! Through trial and error, you will learn the difference between “imaginary” robots that populate books and movies and “real” robots that may assist people now or in the near future. See detailed instructions below.
- Share your experience with other participants on the social platform for collaborative learning.
- Resources needed: DialogFlow [chatbot](#); social platform for collaborative learning

- Duration of activity: 20 minutes.

Instructions for interaction

You are talking with the IENE robot! In order to interact with me, you need to digit your sentence in the virtual smartphone on the left and press return. I will reply as fast as I can! Don't forget to ask me the things suggested in your Learning Unit!

As a suggestion, you may ask me

- wash dishes, clean the floor, wash your clothes;
- bring you some water, your medicine, your clothes or shoes;
- make the way to a room in your house;
- prepare pizza, fish, pasta, or different kind of meat and vegetables;
- help you stand up from your sofa, armchair, bed, chair, or toilet;
- help you make a phone call with a friend of yours or one of your relatives;
- turn on the lights in a room of your house or your smart TV.

The chatbot can be embedded in the IENE-10 platform using the following html code

```
<iframe width="350" height="430" allow="microphone;" src="https://console.dialogflow.com/api-client/demo/embedded/4575ae65-94a1-4142-9506-492a48e2668f"></iframe>
```

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Now, soon, or in the far future.

- You will be presented with a list of tasks that Socially Assistive Robots are expected to perform in a social and health care scenario.
- Using the same online tool for [card sorting](#) you already used in LU 1.2, you will have to categorize these tasks in three classes: 1) Now - robots can successfully perform the task today; 2) Soon - robots may be able to perform these tasks in the near future; 3) In the far future - only "imaginary" robots in books or movies can perform the task (of course, we can never know what will happen in the far future!). Then check the solution below.
- Resources needed: [kardSort](#), an online tool for card sorting.
- Duration of the activity: 5 minutes.

Now, soon, or in the far future (solution in red)

- Take decisions according to Asimov's Laws of robotics (3)
- Go to the kitchen and take a medicine for a person (2)
- Moving from one place to another in the environment (1)
- Converse with people understanding basic commands (1)
- Converse with people in a natural way as like as humans do (3)
- Operate smart devices in the environment (1)
- Feel emotions (3)
- Grasping and manipulating generic objects in a messy domestic environment (2)
- Helping people to raise from bed (2)
- Do things that they were not programmed to do (3)
- Reminding a person to take a pill (1)
- Understand their own position in the environment using sensor data (2)

- Monitoring dangerous situations (1)

Activity 2: Making the robot's life easier

- Please, think about the videos you have watched and the chatbot you have played with. Then play the quiz at the following [address](#). You will be asked to consider a list of tasks that “real” robots are not likely to perform today or in the near future. For every task, we will propose a set of “tricks” that researchers can adopt to make that task feasible, such as colouring objects to make it easier for robots to detect them. You need to identify the “trick” that works better with that task.
- Resources needed: [TryInteract](#), a website for online quizzes.
- Duration of the activity: 3 minutes.

Tricks and cheats (solution in red)

- Navigate from one place of the house to another. Tricks:
 - Stick QR code to walls;
 - Add more sensors to the robot;
 - Use neural networks to recognize places.
- Take and manipulate objects. Tricks:
 - Paint objects with uniform color;
 - Add more fingers to the robot hand;
 - Use neural networks for object recognition.
- Chitchat with people about general topics. Tricks:
 - Always pretend to understand what the person says, by giving general answers like that: “I see”, “Good to know”, etc;
 - Instruct people to use only predefined commands;
 - Explain to the robot the meaning of what people are saying, as you would do with a child.
- Interact with the environment (turning on/off lights, open/close windows, etc.)
 - Let the robot communicate with smart device for home automation;
 - Teach the robot how to do these things through demonstration;
 - Add a robotic arm equipped with a hand to press switches and turn handles.

EVALUATION COMPONENT

Participants to evaluation

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

What to evaluate

The criteria for the Learning Unit's evaluation are: coverage of the identified learning needs, innovation and 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/LJFDZHF>

Module 2 - TRN CULTURAL KNOWLEDGE, Learning Unit 2.3. Benefits and Challenges

Christiana Kouta, Elena Nikolaidou, Elena Rousou, Panagiota Ellina, Cyprus University of Technology

THEORETICAL COMPONENT

Principles and Values

Healthcare settings worldwide are under tremendous strain from the rapidly growing demand associated with the aging population and chronic conditions like dementia. The public expects healthcare organisations to keep pace with the changing societal needs and serve the elderly population with compassion and quality of care. Given the complexity of providing quality care, adopting and integrating technology into practice could be seen as an important opportunity, but it can also be perceived as a significant challenge. Social robots can help address some of the challenges in healthcare settings, such as the shortage of elderly care staff. However, the design of these social robots should reflect human values and principles and enhance the well-being of consumers.

The principles and values that guide this tool include:

- Interpersonal communication (verbal and nonverbal)
- Quality of life
- Human dignity
- Helping
- Caring
- Empathy

Aims

The aim of this learning unit is to develop your understanding and awareness of Social Assistive Robots (SAR) benefits and challenges in the context of health and social care

Learning outcomes

At the end of this training, the participants will be able to:

- Explain the potential benefits of using SARs in health and social care concerning formal care staff.
- Discuss the potential challenges that health and social care staff may face when using SARs in health and social care.

Relevant definitions and terms

Cultural Knowledge. It derives from a number of disciplines such as anthropology, sociology, psychology, biology, nursing, medicine, and the arts, and can be gained in a number of ways. Meaningful contact with people from different ethnic groups can enhance knowledge around their health beliefs and behaviours as well as raise understanding around the problems they face ([Papadopoulos, 2006](#)).

Cultural Robotic Knowledge. Culturally knowledgeable socially assistive robots combine concepts, principles, values, theories, practices, behaviours, and properties from a number of disciplines such as computer sciences, robotic engineering, anthropology, sociology, psychology, caring sciences, and cultural studies, to enable robots to perform task and communicate with humans in culturally appropriate ways (Papadopoulos I & Sgorbissa A.).

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

- **Wu Y, Wrobel J, Cornuet M, Kerhervé H, Damnée S, Rigaud A. Acceptance of an assistive robot in older adults: a mixed-method study of human–robot interaction over a 1-month period in the Living Lab setting. *Clin Interv Aging*. 2014;9:801-811.** Since people live longer and older people constitute an increasing proportion of the population, there is progressively insufficient availability of specialized caregivers. Therefore, one possible form of support that has the potential to solve the problems of the aging of European societies, at least partially, is the use of assistive robots in the care of older people. Such robots can make it easier for older people to remain independent for longer while also reducing the burden on the family and formal caregivers. The article concludes that robots can not only help older adults in everyday life, but also be used in medical care (eg, for remote monitoring of patient health), which can additionally contribute to reducing costs for public services or care-assurance budgets. Available [here](#).
- **Lukasik S, Tobis S, Wieczorowska-Tobis K, Suwalska A. Could Robots Help Older People with Age-Related Nutritional Problems? Opinions of Potential Users. *International Journal of Environmental Research and Public Health*. 2018; 15(11):2535.** Several models of robots supporting older people, with quite a variety of uses, have been developed. Robots can be used as aids in preparing and consuming meals, daily toileting, doing housework, and monitoring the user’s state of health, among others. In addition, these devices can also provide company to older users (e.g., as chess companions) and encourage them to do cognitive training, as some studies have suggested the positive effects of these devices on cognitive function in older people. Social robot interventions have been reported to improve mood and reduce stress levels in elderly users. Available [here](#).
- **Łukasik S, Tobis S, Kropińska S, Suwalska A. Role of Assistive Robots in the Care of Older People: Survey Study Among Medical and Nursing Students. *J Med Internet Res* 2020;22(8):e18003.** Assistive robots can help older people remain independent for longer and support and facilitate the work of health workers and formal caregivers. This research concentrated on the approach of future health care professionals to the use of robots in the care of older people, and what roles they think such devices should play. In general, the results of the analyses indicate a positive attitude of medical and nursing students to socially assistive robots. The vast majority of participants saw high potential in such devices. However, participants in the study suggested that older people might not yet be ready to use such devices owing to difficulties in handling these devices. In addition, the problem may concern not only the operation of the robots but also the selection of the most suitable model or the setting of functions appropriate for a given user. According to the students who participate in this study, older people often do not have sufficient knowledge of electronic devices or their suitability for potential users’ needs and requirements. Therefore, the study participants pointed to the necessity to provide specific training to older people on the use of robots. Furthermore, the study revealed that the most important roles of assistive robots relate to functions such as reminding people about taking medications, ensuring the safety of older people, preventing deterioration of

their memory, and encouraging them to maintain physical activity. Future doctors and nurses were most critical of using a robot as a companion of an older person. Available [here](#).

- **Heerink, M., Kröse, B., Evers, V. et al. *Assessing Acceptance of Assistive Social Agent Technology by Older Adults: the Almere Model. Int J of Soc Robotics 2, 361–375 (2010)***. This paper proposes a technology acceptance model that is specifically developed to test the acceptance of assistive social agents by elderly users. The research in this paper develops and tests an adaptation and theoretical extension of the Unified Theory of Acceptance and Use of Technology (UTAUT), by explaining intent to use not only in terms of variables related to functional evaluation like perceived usefulness and perceived ease of use, but also variables that relate to social interaction. The new model was tested using controlled experiments and longitudinal data collected regarding three different social agents at elderly care facilities and older adults' homes. The model was strongly supported by experiments, accounting for 59–79% of the variance in usage intentions and 49–59% of the variance in actual use. Available [here](#).
- **Hung, L., Liu, C., Woldum, E. et al. *The benefits of and barriers to using a social robot PARO in care settings: a scoping review. BMC Geriatr 19, 232 (2019)***. Social robots may serve multiple functions: affective therapy, cognitive training, social facilitator, companionship, and physiological therapy. Specifically, the social robot - PARO (a baby harp seal robot) was designed as pet therapy for older people with dementia. PARO has been commercialized and used in care settings for more than a decade in multiple countries. This review aims to map out the empirical evidence on the key benefits of PARO and identify barriers that may impede the adoption of this social robot. The questions guiding this review are: What has been reported in the literature regarding the benefits of PARO in dementia care? What are the barriers to adopting PARO in the care setting? The study concludes that key benefits include reducing negative emotional and behavioral symptoms, improving social engagement, and promoting positive mood and quality of care experience. While the social robot PARO offers technological opportunities in supporting dementia care and managing difficult behavioral symptoms, the adoption of PARO in care settings remains low. Key barriers to the adoption of the technology include cost and workload, infection concerns, stigma, and ethical issues. Available [here](#).
- **Shourmasti ES, Colomo-Palacios R, Holone H, Demi S. *User Experience in Social Robots. Sensors. 2021; 21(15):5052***. This study aims to summarize the extant literature focused on user experience in social robots and identify the challenges and benefits of user experience evaluation in social robots. The authors carried out a systematic literature review that relies on PRISMA guidelines to achieve this goal. Findings revealed that questionnaires and interviews are the most common methods to evaluate user experience in social robots. User experience evaluations were found to be beneficial in providing early feedback and, consequently, handling errors at an early stage. However, despite the importance of user experience in social robots, robot developers often neglect to set user experience goals due to a lack of knowledge or time. This study emphasizes the need for robot developers to acquire the required theoretical and practical knowledge on how to perform a successful user experience evaluation. Available [here](#).

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

In February 2017, the European Parliament adopted a Resolution on Civil Law Rules on Robotics with recommendations to the Commission. It proposed a whole range of legislative and non-legislative initiatives in robots and AI. In particular, it asked the Commission to submit a proposal for a legislative instrument providing civil law rules on the liability of robots and AI. (Available [here](#))

Paragraphs 31 and 31 of the report refers to care robots as follows: "...underlines (the European Parliament) that elder care robot research and development has, in time, become more mainstream and cheaper, producing products with greater functionality and broader consumer acceptance; notes the wide range of applications of such technologies providing prevention, assistance, monitoring, stimulation, and

companionship to elderly people and people with disabilities as well as to people suffering from dementia, cognitive disorders, or memory loss.”

“ Points out that human contact is one of the fundamental aspects of human care; believes that replacing the human factor with robots could dehumanise caring practices, on the other hand, recognises that robots could perform automated care tasks and could facilitate the work of care assistants, while augmenting human care and making the rehabilitation process more targeted, thereby enabling medical staff and caregivers to devote more time to diagnosis and better planned treatment options; stresses that despite the potential of robotics to enhance the mobility and integration of people with disabilities and elderly people, humans will still be needed in caregiving and will continue to provide an important source of social interaction that is not fully replaceable.”

PRACTICAL COMPONENT

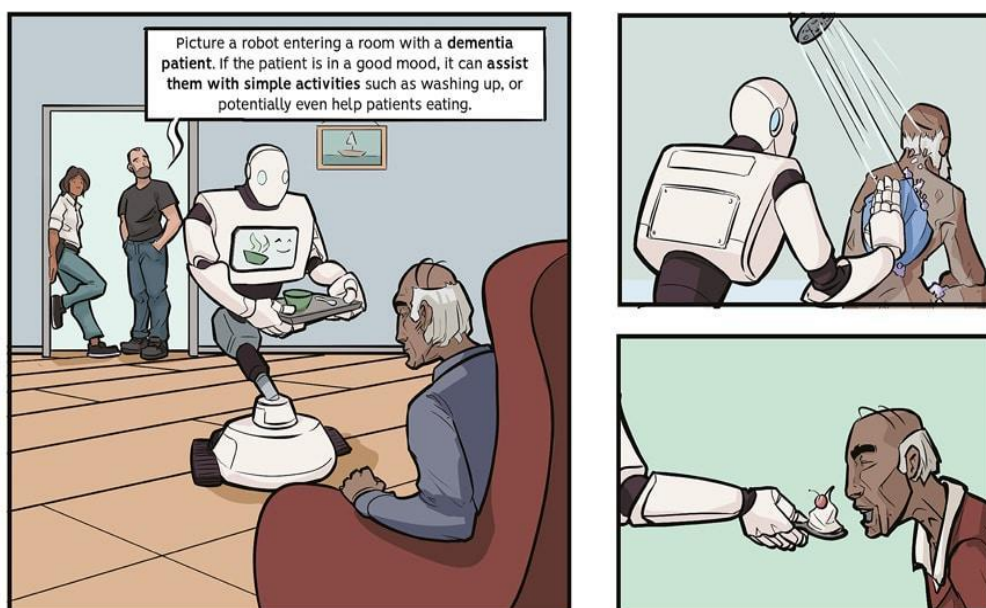
Learning Activities

Activity 1: Reading an article.

- Read the article [The implementation of social robots during the COVID-19 pandemic](#).
- Write a post on the social platform for collaborative learning about how social robots can relieve healthcare providers under pressure during COVID-19 pandemic.
- Resources needed: online [article](#); social platform for collaborative learning.
- Duration of activity: 30 minutes.

Activity 2: Social robots comic.

- Instructions: [Korn, O \(2020\)](#) and his Affective & Cognitive Institute research team are developing a comic. Underpinned by their research findings, it provides an innovative approach to inform the general public of future developments of social robotics in an entertaining way. Set within a detective story, various aspects of social robotics, ranging from real-life examples to the arguments of anti-robot activists, are presented in an engaging style. The comic is designed to appeal to audiences from school kids to university students and adults.
- Look at the picture below from Social Robot Comic [Korn, O \(2020\)](#).



