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), control systems, size, design, etc. (Dobra, 2014)*. Whatever their application field and capabilities, robots are typically used for replacing the human component to complete a specific task (Syriopoulou-Delli & Gkiolnta, 2020). The origin of the word robot comes from the Czech word "robota" meaning forced labor (Murphy, 2000).

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

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 (SAMI).** 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: Drag and drop to complete the text.

- Go to the following address and play the short 'drag and drop' quiz.
- Resources needed: GoConqr, a tool for online Questionnaires; social platform for collaborative learning.
- Post your results on the 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/L9LLL9V