- Describe three benefits and three challenges that you think would be most relevant in your work *OR* Design your Social Robot Comic (either with pen or pencil or using [StoryboardThat](#)).
- Share your answers or your comic with your group on the social platform for collaborative learning.
- Resources needed: Word or similar software for writing, paper and pen or pencil, [StoryboardThat](#), social platform for collaborative learning.
- Duration of activity: 20 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Quiz

- Go to the following [address](#) and answer the True and False Quiz.
- Post your results on the social platform for collaborative learning.
- Resources needed: [GoCongr](#), a tool for online Questionnaires; social platform for collaborative learning.
- Duration: 3 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/LJ5LVKZ>

Module 2 TRN CULTURAL KNOWLEDGE, Learning Unit 2.4 Cultural aspects of socially assistive robots

Irena Papadopoulos and Runa Lazzarino, Middlesex University

THEORETICAL COMPONENT

Principles and Values

Despite underpinning the whole field of Transcultural Nursing, and hence this whole project and curriculum, the principle of cultural competence informs this learning unit more strongly than others. As stated in another project output ([IENE 10 IO 1.2](#)), the TRN curriculum is designed to promote culturally competent and compassionate transcultural care using artificial intelligence and social robotics. Culturally competent and compassionate care (see definition below) is ethically founded upon the values of honesty, kindness, altruism, and co-operation (Papadopoulos, 2018). Within this paradigm, it is important to understand how users' different cultural backgrounds affect their acceptance of socially assistive robots and, consequently, the diffusion of robots. However, it is also compelling, on the other hand, to advance research and development to design autonomous social robots that can more and more align with this paradigm - by becoming culturally competent and in this way able to offer care of increasing quality.

The general principles and values for the IENE 10 are those associated with culturally competent and compassionate care (see definition below). More specifically, the values and principles of this learning unit are:

- kindness
- co-operation
- acceptance
- high quality
- acknowledging diversity
- valuing a person's cultural background/ identity

This learning unit is also founded upon the values and principles of transcultural robotic nursing, which include:

- open mindedness
- genuine curiosity
- innovation
- change

Aims

The chief aim of this learning unit is to raise awareness and understanding of the role of culture in the acceptance and use of socially assistive robots in health and social care. Another aim is to acquire basic insights into the research advancements towards designing culturally competent and compassionate socially assistive robots.

Learning outcomes

At the end of this training, the participants will have acquired a greater understanding and knowledge of:

- the cultural aspects that play a role when implementing socially assistive robots in health and social care;

- some positive and negative relations between the users' cultural backgrounds as well as demographics, and socially assistive robots' acceptance;
- the cultural influences in socially assistive robots' appearance;
- the role of culture on socially assistive robots' verbal and non-verbal communication style;
- Overview of culturally competent socially assistive robots.

Relevant definitions and terms

Culture. All human beings are cultural beings. Culture is the shared way of life of a group of people that includes beliefs, values, ideas, language, communication, norms, and visibly expressed forms such as customs, art, music, clothing, and etiquette. Culture influences individuals' lifestyles, personal identity, and their relationship with others both within and outside their culture. Cultures are dynamic and ever changing as individuals are influenced by, and influence their culture, by different degrees ([Papadopoulos, 2006, p 10](#)).

Individualism/Collectivism. In Geert Hofstede's study of national cultures, individualism is the dimension where social networks are lax and where individuals are expected to take care of only themselves and their immediate families. At the opposite end, collectivism refers to a preference for tightly-knit social networks where individuals, their relatives or members of a particular ingroup are very close and loyal to each other. Hofstede model of national cultures' comparison – along this, and other five dimensions (i.e., Masculinity/Femininity, Uncertainty Avoidance, Long/Short Term Orientation, Indulgence/Restraint, Power Distance) – is usefully applied to investigate the diffusion and acceptance of technology in relation to culture. ([Hofstede Insights, 2021](#))

Culturally competent compassion. The human quality of understanding the suffering of others and wanting to do something about it using culturally appropriate and acceptable nursing interventions. This takes into consideration both the patients' and the carers' cultural backgrounds as well as the context in which care is given ([Papadopoulos, 2011](#))

Culturally Competent Socially Assistive Robots. This term refers to AI-based, autonomous, often humanoid, socially assistive robots that are programmed with cultural knowledge in relation to specific cultures, so to be able to interact in a culturally sensitive way with users as well as acquire increasing information about users' culture as they interact with them. Culturally competent socially assistive robots are not currently in use yet.

Non-verbal Communication. The complex set of ways in which we communicate in forms different from our actual language. Non-verbal communication largely consists in our body language, such as postures, facial expressions, eye gaze, gestures, proxemics, haptics, appearance. Non-verbal communication can however also include paralinguistics (i.e., vocal communication separated from actual languages, such as voice volume, pitch, intonation etc.) and symbolic communications, with objects and images.

Proxemics. The study of personal space and physical distance between individuals in social interactions and situations. In human-robot interactions, the robot proxemics behaviour refers to its capacity to follow users' socio-cultural norms in establishing appropriate physical and psychological distancing. This capacity is central for the robot to better integrate into the human physical and social environment. Proxemics is a form of non-verbal communication.

Socially Assistive Humanoid Robot: Robots embodied as humans, programmed to interact with users through engaging in social interaction, with the involvement of gestures, speech, emotional expression, and other actions. Socially assistive humanoid robots are Socially Assistive Robots which in addition adopt the appearance of humans. Anthropomorphic robots and androids are robots with an enhanced, sometimes very realistic, human-likeness.

Zoomorphic Socially Assistive Robots. Referred to also as animal-/pet-like robots/robopets, these are Socially Assistive Robots embodied as animals, programmed to interact with users through engaging in social interaction, with the involvement of gestures, sounds, emotional expression, and other actions.

What the research says

- **Papadopoulos, I. (2018). *Culturally Competent Compassion*. Routledge.** A very useful and accessible book that brings together crucially important topics of cultural competence and compassion for the first time. The book defines “culturally competent compassion” as the ability to understand the suffering of others and wanting to do something about it using culturally appropriate and acceptable caring interventions. It also explores how to practise culturally competent compassion in healthcare settings. Available [here](#).
- **CARESSES project [website](#)**, in particular the project research output. Below, a **selection of 3 articles** stemming from this project is provided:
 - **Papadopoulos, I. and Koulouglioti, C. (2018) The Influence of Culture on Attitudes Towards Humanoid and Animal-like Robots: An Integrative Review. *Journal of Nursing Scholarship, Special Issue 2018 Nov;50(6):653-665*.** This integrative review shows that culture influences attitudes and preferences towards humanoid and animal-like robots, particularly in relation to non-verbal behaviours and communication styles, with people being more accepting of a robot that behaved more closely to their own culture. Available [here](#).
 - **Papadopoulos, I., Koulouglioti, C., Lazzarino, R. and Ali, S. (2019) Enablers and barriers to the implementation of socially assistive humanoid robots in health and social care: a systematic review. *BMJ Open, 10(1)*.** This systematic review article concludes that available evidence related to implementation factors of socially assistive humanoid robots for older adults is limited but promising, mainly focusing on aspects at the individual level and exploring the acceptance of this technology. Investigation of elements linked to the environment, organisation, societal and cultural milieu, policy, and legal framework is necessary. Available [here](#).
 - **Bruno, B., Recchiuto, C., Papadopoulos, I., Saffiotti, A., Koulouglioti, C., Menicatti, R., F. Mastrogiovanni, F., Zaccaria, R., Sgorbissa A. (2019) Knowledge Representation for Culturally Competent Personal Robots – Requirement, design principles, implementation, and assessment, *International Journal of Social Robotics, 11(3)*, pp. 515-538.** Culture, intended as the set of beliefs, values, ideas, language, norms, and customs which compose a person’s life, is an essential element to know by any robot for personal assistance. Culture, intended as that person’s background, can be an invaluable source of information to drive and speed up the process of discovering and adapting to the person’s habits, preferences, and needs. This article discusses the requirements posed by cultural competence on the knowledge management system of a robot. Available [here](#).
- **Lim, V., Rooksby, M. and Cross, E.S. (2021) Social Robots on a Global Stage: Establishing a Role for Culture During Human–Robot Interaction, *International Journal of Social Robotics, 13*, pp. 1307–1333.** Robotic agents designed to assist people across a variety of social and service settings are becoming increasingly prevalent across the world. Authors synthesise two decades of empirical evidence from human-robot interaction (HRI) research to focus on cultural influences on expectations towards and responses to social robots, as well as the utility of robots displaying culturally specific social cues for improving human engagement. Findings suggest complex and intricate relationships between culture and human cognition in the context of HRI. The studies reviewed transcend the often-studied and prototypical east-west dichotomy of cultures and explore how people’s perceptions of robots are informed by their national culture as well as their experiences with robots. Many of the findings presented in this review raise intriguing questions concerning future directions for robotics designers and cultural psychologists in conceptualising and delivering culturally sensitive robots. Authors highlight the critical role of culture in mediating efforts to develop robots aligned with human users’ cultural backgrounds and argue for further research into the role of culturally-informed robotic development in facilitating human-robot interaction. Available [here](#).

- **He, M. and Lee, J. (2020) Social culture and innovation diffusion: a theoretically founded agent-based model, *Journal of evolutionary economics* 30 (1109-1149).** Social culture (i.e., individualism, power distance, and uncertainty avoidance from Hofstede's cultural dimension theory) directly affects the small-world network structure and individual characteristics. The authors explore how the characteristics of innovation influence the diffusion process. Authors find that individualism positively affects the diffusion speed in the early stage, whereas uncertainty avoidance and power distance have negative effects on innovation diffusion. The characteristics of innovation affect its diffusion when the uncertainty avoidance is high. However, when both uncertainty avoidance and individualism are low, the effect of innovation on diffusion is restricted. Available [here](#).
- **Samuel, S. (2020) Robot priests can bless you, advise you, and even perform your funeral. AI religion is upon us. Welcome to the future, VoX.** Magazine article, with several videos linked to it, which covers the innovative use of robots in the role of religious leaders. Available [here](#).

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

- **Pasikowska-Schnass, M. (2020). Digital culture – Access issues. Briefing, EPRS - European Parliamentary Research Service.** The article discusses how digital shift has touched all aspects of human activity, and culture is no exception. Cultural assets and works have been digitised and digital technology has become a tool for novel creations. Digital born works have enriched the resources available to those interested in culture. Technology has huge potential to facilitate and democratise access to cultural resources. However, certain technical conditions are required to allow access to these cultural resources, for example webpages devoted to digitised cultural heritage and its hidden treasures as well as those devoted to novel creations. These conditions include an internet infrastructure, computers, tablets, or, more frequently, a smartphone – all of which has a price tag. Moreover, the deployment of such infrastructure needs to be evenly distributed so as to provide equal and democratic access to cultural resources – which is not yet the case. Available [here](#).
- **Kulesz, O. (2016). The impact of digital technologies on the diversity of cultural expressions in Spain and Hispanic America, UNESCO.** The article argues that, in the past two decades, digital technologies have transformed the cultural scene profoundly. New forms of creation, production, distribution, access, and participation have revolutionized entire industries, such as book publishing, music, and film. Changes have brought both opportunities and challenges to the creative chain, in a process that has affected both the Global North and South. As the author aims to show, digital technologies have a significant impact on the landscape of opportunities, barriers, and policies associated with the protection and promotion of the diversity of cultural expressions in the digital era is highly complex. Following examination, new technologies cannot be said to be either positive or negative in themselves, the author maintains, but instead can be regarded as both an advantage and a challenge, depending on how they are applied in each context. Public policies have a decisive influence in defining the outcome in either direction. Available [here](#).
- **Care Quality Commission (2019). The State of health and social care in England 2018/19.** The report mentions potential inequalities and issues that need to be considered, such as users' language and culture. The potential benefits of technological innovation are also outlined in this report. Additionally, the report outlines concerns about ethics and data protection. These barriers have been highlighted by staff, e.g., including attitudes of some staff towards technology (e.g., scepticism), and perceived complexity of adopting new technologies (including concerns about existing infrastructure). Available [here](#).
- **Future Advocacy and Welcome Trust (2018). Ethical, social and political challenges of artificial intelligence in health.** This report describes several use cases and settings and outlines several ethical, social, and political challenges associated with AI use. Key themes are consent, fairness, and rights. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Turn that Socially Assistive Robot into a culturally competent one! – a human-robot interaction scenario.

- Participants are asked to read through a hypothetical scenario where the user's English cultural background, together with other factors related to their health, religious inclination, and age, is not considered when implementing socially assistive robots in care.
- Participants are then asked to identify problematic situations in the scenario and rewrite the scenario so that the users' cultural background is taken into account.
- Participants are finally encouraged to share their rewritten scenarios on the discussion board of the social platform for collaborative learning, reflect upon fellow participants' scenarios, and provide feedback to at least one other participant.
- In order to prepare for this activity, participants are invited to read the 'Aims, Relevant Definitions and Terms' and 'What the research says' sections (see above).
- Resources needed: Word or similar software for writing, social platform for collaborative learning.
- Duration of activity: 20 minutes.

Human-robot interaction scenario.

Jane, a clinical nurse practitioner, is taking care of Mrs Davis. Mrs Davis is a retired English teacher who normally lives on her own. She has one daughter. Mrs Davis has Type II diabetes, she is an active member of her local church, and she likes gardening. However, during the last couple of months, her daughter has realised that she is getting forgetful. The night before, Mrs Davis called her daughter frantically in the middle of the night asking whether or not she had missed her granddaughter's birthday. She couldn't remember what day it was and she was afraid. These episodes were getting more frequent. Jane suggested to Mrs Davis' daughter that her mother could benefit from a humanoid socially assistive robot that can provide 24/7 monitoring and support. The robot is brought to the house. It is programmed with a generic support package for assisting older adults. In the morning the robot offers Mrs Davis options for breakfast, like coffee and a muffin, whereas for lunch it suggests a pizza, and for dinner, on a Friday, a beef stew and a carrot cake for dessert. In the morning, the robot wakes up Mrs Davis at the time set, by standing very close to her bed and by playing electronic music tunes. Later on, Mrs Davis tells the robot that she is bored, and the robot suggests watching some sports, mentioning basketball and judo, or play some games, such as Sudoku and Go. In the evening, when Mrs Davis asks the robot to call her family, it places a call with Mrs Davis' cousin living in Madrid. The robot is not learning from Mrs Davis different requests and corrections, and it is not asking open questions, with the result that she grows more confused and frightened by the SAHR, which, furthermore, has a tiny head, small eyes, and huge arms and hands.

Activity 2: Design your own culturally competent socially assistive robot.

- Participants are asked to reflect on how the cultural background of patients/clients may influence their expectations towards socially assistive robots' appearance and communication style.
- Participants are asked to share their idea - which could be a drawing, a photograph, or 500 words text, with fellow participants in the discussion area of social platform for collaborative learning.
- Participants are invited to read the 'Aims, Relevant Definitions and Terms', and 'What the research says' sections (see above) to prepare for this activity.
- Resources needed: Word or similar software for writing, social platform for collaborative learning.
- Duration of activity: 15 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: True/False Quiz

- You are presented with 6 statements related to the topic of this learning unit. Tick the correct 'True or False' option.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 3 minutes.

True/False Quiz

- Culturally competent care is widely and systematically employed throughout the health and social care sector in many countries (**False**)
- To successfully deploy culturally competent socially assistive robots in care homes in Sweden, UK and Chile, it is enough that they are only programmed with Swedish, English, and Spanish language competences (**False**)
- Socially assistive robots' users will be more inclined to accept and use a socially assistive robot that speaks their own language, talks about familiar topics, suggests tailored entertainment, and learns from daily interactions (**True**)
- Younger people from individualistic cultures are more likely to welcome socially assistive robots to care for their parents (**True**)
- Users from different cultural backgrounds would similarly accept a socially assistive robot that keeps at a distance of two metres and always expresses happiness in its tone of voice (**False**)
- Research has found that culturally competent socially assistive robots can be useful as companions to older persons and can help reduce loneliness and depression (**True**)

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/LQYT7VG>

Module 3 TRN CULTURAL SENSITIVITY, Learning Unit 3.1. Communication

Victor Dudau, Edunet Organization

THEORETICAL COMPONENT

Principles and Values

Socially assistive robotics (SAR) addresses critical areas and gaps in care by automating supervision, coaching, motivation, and companionship aspects of one-on-one interactions with individuals from various large and growing populations, including stroke survivors, the elderly and individuals with dementia, and children with autism spectrum disorders (ASDs). This learning unit examines the interaction challenges of SAR from the points of view of the user, caregiver, and peer and the possibilities of effective communication with SAR in the delivery of care.

The learning unit is founded on the core principles from medical ethics:

- autonomy
- beneficence
- non-maleficence
- justice

It respects the general principles and values for the IENE 10 associated with culturally competent and compassionate care:

- co-operation
- commitment
- kindness
- acceptance
- empathy
- friendship/relationship
- encouragement
- ensuring patient dignity

Aims

This learning unit aims to enhance the ability of participants to address issues of human-robot interaction and communication of personnel, family, carers, and robots. Furthermore, it explores how this can be achieved in the best way to benefit those in need.

Learning outcomes

At the end of this training, the participants will have acquired

- an overview of human-robot interaction through hearing, sight, and touch;
- an understanding of the importance of communication between health and social care staff, client and their family members, carers, and SARs during the provision of care;
- enhanced ability to achieve effective communication with SARs.

Relevant definitions and terms

Human-Robot Interaction (HRI). HRI is “the science of studying people’s behaviour and attitudes towards robots in relationship to the physical, technological and interactive features of the robots, with the goal to

develop robots that facilitate the emergence of human-robot interactions that are at the same time efficient (according to original requirements of their envisaged area of use), but are also acceptable to people, and meet the social and emotional needs of their individual users as well as respecting human values” (Dautenhahn, 2013). It may also be defined as the exchanges of information and action between humans and robots to perform a task by means of a user interface. For instance, through vocal, visual, and tactile means (International Organization for Standardization, 2012).

Social Robots. A robot designed to interact with humans, with the ability to explicitly engage on a social and emotional level (Campa, 2016; p.106): for this reason, it should follow social rules and interact in a socially acceptable fashion. For example, a robotic butler for humans would have to comply with established rules of good service. It should be anticipating, reliable, and most of all discreet.

A social robot is typically characterized by some (or full) autonomy when communicating and cooperating with humans, eventually making decisions. Social robots usually have a human-like appearance or at least some typical characteristics of humans: a human-like embodiment may signal to users that the agent affords social interactions, hence usually increasing the robot’s acceptability. Zoomorphic and pet-like robots are also considered social robots. They may be used in different fields based on their capabilities: social robots are mainly used as educators for children and assistants for the elderly.

One of the most well-known social robots is Sophia, developed by Hanson Robotics. Sophia is a social humanoid robot that can display more than 50 facial expressions. Other popular social robots are NAO and Pepper by SoftBank Robotics.

Social robots such as NAO, Pepper, Paro, Huggable, Tega, and Pleo have been increasingly used in healthcare settings. Other notable examples of social robots include ASIMO by Honda, Jibo, Moxi, and Kaspar, designed by the University of Hertfordshire to help children with autism learn responses from the robot through games and interactive play have. Individuals with cognitive impairments, such as dementia and Alzheimer’s disease, may also benefit from social robots. Because of their supportive element in health care settings, some social robots are labelled as “assistive,” giving birth to the term Socially Assistive Robot (SAR).

What the research says

- **Mavridis, Nikolaos (2014) A Review of Verbal and Non-Verbal Human-Robot Interactive Communication, Robotics and Autonomous Systems 63(1).** The article proposes an overview of research in human-robot interactive communication, covering verbal and non-verbal aspects. Ten desiderata are explained and relevant research examined in detail, as a good starting point for discussing state of the art: (D1) Breaking the “simple commands only” barrier. (D2) Multiple speech acts. (D3) Mixed initiative dialogue. (D4) Situated language and the symbol grounding problem. (D5) Affective interaction. (D6) Motor correlates and Non-Verbal Communication. (D7) Purposeful speech and planning. (D8) Multi-level learning. (D9) Utilization of online resources and services. (D10) Miscellaneous abilities. The conclusion is that “many sub-problems towards fluid verbal and non-verbal human-robot communication remain yet unsolved, and present highly promising and exciting avenues towards research in the near future.” Available [here](#).
- **Iroju O, Ojerinde OA, Ikono R (2017) , State of the art: a study of human-robot interaction in healthcare, I.J. Information Engineering and Electronic Business, 2017, 3, 43-55.** Human-robot interaction (HRI) is fast becoming popular in healthcare due to the increase in the number of vulnerable populations, rising cost of healthcare, and the shortage of qualified healthcare professionals. HRI has been used to provide companionship, surgical operations, rehabilitative care, and entertainment to humans within the context of healthcare. Despite the numerous benefits of social robots in healthcare, the interactions between humans and robots are bedevilled by numerous challenges. These include privacy, safety, the form of the robot, trust, emotions, deception, and culture. The article explores HRI in health care and the challenges associated with the interaction between humans and social robots, from ethical challenges and design issues to safety, usefulness, acceptability, and appropriateness. Various social robots in healthcare are described, such as surgical

robots, rehabilitation robots, behavioural therapy robots, companion robots, assistive robots, physician surrogates, telepresence robots, and vital signs monitoring robots. Available [here](#).

- **Tegmark MC, Scheutz M. (2021). Assistive Robots for the Social Management of Health: A Framework for Robot Design and Human-Robot Interaction Research. International Journal of Social Robotics volume 13, pages 197–217 (2021).** Five types of functions that SARs could perform are identified : (a) changing how the person is perceived, (b) enhancing the social behavior of the person, (c) modifying the social behavior of others, (d) providing structure for interactions, and (e) changing how the person feels. Available [here](#).
- **Tanioka T, Yokotani T, Tanioka R, Betriana F, Matsumoto K, Locsin R, Zhao Y, Osaka K, Miyagawa M, Schoenhofer s (2021), Development Issues of Healthcare Robots: Compassionate Communication for Older Adults with Dementia , International Journal of Environmental Research and Public Health 18 (9), 4538.** This article explores four development issues of Health Compassionate Robots (HCRs) regarding compassionate communication with older adults with dementia: (1) accurate sensing behaviour to “hear” voices appropriately to interact with subjects; (2) inefficiency in “listening” and “gazing” behaviours; (3) fidelity of the behavioral response; and (4) deficiency in natural language processing (NLP), i.e., the ability to respond actively to situations that were not pre-programmed by the developer. The authors conclude that for HCRs to have a “heart/mind” capable of compassionate communication, the robot needs the ability to observe the patient’s needs, correctly evaluate them, and communicate its findings to the patient in appropriate words. For example, a series of actions that integrate not only words but also “knowledge, judgment, technical skills, and care” are expected of these robots. When these robots can “express” themselves with human-like emotive behaviours, they will be able "to convey empathic understanding to the patients and their families." Available [here](#).
- **Giger J C, Piçarra N, Alves-Oliveira P, Oliveira R, Arriaga P (2019) Humanization of robots: Is it really such a good idea?** This review examines the pros and cons of humanizing social robots from a psychological perspective. A review of empirical results of the positive and negative effects of humanization on human–robot interaction (HRI) is conducted. Some of the political and ethical problems raised by the humanization of social robots are presented by discussing the overall effects of the humanization of robots in HRI and suggesting new avenues of research and development. The literature reviewed in this paper showed mixed opinions at the physical and psychological levels. On the one hand, humanization seems to lead to positive relational outcomes (such as increased transparency and more natural HRI). On the other hand, excessive humanization can lead to feelings of eeriness and discomfort towards social robots. Available [here](#).

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

- **European Commission, 2020, White Paper on Artificial Intelligence. A European approach focused on excellence and trust.** Through this White Paper, 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. The document argues that AI is a strategic technology that offers many benefits to citizens, businesses, and society, provided that it is human-centered, ethical, and sustainable and respects fundamental rights and values. Available [here](#).

PRACTICAL COMPONENT

Practical Activities

Activity 1: Robots teach communication to kids with autism

- Watch a video on Youtube.com about using the robot to teach children with autism (available [here](#), 3.59 minutes).
- Reflect on how communication, social skills, and emotion are developed by interacting with the robot.
- Share your findings with colleagues in the discussion area of the social platform for collaborative learning. Write a post about the benefits of bringing robotics into the classroom for children on the autism spectrum. Read answers from other participants and compare them with your thoughts, and then pick at least 1-2 posts to reply to.
- Resources needed: video on [YouTube](#), social platform for collaborative learning.
- Duration: 15 minutes.

Activity 2: How robots can communicate autonomously

- Watch a video ([CARESSES, A robot for the elderly that knows about different cultures](#), 6.10 minutes) showing how the Caresses robot interacts with humans in a natural, unpredictable way.
- Discuss with your colleagues the abilities that SARs could have to engage and sustain a conversation with people autonomously, i.e., not being operated by a person. Then, share your thoughts in the discussion area of the social platform for collaborative learning: write a post, read other participants' posts, and reply to at least 1-2 of them.
- Resources: video on [YouTube](#); social platform for collaborative learning.
- Duration of activity: 20 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: multiple-choice questions.

- You are presented with the following questions: select all the answers that you think to be correct.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 3 minutes.

Questions

- SARs could perform functions for the children with autism spectrum disorder (ASD):
 - a) enhance their communication skills
 - b) change their social behaviour
 - c) recover the delay in their development

(correct answer : a,b)

- What means the robot is able to engage and sustain a conversation?
 - a) start up a conversation and keep chatting with a person
 - b) learn more and make conversation more natural
 - c) express with human-like emotive behaviours

(correct answer : a,b)

- What are the specific functions of a compassionate robot?
 - a) evaluate the patient's needs and communicate the findings
 - b) learn about people cultural habits and tastes
 - c) express empathy and compassion to patients and their families

(correct answer :b, c)

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.

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<https://www.surveymonkey.com/r/LWYKQQC>

Module 3 TRN CULTURAL SENSITIVITY, Learning unit 3.2 Ethical and legal issues

Chris Papadopoulos, Deevi- Johanna Voki, University of Bedfordshire

THEORETICAL COMPONENT

Principles and Values

Until now, you have navigated through half of the topics and hopefully gained some new knowledge about different types of robots that can be used in health and social care, especially socially assistive robots and their capabilities, benefits, and their potential role in care. One of the key aspects of implementing SARs in care that also needs careful consideration is ethics and legislation. You need to be aware and understand the main concerns and ethical challenges associated with the use of SARs in health and social care. This includes informed consent, autonomy, dignity, data protection, privacy, confidentiality, and security that support the safe implementation of SARs in health and social care. This section also lists some important policies and regulations currently being used to support the safe implementation of SARs in health and social care. Please be aware that due to the ongoing and fast development of AI and robotics, new legislations will likely be introduced in the future that may replace those described here.

The principles and values that guide this tool include:

- Dignity
- Equality
- Respect
- Security
- Human Rights

Aims

This tool aims to enhance the ability of participants to consider and address issues pertaining to ethics and legislation concerning the implementation of SARs in health and social care.

Learning outcomes

At the end of this training, the participants:

- Should gain knowledge about main ethical and legal concerns associated with the safe implementation of SARs in health and social care.
- Be aware of the importance of seeking and obtaining informed consent from patients/clients and family members when implementing SARs in care.
- Gain some knowledge of current policies and regulations concerning data protection, privacy, confidentiality, and security that support the safe implementation of SARs in health and social care.

Relevant definitions and terms

The Individual. All individuals have inherent worth within themselves as well as sharing the fundamental human values of love, freedom, justice, growth, life, health and security (Papadopoulos 2006, p.10).

Agency. Agency is the capacity of individuals to act independently and to make their own free choice.

Ethics of Artificial Intelligence. The ethics of technology specific to robots and other artificial intelligence beings concerns the moral behaviour of humans as they design, construct, use, and treat artificially intelligent beings, and the moral behaviour of artificial moral agents ([Ranschaert et al. \(eds.\), 2019](#)).

Isaac Asimov's Three Laws. Isaac Asimov (1920–1992) was a science fiction author and formulated the Three Laws of Robotics which continues to influence researchers in robotics and AI: “(1) A robot may not injure a human being. (2) A robot must obey orders, unless they conflict with law number one. (3) A robot must protect its own existence, as long as those actions do not conflict with either the first or second law”. ([Ranschaert et al. \(eds.\), 2019, p 354](#)).

Four Principles of Biomedical Ethics. Beauchamp and Childress' Four Principles are 'respect for autonomy', 'beneficence', 'non-maleficence' and 'justice' ([Beauchamp and Childress, 2001](#)). The Four Principles are the most widely used framework in biomedical ethics in healthcare practice.

Respect for autonomy. Respecting the decision-making capacities of autonomous persons; enabling individuals to make reasoned informed choices. ([Beauchamp and Childress, 2001](#))

Beneficence. Beneficence considers the balancing of benefits of treatment against the risks and costs; the healthcare professional should act in a way that benefits the patient ([Beauchamp and Childress, 2001](#)).

Non-maleficence. avoiding the causation of harm; the healthcare professional should not harm the patient. All treatment involves some harm, even if minimal, but the harm should not be disproportionate to the benefits of treatment ([Beauchamp and Childress, 2001](#)).

Justice. distributing benefits, risks and costs fairly; the notion that patients in similar positions should be treated in a similar manner ([Beauchamp and Childress, 2001](#)).

What the research says

- **Boada, J., P., Maestre, B., R. and Genís, C., T. (2021) The ethical issues of social assistive robotics: A critical literature review. *Technology in Society* Volume 67, 101726.** Although SARs are expected to significantly contribute to care practice, numerous ethical challenges have been raised. In this critical literature review, which includes 56 research publications, ethical issues of SARs were categorized into three main thematic groups: Well-being, Care, and Justice. According to the analysis, the most often mentioned ethical themes were Privacy /Data Control, Deception, and Autonomy (all subthemes under 'Well-being'). Some other examples of ethical concerns were discussed in the following subthemes: 'loss of human contact', 'safety', 'emotional attachment', 'unauthentic intersubjectivity', 'freedom', 'objectification', 'human-human relationships' etc. Available [here](#).
- **Battistuzzi, L., Sgorbissa, A., Papadopoulos, C., Papadopoulos, I., & Koulouglioti, C. (2019). Embedding Ethics in the Design of Culturally Competent Socially Assistive Robots, 1996–2001.** This article describes how a research ethics training module for the project CARESSES- —an international multidisciplinary project that aims to design and evaluate the first culturally competent SAR for the care of older adults- was developed. The article also includes an overview of ethical issues related to conducting research with SARs and older adults in care homes. For instance, concerning autonomy, authors note that SARs can promote and maintain autonomy as they can offer suggestions and encourage users to carry out tasks on their own and care for themselves. However, it is highlighted that assistance from SARs should always be limited to what is required and beneficial to the care recipient. Available [here](#).
- **Sharkey, A., & Sharkey, N. (2010). Granny and the robots: Ethical issues in robot care for the elderly. *Ethics and Information Technology*, 14(1), 27–40.** This article raises and discusses ethical concerns associated with the use of robots in older adults' care. Authors explore the following concerns: 1) the potential reduction in the amount of human contact; 2) an increase in the feelings of objectification and loss of control; 3) a loss of privacy; 4) a loss of personal liberty; 5) deception and infantilisation; 6) the circumstances in which elderly people should be allowed to control robots. Available [here](#).

- **Ienca et al. (2018) Ethical Design of Intelligent Assistive Technologies for Dementia: A Descriptive Review, Science and Engineering Ethics 24(3)** This systematic literature review discusses ethical considerations and explores the use of Intelligent Assistive Technology (IAT) in care, specifically their design in relation to ethical values. Results showed that IATs are not designed to take into account ethical values and considerations in many cases. Issues such as justice, equality, privacy, and security were found to be the most ignored. It is highlighted that to successfully implement these technologies in care and improve the lives of care recipients, ethical evaluations need to be incorporated in products. Available [here](#).
- **Laitinen, A., Niemelä, M. and Pirhonen, J. (2019) Demands of Dignity in Robotic Care: Recognizing Vulnerability, Agency, and Subjectivity in Robot-based, Robot-assisted, and Teleoperated Elderly Care, Society for Philosophy and Technology Quarterly Electronic Journal 23(3).** The authors of this research article discuss the subject of older adults' dignity concerning robotic care, specifically if robotic care maintains or ignores human dignity in the care of older adults. It is concluded that the answer depends 'on the institutional and cultural settings whether positive or negative effects dominate' (p 391). Available [here](#).
- **POSTnote nr 591 (2018) Robotics in Social Care.** In the UK, POSTnotes (briefing notes) are created regularly about scientific subjects to inform members of the Parliament. This POSTnote addresses the use of robotic technology in social care and explores also the main ethical, social and regulatory challenges to its use in social care. Available [here](#).

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

- **International Organization for Standardization (ISO) (2014) ISO 13482:2014 Robots and robotic devices.** This is a regulation about safety requirements for personal care robots. It addresses hazards that are associated with the use of personal care robots and provides requirements to reduce the risks to an acceptable level or eliminate the risks entirely. Available [here](#).
- **European Parliament, Committee on Legal Affairs (2017). Report with recommendations to the Commission on Civil Law Rules on Robotics.** Among other aspects, this report deemphasizes the role of Asimov's rules on robotics, which are known by the public but have no scientific or technological relevance. Under General Principles, this document states that Asimov's rules may be regarded as being directed at the designers, producers, and operators of robots since those laws cannot be converted into machine code until robots become or are made self-aware. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: A case study with reflective questions

- After reading through the terms and definitions section and navigating through the 'what research says' and 'what international/... treaties say' chapters, read the results section of the research article available [here](#) if you have not done so yet. The article is Boada, J., P., Maestre, B., R. and Genís, C., T. (2021) The ethical issues of social assistive robotics: A critical literature review. *Technology in Society* Volume 67, 101726.
- Using the knowledge from your learning, read the following case study and reflect on the following questions:
 - What ethical issues can you identify in this case?
 - What actions could you have taken to prevent these issues from occurring?

- Create a post with your answers and share it on the discussion board of the social platform for collaborative learning.
- Resources needed: [scientific article](#), case study, social platform for collaborative learning.
- Duration of activity: 30 minutes

Case study

You are working as a permanent carer in a long-term care home for older adults who require physical and mental health care support. Arnold is a new member of the caring home. Since he arrived 2 weeks ago, he has not been very social and tends to spend most of his time taking a nap in the recliner chair. The night shift carers inform you that Arnold is usually awake during the night, laying in his bed and falling asleep right before morning activities begin. You soon learn that Arnold often had visitors and was much more social, but that changed when a recent pandemic occurred. Arnold's son informs you that his dad enjoyed doing word puzzles when he was in the previous home. The only thing Arnold seems to participate in is to join other residents to have a traditional Sunday roast in the dining hall.

You decide to ask Arnold if he would like to spend some time with one of the home's socially assistive robots. You think the robot would keep Arnold awake during the day by helping Arnold contact his family and friends and also do word puzzles. You believe that this could help him sleep during the night as well. You also hope that it might be a useful way for him to connect with other residents in the new home. At first, Arnold disagrees and is reluctant to meet with the robot, but you strongly feel that he could benefit from it, so you bring him a social robot that begins to converse with Arnold in the privacy of his own room.

Next week, when you return to work, Arnold seems more active during the daytime. You chat with him about the robot and ask if he has enjoyed the time spent with the robot. Arnold replies, "Well, actually yes. He is very smart. I can do all kinds of puzzles with him, and he helps to call my son. If only I could keep him here all the time. They keep taking him away from me." Later your colleague mentions that Arnold missed the Sunday roast and instead stayed in his room to have dinner. If you ask Arnold about this, he says he was too busy doing the puzzles with the robot and didn't want to quit before he finished.

Activity 2: The importance of privacy

- Please watch the following video on Youtube.com where social robot Pepper is interacting with a human. The video shows different versions of Pepper's response when the dilemma of privacy occurs (available [here](#), 2 minutes).
- After watching, reflect on the video using your learning and knowledge. Think about the following questions and create a post on the social platform for collaborative learning about your views on privacy and given video and post it on the discussion board. Have you ever had a situation when someone disregards your privacy? How did it make you feel? Why do you think privacy is important to us? Which response do you think is best when Marco is alone and when Marco is with guests? Why? Do you think there are situations where privacy can/should be intruded on in your own workplace? If yes, give examples. Do you think this only applies when there is human-human interaction or also for human-robot interaction?
- Read answers from other participants and reflect on their thoughts.
- Resources needed: [Youtube video](#), social platform for collaborative learning.
- Duration of activity: 15minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Short quiz

- You are presented with the following questions: select all the answers that you think to be correct, using the knowledge learned from this tool.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 3 minutes.

Questions

1. Who wrote the three following laws: (1) A robot may not injure a human being (2) A robot must obey orders, unless they conflict with law number one (3) A robot must protect its own existence, as long as those actions do not conflict with either the first or second law?
 - a) Nikolai Tesla
 - b) Elon Musk
 - c) Isaac Asimov
 - d) Immanuel Kant
2. Decide if the following statements are true or false?
In order to enhance a person's autonomy, a social robot should always help the care recipient carry out a task, even when the person could do the activities independently.
 - a) True
 - b) False
3. When the care recipient has been diagnosed with dementia, it might be needed to ask informed consent to use SAR in their care more than one time.
 - a) True
 - b) False
4. Based on the results from Ienca et al (2018) study (listed above), one of the ethical values that were not always been taken into account when using Intelligent Assistive Technology in care was related to:
 - a) human rights
 - b) privacy
 - c) beneficence
5. Some of the ethical values that are important to consider when implementing SARs in health and social care are connected to (pick more than one)
 - a) dignity
 - b) autonomy
 - c) friendship
 - d) loyalty
 - e) equality
6. One of the ethical concerns that Sharkey and Sharkey (2010) discussed in their article, and which is often associated with the use of robots in care is related to:
 - a) safeguarding issues
 - b) cost-effectiveness
 - c) reduction or loss of human contact

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/LS73S7M>

Module 3 TRN CULTURAL SENSITIVITY, Learning Unit 3.3. Working together

Victor Dudau, Edunet Organization

THEORETICAL COMPONENT

Principles and Values

The learning unit is founded on the core principles from medical ethics (autonomy, beneficence, non-maleficence, justice) and the general principles and values for the IENE 10 associated with culturally competent and compassionate care:

- co-operation
- commitment
- communication
- kindness
- acceptance
- empathy
- friendship/relationship, encouragement
- ensuring patient dignity.

Aims

This learning unit aims to enhance the understanding of human-robot collaboration of all involved in the care of patient/client- family, caregiver, professionals, robot, and client themselves.

Learning outcomes

At the end of this training, the participants will:

- Increase knowledge about elements of effective collaboration between the patient/client and different stakeholders and SARs.
- Enhance skills to ensure the quality of patient/client care.
- Better understand the benefits of effective teamwork between the patient/client, formal care staff, family members, and SARs in health and social care.

Relevant definitions and terms

Robot-mediated behaviour intervention. It is the use of robots as an assistive technology in delivering autism intervention therapies. This further means, that robots are used to engage, present, and deliver robot executed behaviour therapy routines presented by the robot to those diagnosed on the autism spectrum. These routines address defined and targeted aspects of social interactions and learning skills development.

Autism Spectrum Disorder (ASD). Autism spectrum disorder [ASD] is characterised by persistent deficits in the ability to initiate and to sustain reciprocal social interaction and social communication, and by a range of restricted, repetitive, and inflexible patterns of behaviour, interests or activities that are clearly atypical or excessive for the individual's age and sociocultural context(WHO International Classification of Diseases).

Alzheimer's disease (AD). Alzheimer's disease (AD) is a neurodegenerative disease that usually starts slowly and progressively worsens. The most common early symptom is difficulty in remembering recent events. As the disease advances, symptoms can include problems with language, disorientation (including easily getting lost), mood swings, loss of motivation, self-neglect, and behavioral issues.

What the research say

- Aymerich-Franch, L. & Ferrer, I. (2021). Socially assistive robots' deployment in healthcare settings: a global perspective.** The study provides an in-depth picture of the current state of the art of SARs' deployment in real scenarios for healthcare-related applications. It contributes to understanding better the role of these machines in the healthcare sector. Using a documentary research method, 279 experiences of SARs deployments are mapped in hospitals, elderly care centres, occupational health centres, private homes, and educational institutions worldwide from 33 different countries and involving 52 different robot models. The most widespread functions identified for these robots were entertainment, companionship, telepresence, edutainment, providing general and personalized information or advice, monitoring, promoting physical exercise and rehabilitation, and testing and pre-diagnosis. These functions show that SARs are progressively emerging as a solution to release medical staff and caregivers from some basic tasks and assist them with patients, older adults, and people with special needs in hospitals, nursing homes, and private homes, among others. Available [here](#).

Emotional wellbeing Recognise and regulate own emotions Self-image - ASD awareness - who am I? Resilience (deflect and guard limits - defend oneself) Confidence - self esteem Rest - relaxation Having fun - experiencing pleasure Safety Making thoughts positive	Play Imitation Develop interest in play Development own play Parallel play (next to each other SAME MATERIAL) Playing together – collaborative play Variation in play (expand play) Negotiate about rules	Functioning in daily reality Cope with unexpected situations or changes Flexibility - switch smoothly - less rigid Problem solving skills Taking initiative Transfer of skills / knowledge Open mind to tasting / eating food
Social / Interpersonal interactions and relations Imitation Attention Appropriately cope with own anger / sadness / .. Awareness of feelings wishes behaviour thoughts of others Appropriately react to behaviour of others Social routines (greet say goodbye introduce) Turn taking (behaviour) Respect / value others (or things) Appropriate behaviour w.r.t. physical proximity / contact or personal space Collaboration / joined attention Ask for help Conflict management	Preschool skills Work posture (sit still - no wobbling) Train or practice skills Be able to start/stop independently Work on his/her own - task approach Cope with schedule/program Pose a question / ask for help Distinguish main from minor issues Follow up instructions Execute task (simple / complex task) Didactic subjects (e.g. maths - reading) Spatial concepts Learn to wait Perseverance Learn to choose - make decisions	Communication Orientation to listen Making contact Learn a new form of communication Understand intention of gesture Understand intention of image / symbol Understand intention of word Use gesture Use nonverbal abilities Talk – use verbal abilities
Sensory experiences and coping Adequate processing of sensory triggers (regulate - mute - stimulate) Understand what body is "saying" (e.g. pee - hunger - noises) Change stereotype behaviour Prevent panic reactions Be able to postpone urge / want	Motor experiences and skills Balance and equilibrium Body awareness Gross and fine motor skills Movement Coordination Strengthening of muscles	Self-care - independent living Potty training Eating - drinking (un)Dressing Self-care - personal hygiene Domestic skills Mobility Hobbies - leisure time

- Claire A. G. J. Huijnen, Monique A. S. Lexis, Rianne Jansens, Luc P. de Witte (2017). How to Implement Robots in Interventions for Children with Autism? A Co-creation Study Involving People with Autism, Parents and Professionals, Journal of Autism and Developmental Disorders 47(2).** Interacting with robots can be particularly empowering for children with autism spectrum disorder (ASD) because it may overcome various barriers experienced in face-to-face interaction with humans. The study gained insight into how robots such as KASPAR can be practically implemented into current education and therapy interventions for children with ASD. In Appendix 1, an overview of ASD Therapy and Educational Objectives is presented; see Figure above. Appendix 2 describes a robot-mediated intervention, including objectives and robot roles, intervention description, and interaction flow. Available [here](#).

- **Rabbitt SM, Kazdin AE, Scassellati B (2015) Integrating socially assistive robotics into mental healthcare interventions: Applications and recommendations for expanded use, Clinical Psychology Review 35.** This article highlights current SAR advances and applications in mental healthcare, analyses the background information on socially assistive robotics, and shows examples of SARs. Then, it reviews the diverse and clinically relevant ways that these robots have already been used in mental healthcare, with specific emphasis on the functions that robots have served (i.e., companion, therapeutic play partner). SAR can be integrated into treatment protocols in a variety of ways. At this time, a robot used along with a human therapist is the primary way treatment has been implemented. However, potential applications of robots expand far beyond that of therapist assistants. These machines can provide therapeutic services in client homes, reaching individuals who cannot receive treatment in traditional settings (e.g., those living in rural settings, individuals housebound because of physical impairments). At some point in the future, robots will likely assume therapeutic activities previously completed by human mental health professionals. Available [here](#).
- **Koutentakis, D. Pilozzi, A . Huang, X (2020), Designing socially assistive robots for Alzheimer's disease and related dementia patients and their caregivers: Where we are and where we are headed, Healthcare 8(2):73.** Ageing societies and the associated pressure on the care systems are major drivers for new developments in socially assistive robotics. However, as the aging population keeps growing, current medical staff and healthcare providers are increasingly burdened by caring for the ever-growing number of senior patients, especially those with cognitive impairment of Alzheimer's disease (AD) and Alzheimer's disease-related dementia (ADRD). The case study presents a robotic-based application utilizing the robot Pepper designed to support older adults and their caregivers in care homes to increase physical and cognitive activity and initiate social interaction. The results indicate that the residents were positively engaged in the training sessions moderated by the robot, but a person is needed who controls the robot. Available [here](#).

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

European Commission, 2020, White Paper on Artificial Intelligence. A European approach focused on excellence and trust. Through this White Paper, 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. According to the report, AI is a strategic technology that offers many benefits to citizens, businesses, and society, provided that it is human-centred, ethical, and sustainable and respects fundamental rights and values. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Robots Help Autistic Kids Learn

- Watch a video on Youtube.com about the collaboration between kids with Autistic Spectrum Disorder (ASD) and SARs. Reflect on the benefits of effective teamwork between the care staff and SARs to improve the social and communication skills of children with ASD. Available [here](#) (3.19 minutes).
- Make a list of activities that can be practically implemented into current education and therapy interventions for children with ASD and share it with colleagues in the discussion area of the social platform for collaborative learning.
- Read posts of other participants and compare them with your thoughts. Then pick at least 1-2 posts by other students to reply to.

- Resources needed: [YouTube video](#), social platform for collaborative learning.
- Duration of activity: 20 minutes.

Activity 2: How robots help healthcare workers

- Watch the video [Could robots replace healthcare workers? | Lessons from Japan](#) (available [here](#), 6 minutes) about how robots and human carers work together for the benefit of older people and answer these questions:
- How can robots support healthcare workers to ensure patient/client care quality and make their daily work easier?
- How can robots encourage older people to be more independent and support their mental wellbeing (See the commentary from the older participants)
- Search on the Internet for other examples of assistive robots and AI devices that help people to be more independent and help their mental wellbeing. Share your findings with fellow students in the discussion area of the social platform for collaborative learning.
- Resources needed: [YouTube video](#), social platform for collaborative learning.
- Duration of activity: 20 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Fill blank spaces.

- Complete the blanks in the sentences below with the words from the right column.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 3 minutes.

<ol style="list-style-type: none"> 1. Healthcare-related applications of IA and assistive robots will likely be capable of assuming some intervention previously completed by humans and support in their daily work. 2. Effective teamwork between the health staff and SARs ensure the quality of care. 3. Through the collaboration between the autistic kids, staff, and SARs in the robot-mediated behavior intervention, there are improvements in social and communication skills of children with 4. Socially assistive robotics can be integrated into mental healthcare interventions for older patients, especially those with cognitive impairment of disease. 5. The collaboration between the patient/client and SARs encourages older people to be more independent and helps with their mental 	<ol style="list-style-type: none"> a) patients/clients b) wellbeing c) health professionals d) Alzheimer e) Autism Spectrum Disorder(ASD)
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Correct answers: 1.c, 2.a, 3.e, 4.d, 5.b.

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/LRPK23P>

Module 3 TRN CULTURAL SENSITIVITY, Learning Unit 3.4 Culturally sensitive and compassionate human-robot companionship

Chris Papadopoulos, Deevi-Johanna Voki, University of Bedfordshire

THEORETICAL COMPONENT

Principles and Values

Although we might not consciously think about our culture and its impact on our lives daily, culture profoundly affects our communication style, character, personality, knowledge, and motivation (O'Neill-Brown, 1997). Our cultural background also plays a significant role in care: caring as culture is part of one's identity and shapes our beliefs and values (Papadopoulos, 2003). Peoples' cultural behaviours, needs, and beliefs need to be considered to be able to provide them with compassionate care (Papadopoulos, 2006). Compassion is an essential concept in healthcare, and it has been found that compassion can positively impact patient well-being.

A model for cultural competence in nursing, developed by Papadopoulos, Tilki and Taylor in the 1990s, has four constructs: cultural awareness, cultural knowledge, cultural sensitivity, and cultural competence. The model provides an insight into what providing culturally competent care should entail (Papadopoulos, 2003). In human-to-human care, providing culturally competent care has been associated with acceptance (Liu et al, 2012) and higher patient satisfaction (Govere and Govere, 2016). Receiving person-centred care that respects and recognises one's culture could promote dignity, equality, diversity, and inclusion. Robots that are culturally competent could provide more person-centred care and possibly increase care recipients' acceptance of using robots in care. We believe that it is important and beneficial for your learning to examine culturally sensitive and compassionate care and why it is crucial for the successful implementation of SARs in health and social care.

The principles and values that guide this tool include:

- Respect
- Competence
- Dignity
- Equity
- Acceptance

Aims

This tool aims to enhance your understanding of compassionate care and your ability to consider culturally sensitive and compassionate human-robot companionship in health and social care.

Learning outcomes

At the end of this training, the participants

- Will familiarise themselves with the principles of culturally sensitive and compassionate care.
- Should gain knowledge about the significance of culturally sensitive and compassionate human-robot companionship in health and social care.
- Should gain awareness about the ways that SARs can provide culturally sensitive and compassionate human-robot companionship in health and social care.

Relevant definitions and terms

Caring. The concept of caring has many definitions. For instance, Leininger (1984 p 4, cited in [Smith and Turkel \(eds\), 2012](#)) defined caring as ‘the direct (or indirect) nurturant and skillful activities related to assisting people’, whereas Papadopolous (2006, p 11) has defined caring as an ‘activity that responds to the uniqueness of individuals in a culturally sensitive and compassionate way using therapeutic communication’.

Culture. All human beings are cultural beings. Culture is the shared way of life of a group of people that includes beliefs, values, ideas, language, communication, norms, and visibly expressed forms such as customs, art, music, clothing, and etiquette. Culture influences individuals’ lifestyles, personal identity, and their relationship with others both within and outside their culture. Cultures are dynamic and ever changing as individuals are influenced by, and influence their culture, by different degrees ([Papadopoulos, 2006, p 10](#)).

Cultural awareness. The degree of awareness we have about our own cultural background and cultural identity. This helps us to understand the importance of our cultural heritage and that of others and makes us appreciate the dangers of ethnocentricity. ([Papadopoulos, 2006](#)).

Culturally competent compassion. The human quality of understanding the suffering of others and wanting to do something about it using culturally appropriate and acceptable nursing interventions. This takes into consideration both the patients’ and the carers’ cultural backgrounds as well as the context in which care is given ([Papadopoulos, 2011](#)).

Cultural Competence. The capacity to provide effective healthcare taking into consideration people’s cultural beliefs, behaviours, and needs. Cultural competence is the synthesis of a lot of knowledge and skills which we acquire during our personal and professional lives and to which we are constantly adding. ([Papadopoulos, 2006](#)).

Cultural Knowledge. It derives from a number of disciplines such as anthropology, sociology, psychology, biology, nursing, medicine, and the arts, and can be gained in a number of ways. Meaningful contact with people from different ethnic groups can enhance knowledge around their health beliefs and behaviours as well as raise understanding around the problems they face ([Papadopoulos, 2006](#)).

Cultural Sensitivity. Cultural sensitivity entails the crucial development of appropriate interpersonal relationships with our clients. An important element in achieving cultural sensitivity is how professionals view people in their care. Unless clients are considered as true partners, culturally sensitive care is not being achieved ([Papadopoulos, 2006](#)).

Health. World Health Organization ([2006, p1](#)) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity.” Health also refers to a state of well-being that is culturally defined, valued, and practised and which reflects the ability of individuals (or groups) to perform their daily role activities in culturally expressed, beneficial, and patterned lifeways ([Leininger 1991](#)).

Human-robot companionship. The production of real or apparent companionship between human beings and robots. This can either be considered to be ‘real’ companionship in the sense of an objectively visible relationship between human and robot, or a ‘felt’ level of companionship for which a human feels a relationship is present even if it is not objectively visible. The majority of work conducted upon human-robot companionship, particularly in the case of social robots, focuses on providing cognitive support, personalized chats, or pet-like affective therapy ([Li et al, 2013](#)). Through such interaction and communication a companionship may be created ([Prescott and Robillard, 2021](#)).

What the research says

- **Lim, V., Rooksby, M. and Cross, E., S. (2021) 'Social Robots on a Global Stage: Establishing a Role for Culture During Human–Robot Interaction', International Journal of Social Robotics volume 13, pp 1307–1333.** Authors of this paper note that the impact of culture is considered more and more when developing new robotic technologies. This review aims to provide a general overview of how culture shapes human-robot interaction. Firstly, it explores how culture and robotics are intertwined from a psychological perspective, and then a review of 50 studies on how our expectations, attitudes,

and behaviours are influenced by culture is conducted. The authors also discuss how robotic design that is culturally specific can improve the human user's experience. It is concluded that culture holds a potentially significant role in influencing users' interactions with social robots. Among other recommendations for future research, authors suggest that developing culturally adaptive robots rather than culturally specific is an area that needs more attention. Available [here](#).

- **Broadbent, E., Stafford, R. and MacDonald, B. (2009) Acceptance of Healthcare Robots for the Older Population: Review and Future Directions, Int J Soc Robot (2009) 1: 319–330.** This article investigates individual and robot variables that have been found to influence older persons' acceptance of healthcare robots. Authors note that three key requirements considered necessary for acceptance need to occur: a) motivation to use the robot, b) ease of use, c) comfort with the robot physically, emotionally, and cognitively. Numerous individual variables, such as age, gender, education level, past experiences, and culture, were identified, alongside robot variables, such as humanness, facial characteristics, and 'personality.' Available [here](#).
- **Papadopoulos, C. et al. (2021) The CARESSES Randomised Controlled Trial: Exploring the Health-Related Impact of Culturally Competent Artificial Intelligence Embedded Into Socially Assistive Robots and Tested in Older Adult Care Homes, Int J Soc Robot 1(12) doi: 10.1007/s12369-021-00781-x.** This article describes CARESSES (short for Culture-Aware Robots and Environmental Sensor Systems for Elderly Support), an international, multidisciplinary project that aims to design the first culturally competent care robots that autonomously adapt the way they behave and speak to the person they assist. The trial of CARESSES is significant in multiple ways, as it is among the first to study the impact of culturally competent SARs for improving health and wellbeing. Although more research is needed, results from the given trial imply that using a CARESSES (experimental) robot compared to not using any robot could likely enhance the emotional wellbeing of older adults. Available [here](#).
- **Papadopoulos, I. et al. (2020) Enablers and barriers to the implementation of socially assistive humanoid robots in health and social care: a systematic review, BMJ Open 10 (1)** This systematic review investigates the barriers and enablers that exist concerning the implementation of humanoid robots in health and social care. Identified enablers were related to enjoyment, usability, personalisation, and familiarisation. In contrast, barriers were associated with technical problems, robots' limited capabilities, and the negative preconceptions towards using robots in care. Available [here](#).
- **Papadopoulos I. (2006) The Papadopoulos, Tilki and Taylor model of developing cultural competence. In: Papadopoulos I. ed. Transcultural Health And Social Care: Development of culturally competent practitioners. Churchill Livingstone, p 7-24** This chapter describes the Papadopoulos, Tilki, and Taylor model. The aim is to help healthcare professionals and services deliver culturally competent care and high-quality care. As mentioned above, the model has four constructs- (1) Cultural Awareness; (2) Cultural Knowledge; (3) Cultural Sensitivity; and (4) Cultural Competence, which all are further described in the second chapter. This model is significant in the field of Transcultural Nursing. Available [here](#).
- **Šabanović, S., Bennett, C., C. and Lee H., L. (2014) 'Towards culturally robust robots: A critical social perspective on robotics and culture'. Proceedings of the ACM/IEEE Conference on Human-Robot Interaction (HRI) Workshop on Culture-Aware Robotics (CARS). Bielefeld, Germany. In Press.** The authors of this article discuss the theme of culturally robust robotics, which, in their view, is a step ahead of culturally aware robots. However, this requires a different design process. The authors provide critical analysis of how culture has been addressed in robotics until 2014 and what steps are needed to move towards culturally robust robotics. It is suggested that culturally robust robotics could be achieved by designing robots to be more culturally reflexive and inclusive of the perspective of diverse stakeholders. Furthermore, they note that robotic technologies should be adaptive and sensitive to particular cultural factors instead of only being able to identify and mimic specific cultures so that they could be used in more than one cultural situation. Finally, the authors also

explore why roboticists and users should be reflexive and aware of their own cultural backgrounds. Available [here](#).

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

- **United Nations (UN) Office of the High Commissioner for Human Rights (OHCHR) (2008), Fact Sheet No. 31, The Right to Health.** This document states that 'All services, goods and facilities must be available, accessible, acceptable and of good quality' (page 4). The document further notes that 'The facilities, goods and services should also respect medical ethics, and be gender-sensitive and culturally appropriate. In other words, they should be medically and culturally acceptable' (p 4). Available [here](#).
- **International Council of Nurses (ICN) (2007, Revised 2013) Cultural and linguistic competence. Position Statement. Geneva Switzerland.** In this statement document, the ICN and its member organisations highlight the importance of cultural and linguistic competence to deliver the best possible outcomes for the client. It is noted that clients have the right to receive culturally and clinically appropriate care, and it is necessary to recognise individual differences (i.e., race, ethnicity, gender, sexual orientation, socio-economic status, age, physical abilities, spiritual or religious beliefs, political beliefs, or other ideologies). However, the statement also emphasizes that 'accepting and respecting cultural differences and adapting care to be congruent with the client's culture should not result in nursing practice that would be in contravention of professional codes of ethics, nursing practice standards, legal frameworks or United Nations human rights conventions' (p 1). Available [here](#).
- **Schouler-Ocak et al. (2015) 'EPA guidance on cultural competence training', European Psychiatry 30, pp 431–440.** This guidance document was created by The European Psychiatric Association (EPA). It aims to provide an outline for cultural competence, structured in the context of knowledge, skills, attitudes, and components of cultural competency. Authors state that to improve cultural competence, 'the systems need to value diversity, assess their own cultural values, be aware of cultural interactions, incorporate cultural knowledge, and adjust service delivery accordingly' (p 436). Although the paper's focus is largely connected to psychiatry, the overview provided about cultural competence and some of the key issues related to the subject and how to deal with these are also relevant in other health and social care areas. Available [here](#).
- **Napier et al. (2014) 'Culture and health', *The Lancet Commissions*. Vol 384, Issue 9954, p 1607-1639.** This Commission paper thoroughly analyses health and health practices related to culture. The authors also review the aspects of cultural competence and inequalities related to culture and health-care delivery. Twelve findings that need attention in the research were identified. Some examples are: 1) Culture should not be neglected in health and health-care provision, 2) Culture should become central to care practises, 3) Competence should be reconsidered across all cultures and systems of care, 4) Exported and imported practises and services should be aligned with local cultural meaning, 5) Building of trust in health care should be prioritised as a cultural value, and 6) New models of wellbeing and care should be identified and nourished across cultures.' Available [here](#). Please note that registering yourself at the website might be necessary to get free access to the article.

PRACTICAL COMPONENT

Learning Activities

Activity 1: Reflect on culturally competent SARs

- After reading through the provided information about terms and definitions and navigating through the ‘what research says’ and ‘what international/... treaties say’ and ‘what research says’ chapters, please visit CARESSES webpage at this [address](#) and read through the information provided. This website is dedicated to the CARESSES trial and provides background information about the culturally competent system and the project itself.
- After visiting the webpage, watch again the video [CARESSES, A robot for the elderly that knows about different cultures](#) (6:10), which you watched in a previous Learning Unit.
- Considering all your learning from this learning unit, create a post on the social platform for collaborative learning where you share your thoughts about culturally competent SARs. Write about your opinion on how culturally sensitive and compassionate care provided by SARs could affect the quality of care in your own workplace. Do you think culturally competent SARs will change the way how care is delivered in the future? If yes, in what ways? Share your post on the discussion board and read answers from other participants. Pick one post from someone else and leave a reply.
- Resources: [YouTube video](#), social platform for collaborative learning.
- Duration: 20minutes.

Activity 2: Mind map

- Considering all your learning so far, create a mind map using Word, PowerPoint, or similar software about the key points you learned during this unit. You can also make the mind map on paper. If you do not know how to create a mind map or you want some ideas, you can watch this short video about creating one [here](#) (2:51)
- Remember, your mind map aims to summarize the main points you have learned from this topic which you would like to tell others about or remind yourself. Feel free to be as creative as you wish (use different colours, pictures, collages, etc.).
- After finishing, please upload your mind map on the discussion board of the social platform for collaborative learning. If you made one on paper, please use your phone or other camera devices to take a photo of your mind map and then upload the file. Have a look at other participants’ mind maps and reflect on how they differ from yours.
- Resources: [YouTube video](#), software for drawing mind maps, social platform for collaborative learning
- Duration: 15 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Complete the sentences.

- Complete the sentences with the right word from the list below. There is one extra word that you will not need to use.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 3 minutes.

Complete the sentences

- emotional wellbeing
- patient satisfaction
- acceptance
- awareness
- identity
- cultural and personal
- diversity

- 1) Culture is part of our _____. (identity)
- 2) Providing culturally competent care has been associated with _____ and higher _____. (acceptance/patient satisfaction)
- 3) The results from a large international project named CARESSES imply that using culturally competent robot have the potential to improve older adults' _____. (emotional wellbeing)
- 4) To be culturally competent means to recognize person's _____ traits and respond accordingly. (cultural and personal)
- 5) According to the guidance document published by EPA (2015) , in order to improve cultural competence, systems need to value _____. (diversity)

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:

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Module 3 TRN CULTURAL COMPETENCE, Learning Unit 4.1 Practical Skills

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THEORETICAL COMPONENT

Principles and Values

This learning unit will provide a basic knowledge of the must-have practical abilities that users interacting with social robots should possess. Indeed, interacting with robots may seem scary for people that have never done it before. What should I do if the robot does not turn on? The robot is supposed to listen and understand the user's speech, but it is not doing that: what is happening? Why cannot the robot find its way to the next room? These are just an example of the high number of questions that inexperienced users may ask in their first attempts at using a social robot in real life. In this topic, participants will find answers to some of these common questions. It may be argued that those practical skills are strictly related to the type of robot used: however, this topic does not want to be a sort of tutorial for a specific type of robot. In fact, a set of general abilities may find application regardless of the robot used. Moreover, the same rationale applies to the common problems and malfunctions that can arise using those complex machines: while all robots are different, and hence they may experience different problems, these problems usually are provoked by similar causes, generate similar consequences, and, more importantly, may be solved with similar solutions.

The principles and values that guide this tool include:

- Effectiveness
- Innovation
- Professionalism
- Learning.

Aims

This learning unit aims to make participants aware of the practical skills and general abilities needed for interfacing themselves with robots and artificial agents. This course does not focus on a specific kind of robot, so information that may apply to a wide range of social robots will be part of this unit. This learning unit also addresses possible issues and malfunctions that can arise during using robots, which may cause concern in inexperienced users to deal with those situations without panicking.

Learning outcomes

Active participation in this training will allow students to:

- Know the main functionalities of robots and artificial agents, with the awareness of their limits and their capabilities.
- Develop the basic skills needed to interact confidently with social robots, focusing on the must-know aspects of human-robot interaction.
- Identify the most common problems that can arise during the interaction with robots, being aware of their causes and consequences.
- Know how to overcome the most common problems related to the interaction with robots.

Relevant definitions and terms

Robot Hardware. All physical components of a robot. It includes *sensors and actuators* (see below), but also joints (the “movable” components of robots), links (the rigid components, which connect adjacent joints), electronic boards, wires, the external cover. All these components together constitute the “body” of the

robot, and in some sense influence the way in which the robot behaves (e.g., a robot with wheels will be probably able to move in the environment, while a robot with arms will be probably able to grab objects). However, these components alone are not enough: we need something that analyses the output of sensors, makes decisions, and finally controls the movements of the actuators and joints: the *robot software*.

Robot Software. **Software** is the complete set of instructions that determines the robot's behaviour. These instructions, usually coded in specific programming languages, are executed on the robot's electronic boards, or they can run in a different computer that communicates with the robot. In any case, these instructions usually analyse the data coming from the sensors onboard the robot, processing them to acquire knowledge about the environment and eventually taking decisions about the movement of the actuators. Ultimately, the robot software constitutes the intelligence of the system, defining its behaviour and the way in which it interacts with the surrounding world.

Sensors. Sensors are physical devices capable of measuring and recording a physical quantity as it evolves with time. Some examples of commonly used sensors in robotics are: cameras (to capture images or videos); RGB-D or stereo cameras (to acquire 3D information about the surrounding environment); microphones (to capture audio); ultrasound sensors (to measure the distance from the closest obstacles); laser rangefinders (to measure the distance from obstacles with a higher resolution, usually to build a map of the environment); touch sensors (to detect collisions or allow people to physically interact with robots); encoders (to measure the movements of robotic parts).

Actuators. An actuator is a component of the robot responsible for controlling a robot part and making it move, typically converting energy into a mechanical force that helps the robot achieve mechanical movements. An electrical motor is a very common type of actuator in robotics, which can be used to control robotic arms, hands, or wheels – if the robot is wheeled. Actuators usually require a significant amount of energy to move mechanical parts, and for this reason, all robots have limited energetic autonomy and need to be periodically recharged. For the same reason, many SARs have wheels, even if their upper body may have a humanoid shape in order to better communicate with people using gestures: wheels are more energetically efficient than biped locomotion (and, obviously, biped locomotion may incur a higher risk of falling).

Artificial Agents. While robots are characterized by a specific embodiment (hence at hardware and software level), artificial agents are generically defined as a software agent, which can exist in a virtual world (e.g. chatbot or smartphone applications) or be integrated with a specific hardware, either very simple (e.g., vocal assistants) or complex (e.g. humanoid robot). In any case, even pure virtual agents may possess many characteristics typical of social robots, such as the ability of understanding and interacting with humans using natural language.

Network Connectivity. Almost all robots (and artificial agents) need to be connected to the internet to work properly. In some cases, the network connectivity is strictly necessary for letting the robot interact with the users: in other words, the robot does not work at all without an internet connection. In other cases, the internet connectivity may improve or enable some robot's capabilities, for example by making it able to convert the user's speech to text.

Social Robots. A robot designed to interact with humans, with the ability to explicitly engage on a social and emotional level ([Campa, 2016; p.106](#)): for this reason, it should follow social rules and interact in a socially acceptable fashion. For example, a robotic butler for humans would have to comply with established rules of good service. It should be anticipating, reliable, and most of all discreet.

A social robot is typically characterized by some (or full) autonomy when communicating and cooperating with humans, eventually making decisions. Social robots usually have a human-like appearance or at least some typical characteristics of humans: a human-like embodiment may signal to users that the agent affords social interactions, hence usually increasing the robot's acceptability. Zoomorphic and pet-like robots are also considered social robots. They may be used in different fields based on their capabilities: social robots are mainly used as educators for children and assistants for the elderly.

One of the most well-known social robots is Sophia, developed by Hanson Robotics. Sophia is a social humanoid robot that can display more than 50 facial expressions. Other popular social robots are NAO and Pepper by SoftBank Robotics.

Social robots such as NAO, Pepper, Paro, Huggable, Tega, and Pleo have been increasingly used in healthcare settings. Other notable examples of social robots include ASIMO by Honda, Jibo, Moxi, and Kaspar, designed by the University of Hertfordshire to help children with autism learn responses from the robot through games and interactive play have. Individuals with cognitive impairments, such as dementia and Alzheimer's disease, may also benefit from social robots. Because of their supportive element in health care settings, some social robots are labelled as "assistive," giving birth to the term Socially Assistive Robot (SAR).

What the research says

Given the focus of this learning unit on practical skills, the scientific papers listed below focus on analysing how non-roboticists perceive robots and the main limitations for their widespread usage. Although investigating slightly different aspects, all reported references deal with the problems related to incomplete knowledge of the robots' practical skills: this may cause a limited willingness of people to use robots in their work (References 1 and 2), to purchase them (Reference 3), and excessive trust in their capabilities, which may ultimately have inauspicious consequences (Reference 4), or a lower confidence level in their safety (Reference 5). Even if not directly analysed in the presented literature, it can be inferred that a basic knowledge of practical robotic skills may be extremely useful also in the healthcare domain.

- **Conti, D., Cattani, A., Di Nuovo, S. and Di Nuovo, A., 2019. Are future psychologists willing to accept and use a humanoid robot in their practice? Italian and English students' perspective. *Frontiers in psychology*, 10, p.2138.** The paper investigates the attitude of Italian and British-English psychology students towards the use of robots in their future work. In this work, their confidence in having the necessary skills and their lack of confidence have been considered. Generally speaking, both Italian and English students felt that they did not have enough knowledge or practical skills to use the robot. However, Italian students were more inclined to take risks, perceiving the usefulness of robots and being more willing to use them. The study concludes that teaching basic computer programming skills even in psychology education may be beneficial to facilitate the use of social robots in this field. Available [here](#).
- **Kennedy, J., Lemaignan, S. and Belpaeme, T., 2016. The cautious attitude of teachers towards social robots in schools. In *Robots 4 Learning Workshop at IEEE RO-MAN 2016*.** The article addresses the views of both the general public and education professionals towards the use of robots in schools. Although the overall attitude was quite positive, the authors have identified a set of problems that may limit their acceptance and have proposed some solutions. Among them, they call for a greater exposure of teachers to robotic systems to better comprehend their capabilities, their current limited performance, and their possible future applications. Available [here](#).
- **Mark La Pedus, 2016. Ready for Social Robots? *Semiconductor Engineering*.** The article analyses the obstacles toward a widespread diffusion of social robots in everyday life. The author underlines how the most recent social robots are still far from being humanoid-like intelligent robots, and they are functionally and socially limited. Indeed, the lack of practical skills, such as manipulation, has been the major limit of social robots so far. However, new technological solutions, such as Artificial Intelligence and more powerful hardware, may pave the way for a new generation of robots to meet market needs. Available [here](#).
- **Aroyo, A.M., De Bruyne, J., Dheu, O., Fosch-Villaronga, E., Gudkov, A., Hoch, H., Jones, S., Lutz, C., Sætra, H., Solberg, M. and Tamò-Larrieux, A., 2021. Overtrusting robots: Setting a research agenda to mitigate overtrust in automation. *Paladyn, Journal of Behavioral Robotics*, 12(1), pp.423-436.** This very recent scientific paper deals with a relevant issue: the trust that users place in Artificial Intelligence and robotics. Indeed, individuals without a background in computer science and robotics may think that technology is more capable than it really is, and this may have different consequences. For example, the tendency to follow robots' suggestions even if they have earlier expressed faulty

behaviour. Their conclusions suggest that robotic literacy should be included in all educational settings where robots are possibly employed, and that user manuals could stress the risks linked to overtrust. Available [here](#).

- **Rubagotti, M., Tusseyeva, I., Baltabayeva, S., Summers, D. and Sandygulova, A., 2021. Perceived Safety in Physical Human Robot Interaction--A Survey. arXiv preprint arXiv:2105.14499.** The article focuses on how users perceive social robots in terms of safety. Indeed, the authors point out how robots should not only be inherently safe: they should also be perceived as safe. Not surprisingly, the survey underlines how, in the reported experiments, subjects with prior experience interacting with robots report having a higher confidence level in their safety. Available [here](#).

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

- **ISO 13482:2014, Robots and robotic devices — Safety requirements for personal care robots.** International standards exist to guarantee compliance of robots with safety requirements, which are covered by ISO13482:2014 Robots and robotic devices – Safety Requirements for personal care robots. Overall, the standard specifies requirements and guidelines for the inherently safe design, protective measures, and information for the use of personal care robots. While the standards generally define requirements and guidelines for mobile servant robots, physical assistant robots, and person carrier robots, specific safety requirements for social robots include hazards related to charging batteries, robot motion, contact with moving components, robot stopping functions. Available [here](#).
- **Expert Group on Liability and New Technologies, Liability for Artificial Intelligence and other emerging technologies, 2019.** In November 2019, the European Commission published a very important document, “Liability for Artificial Intelligence and other emerging technologies.” The report addresses the problems raised by autonomous, intelligent behaviour when damage occurs and victims seek compensation. Specifically, the report discusses how the capability of robots to autonomously perceive the environment and take decisions accordingly can make the existing regulations inadequate or obsolete. Only regulation to determine the so-called “strict liability” is harmonized at the EU level: strict liability covers all cases in which damages are caused by a defective product, which turns out to be inappropriate in the case of intelligent systems and robots in particular. For example, a SAR may not be defective when it exits from the factory, but it may learn and adapt its behaviour as it acquires new information during usage. To which extent will the producer (or a third-party operator that uses the robot) be liable, in this case? The report discusses this and other aspects that should be taken into account to allow AI and robotic technologies to become part of our lives, suggesting the use of obligatory insurance schemes for AI programs and robots and other possible solutions. Available [here](#).
- **The Topol Review – Preparing the healthcare workforce to deliver the digital future (Topol, 2019).** This review is an independent report on behalf of the UK Secretary of State for Health and Social Care, presented in February 2019. While the report generally underlines how digital developments will change the roles and functions of the clinical staff in the near future, it also has a dedicated section on Robotics. The report underlines how clinicians will need to understand the technology and be trained to use it in the right manner and with confidence by possessing the fundamental skills needed to maximize its potentials. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Digital skills of the future.

- Watch a video about the Topol report (available [here](#), 10 min.) about the importance of digital and robotics literacy in the education of healthcare personnel.
- After watching the video, you are asked to answer a few questions (given below).
 - What digital skills do you believe will be more important in your profession?
 - For which of these skills do you think to be not enough prepared?
 - For which of these skills do you think to be already prepared enough?
- You are invited to discuss your answers with other participants on the social platform for collaborative learning. We encourage you to read the Topol report (Topol, 2019) for further information.
- Resources needed: YouTube [video](#), social platform for collaborative learning.
- Duration of activity: 15 minutes.

Activity 2: Explore basic skills and common problems linked to the usage of social robots.

- This activity requires you to watch a video playlist (available [here](#), 6 mins.) specifically created for this Learning Unit. The videos will show some practical skills and must-know instructions needed for the daily usage of social robots, in particular the humanoid robots NAO and Pepper (Softbank Robotics, 2021) (e.g., how to charge the robots, how to handle them, how to force them to stop, ...).
- You are encouraged to discuss the watched videos about what they have learned on the social platform for collaborative learning, also considering the provided elements of discussions.
 - What scares you the most about the practical usage of robots?
 - What are the videos in the playlist that look most useful to you? And why?
 - What are the practical skills needed to use those robots you already thought you had?
- Resources needed: YouTube [playlist](#), social platform for collaborative learning.
- Duration of activity: 15 minutes

Activity 3: Working with robots. Finding solutions to common problems.

- You are invited to interact with a short textual game (a sort of multiple-choice adventure, available [here](#)) in which you have to do some activities with a robot and solve all the practical problems that need to be addressed. The game is structured with multiple choices to allow you to learn some new practical skills needed for interacting with robots.
- Resources needed: Adventure game [website](#). You do not need to register/log in to play the game; just press the green button. The link also provides some additional instructions.
- Duration of activity: 10 minutes

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: A simulated interaction with a social robot.

- You need to interact with a chatbot that simulates realistic situations that may occur when interacting with a robot (available [here](#)).
- Unlike practical activity 3, here you need to reply with open answers to the problems/situations that the chatbot will present. Based on your answers, the chatbot will give a positive or negative feedback. After three “wrong” answers, the chatbot will help you, giving you the possibility to proceed with the dialogue. The activity is completed when the chatbot announces that the dialogue is over. Please consider that the right/wrong answer detection is based on keyword: it may happen that you give the right answer, but the robot does not recognize it.

- Resources needed: chatbot [website](#). You do not need to register/log in to play the game; just press the green button. The link also provides some additional instructions.
- 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/LT2XXG6>

Module 4 – TRN COMPETENCE, Learning unit 4.2: Safety

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THEORETICAL COMPONENT

Principles and Values

The use of technology to improve people's quality of life is becoming a common trait of modern societies. Humanoid robots have already been shown to be useful in healthcare. To ensure successful interactions with humanoid robots, it is essential to understand the factors that influence users' sense of security. Ensuring patients' sense of security is considered a key principle of good caring. This learning unit provides a quick overview of the patient's safety.

The principles and values that guide this tool include:

- Safety of the patient—both physical safety and psychological safety
- Avoidance of harm
- Privacy and data protection
- Effectiveness
- Acceptance
- Communication
- Helping

Aims

This learning unit aims to develop your understanding of the safety of the use of robots for the care of the patient/client. You will be engaged in learning through reflection, knowledge acquisition, and practical activities.

Learning outcomes

At the end of this training, the participants will:

- Expand their own knowledge on the definition and the terms of safety.
- Discuss the main principles of safety.
- Identify specific safety functions that a robot performs.

Relevant definitions and terms

Healthcare robot. Healthcare robots are these robots used in the healthcare setting and are designed to support and care for people with health issues including assisting with their daily tasks and boosting their overall health and well-being

Humanoid robot. A robot which appearance resembles a human and can often carry out tasks like a human ([Ting et al., 2014](#)). Also referred to as an anthropomorphic robot, with a higher emphasis on emulating human structure, sensorimotor and cognitive skills.

Patient safety. Patient Safety is a healthcare discipline that emerged with the evolving complexity in health care systems and the resulting rise of patient harm in health care facilities. It aims to prevent and reduce risks, errors, and harm that occur to patients during the provision of health care. A cornerstone of the discipline is a continuous improvement based on learning from errors and adverse events. Patient safety is

fundamental to delivering quality essential health services ([WHO, 2019](#)). [ISO 13482:2014](#) specifies requirements and guidelines for the inherently safe design, protective measures, and information for use of personal care robots, in particular, the following three types of personal care robots: (i) mobile servant robot; (ii) physical assistant robot; (iii) person carrier robot. These robots typically perform tasks to improve the quality of life of intended users, irrespective of age or capability. ISO 13482:2014 describes hazards associated with the use of these robots and provides requirements to eliminate, or reduce, the risks associated with these hazards to an acceptable level.

Safety consideration in social assistive robots (SAR) includes two key underlying aspects: general safety and perceived safety. General safety in SAR is hoped to be achieved by following safety measures when designing robots to prevent any physical injuries to humans. In order to allow for safe, yet efficient inter-actions, human intention prediction capabilities are essential for robots. More elusive is the aspect of perceived safety, which in SRA is defined as a human's perception of the level of danger when interacting with a robot, and the humans' level of comfort during the interaction. To improve perceived security, in a scenario where a robot coexists in a workplace with humans, it is desirable for the robot to communicate its intentions in a clearly understandable way. Improving security perception is expected to increase robots' acceptance as trusted colleagues (Chadalavada et al., 2020).

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

- **M., Okamura, M., M.J., Matarić, M.J., and H.I. Christensen, H.I. (2010) Medical and Health-Care Robotics. *IEEE Robotics & Automation Magazine*, 17 (3), 26-37. doi: 10.1109/MRA.2010.937861.** The challenge of safe robot action and reaction is as old as the field of robotics itself. However, safety takes on a new dimension when directly close-up interactions with human users, often vulnerable ones, constitute the core of the robot's purpose. Providing an appropriate response to human behavior (e.g., knowing the difference between unintentional human behavior and specific intent) represents a new technical challenge. The robot must anticipate dangerous behavior or conditions (i.e., create virtual constraints) and respond to any urgent conditions in home environments under all conditions. Available [here](#).
- **Vargas, S. (2015) Robots in the workplace. *Safety and Health*.** Recently, technological advances have begun to allow for a greater diversity of robotic systems in the workplace. Robots can help prevent injuries or adverse health effects. Robots also can minimize risks stemming from human error. Available [here](#).
- **Rantanen, T., Lehto, P., Vuorinen, P., Coco, K. (2018) The adoption of care robots in home care—A survey on the attitudes of Finnish home care personnel. *J Clin Nurs.*, 27, (9-10).** This article reports how robot technology has been shown to improve patient safety. More recently, robotics for health care has been an important focus of development and innovation activities in Finland. Care robots enhance the safety of the medication and the safety of older people who live at home. Robots could also be used as promoters of safety. A care robot can help an older person communicate with relatives and friends or help observe an older person's state of health (i.e., through remote communication with a doctor or nurse or the real-time conveying of health information). Finally, it

can help with medication (e.g., giving medicine, recognising medicine, observing medicine use). Available [here](#).

- **Ebrahimi, A., Alambeigi, F., Zimmer-Galler, E.I., Gehlbach, P., Taylor, R.H. (2019) Toward Improving Patient Safety and Surgeon Comfort in a Synergic Robot-Assisted Eye Surgery: A Comparative Study. International Conference on Intelligent Robots and Systems (IROS) Macau, China, November 4-8, 2019.** The article reports how robots may ensure safety during surgeries: the robot's autonomous motion enhances patient safety but might inhibit the surgeon's tool manipulation and diminish surgeon comfort with the procedure. The introduction of technology has been shown to improve patient safety care robots that enhance the safety of medication (65.8%) and the safety of older people who live at home ([Ebrahimi et al., 2019](#)). Available [here](#).
- **Nyholm, L., Santamäki-Fischer, R. & Fagerström, L. (2021) Users' ambivalent sense of security with humanoid robots in healthcare. *Informatics for Health and Social Care*, 46 (2), 218-226.** The article discusses how, in order to ensure successful interactions with humanoid robots, it is essential to understand the factors that influence users' sense of security, a key principle of good caring. Then, a study is presented aimed to illuminate users' sense of security with humanoid robots in healthcare. To this end, twelve semi-structured interviews were conducted. Before being interviewed, the participants were shown a video vignette with Pepper, a fully developed humanoid robot used in the daily care of patients. The data material was analyzed using qualitative content analysis. Most participants perceived the use of humanoid robots in healthcare to be both positive and negative. The overarching theme was: Ambivalent sense of security with humanoid robots in healthcare. The four categories revealed were: Humanoid robots are both reliable and unreliable, Humanoid robots are both safe and unsafe, Humanoid robots are both likable and scary, and Humanoid robots are both caring and uncaring. The article increased knowledge of whether patients perceive a sense of security with humanoid robots in healthcare, including fears users have. Available [here](#).
- **Benetazzo, F., Ferracuti, F., Freddi, A., Giantomassi, A., Iarlori, S., Longhi, S., Monteriù, A., Ortenzi, D. (2015) AAL technologies for independent life of elderly people. *Springer*, 329–43.** The article argues that to ensure that humanoid robots are useful and of benefit in healthcare, a human rather than a technical point of view should be considered during their technical development. A discussion is included about the various factors that should be taken into account, such as safety and user preferences. Available [here](#).

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

- **Regulation 2017/745 of the European parliament and of the council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC.** This regulation means that the devices shall achieve the performance intended by their manufacturer and shall be designed and manufactured so that, during normal conditions of use, they are suitable for their intended purpose. They shall be safe and effective and shall not compromise the clinical condition or the safety of patients, or the safety and health of users or, where applicable, other persons, provided that any risks which may be associated with their use constitute acceptable risks when weighed against the benefits to the patient and are compatible with a high level of protection of health and safety, taking into account the generally acknowledged state of the art. Available [here](#).
- **Proposal for a Regulation of the European Parliament and of the Council on machinery products (2021).** Machinery regulation ensures that the new generation of machinery products guarantees the safety of users and consumers and encourages innovation. Machinery products cover an extensive range of consumer and professional products, including robots. The Machinery regulation will adapt certain provisions in the scope, definitions, and safety requirements to bring greater legal clarity and capture the new features of machinery products. Available [here](#).

- **ISO 13482:2014, Robots and robotic devices — Safety requirements for personal care robots.** International standards exist to guarantee compliance of robots with safety requirements, which are covered by ISO13482:2014 Robots and robotic devices – Safety Requirements for personal care robots. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Find the secret words in a word search puzzle

- Find all words in the online puzzle (available [here](#)).
- Resource needed: The [Word Search](#), a tool for online word search puzzles.
- Duration: 5 minutes.

Patient safety

H	J	X	Y	P	O	H	B	G	U	H	S	A	A
R	O	B	O	T	J	C	P	L	V	Z	A	N	S
C	D	H	C	Z	O	S	I	C	P	Q	F	S	S
A	W	S	A	Q	Y	O	A	V	R	N	E	A	I
R	W	U	I	T	R	Q	Z	V	O	P	T	P	S
E	K	P	Q	A	E	O	C	N	T	R	Y	R	T
G	R	P	G	Q	M	Y	O	W	E	E	O	I	A
I	U	O	H	G	I	Y	M	N	C	V	J	V	N
V	C	R	Q	G	N	L	P	K	T	E	S	A	C
I	R	T	T	F	D	Y	A	A	I	N	Y	C	E
N	I	R	C	U	E	Y	N	O	O	T	K	Y	T
G	S	G	R	E	R	B	Y	F	N	I	D	Q	W
A	K	J	F	J	Q	F	C	Q	I	O	B	L	U
A	S	H	O	P	K	Z	I	J	Y	N	P	Q	X

SAFETY
PREVENTION
PRIVACY
ASSISTANCE
REMINDER
RISKS
PROTECTION
SUPPORT
CAREGIVING
COMPANY
ROBOT

Activity 2: A robot providing care to older people

- Watch the following video about robots for health and social care (available [here](#)).
- Write a post on the social platform for collaborative learning.
 - Can you mention any mechanisms by which the robots increase safety?
 - Identify potential issues that might threaten patient/client physical and psychological safety and provide potential solutions.
- Read comments from other participants and reflect on their ideas.
- Resources: YouTube [video](#), social platform for collaborative learning.
- Duration: 40 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: True - False questions

- Answer the questions below.
- Resources needed: Word or similar software for writing, pen or pencil.
- Duration of activity: 5 minutes.

True/False Questions

- Robots can improve patient safety (True)
- Robots can prevent patients from falling (True)
- Robots are not able to help patient/client with his/her medication (False)
- Robots cannot be used during surgeries because they increase doctors' stress (False)
- Humanoid robots are useful and of benefit in healthcare, but not for older persons (False)

EVALUATION COMPONENT

Participants to evaluation

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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.

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<https://www.surveymonkey.com/r/LTTB68M>

Module 4 TRN CULTURAL COMPETENCE, Learning unit 4.3 Rights and inequalities

Irena Papadopoulou and Runa Lazzarino, Middlesex University

THEORETICAL COMPONENT

Principles and Values

The culturally competent and compassionate care model is person-centred and is fundamentally informed by the principle of patients' rights. This means that the care and treatment of service users must respect their needs and preferences, be accessible and inclusive, and be of equal quality for all service users. It also means that when it comes to the use of socially assistive robots in healthcare, important legal and ethical issues must be taken into account, together with maintaining quality care and trust for all. The advantages of artificial intelligence and socially assistive robots in health and social care can fully actualise only within the boundaries of patients' rights - including consent, awareness, data protection, and policy issues.

Therefore, the most important values and principles of this unit are:

- patients' rights
- equality, diversity, and inclusion
- quality care for all
- person-centred care
- ethics
- informed consent
- respect
- trust

Aims

This learning unit aims to enhance participants' knowledge and skills about the rights of patients/clients in relation to implementing socially assistive robots in health and social care settings. Another aim is to offer tools to better understand, prevent and eliminate potential inequalities in the opportunities, or not, that some patients/clients have to use and/or be provided with care by robots.

Learning outcomes

At the end of this training, the participants will have acquired greater understanding and knowledge of, as well as be better equipped to apply and evaluate situations around:

- Rights of the patient/client when receiving care from socially assistive robots;
- The potential impact of artificial intelligence and robotics on widening health inequalities;
- Prevention and elimination of health inequalities with implementing socially assistive robots in health and social care.

Relevant definitions and terms

Global burden of disease. A measurement of the gap between current health status and an ideal situation where everyone lives into old age, free of disease and disability. The global burden of disease is a comprehensive demographic and epidemiological framework to estimate health gaps for an extensive set of disease and injury causes, and for major risk factors ([WHO, 2011](#)). The introduction of socially assistive robots and other technologies in the health and social care sector should aim to reduce, and not exacerbate,

economic and social inequalities whereby, today, the burden of disease is massively carried by low and middle-income countries as well as by the more disadvantaged sections of society.

Health inequalities. Health inequalities are unfair and avoidable differences in health across the population, and between different groups within society, based on place of birth, work, and age. These conditions influence our opportunities for good health. Health inequalities have been documented between population groups across at least four overlapping dimensions: (i) Socio-economic status and deprivation: e.g., unemployed, low income, people living in deprived areas; (ii) Protected characteristics: e.g., age, sex, race, sexual orientation, disability; (iii) Vulnerable groups of society, or 'inclusion health' groups: e.g., migrants; Gypsy Roma and Traveller communities; rough sleepers and homeless people; sex workers; (iv) Geography: e.g., urban, rural. Action on health inequalities requires improving the lives of those with the worst health outcomes ([NHS, 2021](#)). Recently, the advances in AI have uncovered issues of inequalities due to the fact that not everyone has access to, or the resources to access, advanced technologies in the health sector and beyond.

Person-centred care. Care that is focused and organized around the health needs and expectations of people and communities rather than on diseases. People-centred care extends the concept of patient-centred care to individuals, families, communities and society, and their crucial role in shaping health policy and health services ([WHO, 2011](#))

Patient rights. A set of rights, responsibilities, and duties under which individuals seek and receive health care services. Main patients' rights are: 1) Right to be respected. Every person is a unique individual who is responsible for their own health (except if they have diminished capacity and are unable to act on their own behalf). Each person's care should be tailored to their particular needs. 2) Right to be informed, and to participate, or not to participate. Patients have the right to privacy and to make decisions based on adequate information regarding their health status, care and treatment. 3) Right to equal access to health care. Every citizen has the right to equal access to comprehensive health care ([Briggs M. et al., 1994](#)).

What the research says

- **Lawrence M., (2018) *The forward march of robots halted? Automation, employment and inequality*. Institute for Public Policy Research.** This blog post talks about technological change and the increase in automation. The author puts forward that this change will lead to more inequality, as some areas and jobs will be more affected than others. Finally, the blog post gives recommendations on how these potential problems can be anticipated and managed. Available [here](#).
- **Can the right technology end health inequalities? (2020).** This online magazine article describes existing health inequalities, gives examples of how COVID-19 has spotlighted health inequalities and asks how health technologies can end health inequalities. Available [here](#).
- **Hamblin, K., (2020). Care System Sustainability: what role for technology? An evidence review. Sustainable Care – connecting people & systems, Circle.** This review explores the role of technology in social care. Also, it highlights some concerns, such as inequalities in access to technology, described as the 'digital divide.' The author argues that several challenges faced by care systems are not experienced equally across local authorities, undermining the notion that technology can provide a 'one size fits all' solution to the issues faced in social care. Skills are also essential, and there are inequalities in people's digital skills. The infrastructure is also lacking in some areas. Available [here](#).
- **Marschang, S., (2014) Health inequalities and eHealth, eHealth Forum, Athens, Greek Presidency session on 'eHealth for resource-limited settings' – 12 May 2014, Policy Coordinator for Health Systems, European Public Health Alliance (EPHA).** This paper is a presentation covering (1) European Public Health Alliance & eHealth Stakeholder Group (EHS); (2) EHS report on 'Health inequalities and eHealth'; (3) Barriers experienced by users & vulnerable groups; (4) Barriers experienced by health professionals/providers; (5) Industry solutions tackling identified barriers; (6) Transferable good practices (EU, national, regional eHealth policy); (7) EHS Recommendations. Available [here](#).

- **Blake, V. K., (2020) Regulating Care Robots. *Temple Law Review* 92(3).** The article reports that care robots already assist the elderly in some nursing homes around the globe, and their employment in hospitals and private homes is steadily increasing. Robots are a great promise: they can provide increased independence, assistance with daily living, comfort, and distraction during procedures, education, and companionship during vulnerable and lonely times in patients' lives. Despite these promising features, there are also several concerns: care robots, designed to win patient trust and affection, have unprecedented access to personal lives and recording and sensory capabilities beyond any human. For this, robots pose a significant risk to privacy, confidentiality, and autonomy, which are pillars of respecting patients' rights. Regulation of care robots will be necessary to safeguard these patients' rights. This article proposes a regulatory framework for care robots addressing four key stakeholders involved in care robot governance: the providers and institutions that deploy care robots, the manufacturers of such robots, and government agencies. Available [here](#).
- **Tavani T. H. (2018) Can Social Robots Qualify for Moral Consideration? Reframing the Question about Robot Rights, *Information* 2018, 9(4), 73.** A controversial question that has been hotly debated in the emerging field of robot ethics is whether robots should be granted rights. Yet, a review of the recent literature in that field suggests that this seemingly straightforward question is far from unambiguous. For example, those who favour granting rights to robots have not always been clear as to which kinds of robots should (or should not) be eligible. Nor have they been consistent concerning which kinds of rights—civil, legal, moral, etc.—should be granted to qualifying robots. Also, there has been considerable disagreement about which criteria a robot should satisfy to be eligible for rights, and there is ongoing disagreement as to whether a robot must satisfy the conditions for (moral) agency to qualify either for rights or (at least some level of) moral consideration. This paper aims to show how the current debate about whether to grant rights to robots would benefit from an analysis and clarification of some key concepts and assumptions underlying that question. Available [here](#).

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

- **Lawrence, M., Roberts C., and King L. (2017). Managing Automation. Employment, inequality and ethics in the digital age. Discussion paper. Institute for Public Policy Research Commission on Economic Justice.** Key reflections of this report that are relevant to this learning unit: a) automation is likely to change jobs rather than eliminate them; b) the tasks that human workers do are likely to change, as well as the percentage of their job that is automated; c) there are likely to be inequalities introduced because there is no large-scale policy intervention relating to the roll-out of automated technologies. The report also gives a number of recommendations, for example, about managing the implementation of automated technology, and also in relation to the regulation. Available [here](#).
- **Puaschunder, J. (2019). The Legal and International Situation of AI, Robotics and Big Data With Attention to Healthcare, *SSRN Electronic Journal*.** The most recent decade featured a data revolution. Therefore, the call for developing a legal, policy, and ethical framework for using big data, artificial intelligence, and algorithms has reached unprecedented momentum. Such a framework is urgent and necessary in order to ensure the respect of patients' rights and avoid deepening health inequalities. The report aims at helping a broad spectrum of stakeholders understand the impact of these technologies to provide them with information on key drivers, restraints, challenges, and opportunities for the pursuit of improvement of this new market innovation within the respect of the patients' rights. Available [here](#).
- **Scottish Care (2018) Tech Rights. Human Rights, Technology and Social Care.** This report summarises the use of technology in social care and describes the challenges and implications concerning human rights and other legal and ethical implications. The report relates to social care in Scotland. Several recommendations are given at the end of the report, one of which is developing a technology strategy for social care staff so that they can become technologically confident and increase their knowledge and understanding. Available [here](#).

- **UK Parliament POST (2016) POSTNOTE: Automation and the workforce.** This note describes specific ways in which Robotics and autonomous systems may impact employment and the workforce. They can either take over tasks that have been done by human workers or help human workers to do tasks that cannot be automated. These new technologies will likely create more jobs or change the types of jobs people do, and by implication, change the needed skills. This may drive job losses, and the impact may create inequalities, depending on the demand for certain jobs and certain types of skills. The report also mentions how education and training evolve due to the rate of technological change (which implies the need for up-skilling or re-skilling). Finally, it mentions several suggestions that have been given to address these needs: MOOCs, on-the-job training, and links between businesses and educational institutions to deliver targeted training based on business needs. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Socially assistive robots against health inequalities – reflexive activity

- You are asked to apply your learning towards assessing potential ways in which culturally competent socially assistive robots could reduce health inequalities in their own workplace.
- Please, read the article ‘How to improve cultural competence in health care’ to prepare for the following activity (available [here](#)). Then, think about 1/2 practical examples and share them with other participants by posting your reflections in the discussion area of the social platform for collaborative learning.
- Resources: Online [article](#), word or other writing software/paper and pencil.
- Duration of activity: 15 minutes.

Activity 2: Patient/user rights in care with socially assistive robots

- You are asked to reflect upon and list the key patients/users’ rights that must be respected when receiving care from a SAR.
- Please, read the ‘Aims, Relevant Definitions and Terms’ and ‘What the research says sections’ (see above) to prepare for the following activity. Then, share your ideas with fellow course participants by posting your reflections in the discussion area of the social platform for collaborative learning.
- Resources: Word or other writing software/paper and pencil
- Duration of activity: 10 minutes.

Activity 3: Robots’ rights

- You are asked to reflect upon the debate on whether robots should have rights.
- Please, read the entry on robots’ rights in the ‘What the research says’ section (see above) and run your own quick online research to prepare for the following activity. Then, try to answer the following question: Which kind of robot (tele-operated, artificially intelligent, socially assistive, humanoid, autonomous) do you think should have rights, and why?
- Resources/material needed: Word or other writing software/paper and pencil
- Duration of activity: 10 minutes.

ASSESSMENT COMPONENT

Assessment Activities

Activity 1: Open questions

- You are asked to complete four open sentences around patients' rights when receiving care from socially assistive robots, potential inequalities, and the benefits of introducing SARs in the health and social care sector.
- Resources needed: Word or other software for writing, or paper and pencil.
- Duration of activity: 5 minutes.

Four open sentences

1. The rights of the patients when receiving care from a socially assistive robot can be encapsulated with the following three words:

(example of solution hidden to participants: awareness, consent, personal data protection)

2. One way to reduce the potential impact of artificial intelligence and robotics on widening health inequalities is to

(example of solution hidden to participants: make robots culturally competent and compassionate, and accessible in low and middle income countries)

3. With the care of socially assistive robots, patients could

(example of solution hidden to participants: become more independent, receive assistance with daily activities, enjoy comfort, distractions, entertainment and education, have company in lonely living). However, regulations are essential to safeguard patients' rights.

4. are some of the actors which must be involved in defining the ethics and policies in the use of socially assistive robots caring for patients.

(example of solution hidden to participants: providers and institutions that deploy care robots, manufacturers of and government agencies, patients' lobbies)

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/LT6PNWC>

Module 4 - TRN CULTURAL COMPETENCE, Learning Unit 4.4 The ADORE approach/model

Irena Papadopoulou, Middlesex University

THEORETICAL COMPONENT

Principles and Values

When developing models, frameworks, AI platforms, robotic devices, and systems, it is imperative that the developers adhere to values and principles underpinned by universal ethical codes and specific ethical codes referring to AI and robotics so that their developments benefit humanity and the environment. One of the key driving forces in any development is that of culture. This is most important in the field of health and caring sciences that this MOOC is based on.

The general principles and values for IENE 10 are those associated with culturally competent and compassionate care (see definition below). More specifically, the values and principles of this LU are:

- active listening
- care/caring
- communication
- compassion
- diversity
- valuing a person's cultural background/ identity
- dignity
- learning

This LU is also founded upon the values and principles of transcultural robotic nursing, which include:

- open mindedness
- genuine curiosity
- innovation
- change

Aims

- This module aims to enhance participants' knowledge about the practical skills, safety precautions, rights, and inequalities of patient/client, and the ADORE approach/model in relation to implementing SARs in health and social care settings.
- The specific aim of this LU is to understand the ADORE approach/model and its core principles.

Learning outcomes

When you have worked through this learning unit, you will:

- Have an overview and rationale behind the ADORE approach/model.
- Gain an understanding of the principles of ADORE approach/model.
- Appreciate the ADORE approach/model and its impact on transcultural robotic nursing.

Relevant definitions and terms

The ADORE model/approach. Developed by Professor Irena Papadopoulou during the [CARESSES](#) project (2017-2020), the ADORE acronym stands for Assess, Do, Observe, Revise and Evaluate. The ADORE

model/approach helps the robot to understand the cultural aspects and importance of the humans' actions, processes and decisions, all of which are essential to transcultural robotic nursing. The robot can use ADORE steps to make its cultural assessment (A), act on it (D), observe the results (O), if needed revise its actions (R) and then evaluate the outcome (E). ([Papadopoulos et al., 2022](#))

Culturally competent compassion. The human quality of understanding the suffering of others and wanting to do something about it using culturally appropriate and acceptable nursing interventions. This takes into consideration both the patients' and the carers' cultural backgrounds as well as the context in which care is given ([Papadopoulos, 2011](#))

Culturally Competent Socially Assistive Robots. This term refers to AI-based, autonomous, often humanoid, socially assistive robots that are programmed with cultural knowledge in relation to specific cultures, so to be able to interact in a culturally sensitive way with users as well as acquire increasing information about users' culture as they interact with them. Culturally competent socially assistive robots are not currently in use yet.

Cultural Robotic Knowledge. Culturally knowledgeable socially assistive robots combine concepts, principles, values, theories, practices, behaviours, and properties from a number of disciplines such as computer sciences, robotic engineering, anthropology, sociology, psychology, caring sciences, and cultural studies, to enable robots to perform task and communicate with humans in culturally appropriate ways ([Papadopoulos I. & Sgorbissa A., 2021](#)).

Cultural trigger theory. This theory is closely related to the ADORE model/approach. [Papadopoulos \(2018\)](#) expanded the notion attributed to [Hall \(1976\)](#) who used the metaphor of an iceberg to explain culture. He suggested that only 5-10% of a person's culture is visible in the part of the iceberg which is above the waterline, while 90-95% remains invisible below the iceberg's waterline. Cultural values, perceptions, attitudes, etc., which are the powerful drivers of our culture, are invisible to others and ourselves as they are located under the waterline. [Papadopoulos \(2018\)](#) posited that the subconscious and invisible components of our culture can float to the top of the iceberg if they are triggered, and manifest themselves as cultural behaviours. Events, humans, and robots can trigger these behaviours which they can then observe and react to. In this way, a robot can use the ADORE approach to make its assessment, act on it, observe the results, if needed revise its actions, and then evaluate the outcome.

Non-verbal Communication. The complex set of ways in which we communicate in forms different from our actual language. Non-verbal communication largely consists in our body language, such as postures, facial expressions, eye gaze, gestures, proxemics, haptics, appearance. Non-verbal communication can however also include paralinguistics (i.e., vocal communication separated from actual languages, such as voice volume, pitch, intonation etc.) and symbolic communications, with objects and images.

Proxemics. The study of personal space and physical distance between individuals in social interactions and situations. In human-robot interactions, the robot proxemics behaviour refers to its capacity to follow users' socio-cultural norms in establishing appropriate physical and psychological distancing. This capacity is central for the robot to better integrate into the human physical and social environment. Proxemics is a form of non-verbal communication.

Socially Assistive Humanoid Robot: Robots embodied as humans, programmed to interact with users through engaging in social interaction, with the involvement of gestures, speech, emotional expression, and other actions. Socially assistive humanoid robots are Socially Assistive Robots which in addition adopt the appearance of humans. Anthropomorphic robots and androids are robots with an enhanced, sometimes very realistic, human-likeness.

What the research says

- **Papadopoulos, I. (2018). Culturally Competent Compassion. Routledge.** A very useful and accessible book that brings together crucially important topics of cultural competence and compassion for the first time. The book defines 'culturally competent compassion' as the ability to understand the suffering of others and wanting to do something about it using culturally appropriate and acceptable

caring interventions. It also explores how to practise culturally competent compassion in healthcare settings. Available [here](#).

- **CARESSES project website, in particular the project research outputs.** Available [here](#). Below, a selection of 2 articles stemming from this project is provided.
 - **Bruno, B., Chong, N. Y., Kamide, H., Kanoria, S., J. Lee, Lim, Y., Pandey, A. K., Papadopoulos, C., Papadopoulos, I., Pecora, F., Saffiotti, A. and Sgorbissa, A. (2017) Paving the way for culturally competent robots: a position paper, RO-MAN 2017, Lisbon.** Cultural competence is a well-known requirement for effective healthcare, widely investigated in the nursing literature. This paper claims that personal assistive robots should likewise be culturally competent, aware of general cultural characteristics and the different forms they take in different individuals, and sensitive to cultural differences while perceiving, reasoning, and acting. Drawing inspiration from existing guidelines for culturally competent healthcare and the state-of-the-art in culturally competent robotics, the authors identify the key robot capabilities which enable culturally competent behaviours and discuss methodologies for their development and evaluation. Available [here](#).
 - **Bruno, B., Recchiuto, C., Papadopoulos, I., Saffiotti, A., Koulouglioti, C., Menicatti, R., F. Mastrogiovanni, F., Zaccaria, R., Sgorbissa A. (2019) Knowledge Representation for Culturally Competent Personal Robots – Requirement, design principles, implementation, and assessment, *International Journal of Social Robotics*, 11(3), pp. 515-538.** Culture, intended as the set of beliefs, values, ideas, language, norms, and customs which compose a person's life, is an essential element to know by any robot for personal assistance. Culture, intended as that person's background, can be an invaluable source of information to drive and speed up the process of discovering and adapting to the person's habits, preferences, and needs. This article discusses the requirements posed by cultural competence on the knowledge management system of a robot. Available [here](#).
- **Hanley J. (undated) Beyond the tip of the iceberg: Five Stages toward Cultural Competence.** Understanding the cultures of those we serve requires more than words and good intentions. The journey toward cultural competence requires the willingness to learn from one's experiences and act. This article explains the cultural iceberg theory as well as the steps needed for the development of cultural competence. Available [here](#).
- **Iceberg Model of Culture by Edward T Hall (2017).** This is an informative YouTube short video (1.12 mins) clearly and concisely explaining the cultural iceberg theory. Available [here](#).
- **Papadopoulos I., and Koulouglioti C. (2022). From stories to scenarios and guidelines for the programming of culturally competent, socially assistive robots, in *Transcultural Artificial Intelligence And Robotics In Health And Social Care Book* authors: I. Papadopoulos, C. Koulouglioti, C. Papadopoulos, A. Sgorbissa. Publisher: Elsevier (available in 2022).** This chapter describes in detail the processes involved in the development of theories and tools which were used to collect and analyse data to help the production of and evaluation of the interim and final guidelines. The chapter introduces the ADORE model, which enables the robot to capture culture-specific information about the user, thus avoiding stereotypical culture-generic information. The Cultural Iceberg Trigger theory is also introduced and explained. This theory enables the researchers to explore and capture the enactment of behaviours that represent the human subconscious cultural values, beliefs, and perceptions. Both theories were used to develop tools for data collection and analysis of an observational study which is discussed in this chapter. Available [here](#).

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

As the ADORE model/approach was developed to enable the use of robots in a specific project, there are no European or international treaties and conventions written about it. Specifically, ADORE aims to enhance the

quality of life for older people and help them retain as much independence as possible. However, the aim of the ADORE is compatible with many guidelines and policies the participants would have come across in the previous learning units. For example, the following principles adopted by ADORE are either explicit or implicit in them: (1) technology shall take into account cultural diversity, (2) technology shall be equally accessible to people from different cultures, (3) stereotyping shall be avoided in AI and robotic developments.

German Ethics Council (2020). Robotics for Good Care: Opinion. Berlin. A recent publication from the German Ethics Council also refers to these and other principles, and it is worth reading by participants who have the time and wish to expand their knowledge. Available [here](#).

PRACTICAL COMPONENT

Learning Activities

Activity 1: Mrs Khan's headache

- Please, read the following dialogue between a robot and Mrs Khan, an older woman who lives alone. She has one son and a daughter who are married but live in another town. Then answer the questions which are after the dialogue.

ROBOT: Mrs Khan, you are very quiet today, can I play some cheerful Pakistani songs for you?

MRS KHAN: No thank you, I am quiet because I have a bad headache.

ROBOT: You have a headache. I will bring you some water so you can take a headache tablet.

MRS KHAN: Thank you. You are very helpful.

ROBOT: I will ask you if your headache is better in half an hour.

MRS KHAN: I hope you are right. I will let you know.

- Questions:
 - What was the robot trying to do in the above dialogue?
 - What stages of the ADORE model did the robot use during the dialogue?
- Resource needed. Word or similar writing software, or paper and pencil.
- Duration of activity: 10 minutes.

Activity 2: The importance of accurate assessment of a person's culture

- Based on the learning you have acquired during this course, prepare a reflective account of 500 words about the importance for the robot to make an accurate cultural assessment for the person it has been assigned to.
- Post your reflective account on the discussion board of the social platform for collaborative learning for others to read and discuss/comment.
- Read someone else's reflective account for this activity and offer constructive comments and suggestions.
- Resource needed: Word or similar writing software, or paper and pencil; social platform for collaborative learning.
- Duration of activity: 15 minutes.

ASSESSMENT COMPONENT

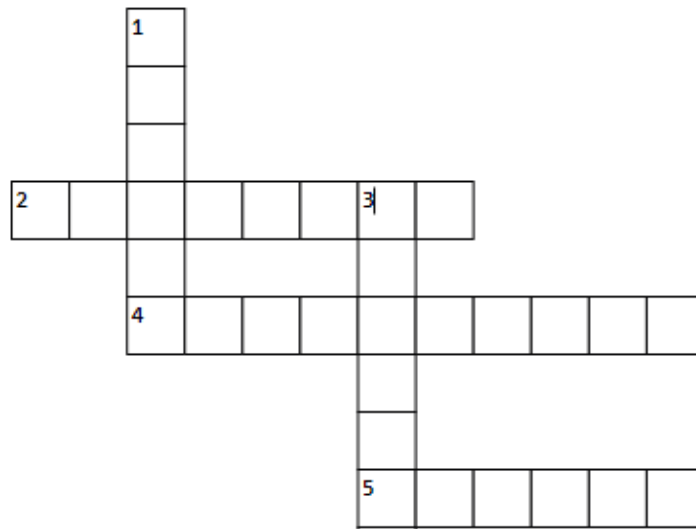
Assessment Activities

Activity 1. Mrs Khan's has a headache again.

- Answer the following questions based on the dialogue 'Mrs Khan's headache'.
 - What ADORE steps has the robot adopted?
 - How did the robot demonstrate culturally appropriate actions?
 - Suggest a sentence or a question the robot could use to show more awareness of Mrs Khan's culture.
 - What principles and values associated with this learning unit has the robot used during its encounter with Mrs Khan?
- Resources needed: Word or similar writing software, or paper and pencil.
- Duration of activity: 5 minutes.

Activity 2: Crossword

- Complete the crossword puzzle about the ADORE model (available [here](#)).



Across

- 2.** The ADORE model helps us collect culture-generic and culture ----- data
- 4.** What does the ADORE model help us NOT to do?
- 5.** What is the 4th step in the ADORE model?

Down

- 1.** Which is the first step in the ADORE model?
- 3.** Which metaphor has culture been likened to?

- To help you complete the puzzle, a list of words is provided here to choose the one that applies to each question above. Not all the words are correct!
 - Evaluate
 - Assess
 - Specific
 - Reviewing
 - Stereotype
 - Trigger
 - Revise
 - Iceberg
 - Customs
- Resource needed: [CrosswordLabs](#), a tool for online crossword puzzles.
- Duration of activity: 5 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/LMD5MW3>

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